teaching format to a blended format with a distance learning (synchronous/asynchronous) section. This process enabled us to identify the need to develop an online database (Fossils3D) and a web app interface for desktop and IOS/Android devices (PaleoApp) to stimulate students' interest in paleontology. These new eLearning tools are intended to facilitate their un-derstanding of fundamental paleontological concepts through engaging educational materials that provide access to online experience with 3D fossil specimens, especially where introductory paleontology courses are not formally taught. Therefore, this eLearning project complements ongoing efforts by other enti-ties, such as the Paleontological Research Institution, to make paleontology more accessible, especially to students all over the world who do not have the op-portunity for face-to-face instruction.

FOSSILS DEFINE NATURAL VARIATION IN A CARIBBEAN CORAL REEF ECOSYSTEM AND REVEAL AN UNEXPECTED BRIGHT SPOT

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Coral reefs are one of the most threatened marine ecosystems in the world. Fortuitously, reefs tend to leave excellent fossils records that can be exploited to define change and variation in coral communities over time and space to provide context to the current declines in reef health. In this study we quantify the Historical Range of Variation (HRV) in coral commu-nity structure in a mid-Holocene (7.2–5.6 ka) fring-ing reef system in western Panama and compare it to variation in adjacent modern communities. Our results, somewhat unsurprisingly, show that most of the modern reefs exist in completely novel states, driven principally by the loss of the staghorn coral *Acropora cervicornis,* but also changes in other coral components. In sharp contrast to this expected region-wide shift, we discover one modern reef whose coral assemblages are contained within the fossil-defined HRV, identifying it as a potential vestigial reef com-munity, or coral reef "bright spot". Reef matrix cores reveals this isolated reef has remained in this state for at least the last 800 years. Curiously, the reef has never been considered outstanding despite being the focus of much research, presumably because it fails to satisfy assumptions about what a "pristine" coral reef should look like in this area. This finding demonstrates how quantifying the gamut of past variation of an eco-system can better define pre-human baselines, help reveal what is natural and what is novel, and uncover unexpected bright spots.

THE END-TRIASSIC MASS EXTINCTION (ETE) ON LAND AND THE ROLE OF HIGH-LATITUDES IN DINOSAUR DOMINANCE

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Late Triassic continental tetrapod communities show a bi-polar provinciality in which all herbivorous dinosaurs and several temnospondyl amphibian groups are restricted to higher latitudes whereas diverse pseudosuchians with uncommon carnivorous dinosaurs and a very low diversity of temnospondyls characterize the tropics. A similar provinciality is apparent in pollen and spores, most notably in the distribution of the voltizialian conifer vesicate pollen forms (e.g. *Patinasporites*) that were dominants in the tropics becoming rare then absent towards the high latitudes. This provinciality collapsed by the earliest Jurassic, part of the distinctive biotic pattern of the ETE. Notable is the differential survival of archosauromorph forms dominant in higher latitudes, sorted by clade-level physiologically-related traits and size. All large (> 1 m) continental, presumably uninsulated, bradymetabolic pseudosuchians and other archosauromorphs became extinct prior to the earliest Jurassic, while not only were the insulated (protofeathers), tachymetabolic dinosaurs (and pterosaurs) minimally effected, large herbivorous dinosaurs expanded their ranges though the tropics and the earliest known ornithischians (also primitively insulated) appear and become common. During the Early Mesozoic, the higher latitudes (> 40° N or S) were forested with no evidence of polar glaciers presumably because of high CO_2, (800-4000 ppm) although there is evidence of seasonal freezing. There are almost no tetrapods known from these forested areas, whereas slightly lower latitudes in both hemispheres are some of the richest Late Triassic and earliest Jurassic continental

assemblages, a pattern which we assert is a due to a collection and/or preservational bias. We additionally propose, that the abundance of large, insulated herbivores in the higher latitudes reflects their dependence on reliable food sources and a preference for cooler climates, while they could not compete with generally bradymetabolic pseudosuchians in the violently variable tropics under high atmospheric CO_2 levels.

Seemingly paradoxically, during the CO_2 doubling events (~2000 to 4000 ppm) generated by emplacement of the Central Atlantic Magmatic Province (CAMP) ~201 Ma and the ETE, the continental low latitude biomes were wiped out and replaced by members of higher latitudinal communities, rather than a poleward shift that might be expected from global warming. We resolve this paradox by noting that among continental amniotes only small forms that could take advantage of burrows or insulated clades, including both large and small forms, survived the ETE, which would seem to be accidental pre-adaptations for survival through brief but intense freezing episodes as would be expected of the super-volcanic winters of the CAMP. Thus, despite the 150 year prejudice of casting the Age of Dinosaurs as tropical, the dominant life forms on land became so by being fundamentally cold-adapted.

REVIEW OF THE MIDDLE CAMBRIAN TRILOBITES OF THE BATHYURISCUS-ELRATHINA BIOZONE OF MONTANA: TAPHONOMY AND TAXONOMIC INFORMATION

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Although Cambrian outcrops are extensively ex-posed in western Montana, relative few studies have been conducted on the trilobites from these strata. The last thorough description of the trilobites of Montana was published by Charles F. Deiss in 1939. Since that publication, many taxa have been synonymized or re-classified. Here, I present new information on the trilo-bite fauna present in the Middle Cambrian shale units near Manhattan, Montana. The composition of 171 samples in the paleontology collection at the Museum of the Rockies, Montana State University includes three orders (Corynexochida, Agnostida, Ptychopariida) and four families of trilobites. These trilobites, though typically found as shed elements, are well preserved, facilitating identification. The dataset includes spe-cies indicative of the Bathyuriscus-Elrathina biozone and are comparable to those of the Wheeler Shale in Utah and the Burgess Shale in British Columbia. In addition to trilobites, brachiopods and one sponge are also represented. The Middle Cambrian faunas of Utah, Nevada, British Columbia, and Alberta have been well explored. As Montana is situated between these areas, these trilobites are critical to the understanding of the faunal and biogeographical transitions between these regions.

LATE QUATERNARY ENVIRONMENTAL CHANGES IN THE VALLEY OF MEXICO INFERRED FROM SMALL MAMMAL ASSEMBLAGES

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Tlapacoya Hill is an eroded andesite volcano located on the shore of the former Chalco Lake, in the southern Valley of Mexico. Between 1965 and 1973, several excavations were carried out in Tlapacoya, including two rock shelters Tlapacoya II and V located on the west and east slopes of the hill. Thousands of small bones were collected through sieving and housed in the Paleontological Collection (INAH). In this work, we present the results of the preliminary study of the small mammals remains, analyzing the shifts in their taxonomic abundances based on genus level identifi-cation to infer the environmental changes during the Late Quaternary on the region.

In the interior of Tlapacoya II, nearly eight-thousand identified specimens of small mammals, were recovered from a 3-meters stratified deposit encompassing from the end of the Pleistocene to the middle of the Holocene. Identified mammals include chiropterans of the genera *Mormoops*, *Myotis*, and *Desmodus*, three lagomorph genera (*Lepus*, *Sylvilagus* and *Romerolagus*),two soricids (*Cryptotis* and *Sorex*), and 18 rodent genera from four families (Sciuridae, Cricetidae, Geomyidae, and Heteromyidae). The rodent community represents distinct temperate and xeric environments. The presence of the volcano mouse *Neotomodon* and rabbit *Romerolagus,* indicate lower altitudinal displacement of the temperate forests. Extralimital rodent *Onychomys* suggests an