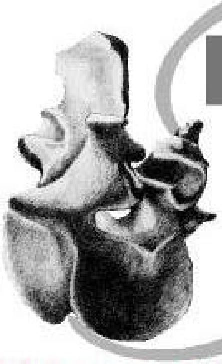

EWVP
6th

VI European Workshop on Vertebrate Palaeontology

2001
September 19-22
Florence - Montevarchi

The University of Florence, Italy

Earth Sciences Department
Museum of Natural History (Section of Geology and Palaeontology)
Cultural Association Tethys
Palaeontologic Museum of Accademia Valdarnese del Poggio

Abstract volume

The organizing team welcomes the participants in the 6th European Workshop of Vertebrate Paleontology in Florence and expresses its deepest thanks to the many colleagues that enthusiastically answered to our call making this issue possible. The organizers hope the participants will find Florence not only that jewel-case of art celebrated all over the world, but also an appropriate place for discussing crumbled fossil bones.

May the meeting come up to everybody's best expectations!

The 6th European Workshop on Vertebrate Paleontology has been made possible, thanks to the support and collaboration obtained from the Tethys Cultural Association, the Section of Geology and Paleontology of the Museum of Natural History of Florence, the Department of Earth Sciences of Florence and the Museum of Plaeontology of the Accademia Valdarnese del Poggio of Montevarchi.

The organizers would like to thank the administration of the Section of Geology and Paleontology of the Museum of Natural History of Florence and the Accademia Valdarnese del Poggio for granting their facilities, and all the volunteers for their generous donation of time and talent. Without their dedication and tireless efforts, this issue would have been impossible.

Special thanks are due to Maria Cristina Andreani, manager of the display department of the Section of Geology and Paleontology of the Museum of Natural History of Florence, for her assistance and for creating the logo and producing the panels of explanation of the evolution of the Upper Valdarno.

The organizers are also grateful to the Comune of Montevarchi for offering the conference lunch and to Tiziana Vitali for arranging the tea party.

The organizing team was formed by:
Laura Abbazzi, Giulia Bebi, Massimo Delfino, Flaviano Fanfani, Marco Ferretti, Paul Mazza, Lorenzo Rook, Michele Sani, Giuseppe Tito.

The organizers are deeply indebted to Eberhard "Dino" Frey for indicating the Section of Geology and Paleontology of the Museum of Natural History of Florence as the host for the 6th edition of the European Workshop on Vertebrate Paleontology and also for his indispensable hints for the organization of the meeting.

The Programme

	Wednesday 19.09
8.00 -10.00	**ARRIVAL AND REGISTRATION**
10.00 -10.20	**WELCOME** by D. TORRE and P. MAZZA
10.20 - 11.20	**GUIDED VISIT TO THE MUSEUM**: Highlights on the evolutionary history of the vertebrate fauna from Italy
11.20 - 11.40	**BREAK**
11.40 - 12.00	FREY Eberhard*, BUCHY Marie-Céline & STINNESBECK Wolfgang - Dinosaurs, marine reptiles and a scorpion in the kitchen
12.00 - 12.20	BILLON-BRUYAT Jean-Paul*, MAZIN Jean-Michel, BUFFETAUT Eric, TONG Haiyan & ABIT Dominique - New occurrence of vertebrate remains in the latest Jurassic of western France (Oléron island, Charente-Maritime)
12.20 - 12.40	ABBAZZI Laura - Large sized deer of the *Megaceroides* genus in Italy: an overview
12.40 - 14.00	**LUNCH BREAK**
14.00 - 15.00	**1ST POSTER SESSION**
15.00 - 15.20	CSIKI Zoltan* & GRIGORESCU Dan - Fossil mammals from the Maastrichtian of the Hateg Basin, Romania
15.20 - 15.40	BARDET Nathalie*, PEREDA SUBERBIOLA Xabier, IAROCHÈNE Mohamed & OCP - The basal mosasaurid *Halisaurus* from the latest Cretaceous phosphates of Morocco
15.40 - 16.00	FREY Eberhard*, BUCHY Marie-Céline & STINNESBECK Wolfgang - The monster of Aramberri and friends: New finds of marine reptiles in the Mesozoic of northeastern Mexico
16.00 – 16.20	**BREAK**
16.20 - 16.40	AUMONT Adeline - Biochronological implications of Paris Basin Paromomyidae (Plesiadapiformes, Mammalia – Early to Middle Eocene, France)
16.40 - 17.00	MEYER Christian A.*, WEH Markus, GRAF Kaspar, BUCHER Stefan, THÜRING Basil & BOLL Samuel - The first Cretaceous dinosaur tracks from the Swiss Helvetic Realm
17.00 - 17.20	SIGNORE Marco*, DE VITA Sara, JULIANO Clelia, LA MAGNA Giovanni, TORRE Silvio, ZAMPONI Renato - New Excavations in Pietraroja (Benevento, Southern Italy): preliminary results
17.20 - 17.40	SIGNORE Marco*, BARBERA Carmela, DE VITA Sara, LA MAGNA Giovanni - Tetrapod Fauna of Pietraroja Plattenkalk (Benevento, Southern Italy)
17.40 - 18.00	BUFFETAUT Eric*, DELFINO Massimo & PINNA Giovanni - The crocodilians, pterosaurs and dinosaurs from the Campanian-Santonian of Villaggio del Pescatore (northeastern Italy): a preliminary report
18.00 - 19.00	**PLENARY LECTURE** DAL SASSO Cristiano - Update on Italian dinosaurs
	Thursday 20.09
9.00 -10.00	**PLENARY LECTURE** OXNARD Charles - Reconstruction of phylogenies of human origins
10.00 -10.20	PRAT Sandrine - New considerations about the taxonomy of early *Homo*
10.20 - 10.40	MACCHIARELLI Roberto*, ROOK Lorenzo, BONDIOLI Luca - Architectural variation of the iliac trabecular structure in extant and fossil primates, including *Homo*. Presentation of an atlas of electronically processed radiographic images
10.40 - 11.00	SCHERF Heike* and SCHRENK Friedemann - Microcomputertomographic investigation of the femoral trabecular architecture on different Primates and Insectivores
11.00 - 11.20	**BREAK**
11.20 - 11.40	SIGNORE Marco - Palaeobiology of theropod dinosaurs (Dinosauria, Saurischia): a work in progress
11.40 - 12.00	FREY Eberhard* & BUCHY Marie-Céline - A croc-like pelvis and a bird-like chest, a hypothesis for the pterosaur breathing mechanism
12.00 - 12.20	KRÖNER Mathias - The Cutis of the Ichthyosaurs
12.20 - 12.30	**GENERAL ANNOUNCEMENTS**
12.30 - 14.00	**LUNCH BREAK**
14.00 - 14.30	**2ND POSTER SESSION**
14.30 – 14.50	O'HIGGINS Paul*, ROOK Lorenzo, BONDIOLI Luca, & MACCHIARELLI Roberto - Geometric morphometric methods and their applications to the studies of fossils
14.50 - 15.10	FERRETTI Marco P. - Enamel structure and proboscideans systematics: an overview
15.10 - 15.30	CAMERON David W. -Phylogenetics and Species Adaptation
15.30 -16.00	**BREAK**
16.00	**TRANSFER TO "LA SPECOLA" ZOOLOGICAL MUSEUM (OPTIONAL)**
17.00 - 18.30	**1ST WORKSHOP:** Paleontology, school children and the public Conveners: FANFANI Flaviano & SARDELLA Raffaele BEBI Giulia & CIOPPI Elisabetta*: School and Museum: more and more together COSTA Gian Paolo* & SAMI Marco: Has no future who has no past: Palaeontology for interpreting remote past during scholar age GENTILI Sergio*, BARILI Angelo & MESCHINI Pierluigi: The Mine of Marvels: loving to understand and understanding to love (emotions and knowledge!)

	Friday 21.09
7.30 -8.00	**CHECK IN FOR THE EXCURSION. DEPARTURE AT 8 O'CLOCK**
8.00 -12.30	**EXCURSION IN UPPER VALDARNO**
12.30 - 13.00	**ARRIVAL AND WELCOME TO MONTEVARCHI . VISIT TO THE MUSEUM OF PALAEONTOLOGY OF THE ACCADEMIA VALDARNESE DEL POGGIO**
13.00 - 15.00	**CONFERENCE LUNCH AND FREE SIGHT-SEEING OF MONTEVARCHI'S HISTORICAL CENTER**
15.00 - 16.00	**PLENARY LECTURE** MAZZA Paul - Vertebrate Taphonomy
16.00 - 17.30	**2ND WORKSHOP**: Taphonomy of vertebrate sites Convener: MAZZA Paul MAZZA P. & VITALI T.: two examples from the Upper Valdarno MARRA Antonella C. & BONFIGLIO Laura: Consumption by cave spotted hyena on remains of insular large mammals
17.30 - 18.00	**TEA PARTY**
18.00	**DEPARTURE TO FLORENCE. ARRIVAL TO FLORENCE CENTER AROUND 19.00**
	Saturday 22.09
9.00 - 9.50	**3RD POSTER SESSION**
9.50 -10.00	**6EWVP PARTICIPANTS PHOTO TAKE**
10.00 -11.00	**3rd workshop:** Palaeogeography, endemisms, and vertebrate evolution Conveners: MASINI Federico & PALOMBO Maria R. MASINI Federico: Vertebrate assemblages of central-western Mediterranean islands during the Pliocene and Quaternary: reflecting on extinction events PALOMBO Maria R. : Dwarfing in insular mammals: the case of endemic elephants of Mediterranean islands
11.00 - 11.20	**BREAK**
11.20 - 12.20	**3RD WORKSHOP CONTINUED**
12.20 - 13.00	**FINAL DISCUSSION**

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Abstracts

Large sized deer of the *Megaceroides* genus in Italy: an overview

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The large sized deer referred to genus *Megaceroides* Robert (= *Praemegaceros* Portis, *Megaloceros p.p.* Brookes) are important faunal elements in the European Mammal assemblages since the upper part of the early Pleistocene (late Villafranchian Mammal Age, Farneta faunal unit) and during the early and middle part of the Middle Pleistocene (Galerian Mammal Age). Species referred to this genus, namely *M. obscurus* Azzaroli, *M. verticornis* Dawkins, *M. dawkinsi* Newton and *M. solilhacus* Robert, are so closely related, that some authors refer them to the so-called *verticornis* group, *M. verticornis* being the best known and commonest species in Europe.

In the Italian peninsula, excluding therefore the endemic forms of islands (e.g. *M. cretensis*), the *Megaceroides* genus is represented by three species: *M. obscurus*, *M. verticornis* and *M. solilhacus*.

M. obscurus represents the most primitive and older species of the genus. It is documented in the early Pleistocene localities of Central Italy referred to the Farneta f.u. of the Late Villafranchian. *M. obscurus* gives rise during the end of the Early Pleistocene to *M. verticornis*. The diffusion of the latter species represent an important bioevent in Italy on which is based the definition of the beginning of the Galerian Mammal Age. It in fact occurs at Colle Curti, type locality of the Early Galerian.

M. solilhacus is documented in the Italian localities referred to the Middle and Late Galerian, and the most significant sample of this species comes from the locality Isernia La Pineta (Southern Italy). *M. solilhacus* belongs to a lineage distinct from, though closely related to, that of *M. obscurus*-*M. verticornis*.

Genus *Megaceroides* disappears from Italy before the end of the Middle Pleistocene, as the younger findings dating to the late Galerian, suggest.

The Santonian-Campanian Succession of the Villaggio del Pescatore (Trieste Karst) yielding the hadrosaur: Palaeoecology, Stratigraphy, Sedimentology and Geochemistry

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The Villaggio del Pescatore area (Duino-Aurisina) is well known for the recent finding of remains of hadrosaurs, crocodiles, fishes, plants, etc., within a stratigraphic succession consisting of dark-gray to gray limestones, rudist limestones, biocalcarenites and breccia. The fossil remains are mostly hosted within the lithosome made of laminites, which are embedded in thick breccia beds. In the quarry opened for the recovering of the bones, the detailed stratigraphic succession, fom the bottom to the top, consists of:

- bioclastic peloidal packstone;
- 6.5 m thick level of breccia mainly consisting of fossiliferous mud supported clasts up to 10 cm in size characterized, at the top, by kerogen-filled fracture
- 50 cm thick level of bioclastic packstone with miliolids and desiccation structures at the top, sometimes with a network of fractures filled by kerogen;
- 7 m thick body with laminites made by mm-thick laminae of dark mudstone and white wackestone, locally alternating with very thin packstone and rudstone levels and, seldom, by some cm thick turbidites;
- 3 m thick upper breccia body representing a coarsening and thickening upward sequence constituted by two parts bounded by an unconformity surface: the lower part consists of cm-dm sized monogenic plasticlasts floating in a matrix made by deformed laminites, and an upper part consisting of polygenic lithoclasts derived from the dismantling of a pre-existing carbonate platform;
- floatstone with rudists.

From the biostratigraphic point of view, the succession can be ascribed to Santonian-Campanian. Actually, the palynological investigations have revealed the presence of abundant organic matter consisting of unstructured sheets, multicellulars filaments and spores of algae or fungi in its basal part. Within the scarce pollen content, the finding of Papillopollis aradaensis Kedves & Pittau, 1979 indicates a Santonian-Campanian age. Moreover, the finding of the foraminifer Keramosphaerina tergestina (Stache, 1889) near the top of the succession indicates a Santonian-Campanian age. Such data may allow the attribution of the hadrosaur “Antonio” to the Santonian-Campanian.

The laminitic body yielding dinosaur skeleton is characterized by a wide range of intraformational deformations (slumps, load structures) that can be referred to a noticeable instability of the bottoms due to their overall dipping towards south and to a synsedimentary tectonics. Taking in account the lacking of clear emersion evidences and the presence of gravity driven deposits a relatively deep environment may be inferred; as a working hypotesis we speculate that laminites represent the infilling of a narrow trough related to a synsedimentary tectonics opened inside a supratidal environment of the carbonate platform and influenced by fresh water and marine influx, as demonstrated by the carbon and oxygen stable isotope analyses.

Biochronological implications of Paris Basin Paromomyidae (Plesiadapiformes, Mammalia – Early to Middle Eocene, France)

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The chronological succession of the mammalian faunas from the Paleogene of Europe has received a formal framework at the International Symposium on Biostratigraphy and Paleoecology of the European Paleogene, held in Mainz in 1987 (Schmidt-Kittler, 1987) and updated at the BiochroM'97 congress in Montpellier in 1997 (Aguilar *et al.*, 1997).

The reference levels were created based on the evolutionary lineages of some mammals and on the mammalian species FADs and LADs (First Apparition Datum and Last Apparition Datum). This is the first step to an integrated continental biostratigraphy of Europe. However, problems still exist on the age of some localities as their positions are under discussion. Many Paris Basin localities are not easy to place on the stratigraphic scale : all are isolated from each other and many of them are not very rich in their fossil assemblages.

The study of paromomyids can give us some keys to resolve that kind of stratigraphic problems. Eocene paromomyids of the Paris Basin were described as two species: *Arcius fuscus* and *A. lapparenti* (Russell *et al.*, 1967). But the morphological and biometrical analyses based on more abundant material lead to the conclusion that these species are probably not valid. It appears that *A. fuscus* et *A. lapparenti* are synonyms, and that one other new species must be described (Aumont, in progress). One of them ('big' species) shows morphological and biometrical variations from MP7 to MP13, while the other ('small' species) is only known in faunas close to MP8+9.

These variations in form and biometry and the presence of one or two of the paromomyid species can be used to phenetically group the localities. The result is congruent with most previous successions :

- Mutigny appears to be probably older than Avenay, the latter being older than Condé-en-Brie (MP8+9) ;
- Meudon seems older than Pourcy (MP7) ;
- the last specimens of the Paromomyidae family occur at Bouxwiller close to MP13.

This method will be applied in the southern part of Europe where many stratigraphic problems remain to be resolved (stratigraphic positions of the localities, stratigraphic correlations between southern and northern parts of Europe). The presence in the South of paromomyid species already known in the Paris Basin could help resolving these problems.

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Russell, D. E., P. Louis, & D. E. Savage. 1967. University of California, Publications in Geological Sciences, 73:1-52.
Schmidt-Kittler, N. 1987. Münch. Geowissensch. Abh. (A), Munich, 312 p.

The basal mosasaurid *Halisaurus* from the latest Cretaceous phosphates of Morocco

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Since Arambourg (1952), no study of the marine reptiles from the latest Cretaceous (Maastrichtian) phosphates of Morocco has been made. Based on isolated teeth, Arambourg recognised four species of mosasaurs, among which two were new.

Due to palaeontological field works undertaken since 1997 as part of an active collaboration CNRS-OCP-MEM, several marine reptile skeletons, especially of mosasaurs, have been recovered from the phosphatic deposits of the Oulad Abdoun Basin of Morocco. Most of the mosasaur material comes from the northeastern part of the basin, northern part of the Grand Daoui zone, Sidi Daoui area, an actively quarried area for phosphate. This area is very rich in marine vertebrate fossils, especially selachians, actinopterygians, mosasaurids, elasmosaurids and turtles. Stratigraphically, the specimens occur in the upper part of the "bed 3" of the miners, which is Late Maastrichtian in age according to selachian data. As a result of the excavations, a number of partial to relatively complete skeletons, including skull, vertebrae, limb and girdle bones, of a small mosasaurid (3-4 m long) have been unearthed. These remains belong to a new species of the basal mosasaurid *Halisaurus*, a taxon never mentioned by Arambourg in the phosphates of Morocco (Bardet et al. in prep). *Halisaurus* has a highly kinetic skull (length about 30-40 cm) which explains why the cranial bones are often found disarticulated. Several *Halisaurus* diagnostic characters are present on the prefrontal, frontal, parietal, quadrate and cervical vertebrae (see Holmes & Sues 2000, Bardet & Pereda Suberbiola 2001). The Moroccan *Halisaurus* species differs from *H. platyspondylus* (type species) from the Late Maastrichtian of New-Jersey and Maryland (Holmes & Sues 2000), *H. ortliebi* from the Late Maastrichtian of Belgium (Lingham-Soliar 1996) and *H. sternbergii* from the Santonian of Kansas (Bardet & Pereda Suberbiola 2001) by several important cranial characters. The limb and girdle bones appear to be different from those of *H. sternbergii*, the only *Halisaurus* species in which appendicular material was known until now.

The teeth of the new *Halisaurus* species are highly diagnostic. This is the first time that teeth of *Halisaurus* are described. Similar teeth are known in the lower and upper "bed 3" of the Oulad Abdoun Basin, as well as in the Maastrichtian phosphates of the Ganntour Basin (Morocco), and of other basins of the Africo-Arabian Plate (Syria, Jordan and possibly Negev and Angola).

Besides *Halisaurus* nov. sp., mosasaurs are represented in the Maastrichtian phosphates of Morocco by at least five other species, namely *Mosasaurus beaugei*, *Platecarpus ptychodon*, *Leiodon anceps*, *Globidens* sp. and *Prognathodon* sp.

Arambourg C. 1952. Notes et Mémoires Serv. Géol. Maroc 92: 1-372.
Bardet N. & Pereda Suberbiola X. 2001. C. R. Acad. Sci. Paris 332: 395-402.
Holmes R.B. & Sues H.D. 2000. J. Paleont. 74: 309-316.
Lingham-Soliar T. 1996. Bull. Inst. Roy. Sci. Nat. Belgique 66: 129-136.

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School and Museum: more and more together

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The didactic activity carried out in the Geological and Paleontological Section of the Natural History Museum of Florence, with the support of the Cultural Association Tethys, consists of a variety of proposals addressed to students of every age and to teachers. Besides providing the classical guided tours a museum has to give the opportunity to interested classes to develop educational programs, centrally concerned with learning from objects and specimens. Teachers may need support in planning the work with their class and can find some replies in lessons, courses, field trip organised by the museum itself. Primary-school children are the most popular in our museum, even if also very young children (3-5 years) can find a very attractive beginning of a long process of training. Reaching older students (14-18 yrs) is one of the greatest problem in many museums. We try to attract them with some different approaches: begin the visit from outside the museum, going at first in the field to learn from the natural lab and then, at the museum, to discover the *raison d'être* of a natural history museum.

Scuola e museo: sempre più insieme

L'attività didattica svolta presso la Sezione di Geologia e Paleontologia del Museo di Storia Naturale di Firenze, in collaborazione con l'Associazione Culturale Tethys, consiste in una varietà di proposte rivolte a studenti di ogni età e insegnanti. Oltre alle classiche visite guidate, un museo deve fornire alle classi interessate l'opportunità di sviluppare programmi educativi principalmente riferiti all'apprendimento dagli oggetti e dai campioni conservati. Gli insegnanti possono aver bisogno di un supporto nel programmare il lavoro con la classe e possono trovare delle risposte in seminari, corsi ed escursioni organizzate dal museo stesso. Gli studenti delle elementari sono tra i più popolari nel nostro museo, anche se quelli delle materne (3-5 anni) possono trovare un inizio molto attraente per il loro percorso formativo. Raggiungere gli studenti più grandi (14-18 anni) rimane uno dei più annosi problemi in molti musei. Una nostra proposta è quella di attrarli con un approccio di tipo differente: iniziare la visita dall'esterno, con escursioni sul terreno per imparare direttamente dal laboratorio-natura e poi, in museo, venire a scoprire la ragion d'essere di un museo di storia naturale.

Studies on the Miocene toothed whale fauna from the Pietra leccese (South Italy): the state of the art

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A new framework of the Miocene toothed whale (Odontoceti; Cetacea) fossil fauna from the "Pietra leccese" sediments (South Italy) is proposed on the basis of the review of the historical collections and of the examine of new specimens collected in the last twenty years and previously only partially studied and published by the authors (Bianucci et al. 1992; 1994a,b; Bianucci, 2001; Bianucci & Varola, 1995)

On the whole the Pietra leccese odontocete fauna is relatively primitive considering that four families and all genera are extinct today, and considering that, as in all the Miocene Mediterranean, the modern delphinoid are not present. The seven families and at lest 16 genera recognised show a diversity similar to that of Chesapeake Group (North Eastern America) that covers a similar time interval. Nevertheless there are substantial differences at generic level among the two fauna and some endemic taxa characterise the Pietra leccese association. These data confirms, in any case, a certain degree of interchange between the Mediterranean and the North Atlantic cetacean fauna during the Miocene, as already pointed out by the authors (Bianucci et al., 1994a).

Bianucci G., 2001- J. Vert. Pal., 21(3): 573-577.
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Bianucci G., Landini W. & Varola A. 1994a - Boll. Soc. Pal. It., 33: 215-230.
Bianucci G., Landini W. & Varola A. 1994b - Boll. Soc. Pal. It., 33: 231-242.
Bianucci G. & Varola A. 1995 - Soc. Tosc. Sci. Nat., ser. A, 101: 1-13.

Systematic list of the Odontoceti from the Pietra Leccese.

Family EURHINODELPHINIDAE	*Eurhinodelphis cristatus*
	Eurhinodelphis sp.
	?*Argyrocetus salentinus*
	?*Argyrocetus* sp.
	Schizodelphis sp
	?*Schizodelphis longirostris*
Family KENTRIODONTIDAE	*Rudicetus squalodontoides*
	?*Lamprolitax* sp.
	Kentriodontidae indet. 1
	Kentriodontidae indet. 2
	Kentriodontidae indet. 3
Family INIIDAE	*Hesperoinia dalpiazi*
Family PHYSETERIDAE	*Orycterocetus* sp.
	“*Scaldicetus*” *mortselensis*
	Hoplocetinae indet. 1
	Hoplocetinae indet. 2
Family SQUALODELPHINIDAE	?*Notocetus* sp
Family SQUALODONTIDAE	*Squalodon* sp.
Family ZIPHIIDAE	*Messapicetus longirostris*

New occurrence of vertebrate remains in the latest Jurassic of western France (Oléron island, Charente-Maritime)

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Vertebrate remains are reported from the Tithonian (Late Jurassic) of the Atlantic island of Oléron (Charente-Maritime, western France). The specimens were discovered at the northwestern tip of the island, more precisely at the locality known as "La pointe de Chassiron". A few vertebrate remains have previously been reported from this area, including a theropod dinosaur footprint (Lapparent & Oulmi 1964) and a turtle skull (*Thalassemys*) with some associated postcranial remains (Rieppel 1980). We report here specimens belonging mainly to the private collection of one of us (D.A.), showing an abundance of marine and continental vertebrates, including sharks, fish, turtles, crocodilians, lepidosaurs, pterosaurs and theropod dinosaurs.

These vertebrate remains were discovered on the intertidal area and along the sea cliff in several marl and calcareous beds, representing a deposition thickness of some 54m. The different beds reveal several faunas in ancient marine and littoral environments, along the coast of the opening Atlantic ocean. It is noteworthy that the marine crocodilian *Steneosaurus* is regularly encountered, with teeth in most fossiliferous beds.

Two beds have revealed an extensive faunal assemblage. One is a bone bed, deposited in a littoral environment, where isolated vertebrate remains are frequent, more or less well preserved, including numerous fish teeth and scales (Semionotiform, Pycnodontiform), turtle limb bones, vertebrae and osteoscutes (Thalassemydidae), crocodilian teeth (*Steneosaurus, Bernissartia*) and jaw fragments (*Steneosaurus*,), and a theropod dinosaur tooth (? *Megalosaurus*). The other bed has yielded few vertebrate remains, always well preserved, belonging to large specimens, including a partial crocodilian skull (*Steneosaurus*), a turtle (Plesiochelyidae) and a lepidosaur dentary.

In two other beds, isolated pterosaur limb bones (including the proximal end of a Pterodactyloidea first flight digit phalanx) indicate the presence of medium to large specimens (1m to 2.5m in wing span).

Another bed has yielded two teeth belonging to the marine crocodilian *Machimosaurus* (Teleosauridae). The presence of *Machimosaurus* along the French Atlantic coast is especially interesting in terms of palaeobiogeography because this genus was previously known only from Portugal in the Tithonian stage (from Hua 1997).

The Oléron island clearly appears as a new Tithonian vertebrate locality. The numerous and diverse remains will improve our knowledge of vertebrate biodiversity and palaeobiogeography, particularly for reptiles, in the latest Jurassic of western Europe.

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Lapparent, A. F. & Oulmi, M. 1964. Une empreinte de pas de Dinosaurien dans le Portlandien de Chassiron (île d'Oléron). C. R. Som. Soc. Géol. Fr.: 232-233

Rieppel, O. 1980. The skull of the Upper Jurassic cryptodire turtle Thalassemys, with a reconsideration of the chelonian braincase. Palaeontographica A 171: 105-140

First occurrence of *Nursallia* sp. (Pycnodontoidei) in marine sediments of the Agua Nueva Formation (Turonian), Vallecillo, NE Mexico and its significance

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Since the first report of the Vallecillo fish assemblage (NE Mexico), the lithographic member of the Agua Nueva Formation has been recognized as low energy environment sediments deposited within an outer part of a shallow shelf during the Turonian (Blanco et al 2001 a and b in press). No evidence of compoud, organogenic reefs as barriers or patches with lagoons or channels has been reported for any location of northeast Mexico during the Cenomanian and the Turonian (Bishop, 1970; Padilla y Sánchez, 1982; Sohl, et al 1991).

In Vallecillo, the fish fauna is represented by lamniform and ptychodontid sharks as well as telosteans such as the Pachycormidae, the Nursallidae, the Ichthyodectoidei, the Dercetidae, the Pachyrhizodontidae, the Enchodontidae, the Tselfatiifae, and the Araripichthydae (Blanco, et al 2001 a and b in press). Of these groups, *Nursallia* sp. is one of the most abundant forms in this locality.

The genus *Nursallia* is characterized by laterally compressed fishes with a skull lacking a fossa supratemporale and a parietale with a well-developed piniculus parietalis. The spleniale and vomer bear teeth with a semi-globular crown which are poorly preserved in the Vallecillo specimens. *Nursallia* can be clearly distinguished from other Pycnodontiformes by the horizontal orientation of the mouth. The dorsalis and caudalis extend over the caudal half of the dorsal and ventral margin of the body respectively. In the caudalis the three hypuralia are subtriangular in outline.

Compared with other Turonian assemblages of America, the Agua Nueva Formation is notable for the occurrence of *Nursallia*, which represents the first record for Cretaceous sediments of North America and for the Turonian of the American continent. The presence of *Nursallia* in outer shelf sediments not only extends the distribution of this genus into the northwestern part of the Tethys Sea, but also indicates that its distribution was not restricted to reef environments only. Also it is likely that *Nursallia* was not exclusively durophagous as suggested by Nursall (1996). That is suggested by the absence of reefs or benthic fauna with hard structures in the sediments of the Agua Nueva Formation at Vallecillo.

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Padilla and Sánchez, R.J. 1982. Geologic Evolution of the Sierra Madre Oriental between Linares, Concepción del Oro, Saltillo y Monterrey, México. Thesis. The University of Texas at Austin, 232p

Sohl, N.F., E. Martínez, P. Salmerón-Urena, and F. Soto-Jaramillo, 1991. In: The Gulf of Mexico Basin. The Geology of North America, Volume J. 205-244p

Biometry of a collection of long bones of cave bear (*Ursus spelaeus* Rosenmüller & Heinroth) from a cave in Lima Valley (Tuscany, central-north Italy)

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Authors present the first data of a biometrical analysis on a collection of long bones of *Ursus spelaeus* Rosenmüller & Heinroth, from a cave in Lima Valley. These have been found together with other parts of skeleton (teeth, skulls, mandibles); this fact can make us sure about the species determination. In particular the bones analysed are: omerus (adults n=20; juveniles n=31; newborns n=12), femur (adults n=23; juveniles n=37; newborns n=9), tibia (adults n=15; juveniles n=30; newborns n=0), fibula (adults n=9; juveniles n=1; newborns n=0), radius (adults n=16; juveniles n=15; newborns n=0) and ulna (adults n=10; juveniles n=29; newborns n=2) for a total of 259 samples. In this paper we have considered only the bones for which it has been possible to take at least one measure (n= 234; 90.3% of total long bones).

Studied material was been found by authors and the other membreships of Naturalistic Group, between 1970 and 1995. The entire collection is composed by about 800 bones referred to individuals aged between newborns and adults. The site, not yet published, is Grotta dei Porci of the Monte Uccelliera (Bagni di Lucca, Lucca), located at 900 metres a.s.l., above the Coccia di Vico torrent, affluent of Lima river. The cave extends for about 120 m in the mesozoic calcareus and is characterized by the presence of cuniculi and medium-size rooms. Bones, covered by a reddish sediment rich of iron oxide, have been found far away the entrance, where were probably transported and chaotically accumulated by water flux.

In this paper the long bone measures are compared with others from a relative near site, Grotta di Equi Terme (De Stefani, 1924; Palma di Cesnola, 1970), for which are available biometrical data (see for example: Fracassi, 1920; Cuggiani, 1981).

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Palma di Cesnola A. (1970). Lav. Soc. It. Biogeografia, Ser. 1.
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The crocodilians, pterosaurs and dinosaurs from the Campanian-Santonian of Villaggio del Pescatore (northeastern Italy): a preliminary report

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Laminated carbonates of Santonian-Campanian age at Villaggio del Pescatore (Duino, Trieste, northeastern Italy) have yielded fairly abundant and well preserved remains of various vertebrates. Besides fishes, the vertebrate assemblage from Villaggio del Pescatore includes crocodilians, dinosaurs and pterosaurs. Since the painstaking and time-consuming preparation of the material by Flavio Bacchia and his team is still under way, and detailed study of the specimens is still in progress, only preliminary observations and conclusions are presented here.

Crocodilians are represented by several specimens, including both isolated elements and at least two partial skeletons. A specimen including a well preserved head and the anterior portion of the trunk is of especial importance. Vertebrae are procoelous. Although it is not yet possible to examine the palate because of unfinished preparation, the broad, short-snouted skull suggests alligatorid affinities.

Pterosaurs are represented only by a single isolated bone, which is clearly a fourth (wing) metacarpal, lacking the middle portion of the shaft. A precise identification is not possible on the basis of such fragmentary material, but the specimen apparently belongs to a middle-sized pterodactyloid pterosaur.

Dinosaurs are represented by at least four individuals. All clearly belong to the family Hadrosauridae, but the exact number of taxa present is uncertain, as some of the specimens have not yet been fully prepared and noticeable size differences are apparent. One nearly complete and exquisitely preserved skeleton (lacking only a few distal caudal vertebrae), slightly over 4 metres in length, has been fully prepared. It is the most complete hadrosaur specimen hitherto found in Europe, and apparently belongs to a new taxon. This hadrosaur shows various primitive features, including relatively narrow premaxillae, strong denticles on the premaxilla and predentary, a rather low number of tooth emplacements, and a very broad condyle on the quadrate. Other features appear to be specialised and possibly autapomorphic; they include a very long jugal bone and very large infratemporal opening, the complete loss of the 5th digit of the manus, a femur that is shorter than the tibia, chevron bones forming a distal "boot", and distal caudal vertebrae that are strongly flattened dorsoventrally. The new hadrosaur resembles the primitive hadrosaur *Telmatosaurus*, from Romania, in some respects, but differs from it in several features, including relatively narrow lower teeth, a dorsally very broad scapula, and a humerus with a relatively strong and angular deltopectoral crest.

The hadrosaurs from Villaggio del Pescatore appear to be significantly older than those found in Romania and western Europe. In southern France, there is no evidence of hadrosaurs before the late Maastrichtian. Although their relationships with other European hadrosaurs are not yet fully understood, the new hadrosaurs are potentially very important for our understanding of hadrosaurian evolution in Europe. More generally, taken together with recent crocodile and dinosaur finds from Slovenia, the vertebrate fauna from Villaggio del Pescatore, coming as it does from the Dinaro-Adriatic carbonate platform, should provide important evidence about the poorly known continental palaeobiogeography of this part of the Tethyan regions in the Late Cretaceous.

Phylogenetics and Species Adaptation

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The fossil record enables us to propose a number of likely adaptive alterations within and between specific groups, based on fossilised morphology and our understanding of functional and developmental morphology. For example, a number of shared unique features identified between the early Miocene hominoid species of *Proconsul* (e.g., *P. africanus* and *P. major*) suggest that not only did these taxa at some time in the past share an immediate common ancestor (thus their species ranking), but that they also occupied a similar environmental niche. These features must have at least partially evolved as a common adaptive response to similar adaptive pressures. This is based on the concept of phylogenetic niche conservatism, which states that past and present members of a lineage (clade) are likely to have occupied similar environments as only those species that are best suited to particular environments are likely to survive.

Conversely unique features that help define the differences between species are likely to be an adaptive response to distinct environmental factors impacting on each species. Overall, therefore, it is likely that the speciation event resulting in *P. africanus* and *P. major* was not related to a dramatic shift from a forest to desert environment, because it is unlikely that any ancestral population could survive such a dramatic environmental shift. It is more likely that an ancestral population moved into a slightly more or less wooded environment, as this is what it is best adapted to and/or it changed emphasis on dietary preferences. Natural selection and other processes would then dictate morphological adaptations that would further enhance its reproductive survival in its new environment and/or changed dietary regime.

It is, of course, possible that a morphological feature, or complex, is not the result of adaptation, but is an ancestral character, which has been maintained as a neutral feature. In most cases, however, the character will be lost unless the cost of retaining such a character is not outweight by benefits brought to it in a new environment i.e., a neutral feature becomes beneficial (exaptation). Closely related species can display characters that are of little or no adaptive significance, and may not even serve the purpose they it originally did in the common ancestor. For example, the original evolution of wing-like structures in primitive birds was not for flight, but for body heat distribution. If we search related taxa and find the same character expressed differently, however, then this may go some way to explaining why the character has been retained.

Identifying adaptive radiations within fossil species is a major key in the understanding of the emergence and extinction of fossil groups. Recently required adaptive features have enabled these taxa to exploit different ecological niches. Because adaptive radiations leave palaeontological patterns in the fossil record, identifying these features within fossil groups should be a prime target for palaeontological studies.

Tham Wiman Nakin Cave : A unique Late Middle Pleistocene mammalian locality of Northeastern Thailand

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Tham Wiman Nakin cave is located in Chaiyaphum Province, Northeastern Thailand, 20 km Northeast of Chulaborn Dam. It is a large karstic cavity opened in Middle Permian limestones. The cavity is complex but it is possible to recognize two main phases of deposition. The fossiliferous and oldest one consists of brown silty clays with numerous calcite concretions yielding isolated mammalian teeth and bone fragments. This layer which represents more than 10 meters of filling is overlain by a more calcitic formation which can also be divided into several layers. The most superficial one has yielded an Uranium/Thorium age of 100 000 years. It covers another calcitic formation dated of 160 000 years which represent the uppermost age limit for the underlying fossiliferous deposit (Esposito et al., 1997). Gamma measurements have also been conducted on isolated molars from different layers. A Pongo molar has indicated an age of 145 000 years with a lower limit of 73 000 years and no upper limit. The fossiliferous layer has yielded mostly isolated teeth of large and small mammals. A few rare ear bones of large mammals represent the only remains of the post-cranial skeletons. Most of the bone fragments, as the dentine part of the teeth, show abundant traces of gnawing by porcupines. The accumulation of fossils in the cave can be interpreted as the result of the leaching of a rock shelter where carnivores eat their preys and where the porcupine came to gnaw the bone remains. Most fossils have therefore been exposed to air for some time before becoming washed down in the cave.

The large mammal community consists of over 30 species, including most of the extant Thai taxa but with the addition of giant Panda (*Ailuropoda*), Orangutan (*Pongo pygmeus*) and hyaena (*Crocuta crocuta*). The paleoenvironment indicated by large mammals is clearly one dominated by evergreen forest, with enough bambus to support a population of Pandas. Micromammals are represented by numerous rodent species, insectivores and bats. Rodents are represented by 4 species of flying squirrels by 3 arboreal murines and many terrestrial murines (9 species). These terrestrial murines dominates the microfauna with the peculiar occurrence of *Hadromys humei* and *Mus pahari gairdneri*, not represented in the extant fauna. Both species live today in more northern territories or on high plateaus, indicating cooler conditions relative to the present ones. The association of giant Panda confirms this interpretation. Rhizomyids and Hystricids are also present. The mammalian association corresponds to that of the Late Middle Pleistocene of Southeast Asia, with the typical association of *Pongo* and *Crocuta*, as shown by Kurten (1956), de Vos (1984) and Tougard (2001).

One single upper premolar of *Homo* sp. (Tougard et al., 1999) has been recovered from the lowermost excavated layer of the fossiliferous deposit. Unfortunately, this layer has been intensively leached by running water and the fossils are therefore strongly demineralized and dark brown colored when compared to those from the other layers, allowing no direct absolute dating. It nevertheless documents the presence of man in Thailand during the Late Middle Pleistocene and indicates that Thailand was on the dispersal way of *Homo* between Northern and Southern Asia. This conclusion should stimulate strongly further research concerning old Pleistocene deposits in Thailand and adjacent areas.

Has no future who has no past: palaeontology for interpreting remote past during scholar age

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The knowledge of past times, the "historical memory", is a need to successfully cope with future challenges. Palaeontology and its related historical track offer plenty of didactic hints and enable to successfully suggest visitors (especially those in scholar age) the main themes connected with evolution and interaction with environment of both vegetal and animal species (man included) living on our planet. The historical interpretation of the Life *of* and *on* the Earth assumes an educational value of primary importance for young generations. Here the experience gained on this regard by personnel of the Faenza Civic Museum of Natural Sciences during a fifteen year-long period is presented.

"Non ha futuro chi non ha passato": la paleontologia per leggere, in età scolare, il passato remoto.

La conoscenza del tempo passato, la *memoria storica*, è indispensabile per affrontare con successo le "sfide" future. La paleontologia ed il percorso storico di questa scienza offrono innumerevoli spunti didattici e consentono di proporre con successo, anche e soprattutto ad utenti di età scolare, le principali tematiche connesse all'evoluzione ed all'interazione con l'ambiente delle specie animali (uomo compreso) e vegetali presenti sul nostro pianeta.

La lettura storica della Vita *della e sulla* Terra riveste un valore educativo di primaria importanza per le giovani generazioni.

Viene presentata brevemente l'esperienza maturata in proposito nell'ambito del Museo Civico di Scienze Naturali di Faenza nell'arco di un quindicennio di attività.

Fossil mammals from the Maastrichtian of the Haþeg Basin, Romania

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Mammals are very rare in Late Cretaceous European sites. Multituberculates were discovered in the Maastrichtian of the Haþeg Basin (Grigorescu, 1984; Grigorescu et al., 1985: Rãdulescu & Samson, 1986, 1996), while therians are recorded from a few western European localities (e.g. Gheerbrant & Astibia, 1999). The Haþeg multituberculate fauna, until recently, included indeterminate cimolodontans and two new taxa: *Barbatodon transylvanicum* and *Kogaionon ungureanui.* Recently recovered specimens add to this diversity and provide information about the relationships of these taxa.

The Fântânele microvertebrate assemblage, recovered from the richest fossil mammal site, yielded several remains of multituberculates. These are represented by about 20 isolated teeth. The most important specimens include bicusped P1s, m1s (cusp formula 3:3), partly enamel covered i1s and short and wide M1 (5:4:2), together with m2, P3, P4 and p4, as well as a bicusped, fully enamel covered I2; a similar I2 was also recovered from Tuºtea.

Comparisons with other Late Cretaceous-Paleogene multituberculates reveal greatest affinities to *Hainina* from the Paleocene of western Europe (Vianey-Liaud, 1979, 1986, Pelaez-Campomanes et al., 2000) and Romania (Gheerbrant et al., 1997) (P1, m1), but especially to *Kogaionon* (M1). Size differences suggest that two different, although probably closely related taxa are present, previously referred to as *Hainina* sp. A and *H.* sp. B (Csiki & Grigorescu, 2000). New evidences suggest that they represent new taxa, closely related to *Kogaionon.* Based on comparisons with the m1s from Vãlioara, the holotype of *Barbatodon* is regarded as a kogaionid m1.

The kogaionids represent a peculiar European endemic family, whose relationships to the other Cimolodonta are difficult to decipher.

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Update on Italian dinosaurs

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Italy had always been considered to be devoid of dinosaur skeletal remains, while discoveries of several Early Lower Jurassic dinosaur trackways were made during the last decade in Lavini di Marco (Rovereto, Trentino, northern Italy). Recently a large Late Cretaceous tracksite that seems to preserve more than 40,000 footprints including taxa that are rare in the ichnological record was found near the town of Altamura (Puglia, southern Italy), and other footprints of Early Cretaceous age were reported from the relatively close Foggia Province.

After the discovery of *Scipionyx*, two more dinosaur taxa came to light as body remains. Hadrosaurine hadrosaurid bones, among which at least one virtually complete skeletons, were uncovered in Late Cretaceous limestones near Trieste (Friuli, Italian-Slovenian border); remains of a large theropod were finally found in the Early Lower Jurassic Alpine foothills of Saltrio (Lombardy, Italian-Swiss border). The latter specimen, although very fragmentary, is crucial for the knowledge on theropod dinosaur evolution as it might represent the most ancient large tetanurine in the fossil record.

All skeletal remains belong to brand new, possibly endemic genera, and come from marine coastal deposits, documenting a peculiar paleobiogeographical situation. Unlike previous geological studies, these findings are a compelling evidence that during Mesozoic times the Italian peninsula was not completely submerged by the Tethys Ocean. The model of small islands within a carbonatic platform is also insufficient to explain the presence of large land animals such as the eight-meter-long 'Saltriosaur', given that predatory dinosaurs occupied the apex of a complex, definitely terrestrial alimentary pyramid. It is more likely that continental bridges temporarily connected Laurasia and Gondwana in the central Tethys, allowing not only migrations between the two hemispheres, but also genetic drift during marine transgressions.

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The fossil record of the Italian Crocodylomorpha

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The history of the Italian palaeoherpetology probably starts with a letter, published by Giovanni Arduino in 1765, quoting the presence of some crocodile remains in northeastern Italy. Since then, the record of the Italian Crocodylomorpha, as well as that of the rest of the herpetofauna, has grown considerably: crocodilian remains have been recovered from more than 40 localities ranging from Middle Jurassic to late Miocene-early Pliocene in age.

Thanks to the activity of several renowned Italian palaeontologists like Aldinio, Capellini, Costa, Lioy, Lovisato, Pantanelli, Ristori, Sacco and de Zigno, the study of these remains flourished around the second half of the 19th century. Owing to the relatively poor knowledge of the taxonomy, morphology and variability of the fossil and living crocodiles, new taxa were created on almost each remnant that was reasonably well preserved, leaving room for debates and critiques.

In the last decades, the holotypes of *Capelliniosuchus mutinensis* SIMONELLI (n.g. n.s.), *Eridanosaurus brambillae* BALSAMO-CRIVELLI (n.g. n.s.), *Gavialis mutinensis* PANTANELLI (n.s.) and *Rhytisodon tuberculatus* COSTA (n.g. n.s.) have been identified as not belonging to crocodilians and they are now considered to be, respectively, a mosasaur, a rhinoceros, an ichthyosaur and, probably, an odontocete.

Although a modern revision of all the fossil record is still lacking, the following genera are thought to have occurred in Italy: *Allognathosuchus*, *Asiatosuchus*, "*Crocodylus*", *Diplocynodon*, *Doratodon*, *Megadontosuchus*, *Metriorhynchus*, *Pristichampsus*, *Steneosaurus* and *Tomistoma*.

It is worth mentioning that the presence of living crocodiles in historical times has been reported for some Italian regions (Lombardy, Tuscany and Sicily; Anderson, 1898; Cordier, 1986) and that their present absence has been considered as a proof of the recent impact that humans had on the crocodile distribution (Markwick, 1998). The lack of fossil remains in all the palaeontological sites younger than the late Miocene-early Pliocene, linked to the fact that almost all the remnants of this "monsters" were -and sometimes still are- stored and displayed in churches, suggests to prudently consider these reports as legends and the crocodiles remnants as relics exhibited in order to attract the believers.

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Enamel structure and proboscideans systematics: an overview

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Enamel microanatomy has become an important feature in the taxonomy and phylogeny of several mammal groups. Enamel mechanical properties, especially resistance against wear and fracture propagation, were also evidenced in recent studies. Preliminary comparison, as part of an ongoing work, with representatives of the principal proboscidean clades suggests that the occurrence, in the central portion of the molar crown, of a complex enamel type (plaited enamel) and a *schmelzmuster* composed by 5 enamel types (plaited enamel-HSB-radial enamel-tangential enamel-prismless enamel) are synapomorphies of the Elephantoidea (sensu Tassy 1990). This complex *schmelzmuster* developed from a more simple one, as that found in the Eo-Oligocene *Moeritherium lyonsi* (Ferretti unpub. data; Bertrand 1987; Pfretzschner 1994). The early diverging families Numidotheriidae, Barytheriidae, and Deinotheriidae developed, possibly from a moerither-like pattern, a specialized enamel made up almost entirely by plaited enamel (Bertrand 1987; Koenigswald et al. 1993; Pfretzschner 1994). Representatives of the Early Oligocene genus *Palaeomastodon*, the sister taxon of all Neogene elephantoids (Tassy 1990), display an intermediate condition between those of the latter group and *Moeritherium lyonsi* (Bertrand 1987; Pfretzschner 1994). The observed enamel thickness differentiation in the Eurasian mammoth lineage (Ferretti in press; 1999) indicates that differential relative thickness of the enamel layers could also represent a useful diagnostic character for intrageneric systematics within elephantids. From these results it appears that enamel structure in proboscideans represent an important tool for ingroup systematics at the species and family level. On the other hand it bears also relevant evidence for the phylogeny of the Thetytheria (see Koenigswald et al. 1993), in some cases questioning reconstructions based on skeletal anatomy and tooth morphology alone (Fischer and Tassy 1993).

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The monster of Aramberri and friends: New finds of marine reptiles in the Mesozoic of northeastern Mexico

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The re-investigation of the tetrapod collections of the Universidad Autonoma de Nuevo Leon (UANL), Linares and the Museo del Desierto in Saltillo (MDS), Coahuila, NE Mexico yielded a large variety of mesozoic tetrapods. Here we report on the marine reptiles.

Pliosauridae. "The Monster of Aramberri": The fragmentary skeleton was discovered in 1984 by a student in the La Casita Formation (Kimmeridgian) close to the village of Aramberri, Nuevo Leon. It was described by Hähnel (1988) as the remnants of a dinosaur. We identified the fragment as the regio cervicothoracalis of a pliosaurid. The size of the shoulder elements and the diameter of the corpora vertebrales of more than 200 mm suggest a length of 15 m or more. Skull fragments were also discovered then but have not been yet relocated in the collection. Therefore a precise identification is not possible for the moment.

Pliosauridae non det.: A fragment of an unknown pliosaurid was discovered close to the hamlet of La Soledad, Nuevo Leon. It comprises the rostral part of a rostrum close to its terminus with four pairs of bicarinated teeth with a triangular section. The preserved tooth row indicates a straight symphysial region. Neither the shape of the teeth nor the shape of the rostrum can be referred to any known species. The specimen is early Tithonian in age.

Crocodilia. *Geosaurus vignaudi* (Frey *et al.*, submitted): The limestone slab with the specimen, an almost complete and articulated skull with the cranialmost three vertebrae cervicales, was collected in 1991 at Mazatepec, E Mexico in a dirt road pavement. It is the northernmost undoubted report of *Geosaurus* in the Americas and comes from the middle Tithonian of the La Caja Formation.

Metriorhynchidae non det.: The fragmentary rostrum and columna vertebralis are three dimensionally preserved and come from the La Casita Formation (Kimmeridgian). The specimen was collected in the region of Iturbide, Nuevo Leon.

Goniopholidae indet.: The slab containing dermostea and bone fragments comes from the same locality and section as the metriorhynchid material. According to the fragments and the size of the dermostea, the animal was approximately 1500 mm long. Other remains from supposed goniopholid crocodilians were discovered in the deltaic deposits of the Difunta-Group (Campanian – Maastrichtian) at Saltillo (Coahuila).

Squamata. Mosasauria indet.: Until now more than 20 vertebrae and a few skull fragments with teeth of mosasaurs have been collected from various places around Saltillo and Monterrey (Aranda-Manteca & Stinnesbeck, 1993). Two forms were preliminary identified as cf. *Mosasaurus* and cf. *Platecarpus*. The material appears to be abundant in the Campanian-Maastrichtian deposits of NE Mexico.

Ichthyosauria. A large number of vertebrae and segments of columnae vertebrales of ichthyosaurs is kept in the collections of the UANL and MDS, but no cranial material has been discovered until now. The material comes from the La Casita Formation and was collected in the area of Iturbide, Galeana, Aramberri, San Lucas, Potrero Chico and other villages in Nuevo Leon but is also abundant in the state of Coahuila. We plan to visit these areas in October and precise the geographical localisation of the finds. We also expect to discover more material in order to determine the taxonomical and palaeobiogeographical importance of the assemblages.

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A croc-like pelvis and a bird-like chest, a hypothesis for the pterosaur breathing mechanism

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Pterosaur bones are hollow. Most likely they contained air sacks which were ventilated by a channel system passing through the foramina pneumatica. This and the nearly immobile vertebrocostal segments of the costae thoracales hints to an air sack system in pterosaurs which anatomically resembled that found in birds. The lack of thoracic pump allowed the evolution of an unidirectionally ventilated high performance lung, necessitates, however, a pumping system independent from the thorx. For birds a sternoabdominal pump is described which ventilates the thoracic and abdominal air sacks through the alternating contraction of the pectoral and abdominal muscles. The ventral opening of the pelvis evolved probably in dependence from increasing the efficiency of the abdominal pump. For pterosaurs a similar ventilation mechanism can be reconstructed. The sternum is attached to a fork at the distal terminus of the coracideum (furca coracoidei) which allows a rotation around a transverse axis. The anchoring point of the sternum lies at the caudal end of the manubrium which bears the crista sterni. The sternal plate follows caudal to this anchoring point. The sternum could have been flicked like a see-saw around the rotation axis by the opeation of the pectoral adductors. The latero- and sternocostal segments of the costae thoracales must have served as a spring support for the sternal plate. The wide furca coracoidei of the azhdarchid Konstruktion allows a stronger flicking of the sternum than the narrow one of the ornithiceirid Konstruktion. The consequence would have been a larger volume of air per pump movement in the azhdarchid Konstruktion, possibly a hint for an active flight.

Compared with that of birds the abdomen of pterosaurs had a small volume. The pelvis was ventrally closes or open to a maximum of half the width of the thorax. This configuration allows only little movement of the abdominal muscles. Provided the ossa praepubis could have been moved actively by inserting muscles, an increase of the pump volume would have been the consequence. Probably the ossa praepubis evolved from the most caudally situated pair of costae gastrales the presence of which is proved for some Rhamphorhynchoidea. For the Theropoda the role of the costae gastrales as a breathing support has been described already.

The Mine of Marvels: loving to understand and understanding to love (emotions and knowledge!)

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Over the last decade the by-now abundant collection of fossils that have been excavated from the quaternary lignites of Pietrafitta (a village situated in the province of Perugia, in central Italy) has proved its great usefulness in the teaching and educational sector (Gentili *et al*, 2000), with the schools being the main subject involved. Teaching activity focusing on the "use" of the fossil remains, the lignites and the mine itself has generally been divorced from aid that would be provided by information technology and/or technical back-up since there are still no exhibition areas that could be utilized, such as would be the case if there were a museum (Gentili *et al*, 2000). On the basis of the users' perception of the quality of their contact with the artefacts, the reality of the great educational potentialities of the Pietrafitta collection has come to the fore, together perhaps alongside the more general cultural heritage represented by the fossil remains of Italy.

The conception, planning and putting into practice of teaching activities, often simply from an empirical standpoint, have seen the direct involvement of teachers, palaeontologists and the miners themselves. All this underlines the importance, in and for the educational process, of what is transmitted at first hand to pupils otherwise subject to a bombardment of virtual reality that tends more and more to eliminate this "on the spot contact" with "objects" and with reality.

Through the use of essentially two types of approach, the narrative form (Gould, 1995; Durant, 1998) and the emotive power of the objects on display (Bettelheim, 1997), the people (students and others) visiting the mine are encouraged to "discover" the fossil remains for themselves and follow up directly all the subsequent phases of palaeontological research (restoration, analysis and study, exhibition work and so on), guided by the "narration" provided by the palaeontologist. In this way the students, as well as having a direct as opposed to a virtual contact with the problems, strategies and methodologies involved in the study and reconstruction of the environments and life of the past, also acquire an original and diversified picture of palaeobiology (Pinna, 1997). An important "detail", even though this may sound like a provocation to those who regard museums solely as places for conserving artefacts, has been the possibility for hundreds of school students to have a "hands-on" contact with their own past (Angela, 1998) and thus have their curiosity and imagination aroused (Bettelheim, 1997). These experiences have enormous potentialities, not only because they teach people how to love, know and therefore watch over, safeguard and put a proper value on their own local environment, but most of all because they bring out the capacity to share (Tonon, 1994). The activity of excavating and studying fossils has required the joint efforts of all the participants to bring about a successful conclusion. This in itself represents an important social message, namely that it is necessary to have the collaboration of and then bring together the collective efforts of everyone if we are to reconstruct our own history. Today more than ever, palaeontologists must become involved in educational and teaching work within the sphere of their expertise, not only to avoid the danger that it is only palaeontologists who are authorised to speak about palaeontology (Pinna, 1997) but above all to increase the "hopes" for a science that gives an on-the-spot account of the history of our own planet. If palaeontologists do not become fully aware of this is there really any hope for our past?

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Cave bear morphometrics and evolution: the lower carnassial

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In this contribution a morphometric study of the lower carnassial of Cave *Bear (Ursus deningeri/Ursus spelaeus*), from several populations of diverse European localities and also different ages is carried out. This study includes a metric comparison and differences in the degree of convergence and the deployment of dental cusps.

It was extensively described in the literature (see Kurtén 1976 for a review) that the evolutionary tendency in these species favors the appearance of cheek teeth with cusps more and more blunt and split into smaller ones, and progressively broader occlusal surfaces, produced by a smaller convergence of cusps, which is related to the herbivore type of feeding of this species. However, this tendency was not studied with details except for the upper and lower premolars (Rabeder, 1983, 2000) and it is not well known if this process takes place at the same rate in all the populations, or whether there are geographic or chronological differences. In this work we try to such a study of this process in different European populations, separated in the time and/or the space, based on the lower carnassial (first lower molar), being the piece that, according to our previous work, reflect better these variations, and the one that better each population characterizes (Grandal 1993a, 1993b).

Thus, the percentage of appearance of different pre-determined morphotypes in each population is studied. Nevertheless, in this work the a priori assignation of a polarity to the studied characters, has been avoided as far as possible.

As result of the morphologic analysis is observed clearly a group of the populations according to its geographic position. It is the logical result of the isolation of the populations, by diverse geographic barriers or simply the distance. This demonstrates that the expansion of the cave bear happened at a very early time, and that later did not exist great migratory movements that returned to put in contact to remote populations. This agree with the results of DNA analysis performed in cave bear remains (Hänni et al, 1994; Loreille et al, 2000).

As far as the metric analysis, differences in the degree of convergence of the peaks in the talonid or trigonid are only observed between the oldest sites and all others, that display a homogenous trend, independently of their geographic location.

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The Cutis of the Ichthyosaurs

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The examination of about 50 ichthyosaurs with soft tissue preservation, revealed that the histology of the ichthyosaur skin resembles that of dolphins.

Most of the phosphatic preserved soft tissues in ichthyosaurs can be interpreted as residuals of the ichthyosaur skin. The external surface of the epidermis of ichthyosaurs resembles the inner surface of the human hand (palm), with it's fine lines (dermatoglyphs), but the lines in ichthyosaurs differ in forming no arches or whirls. They are oriented parallelly over large surfaces and they are about five times smaller than those on the human skin. Normally one can find about 8 to 14 (in some cases up to 20) parallel lines per millimeter. This small sinusoidal groves and ridges show an amplitude of approx. 0.025mm. By mapping of the orientation of these structures it turned out that these structures are oriented in direction of the water flow, similar to the orientation of the structures in the dolphin skin (see Geraci et al. 1986 Fig. 1.1. and 1.2.B.). Similar surface structures in similar diameter and orientation can reduce the turbulent flow resistance of fast swimming bodies up to 10% (see Nitschke 1983).

The boundary between epidermis and dermis resembles in form and orientation the external surface of the epidermis, but with a different amplitude of the sinusoidal groves and ridges. With an amplitude of 0.1mm to 0.2mm, these grooves are clearly deeper incised that those of the external side.

The ichthyosaur epidermis (with a thickness of max. 1mm) is mainly composed of relatively large cells, measuring in diameter about 0.01mm to 0.02mm. Likewise the nucleus seems to be relatively large with a diameter from 0.005mm to 0.01mm.

The "stratum reticulare" is predominantly composed of long and fine fibers with a diameter of about 0.02mm. Transverse bands, like in striated muscles, could not be observed. Maybe these structures are dermal, smooth (nonstriated) muscles or fibres of a connective tissue.

Structures of the ichthyosaur skin can be observed over the whole thorax, tail, dorsal fin and partly on the extremities, normally preserved in small pieces or in small stripes.

Epidermis rifts which usually run parallel or perpendicular to the adjustment of the grooves are often observable in ichthyosaurs. These rifts could be caused by dehydration when a dead ichthyosaur was drifting at the water surface, or by other taphonomic stresses. Similar ruptures can be observed on stranded dolphins. The orientation of the rift, is conditioned due to the structures of the texture. Likewise a weaved linen cloth usually rips in two perpendicularly rift systems. These epidermal rifts or ruptures promote the permeation of phosphates or prefossilizing substances which can easily be replaced by phosphates. Therefore the skin is distinctly (thicker) preserved close to the rifts. The type of preservation often changes form phosphatically to carbonaceous preservation close to the ruptures. In this case the residuals of the skin look like small stripes, often misinterpreted as rodlike structure or as tendons.

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Biomolecular techniques applied to the vertebrate paleontology

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Molecular paleontology embraces the study of organic molecules into fossil specimens. The molecular evolution is a process by which the genetic changes accumulated in the time must be due to the testimony of stochastic events as selective processes that it finds to rebuilt the process of the modifications of gene's structures between past time to today. The organic fossil molecules can be exposed to an infinity of degradation processes due to the effects of diagenesis, such as warm, pressure, percolating fluids that can, over time, give origin to different molecules from those originary molecules. Nevertheless a little part of organic fossil material is not degraded and it permits to discover, for the last million years, the evolutionary history of genes (Hermann et al., 1994). There are many reports of lucky amplifications from ancient mt-DNA (Higuchi et al. 1984, Golenberger et al. 1990, Stringer et al. 1988, Hanni et al. 1994, etc.) but not from nuclear DNA. This emphasizes the vantage to work with mt-DNA such for evolutionary reasons and for techniques too. In fact highly repeating mt-DNA sequences are abundant in any cell. The limit to the ancient DNA analysis is the presence of contaminants as microrganisms, foreign DNA from analysed species. Other limit is the DNA fragmentation which occurs when there are analysed remains from extinct ancient species and it is not always possible to compare the results obtained with those of living corresponding species. Further behind we go into the past, and tougher it is analyse the ancient DNA. The PCR (Polymerase Chain Reaction) is the best tool to amplify a small quantitative of intact ancient DNA. The tipology of samples that can be submitted to the ancient DNA analysis is very large: in fact, it is possible to obtain ancient DNA from bone tissue, hair, skin, tooth etc. Often the conservation state of remains influences the refounding of genetic material. The best results are from the bone analysis preserved in the permafrost, because the tissues (bones, skin, etc.) farewell in such taphonomic condition. When, instead, the remains are founded in the caves or in environments very rich of water, the teeth are those remains which in better the genic material could be preserved also, because the hardness of external enamel preserves the genic material inside it.

At present we are carrying out researches on Pleistocene caprines of South Italy and particularly on *Capra ibex* by comparing the genic material obtained from the *Capra ibex* population of the National Park of G. Paradiso. It's hoping to compare the DNA obtained from the other similar now caprid present on Euro- Asiatic Continent.

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Architectural variation of the iliac trabecular structure in extant and fossil primates, including *Homo*. Presentation of an atlas of electronically processed radiographic images

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In the last few years there has been a growing interest in vertebrate paleobiology for functional analysis of fossil trabecular bone. Within the Cultural Heritage Project promoted and supported by the Italian NATIONAL RESEARCH COUNCIL (www.culturalheritage.cnr.it), in collaboration with a number of international scientific institutions (Museums, Universities), we have developed a long-term project designed i) to assess ontogeny and age-related intraspecific ranges of morphoarchitectural variation of the cancellous network, ii) to investigate the nature of the relationships between iliac and femoral trabecular architectures and postural/locomotor behaviours, iii) to document the radiographic appearance of trabecular features/architectures in extant primates (and in a number of nonprimate mammals), and iv) to document trabecular patterning in fossil primate taxa (including *Homo*) by means of advanced digital image processing techniques allowing the extraction of reliable structural information from original calibrated radiographic films.

The extant primate record includes prosimians (*Indri*, *Propithecus*, *Perodicticus*), New World (*Lagothrix*, *Alouatta*) and Old World monkeys (*Colobus*, *Presbytis*, *Theropithecus*, *Papio*, *Macaca*, *Cercopithecus*), lesser (*Hylobates*) and great apes (*Pongo*, *Gorilla*, *Pan*), and humans. For comparative purposes, a whole of 22 nonprimate specimens representing Diprotodontia, Xenarthra, Carnivora, Artiodactyla, and Lagomorpha have also been considered.

The fossil sample investigated so far for structural analysis of the iliac bone includes the following taxa: *Paracolobus chemeroni* (Chemeron, Kenya) and *P. mutiwa* (West Turkana, Kenya), *Theropithecus oswaldi* (Koobi Fora, Kenya), *Macaca majori* (Capo Figari, Italy) and *M. sylvana* (Pietrafitta, Italy), *Proconsul heseloni* (Kaswanga, Kenya) and *P. nyanzae* (Mfwangano, Kenya), *Limnopithecus legetet* (Rusinga, Kenya), *Pliopithecus vindobonensis* (Neudorf and der March, Czech Republic), *Oreopithecus bambolii* (Baccinello, Italy), *Australopithecus africanus* (Makapansgat and Sterkfontein, South Africa) and *A.* (*Paranthropus*) *robustus* (Swartkrans and Kromdraai, South Africa), *Homo erectus s.l.* (Koobi Fora and West Turkana, Kenya; Olduvai Gorge, Tanzania), and *H. sapiens s.l.* (Krapina, Croatia; Kebara, Israel; Mladec, Czech Republic).

The entire body of original and elaborated images (fossil and extant samples) has been collected into a CD-ROM representing the third number of the *Digital Archives of Human Paleobiology*.

The *DAHP* are a scientific series aimed to facilitate the circulation of qualitatively and quantitatively comprehensive sets of data and images of anthropological, paleobiological, and paleoanthropological interest. Their main objective is to make available, in an interactive form, the scientific documentation of (paleo-archaeo) anthropological research from different - particularly methodological - backgrounds, conducted on representative collections or on single specimens of special interest. Their ultimate goal is to permit full use of the information provided and to stimulate further independent analyses and elaboration. The *DAHP* are, by definition, free of charges; information and order form are available at: www.pigorini.arti.beniculturali.it

Consumption by cave spotted hyena on remains of insular large mammals

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This communication describes types and frequencies of hyena-inflicted damages on large mammal remains coming from a trench (15 m^2 large and 1.5 m deep) dug in the Late Pleistocene sediments of the San Teodoro cave, a very large cavern (60 m long, 20 m wide, up to 20 m high, total surface more than 1.000 square meters) located in Acquedolci (province of Messina, North Eastern Sicily, Italy). Bonfiglio et al. (1999, 2001) identified the cave as an enormous Pleistocene hyena den.

The recovered endemic large mammals are: *Elephas mnaidriensis* (7.2% of Number of Identifiable SPecimens), *Cervus elaphus siciliae* (59.7% of NISP), *Bos primigenius siciliae* (5 % of NISP). They are accompanied by the non-endemic large mammals: *Sus scrofa* (3.5%), *Crocuta crocuta spelaea* (11.6% of NISP), *Canis* cf. *lupus* (0.3% of NISP), *Vulpes vulpes* (1.3% of NISP), *Equus hydruntinus* (11.3% of NISP). 3962 hyena coprolites were scattered in the whole excavated sediment. Small mammals, birds, reptiles and molluscs are also present.

Typical damages by crushing, gnawing, chewing and partial digestion are present on 50,7% of the recovered large mammal remains (421 specimens taxonomically identifiable; 394 specimens only anatomically identifiable).

Cranial bones (11.3% of remains) are extremely fragmentary. All the abundant deer antlers (shed and unshed ones) are incomplete and fragmentary and a large part of them present gnaw marks, ragged edges and tooth pits. Emi-mandibles (4% of remains) preserve only molar and/or premolar portions and more than 55% of them have ragged-edged margins, gnaw marks and tooth pits. Vertebrae (8% of remains) are always extensively damaged and only portions of the corpus are preserved, while ribs are rare and strongly fragmented. Long bones (6.9% of remains) are always fragmented, one or both epiphyses bitten away. The majority show ragged margins, gnaw marks and/or tooth. Strongly fragmented diaphyses are relatively common in the assemblage (7% of remains).

The large amount of bone splinters (1032) mainly includes small-sized fragments with irregular and pointed margins. Digestion traces in the form of dissolution of bone, which can also produce circular holes, and of typically thin margins are visible on 38% of them.

Undigested bone splinters are a product of bone crunching and flaking by hyenas, while partially digested ones comes from disgorged piles.

The described modifications on skeletal elements fit in with bone consumption patterns made by Pleistocene and living spotted hyenas in sites used as dens (Brain 1981; Brugal et al., 1997; Bunn 1983; Fosse 1997; Piperno & Giacobini 1990-91; Stiner 1990-91; Sutcliffe 1970; Villa & Bartram 1996).

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Vertebrate assemblages of central-western Mediterranean islands during the Pliocene and Quaternary: reflecting on extinction events

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Vertebrate populations in the Mediterranean islands are strictly controlled by palaeogeographic conditions and by their evolution during the Quaternary. At the beginning of the Pliocene the Tyrrhenian basin was already open and the distribution of land areas was fairly close to that of the present day. During the Pliocene and Quaternary tectonic movements, predominantly uplift, resulted in the emergence of a number of new areas. These tectonic movements interacted with "third order" eustatic fluctuations in influencing the palaeogeography and patterns of vertebrate dispersals on the islands. From the Middle Pleistocene, major glacio-eustatic fluctuations began to play an increasing role in controlling dispersal events, and these apparently became dominant in the late part of the Middle Pleistocene (IOS8 - 6) and in the Late Pleistocene. Semi - periodic eustatic fluctuations tend to produce a characteristic pattern in which 'short' intervals favourable to dispersals alternated with longer phases of isolation. In addition to these general trends, each island has its own individual characteristics linked to its history, geographic location, and physiographical, biological and climatic conditions.

The fossil record provides information on biodiversity changes in islands, which can be used to reconstruct basic palaeoecological patterns and to develop or test ecological models. Unfortunately, the incompleteness of this fossil record means that we often have only rough and poorly detailed information. Nevertheless, with regard to extinction events, four broad categories can be recognised.

1. Extinction events (in some cases) roughly coeval with events recorded on the mainland (e.g.. *Equus hydruntinus* during the Holocene climatic optimum).
2. Timing of extinction of taxa occurring both on the island and the mainland later on the island, or more rarely earlier, than on the mainland.
3. 'Snapshot' events, where extinction strikes 'new comer' taxa that apparently only present on the island for a (geologically) short time. Such events are very difficult to detect in the fossil record, but were probably more common than one might expect.
4. Finally, in same cases it is evident that the island acts as a refugium in which certain taxa, or their endemic descendants, survive much later than on the mainland: e.g. *Prolagus* and *Nesiotites*, in Sardinia, *Myotragus*, in the Balearics, and *Leithia* and *Maltamys* in Sicily.

New excavation on the "Purbeckian" site of Cherves (south-western France): a rich reptilian community revealing a terrestrial ecosystem

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The paleontological site of Cherves de Cognac (Charente, southwestern France) is a very large quarry exploiting "purbeckian" gypsum banks, intercalated between black marl deposits. The general geological context reveals a probably Late Tithonian complex, deposited in littoral marine conditions. The sedimentological approach leads to consider these deposits as made in a proximal area, with alternation of marine invasions and evaporitic stages (gypsum).

This site is known for a long time by amateur paleontologists who, occasionally, collect small isolated fossils (fish and reptile teeth, fish scales…) from one of the marl levels, on the quarry cliff. However, some amateurs have provided a more extensive work, with true excavations on a flat area. They have collected a diversified fauna (fish and shark remains, crocodilian, turtles, rhynchosaurians, theropod and sauropod dinosaurs), mostly unpublished.

In 2001 a first institutional excavation has been made on the fossiliferous level by the University of Poitiers and the Musée d'Angoulême, with a scientific program planned to continue during several years. This excavation confirms the great diversity of the faunal assemblage, the main marl deposit yielding fish remains (Semionotiforms, Picnodontiforms), shark teeth and cephalic spines (*Polyacrodus*-type), two type of turtle osteoscutes, crocodilians (*Goniopholis* sp. And *Pholidosaurus* sp.), theropod teeth.

This faunal assemblage is that of a terrestrial ecosystem. Bones are randomly oriented, some are broken and sometimes in vertical position. This taphonomical observation, linked to sedimentological features leads to consider that the fossiliferous deposit of Cherves corresponds to a landslide or a littoral tempest.

Taphonomic analysis and interpretation: a case study of the Late Villafranchian mammalian fossil remains from Poggio Rosso, Upper Valdarno (central Italy)

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The Upper Valdarno is celebrated all over the world for the invaluable collections of fossil mammalian bones it has provided for over three centuries. Although many type specimens of Late Villafranchian species were found in this basin, no taphonomic investigations have been ever tempted to explain the causes of accumulation of the bones and to make sound paleontological inferences on the Upper Valdarno Early Pleistocene communities. Such an opportunity was offered by the discovery, in 1995, of a wealthy accumulation of bones on the side of a hill called Poggio Rosso, in a clay pit near Matassino. Eighteen species were recognized in the accumulation. The specimens are in a fairly good state of preservation and most of them are still in anatomical connection. It did not take long to realize that hyaenas had played a fundamental role in forming the accumulation. The carcasses are largely incomplete, axial parts being severely under-represented respect to limbs. Several bones show clear evidence of carnivore activity, especially of a large-sized animal: bites and gnawing marks are fairly common and numerous hyaenid coprolites were found scattered amongst the specimens. Eighteen species were recognized in the accumulation. Carnivore remains form over 30% of the total and a great deal of them belong to small-sized taxa. At last, almost 80% of the bones are aligned in two preferential directions, NW-SE and NNE-SSW. On the basis of all the information gathered for the present study, the most parsimonious and convincing conclusions on the Poggio Rosso assemblage is that it was formed by carcass parts biologically transported to their den by a cooperative population of the large-sized *Pachycrocuta brevirostris*, the typical Villafranchian hyaena of the Upper Valdarno. Finally, an ephemeral water flow trivially removed the specimens, re-arranging the bones before their final inhumation.

The first Cretaceous dinosaur tracks from the Swiss Helvetic Realm

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Up until now dinosaur tracks form Switzerland were only known form Triassic and Late Jurassic strata. We report here for the first time the occurence of ornithopod tracks from the Schrattenkalk Formation (Late Aptian) from the Swiss Central Alps. The locality is situated in an abandoned quarry on the shore of Lake Lucerne close to the village Beckenried.

Prior to mapping in alpinistic style, the surface was photographed by helicopter. The best footprints and one trackway have been casted.

The steeply inclined surface yields more than 200 tracks of adult and subadult ornithopods that are attributed to Iguanodontids. Six parallel trackways of equal footprint size indicate a small herd moving at the same speed. So far all trackways show a bipedal gait; footprint length (mean: 45 cm) points to animals with a size of about 4 m.

The substrate consist of shallow water micrites with traces of emersion and is overlain by high energy rudist grainstones. Up to now the deposition of the Upper Schrattenkalk Member in the Helvetic realm was thought to have formed on a large shelf far away from any continents. The present discovery will shed new light on the paleogeographic position of the Helevetic nappes.

Zonal stratigraphic correlations of the Upper Permian from the Cis-Urals and South Africa according to tetrapods

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The majority of the Permian and Triassic tetrapod genera occur within a narrow stratigraphic range and are important for correlation reasons. But common genera are extremely rare for such remote regions as Laurasia and Gondwana. However, detailed stratigraphic correlation accurate to within zones may be based on the evolutionary close genera from common families. The results for various tetrapod groups are not contradictory. This is demonstrated below for the Tatarian stage from the Cis-Urals and the Lower Beaufort from South Africa. The data from the latest fauna revisions was used.

East Europe				South Africa		
stage	sub-stage	province zone	genera-correllants		assemblage zone	group
Tatarian	Upper	Archosaurus	7	7, 10, 13”	Dicynodon	Lower Beaufort
		Scutosaurus	7, 13’			
		Proelginia	6?7, 9, 10, 13	6, 13”	Cistecephalus	
		Deltavjata	5	5, 13”	Tropidostoma	
			12	12’	Pristerognathus	
	Lower			2, 8’, 12’	Tapinocephalus	
		Ulemosaurus	1, 3, 4, 8	1’, 3’, 4’, 8’	Eodicynodon	
Kazanian	Upper	Estemmenosuchus				Ecca
	Lower	Parabradysaurus				
Ufimian		Clamorosaurus				

Note. Numbers designate the genera of the families common for the regions compared. Primed numbers designate the South African genera close to the East European ones under the same numbers in their evolutionary levels. Dinocephalia: Fam. Ulemosauridae: 1 – Ulemosaurus, 1’ – Tapinocaninus; Fam.Tapinocephalidae: 2 – Moschops; Fam. Anteosauridae: 3 – Titanophoneus, 3’ – Australosyodon. Anomodontia: Fam. Venyukoviidae: 4 – Ulemica, 4’ – Patronomodon. Fam. Dicynodontidae: 5 – Tropidostoma, 6 – Oudenodon, 7 – Dicynodon. Therocephalia: Fam. Pristerognathidae: 8 – Porosteognathus, 8’ – Glanosuchus. Gorgonopia: Fam. Gorgonopidae: 9 – Sauroctonus, 9’ – Scylacops. Eotheriodontia: Fam. Burnetiidae:
10 – Proburnetia, 11 – Burnetia. Pareiasaurida: Fam. Pareiasauridae: 12 – Deltavjatia, 12’ – Bradysaurus, 13 – Proelginia, 13’ – Scutosaurus, 13” – Pareiasaurus.

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Rich faunas of the Permian and Triassic tetrapods that used to exist in transitional (semihumid-semiarid) climatic settings

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Tropical and subtropical temperature conditions were dominant over vast areas in the Late Permian and Triassic. Similar belts of the present epoch comprise the following climatic sequence of the landscape-geographic zones, based on the degrees of humidity: constantly moist forests – seasonally moist, light (monsoon) forests – forest-savannahs – humid savannahs – arid savannahs, tropical and subtropical steppes – desertified savannahs, semideserts – deserts. Various researchers associate forest savannahs, humid and arid savannahs and, frequently, semideserts with transitional (semihumid-semiarid) climates. Large terrestrial animals (absent in the constantly humid forests rich in crown-dwellers) become abundant among the vertebrates starting from the sparse forest and forest-savannah settings. Such features of the fauna that becomes just somewhat poorer systematically, are maintained to involve the settings of arid savannahs and steppes. An important part is played by reptiles and amphibians, some of them hibernating. The animal world is highly impoverished in taxa and individuals in semideserts and desertified savannahs (Grigoryev, 1970).

Rich faunas of large Late Permian and Triassic tetrapods are generally associated with arid (carbonate) red-bed formations. Paleontologists frequently regard such fauna habitats as humid, while lithologists consider them to be arid. The actualistic data above, testify to the rightfulness of a compromise conclusion: that of living in transitional, as regards humidity, settings. Distinguishing between the semihumid and semiarid paleosettings, is complicated by diverse views on distinguishing between modern climates. Many Russian climatologists and landscape specialists associate semiaridity with steppes and dry savannahs, some of them extend the notion to semideserts. Still other scientists, mostly from the West, confine semiaridity to semideserts. Adhering to the first point of view, we may assess the habitats of the Early Beaufort tetrapods from South Africa as mostly semihumid, and those of poorer Tatarian faunas from Russia – as mostly semiarid.

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Geometric morphometric methods and their applications to the studies of fossils

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One aspect of the interpretation of fossil material is the study of the extent to which scaling (allometry) might explain shape differences from related forms. Standard approaches to allometry rely on analyses of linear measurements or areas and volumes in statistical studies. Whilst the statistical methods are powerful, the measurement approaches most commonly used tend not to preserve geometric relationships. Consequently the results of analyses are not readily visualized. The last ten years have seen a revolution in morphometrics with the development of methodologies that directly analyse coordinates of equivalent landmarks between taxa (Dryden and Mardia, 1998). These methods rely on registration of coordinate configurations between related forms and enable multivariate analysis of these in a well defined shape space. They partition size from shape, and enable ready examination of allometry. Furthermore, they generate readily interpretable geometric representations of form variability (O'Higgins, 2000).

In this paper we briefly review these methods and show how they can be applied to fossil material to gain insights into scaling. Thus we present the results of two example comparative ontogenetic studies aimed at assessing the possible basis in growth of adult morphological differences. The first examines the face of the fossil macaque *Macaca majori* from Capo Figari (Northeastern Sardinia, Italy) in a comparative ontogenetic context. Thus a fairly complete face from an adult representative of this fossil species is compared with three extant macaque species: *Macaca sylvanus*, *Macaca mulatta* and *Macaca fascicularis*. This study reveals that the subadult face in *Macaca majori* shares much in common with extant macaque species but its growth manifests some unique features. These lead to greater lateral flaring and relatively larger zygomatic roots in adults. The second study compares adult Neanderthal pelvic morphology with that of an ontogenetic series of modern humans. This study indicates that many of the differences between these hominins can be explained by extension of the modern human ontogenetic size/shape trajectory.

Both studies lead to ontogenetic explanations of differences between fossil and extant skeletal material and point to ways in which growth divergences are linked to function. The findings illustrate the value of geometric morphometric approaches to the analysis of such scaling relationships in that the interpretation of analyses is considerably aided by the visualisations of results that are obtained.

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Reconstruction of phylogenies of human origins

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Recent determinations of the time and place of modern human origins employ data both from the very substantial fossil record, and from genetic variations of mitochondrial DNA and Y chromosomes in living peoples. There is as yet no total consensus on either the timeframe involved, or the history of migrations patterns of modern human diversity. Many studies imply, however, that the origin of modern humans was in Africa, that this occurred circa 150,000 years ago, and that it involved migrations with replacement of all prior human groups on each continent.

The date of 150,000 years has very wide limits around it. It often depends upon determination of a prior date, the time of the human/chimpanzee common ancestor. Should that time be 5 million years, as is usually assumed, then the molecular studies imply 150,000 years for modern human origins. Recently described fossils (e.g. *Ardipithecus* at 4.5 million years and *Orrorin* at 6.0 million years) suggest that the human/chimpanzee ancestor was earlier than 6 million years. If correct, molecular studies would give dates earlier than 150,000 years for modern human origins.

The concept of complete replacement after migration everywhere without gene admixture is also essential to this story. It may be thought to be problematical on common-sense grounds.

Finally, the concept that studying mtDNA and Y chromosome differences in modern humans tells us about the evolution of modern humans, may also be problematical. It is possible that the mechanisms involved in mtDNA and Y chromosome evolution themselves are what are first derived from such studies. The data may then have to be interpreted in the light of additional factors. These might include: population size (e.g. effect of population bottlenecks), mating pattern (e.g. obligate polygny compared with monogamy or facultative polgyny), and adult sex ratio (approximately 1:1 in most modern humans, but anything from 1 to 2 to several in some indigenous groups, and certainly in present day great apes).

It is possible to study these problems in another way using computer models. Three different computational models are presented here. The first speaks to the matter of species evolution (i.e. generally non-interbreeding groups). It asks questions like: how likely does the current fossil record imply a human/chimpanzee common ancestor at 5 million years? The second speaks to the matter of population evolution (or sub-species, groups that can interbreed and migrate). It asks questions like: how likely is complete replacement when interbreeding and migration are possible? The third speaks to the matter of individual lineages (lineages of mothers-of-mothers and fathers-of-fathers). It asks question like: are there differences between paternal and maternal lines of inheritance? All of these are merely models. They do not tell us anything about "what was". But, when replicated many times, they may give useful statistics with implications for thinking about "what might have been".

Dwarfing in insular mammals: the case of endemic elephants of Mediterranean islands

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The speciation of the large-sized endemic mammals (elephantids, hippopotamids, cervids, bovids) of the markedly oligotypic Pleistocene fauna of the islands of many biogeographic provinces (Mediterranean, Sunda Sea, South China Sea, Eastern Pacific Ocean, Arctic Ocean) represents a special ground for the study of evolutionary mechanisms and of speciation processes in particular.
The pathways of immigration and the processes of insular evolution have indeed enjoyed considerable interest; nevertheless no modelling seems to suitably explicate the problems connected with the origin and evolution of insular species (Mac Artur & Wilson, 1967; Diamone & May, 1976; Alcover et alii, 1981 and references within; Azzaroli, 1982; Caloi & Palombo, 1989 and references within; Wilson, 1992).

A groundswell of hypotheses has been formulated to explain the size modification.

The morphologic modifications can be studied under the perspective of allometric development, heterochrony, evolutionary rate and type of adaptation.

Elephants were the most characteristic and common taxa in Pleistocene unbalanced endemic fauna (Caloi & Palombo, 1992; Vartanyan et al., 1993; Lister & Sher, 1999). Mediterranean insular elephants have been generally ascribed to the paleoloxodontine, offspring of the Middle and late Pleistocene continental *Elephas* (*Palaeoloxodon*) *antiquus* Falconer & Cautley, 1847. The only exception should be the small Sardinian *Mammuthus lamarmorae* (Major, 1883), descendent of an averagely evolved *Mammuthus* representative; the phylogenetic relationships of “*Elephas*” *cypriotes* Bate, 1907 and “*Elephas chaniensis*” Symeonidis, 2000, on the other hand, are uncertain.

The frequency with which elephants have colonized islands and undergone size reduction provides researchers with multiple instances of a natural experiment. Dwarfed populations evolved independently on each island. Nonetheless, compared to their mainland ancestor, endemic elephants were characterised by similar evolutive patterns that allowed to parallel size reduction and, occasionally, the appearance of homoplasic characters.

Elephants approach one extreme in the spectrum of terrestrial mammalian body sizes. On the Pleistocene islands, they have also undergone size reduction to an extreme degree, so dwarf elephants are the most important examples of Foster's island rule for mammalian body size (Foster 1964). Mechanisms of body size modification include phenotypic and genetic divergence. According to some authors (Roth, in press), the size difference between the smallest insular dwarf elephants and their mainland ancestors was too great to be achieved by stunting alone.

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New pterosaur remains from the Cretaceous of Morocco

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Pterosaur remains have been recently described in several localities of Morocco, all Cretaceous in age. Kellner & Mader (1996) referred a cervical vertebra from the Albian or Cenomanian of the Province of Ksar es Souk (southern Morocco) to the Azhdarchidae. Later, Kellner & Mader (1997) compared an isolated tooth from the same area, west of the Hamada du Guir, with those of anhanguerids from the Early Cretaceous of Brazil. Based on an upper jaw with teeth found near Beg'aa, southwest of Taouz, Mader & Kellner (1999) erected the anhanguerid *Siroccopteryx moroccoensis*, the only pterosaur species named so far in Morocco. Moreover, Wellnhofer & Buffetaut (1999) described jaw fragments of toothless pterosaurs and isolated teeth from the Kem Kem region, east of Taouz, of probably Cenomanian age. These authors recognised tentatively four taxa: ?Pteranodontidae, ?Azhdarchidae, Tapejaridae (based on jaw remains) and Ornithocheiridae (based on teeth). The oldest record of pterosaurs in Morocco is from the basal Cretaceous (?Berriasian) of Anoual, eastern High Atlas Mountains, east of Talsinnt: Knoll (2000) described isolated teeth and regarded them as reminiscent of those of the Ornithocheiridae and Gnathosauridae. During palaeontological field work in 2000, pterosaur remains were found by the OCP in the Late Cretaceous phosphatic deposits of the Oulad Abdoun Basin, between Khouribga and Oued Zem. The material was collected from the "site 1" of Sidi Daoui area, in the northern part of the Grand Daoui zone, an actively mined area for phosphate. Stratigraphically, the pterosaur comes from the upper part of the "bed 3", which is Late Maastrichtian in age according to selachian data. The remains, enclosed in a phosphate block, consist of five disarticulated cervical vertebrae and an indeterminate fragment of bone, which could belong to the same individual. The centra are hollow and the thickness of the cortical bone is about 1 mm. As typical in pterodactyloids, the neck vertebrae show a disparity in length, the longest one (fifth?) measuring about 30 cm long. Three of the vertebrae are similar in form to the mid-cervicals of Azhdarchidae (e.g., very elongate centrum with a vestigial or absent neural spine). The two other ones exhibit a different pattern as they are characterised by a prominent neural spine. These vertebrae are probably posterior cervicals. The Moroccan pterosaur is here provisionally referred to as Azhdarchidae indet. By comparison with other azhdarchids, the estimated winspan is about 5-6 m, which represents a large pterosaur.

Up to now, azhdarchids have been reported in the Africo-Arabian Plate from the Early Cretaceous of Niger (undescribed), the mid-Cretaceous deposits of southern Morocco, and the Late Cretaceous of Senegal, Jordan (*Arambourgiania philadelphia*) and possibly Negev (see Dalla Vecchia et al., 2001 for references). The pterosaur remains described here represent the first record of this group in the latest Cretaceous of Morocco and northern Africa, and one of the youngest records worldwide.

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Dormice (Mammalia: Gliridae) records from the Pleistocene of Sicily

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Investigations undertaken during the last ten years (i.e. the excavation and sampling of both new and previously known fossiliferous sites) have shown that fossil dormouse record from Sicily is not restricted to the oldest (Early Pleistocene and early Middle Pleistocene) faunal assemblages, but covers the period up until the last occurrence of endemic Sicilian macro-mammals (elephant and hippopotamus), late Middle Pleistocene – early Late Pleistocene in age.

Faunal and geological evidences have shown that during the Early and Middle Pleistocene, land-bridges connected the present day island of Sicily with the Maltese archipelago. In addition to dwarf elephants and small hippopotamus, dormice are common elements of the fossil faunas of both island systems.

All the fossil dormice excavated on Sicily have until now been attributed to forms defined from the island of Malta by de Bruijn (1966) and Zammit Maempel & de Bruijn (1982). These comprise the giant form *Leithia melitensis* (which was twice the size of the recent dormouse) and *Leithia cartei*, in addition to the medium-sized *Maltamys gollcheri* and *Maltamys wiedincitensis*, the latter being slightly bigger and more recent than its congener. However, recent studies indicate that *Leithia* from Sicily exhibit a greater variety in tooth size than those described from Malta, ranging from forms smaller than *L. cartei* through to specimens even larger than *L. melitensis*. Similarly, Sicilian *Maltamys* include specimens that are smaller than *M. gollcheri* and others that are larger than *M. wiedincitensis*, in addition to intermediate forms. Consequently, it is increasingly evident that a complete revision of Sicilian dormice is necessary and it is therefore suggested to temporary consider them as *confer* (cf.). In addition to the great variations in tooth size, certain differences in dental morphology also exist between Sicilian *Leithia* and *Maltamys*. These differences are more pronounced when comparing upper teeth ridges of these genera, since those of *Maltamys* exhibit a greater complexity.

Daams (1981) considered that the ancestor of *Leithia* and *Maltamys* is probably an unknown form and therefore all the insular glirids should be classified as *incerta sedis*. However, Zammit Maempel and de Bruijn (1982) believe that both genera derived from a species of *Eliomys* that first appeared in the Mediterranean during the late Miocene/early Pliocene. Furthermore, since *Eliomys* is closer in size to *Maltamys* than to *Leithia*, they suggest the speciation of the latter occurred earlier than that of *Maltamys*. The morphological similarities between *Maltamys* and *Leithia* can be explained by evolutionary convergence.

One of the purpose of the current investigations is to test which of the hypotheses regarding the ancestry of these two genera of Sicilian dormice is correct.

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New considerations about the taxonomy of early *Homo*

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No consensus has been achieved regarding the status of the species *H.habilis*, since the first discoveries in 1959 in the Olduvai Gorge. Many hypotheses have been expressed:

a) the specimens from Olduvai, East Turkana and Omo belong to the same paleospecies (i.e. Tobias, 1991);
b) the hypodigm is heterogenous (i.e. Wood, 1992 ; Rightmire, 1993 ; Lieberman *et al.*, 1996, Prat, 1997) ;
c) or these specimens don't belong to the genus *Homo* but to *Australopithecus* (Wood and Collard, 1999) or *Kenyanthropus* (Leakey *et al.*, 2001).

The goal of this study is to critically reevaluate the phylogeny and the taxonomy of the specimens of early *Homo*. A numerical cladistic analysis on 122 morphological characters was carried out on the original Plio-Pleistocene specimens. However, the Operational Taxonomic Unit used in this analysis is defined by the fossil specimen and not by the species (as often used), in absence of consensus about the hypodigm of the species *Homo habilis*. The result of this analysis shows, on the one hand, a particular taxonomic position for the Kenyan specimen KNM-ER 1805, and on the other hand that the conclusions of Wood and Collard (1999) concerning the revision of the genus *Homo* and the inclusion of the specimens of *H.habilis* and *H.rudolfensis* in the genus *Australopithecus* are questioned.

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Mechanical differences in the mastication of the upper Pleistocene bone consumers *Crocuta crocuta spelaea* (Hyaenidae, Mammalia) and *Canis lupus* (Canidae, Mammalia)

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We have taken occasion of studying *Crocuta crocuta spelaea* and *Canis lupus* upper-Pleistocene fossil skulls from the Castellana Caves (Apulia, Italy), stored in the Paleontological Museum of "Federico II" University, in Naples, to analyze adaptations to bone consumption in these taxa. Since hyenas use, to such purpose, the closest pre-carnassial teeth, while the bone-crunchers dogs rely upon the molars (Werdelin, 1989), differences in the form and the displacement of both teeth and jaws, are expected to occur. We actually found these differences. In canids, longer jaws and a much complete dentition, allow a certain degree of omnivory, in which the consumption of bones is only a marginal part. In hyenas of the *Crocuta* lineage, bone-cracking has reached the maximum degree of specialization, with a mechanical layout of the skull fairly devoted to resist the very large mechanical loads such a peculiar feeding behaviour is expected to arouse (Radinsky, 1981b).

We have stressed some considerations about allometric effects of the larger size of the European specimens of *Crocuta crocuta spelaea* in comparison to the extant spotted hyena (Klein & Scott, 1989). We have also proposed some ecological and evolutionary considerations about the co-occurrence of two, even if different, bone consumers. We stress the hypothesis that omnivory has favoured survival, in northern areas, of wolves as well as brown bears, in comparison to others carnivores, when they faced broad environmental and ecological changes, such as the spreads of first human settlements and the end of last glacial, that have characterized the end of the Pleistocene.

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Galinha dinosaur tracksite (Portugal). A place to learn to respect the palaeontological heritage

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The Galinha dinosaur tracksite, an old quarry near Fátima, on the eastern side of Serra d'Aire, 120 km north of Lisbon, represents the largest and most important Middle Jurassic (Bajocian-Bathonian) tracksite currently known. The site is characterized by the longest sauropod trackways known anywhere (147 m and 142 m) and by some of the largest known trackmakers (pes length 100 cm, width 80 cm: manus length 60 cm, width 75 cm). The trackways all appear to be wide gauge (cf. *Brontopodus*), and some consist only of manus impressions. The manus/pes area ratio is 1/2 as compared with ratios ranging up to 1/4 or 1/5 in other sauropod tracks and some manus impressions, particularly well-preserved, show very good traces of digit I. In one trackway these traces consistently reveal the presence of a large claw that was directed in a posterior-medial direction. Theses features suggest a distinct ichnotaxon (Santos *et al*., 1994).

The excellent state of preservation of the most of the footprints and the spectacular visual impact make this tracksite a privileged observation point of the dinosaur trackways. In 1996 the Portuguese Government classified Galinha tracksite as a Natural Monument known as *Natural Monument Serra d'Aire Dinosaur Tracksite* (MNDPDSA) and since then a geological, paleontological and environmental education centre has been developed. Indeed to protect and to value the natural heritage is necessary to create appropriate legislation but also, and fundamental, to promote educational programs to school children and general public, in order to inform and modify their attitude about the scientific and cultural value of this heritage.

The MNDPDSA is considered an exomuseum (Galopim de Carvalho, 1989; Galopim de Carvalho *et al*., 1996), where is possible to: 1- learn and feel paleontology as well as other geological issues for different school (elementary to college) and scientific levels; 2 - promote several educational actions which can contribute, through the knowledge of geological and biological evolution and an understanding of the development of different past ecosystems, to fully respect the environment of our planet; 3 - afford facilities to school children have the pedagogical support in some curricula.

The MNDPDSA is the only geological/paleontological Portuguese site adapted to receive visitors and in the last year 31 thousand people visited this site, half of them school children. There are a hall with a video room and a dinoshop, a pedestrian trail with outdoor stands informing the main aspects of each site, guided tours, as well several publications on dinosaur tracks and nature issues. It is already planned for the near future a Jurassic botanical garden, a quarry museum where it can be seen the process of exploitation of the limestone from the 70's until 1996 and a sauropod natural size model to allow the visitors understand how were the dinosaur trackmakers.

Indeed, the educational propose of these outdoor geological/paleontological museums is fundamental to the success of geoconservation strategies in order to protect and to value geological/paleontological sites.

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Microcomputertomographic investigation of the femoral trabecular architecture on different Primates and Insectivores

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The loading conditions on the femur which occur during locomotion depend on bodyweight and muscle activities (PAUWELS 1965, DUDA 1996). The largest part of the loads induced on the femur can be compensated by the corticalis, but the trabecular bone also aligns along the principle stress trajectories (KUMMER 1959, PAUWELS 1965). Different types of locomotion induce different loads on the femur. The trajectory aligned trabecular bone therefore permits a discrimination of varying locomotional preferences. This relation was examined in the proximal part of the femur of *Erinaceus europaeus*, *Tenrec ecaudatus*, *Lemur macaco* and *Talpa europaea*. The results were used to interpret the trabecular architecture of the proximal femur in the two Eocene Nothractinae *Smilodectes gracilis* and *Notharctus tenebrosus* with regard to their locomotional preferences (SCHERF 2000). Previous investigations of the trabecular architecture were made on bone-sections and -thinsections, which only allow a limited insight in the 3D-structure of the trabecular bone and destroy the sample. An alternative is non-destructive microcomutertomography (µCT). For this work the µCT-systems µCT 20 and µCT 80 at SCANCO Medical were used. These µCT-systems provides a nominal resolution of between 8-34 µm (µCT 20) and 40-160 µm (µCT 80), depending on the object size. After the measurement, the obtained 2D-section can be evaluated histomorphometrically and used for 3D-reconstructions which can also be evaluated histomorphometrically (SCANCO 2001).

The trabecular architecture of *Erinaceus europaeus* is relatively steady and consists of platelike trabeculae which are connected through thinner, rodlike trabeculae. Platelike trabeculae can absorb maximum loads from various directions in the plane of their extension. Rodlike trabeculae can only absorb maximum loads in their axial direction. Various loading conditions in various directions can be caused by various kinds of habitual locomotion. *Erinaceus europaeus* shows such a variation in locomotion because he moves on the ground and also climbs. *Tenrec ecaudatus* shows a predominantly rodlike trabecular architecture which is highly connected. This feature speaks for steady loading conditions in a constant direction that corresponds with the terrestrial quadrupedal locomotion of *Tenrec ecaudatus*. The high loading conditions which occur during the leaping phase of the locomotional spectrum of *Lemur macaco* are reflected in the trabecular architecture through thick, horizontal, rodlike, and less connected trabeculae which enclose the marrowcave between thickened parts of the corticals and act as cross-beams to stabilize the corticalis. Towards the Trochanter minor and tertius, follows a framework of smaller, thinner and more connected trabeculae which can be regarded as a response to the muscle forces which act upon this area. *Talpa europaea* shows also thick, horizontal less connected trabeculae which have a more platted morphology. This architecture can be interpreted as a response to the use of the hindlimbs for terrestrial quadrupede locomotion and from extensive digging activity. The comparison of the µCT-scans of the fossil species *Smilodectes gracilis* and *Notharctus tenebrosus* with these results shows similarities of their trabecular architecture to *Lemur macaco*, so that their locomotional spectrum could be interpreted from this database as similar to that of *Lemur macaco*.

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Tetrapod Fauna of Pietraroja Plattenkalk (Benevento, Southern Italy)

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While well known because of the dinosaur *Scipionyx samniticus*, the tetrapod fauna of Pietraroja (Benevento, Southern Italy) has never been studied completely. New findings in the excavations carried out in spring 2001 brought new information on the fauna. The previous samples and excavations, however, already provided the palaeontologists with two crocodilians, a theropod dinosaur, two amphibians and at least five lizards and a sphenodontian (D'Erasmo, 1914-15; Barbera & Macuglia, 1988; Signore, 1996; 2001). We are currently examining this fauna from both a systematic and palaeogeographic point of view, and the work is still in progress. However, the new specimens found in the last excavations, and the detailed study of the previously known tetrapods, except the crocodilians, is giving results. The tetrapods appear to confirm the presence of a landmass somewhere behind the sea where the carcasses were buried, and the presence of a freshwater source capable of sustaining both crocodilians and amphibian is now out of question. But there is another interesting point in the tetrapods of Pietraroja: all those examined until now appear to be primitive respect to the outcrop dating. Pietraroja, as a matter of fact, is dated to the Aptian – Albian (Bravi, 1996), but all the tetrapod appear to be more primitive than contemporary faunas around the Thetis Sea. Further analysis will either prove or disprove this idea, but without doubt the Pietraroja tetrapod fauna will prove to be a milestone in the study of the Thetis palaeogeography.

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New Excavations in Pietraroja (Benevento, Southern Italy): preliminary results

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During the spring of 2001, systematic excavations in the Pietraroja plattenkalk have been carried out by a team from Università degli Studi del Sannio and Università degli Studi di Napoli "Federico II".

The excavations were carried out in an area external to the Geopalaeontological Park of Pietraroja, out of the need to proceed to a sampling in the view of a new water reservoir in the area. The excavations have been monitored via digital camera and portable computer, and a complete scanning of the specimens found has been done on the field and later in laboratory. The area of Pietraroja is not well known in literature, therefore new analyses have been carried out. Interesting results arose from the excavations. First, the possibility of using computer systems to monitor excavations, and acquire and analyse data directly in the field by using laptop computer and digital videocamera. Fossils can be positioned in the original setting by comparing and computing video images and pictures. Moreover, every phase of the excavation may be monitored and observed later, therefore giving the possibility in quasi-realtime to adopt new strategies or approaches to difficult phases of the work, which has been carried out almost completely by hand, except the first part, in which a mechanical excavator was used. A second interesting point is the sedimentological and palaeoecological setting of the area. We observed several sedimentological, environmental, and taphonomical markers that set the depth of Pietraroja downward. Most possibly, as also confirmed by the work of Carannante and Vigorito (2001) Pietraroja was a deep basin with a channel system. This setting should substitute the old view of Pietraroja as a shallow, overheated lagoon (Catenacci & Manfredini, 1963; D'Argenio, 1963; Signore, 1996; Bravi, 1996).

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Palaeobiology of theropod dinosaurs (Dinosauria, Saurischia): a work in progress

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In the last decade we assisted to a new bloom for the theropod palaeontology, thanks to incredible findings, such as *Scipionyx samniticus* (Dal Sasso & Signore, 1998). While some voices tried to go against the idea that birds are dinosaurs, the idea that birds are related to theropod dinosaurs is generally accepted. But this idea caused a stall in palaeobiological studies on theropods, because most scientists assumed that theropod anatomy and physiology was exactly the same as modern birds, forgetting that birds are a very specialised branch of theropods. Air sacs were not the only breathing system in theropods, mainly because their sheer volume would have made breathing impossible over a certain size (Signore, 2001), therefore possibly dinosaurs used a diaphragmal breathing coupled with a costal ventilation to breathe; this hypothesis is still in course of testing, but from the fossil evidence in *Scipionyx samniticus* (Ruben *et al.*, 1999) the model could work at least for theropods. Moreover, while some authors suspected the involvement of a predatory strike in the origin of birds flight (see Signore, 2001, for a review), no one tried to understand the origin of flight as deriving from an offensive movement. I used a morphofunctional approach to try and give an explaination of some of the most important osteological characters that gave rise to the flapping flight, by studying theropods hands and arms. From a morphospace analysis study, I discovered that the furcula was used as a supplementary attachment point for the forelimb muscles to increase the power of predatory strike without overcharging the humerus, while the bowed ulna possibly functioned as an energy dissipation system, and the semilunate carpal as an automatic grasping device. All together, these elements made a terrible weapon of hunting, from which the flapping flight evolved in birds.

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Review of the fossil filefishes of the family Monacanthidae (Tetraodontiformes), from the Pliocene of Italy

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Of the ten extant families of tetraodontiform fishes (triggerfishes, boxfishes, pufferfishes, giant ocean sunfishes, etc.), all are known from either the Eocene or Oligocene with the single exception of the Monacanthidae (filefishes). The monacanthids are the most speciose family of tetraodotiforms, with about 100 species alive today in tropical and temperate waters worldwide. However, fossil filefishes are only known from the upper Pliocene of Italy from the Vrica section near Crotone, Calabria (Landini & Menesini, 1978) and the Marecchia river in Emilia Romagna and the Metauro river in Marche (Sorbini L., 1988). The Calabria specimen was briefly described, figured and provisionally referred to *Stephanolepis* sp. (Landini & Menesini, 1978: 170) whereas the morphologically similar but more numerous specimens from Marecchia and Metauro were figured and simply listed as *Alutera* sp. and Gen. et sp. indet. (Sorbini L., 1988: 11,12; Landini & Sorbini L., 1992: 155).

We have re-examined all of the above material plus an additional specimen from the Stuni section (near Vrica section and in stratigraphic continuity with its lowermost layers) and numerous new specimens from Metauro including relatively large ones (up to 270 mm Standard Length). These only known fossil monacanthid materials represent two new species of a new genus. The two new species are unique among monacanthids by the enlargment of many of the body scales with increasing specimen size, this enlargment being only moderate in one of the new species and great in the other new species. Whereas the moderate enlargement involves individual separate scales, the great enlargment involves the aggregation of numerous small individual scales into a composite plate (composed of 2000 and plus in largest plates) of complex unified structure. The scales in all extant species of monacanthids are relatively small and do not become proportionally larger with increasing specimen size (except for some specialized plates of bristles or barbs on the caudal peduncle). The two new species differ from one another not only in scalation but also in orientation of the neural spine of the 4th abdominal vertebra.

The new genus is unique among monacanthids not only by the moderate to great enlargment of the scales, but also by the combination of osteological characters as pelvis shape, soft dorsal- and anal-fin bases, teeth, number of vertebrae, neural spines position, first dorsal-fin spine morphology.

Some of the observed diagnostic features are apomorphic in respect to the balistid sister group of monacanthids and most other monacanthids, including all of those that are basal members of the several major clades. These derived conditions indicate that the new genus is related to the *Alutera*-like group of monacanthids which includes: *Alutera*, *Brachaluteres*, *Pseudaluteres*, *Paraluteres*, *Anacanthus*, *Acanthaluteres*, and *Oxymonacanthus*. Within this group of *Alutera*-like genera, the new genus is distinctive both by its scalation and its unique combination of osteological characters.

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Remarks on shoulder-blade functional morphology of megatherine sloths (Xenarthra, Mammalia) in comparison to other ground sloths

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Inside the big group of ground sloths, megatherines represent the largest forms; some Pleistocene genera of both American continents are bigger than an elephant in size. These forms, mainly because their gigantic size, reveal an exasperation of salient characters we can see in the other groups of ground sloths; but at the same time they show some unique adaptations which clearly separate them from these last ones.

A particular megatherine adaptation, shared with the majority of authors, but not as much developed more in other ground sloths, is their ability to get up and hold on for a long time on posterior limbs, to do everything like to feed themselves, defend and probably to move on short spaces in the middle of vegetation. This adaptation is also recognisable in the morphology of the shoulder-blade, beyond other elements of post-cranial skeleton.

Among the most salient distinguishing elements as far as the shoulder-blade concerns about xenarthrans, and therefore megatherine sloths, from almost totality of other Mammals, we have: the presence of a complete bony bridge between the acromial and coracoideus processes, for the independent development of a real coracoid bone; the presence of a second scapular spine called Inferior scapular spine, very evident above all in Vermilingua (Tree and giant anteaters).

Inside of the suborder of Tardigrada (which includes beyond the ground sloths, all extinguished, the actual tree sloths also) the differences in the shoulder-blade are surprisingly very marked. Among these we remember the different extension of the supra and infra spinata fossae, the different inclination of the main scapular spine respect to the position of the glenoid cavity, the different development and morphology of the acromial, coracoidea, axillar and cranial portions, the different morphology and length of the inferior scapular spine.

On the base of these characteristics, in concomitance with the differences also at the humerus and collar-bone, is reasonable to retain that megatherine sloths were characterized, regard to others ground sloths, from a bigger range of movement (rotation) at the humeral head inside the glenoid cavity, a bigger capacity of extension and abduction of the forearm, but less power in flexion of the same one. Very powerful must have been instead the movement of adduction, because of the remarkable development of insertions concerning pectoral muscles both on the humerus and on axial skeleton.

Well then it is probably that these animals used their forearms like some brachiator tree primates and more like the same tree sloths, and acted with hands pretty high over their head. The possibility, extendedly recognized from many authors, that megatherine sloths fed themselves with tree leaves, catching branches with hook-hands, is furthermore supported from this analysis. Besides we can reasonably believe that the movement of bringing near leaves to prehensile tongue, and therefore to mouth, was mainly characterized from an oblique dorsolateral – medioventral direction and not merely dorso – ventral.