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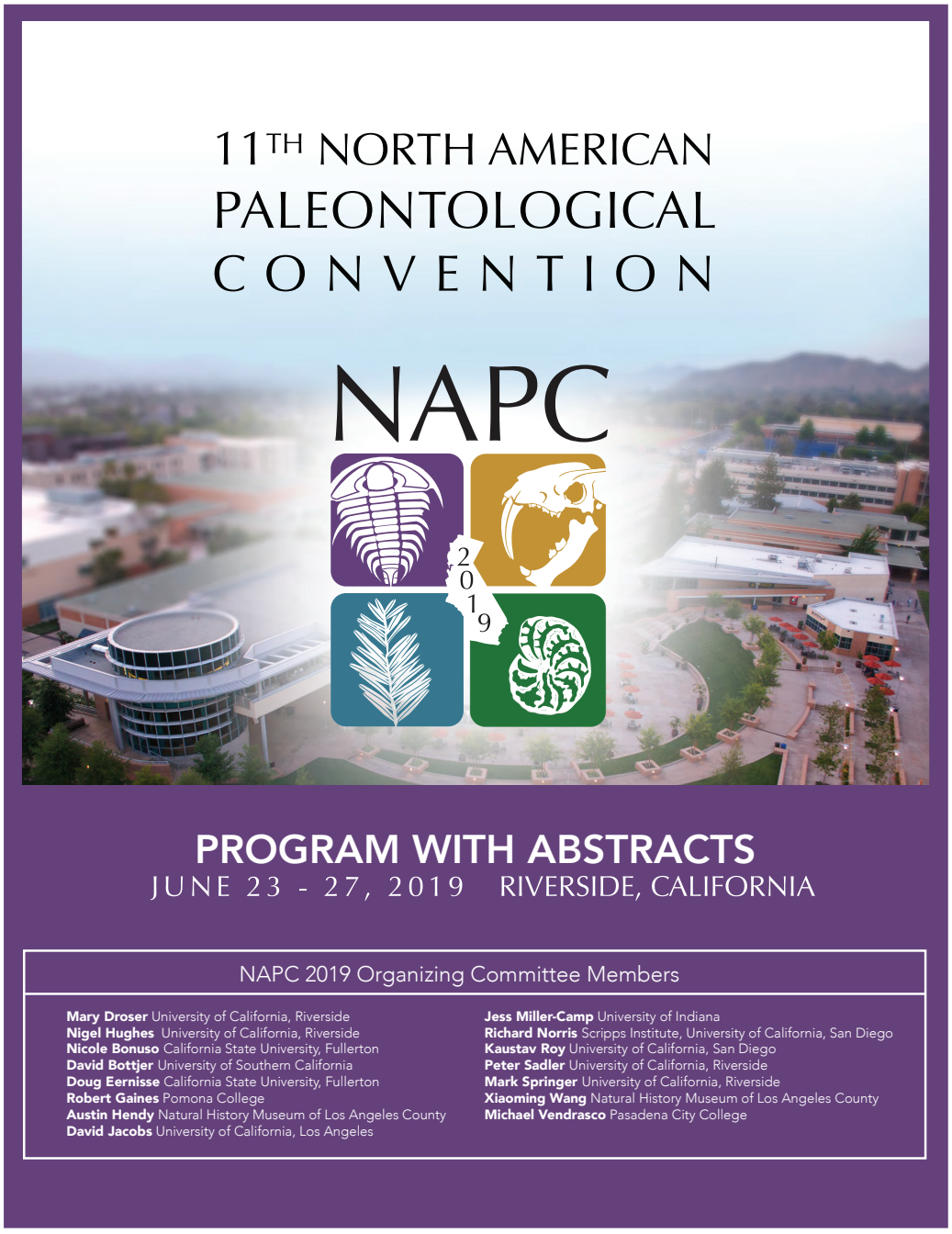

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Terrestrial and freshwater vertebrate faunas of the Late Cretaceous of eastern North America (Appalachia) are rare and invariably associated with coastal marine environments and faunas. Consequently, our understanding of those non-marine faunas is relatively poor when compared to the richly fossiliferous coeval deposits of the Western Interior of the continent (Laramidia). Discovered in 1980, the Campanian-age Ellisdale Site of the Marshalltown Formation, Monmouth County, New Jersey remains the sole vertebrate fossil assemblage of Appalachia to have produced adequate sample sizes of small, non-marine taxa including frogs, salamanders, non-marine lizards, and mammals via bulk sediment sampling and underwater screenwashing techniques. Past and ongoing work indicate that these taxa differ at the generic level from their Laramidian counterparts, supporting previous suggestions of broad regional distinctions between Appalachia and Laramidia. Fossiliferous sediment samples collected in 2018 from a previously unsampled area of the Ellisdale Site ('92 Pit) are yielding the expected faunal assemblage (mostly cartilaginous and bony fishes with a few turtles, crocodylians, and dinosaurs) as well as new and exciting discoveries of non-marine vertebrates. These include a proximal femur that is possibly the oldest mammalian postcranial specimen from Appalachia. Although this femur is incomplete, it possesses a subtrochanteric tubercle, a large, proximally-projecting greater trochanter, a ventrally positioned lesser trochanter, and a post-trochanteric fossa; all features that are diagnostic of multituberculates. The element is relatively robust, with a basally broad neck and well-developed lesser trochanter. Other novel discoveries include the oldest Appalachian record of a chelydroid turtle, based on a nearly complete peripheral from the carapace. This element exhibits several ridges that extend perpendicular to the major sulcus on the dorsal surface of the bone and a transversely oriented medial pit ventrally; it either represents a chelydrid (snapping turtle) or a kinosternid (e.g., mud turtle). An indeterminate but morphologically distinct shed tooth of an atoposaurid-like mesoeucrocodylian also has been identified. The tooth is extremely labiolingually compressed, with what appears to be weakly developed denticles along the thin mesial and distal carinae. These new elemental and taxonomic records expand the known terrestrial and freshwater assemblage of the Ellisdale vertebrate fauna, adding to our knowledge of the unique land life of the Appalachian "Island Continent" and filling in a major gap in the worldwide biogeographic record of the early- to mid-Campanian stage of the Late Cretaceous.

A RECENTLY EXPANDED PALAEOCOMMUNITY OF PLANTS AND INSECTS FROM THE LATE CRETACEOUS (CENOMANIAN) OF LABRADOR, CANADA

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The Redmond Formation is one of the rare Mesozoic exposures known from the Quebec-Labrador Peninsula, and is only found in an abandoned iron ore mine located near Schefferville. This ferruginous argillite deposit of probable lacustrine origin and Cenomanian age has been known to contain semi-complete to fragmentary leaf and insect impression fossils for most of the time since its discovery in the late 1950s. However, only 5 insect species have been formally described, along with mentions of genera belonging tentatively to Blattaria, Schizophoridae, Cupedidae, and Haliplidae.

Fieldwork undertaken in the Redmond Mine in 2013 and 2018 has resulted in a significant expansion of the species richness and functional diversity of this mysterious palaeocommunity. More fossil angiosperm, conifer and fern leaves were recovered from the site. New angiosperm morphotypes were brought together with species known from historical specimens to produce the first absolute palaeoclimate estimate for Cretaceous eastern Canada. Our results suggest a mean annual temperature of 15°C and confirm the initial hypothesis of a warm temperate to subtropical climate, which is as expected for a particularly warm episode of the Cretaceous.

The expedition was most successful in expanding the known insect diversity: the specimens we present here are assigned to families or orders that were insofar not represented in the Redmond Formation. The hypothesis of a lacustrine depositional setting is strongly supported by the discovery of the first relatively complete representatives of mayfly nymphs (Ephemeroptera), belostomatid hemipterans

and hydradephagan coleopterans known from this site. We also report the first occurrences of a basal mantis (Mantodea), a lacewing (Osmylidae), a hairy cicada (Tettigarctidae), planthoppers (Fulgoromorpha), leafhoppers (Cicadellidae), orthopterans, and hymenopterans. Together, these new specimens contribute substantial information on insect evolution and biogeography at a pivotal time in the evolution of terrestrial ecosystems for a poorly represented region of the Cretaceous world.

CONSTRUCTING THE HIGH-RESOLUTION EVOLUTIONARY HISTORY OF ORDOVICIAN MARINE ANIMALS IN SOUTH CHINa

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Biodiversity pattern based on accumulated data is a major pursue in the macroevolution study, which can be used to investigate those major biological events such as originations, radiations, turnovers and extinctions. The Ordovician is considered as a significant period during the Phanerozoic Eon, containing two major biological events in Earth's history—the Great Ordovician Biodiversification Event (GOBE) and the end-Ordovician mass extinction event. These two events are also evident in South China based on previous research works. However, more precise analyses on big dataset are still necessary to fully disclose the diversity change during the Ordovician.

Constrained Optimization (CONOP) has been widely adopted as one of the most efficient, accurate and high-resolution methods that can conflate all sections in a multidimensional space at one time to gain the optimal composite bio-sequence, and thus is used here. The employed data for the present study are from the Geobiodiversity Database (GBDB, http://www.geobiodiversity.com/), which is an integrated platform for the integration, management and sharing of stratigraphical and paleontological legacy data. The raw dataset contains over 10000 species from ~1800 sections in South China, which includes all major marine fossil groups in the Ordovician such as graptolites, trilobites, brachiopods, conodonts, cephalopods, corals, and so on. During the quality control procedure, we excluded those low-quality sections either of a few fossil records or less sampling effort, and the taxonomic names of open nomenclature. The taxonomic names were then updated to a uniform systematic paleontological framework. The final dataset with quality control contains at least over 49000 bioevents (FADs or LADs) of 3375 species. The data were run repeatedly on the supercomputer - TianHe II with the parallel computing version of the CONOP program designed by the GBDB team. The result, the optimal composite bio-sequence, was calibrated by the ICS geological time scale to construct a high-resolution Ordovician marine biodiversity patterns of species, genus and even higher-rank taxon. Compared with previous biodiversity analyses which were generally of only about 6-10Ma temporal resolution, the present research provides a much higher temporal resolution of at least 30Ka, which gives more details of the biodiversification history, and sheds new lights for fully understanding the Ordovician marine world in South China.

A SPATIALLY-CONSTRAINED PALEOCENE MAMMAL ASSEMBLAGE FROM THE SAN JUAN BASIN, NEW MEXICO, USA

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The Paleocene Nacimiento Formation in the San Juan Basin (New Mexico, USA) preserves one of the most detailed records of mammal faunas during the time immediately following the Cretaceous-Paleogene mass extinction. The Nacimiento Formation is composed of alternating siltstones, sandstones, and redbeds from alluvial floodplain deposits. Generally speaking, fossils in this region weather out of steep cliffs and accumulate in topographic lows such as shallow pans. One such pan (L-1079), located a few meters below the upper black mudstone near the top of the overlying Ojo Encino Member in biostratigraphic zone Torrejonian 6 (Tj6) on the East Flank of Torreon Wash, is notable its abundance of fossils. L-1079 was discovered in the late 1970's and has been repeatedly visited for additional surface collection.

166 teeth were studied to characterize the mammalian fauna of the site. The minimum number of individuals (MNI) for the quarry is 24. The most common taxa are *Pantolambda bathmodon* and *Tetraclaenodon puercensis* with a MNI of 4 and 5 individuals respectively. The next most abundant taxa are *Mimotricentes subtrigonus* and *Promioclaenus lemuroides* (MNI=2