POLAR DINOSAURS AND THE GENESIS FLOOD

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Abstract

Many dinosaur fossils have recently been discovered at polar latitudes. Warm-climate vegetation is also found at these latitudes. However, general circulation climate models consistently show that mid and high latitude continental areas would be very cold in winter during the Cretaceous and early Tertiary. This contradictory information is difficult for the uniformitarian scientist to explain. The creationist model offers at least three possible solutions to this mystery. One solution is especially emphasized because it also provides a possible solution to two creationist problems: 1) billions of dinosaur tracks found around the world and 2) dinosaur nests with newly hatched baby dinosaurs. Both of these events occurred on top of thousands of meters of Flood sediment. It is proposed that a strip of land, roughly paralleling the continental divide of North America, was temporarily exposed during the first 150 days of the Flood.

Introduction

Climatic mysteries of the past are mounting up for the evolutionary / uniformitarian paradigm. Abundant evidence has come to light supporting a warm Cretaceous and early Tertiary fossil flora and fauna at mid and high latitudes or paleolatitudes (McKenna, 1980; Jefferson, 1982; Creber and Chaloner, 1985; Taylor, 1990; Francis, 1991; Felix, 1993).

Recent discoveries of dinosaur nests, eggs, and even newly hatched baby dinosaurs suggest new hypotheses on dinosaur behavior to uniformitarian scientists. This new data is difficult to explain within the Flood paradigm because these discoveries are within sediments most creationists would accept as Flood deposits.

The Paluxy River is not the only area where dinosaur tracks occur in profusion. During the past 15 years, dinosaur tracks have come to light in many parts of the world. They likely number in the billions (Gillette and Lockley, 1989; Lockley, 1991). In western North America, the tracks have been discovered within and east of the Rocky Mountains. They are especially numerous in Colorado and Utah.

More dinosaur graveyards have been recently discovered in Montana and Wyoming. A few of these dinosaur graveyards contain thousands of fossilized dinosaurs packed into a small layer. These occurrences suggest catastrophic burial.

In this article, I will describe the uniformitarian problem of dinosaurs that presumably lived within the Arctic circle. In the process of suggesting how polar dinosaurs fit within a Genesis Flood paradigm, I will also offer a creationist explanation for dinosaur nests, tracks, and graveyards.

Geographic Distribution of Polar Dinosaurs

Up until 1980, evidence for polar dinosaurs came from only one location. This location was the dinosaur footprints from Spitsbergen (Colbert, 1964). Now, dinosaur fossils and footprints are found at many polar locations, or from presumed polar locations based on the inferred paleolatitude (Monastersky, 1988). For instance, dinosaur fossils have been unearthed on the Colville River of the North Slope of Alaska (Brouwers et al., 1987; Parrish et al., 1987; Rich and Rich, 1991, p. 35; Clemens and Nelms, 1993). They have also been discovered in northern Canada: from the Yukon Territory, the western part of the Northwest Territories, and possibly the Queen Elizabeth Islands of northeast Canada (Davies, 1987, p. 199; Weishampel, 1991). An ankylosaurus fossil has been dug out of central Siberia (Weishampel, 1991, p. 104, 105). Dinosaur bones have been unearthed on New Zealand (Weishampel, 1991, p. 139), which allegedly was located near the South Pole at the time (Figure 1). Dinosaur fossils have been discovered at two locations on Antarctica: 1) an ankylosaurus and a hypsilophodontid from James Ross Island and nearby Vega Island, respectively, of the Antarctic Peninsula (Crame, 1989; Benton, 1991); and 2) at least four types of dinosaurs, including a unique *Tyrannosaurus rex* -like dinosaur, in the Transantarctic Mountains, 650 kilometers from the South Pole (Hammer and Hickerson, 1994).

Of special interest is the recent analysis of a diverse megafauna and megaflora that contains many types of dinosaurs in southern Victoria, Australia (Douglas and Williams, 1982; Rich et al., 1988, 1989; Rich and Rich, 1991, 1993). The current latitude is about 38°S but, according to the plate tectonics paradigm, southern Victoria was located at about 75°s during the early Cretaceous (Figure 1). The fossil dinosaurs, which make up 5,000 individual bones and two partial skeletons, include allosaurus, ankylosaurus, and hypsilophodonts. Pterosaurs and plesiosaurs are also represented. Because the environment was assumed to be terrestrial, based on abundant fossil flora and the dinosaurs themselves, the plesiosaurs are said to have lived in "lakes" The allosaurus was long thought extinct by this time.

Many other vertebrates and invertebrates, as well as plants, were discovered with the dinosaur fossils of southern Victoria. Vertebrate fauna include birds, turtles, amphibians, a lizard, and many types of fish, including the lungfish. Remains of labyrinthodont amphibians, supposedly ancestral to modern amphibians and reptiles, were also found. They were thought extinct by 160 million years ago, but the sediments are dated at 115 million years old, based on the other fossils. More than 80 species of invertebrates have been identified. There are ostracodes, spiders, bryozoans, bivalves, and twelve orders of insects, including mosquitoes. Very diverse megaflora is associated with the megafauna. Ferns with large fronds, tree ferns, ginkgo, many types of conifers, and angiosperms were associated with the diverse fauna. The tree ferns imply

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at least a subtropical climate. Tree rings from the conifers are up to seven millimeters wide, very wide for the assumed paleolatitude (Douglas and Williams, 1982, p. 178). In fact, the flora and fauna of southern Victoria, if they died where they lived, are more consistent with the current latitude than with the inferred paleolatitude.

Since it would have been dark and cold for up to four months at the presumed paleolatitude of southern Victoria, some evolutionists have suggested that the dinosaurs migrated to lower latitudes before winter. Other cold-sensitive animals, such as turtles, lungfish, amphibians, and lizards may have hibernated. However, many of the principle investigators do not believe migration was likely (Brouwers et al., 1987; Rich et al., 1988). First, the vegetation indicated at least a mild climate. Second, migration would have been difficult for the small hypsilophodont dinosaurs. Third, many of the other vertebrates could not have migrated. Fourth, the fact that more than half the dinosaur fossils are juveniles suggests ". . . that these dinosaurs were not just casual visitors but lived near the pole for much of the year, using the area as a nursery during the period of maximum sunlight" (Rich and Rich, 1993, p. 53). Brouwers et al. (1987) also suggest that young hadrosaur fossils found on the North Slope of Alaska indicate year-round residency.

The premise that dinosaurs once lived through the dark winters at polar locations has reinforced the idea of endothermy (warm bloodedness) in dinosaurs. Some of these investigators also question both the asteroid and the volcanic hypothesis for the end-Cretaceous extinction of the dinosaurs and many other animals (Brouwers et al., 1987; Rich et al., 1988; Clemens and Nelms, 1993). These hypotheses claim that dust from either an asteroid impact or widespread volcanism caused an "asteroid or volcanic winter." These scientists suggest that if the dinosaurs were already acclimated to the cold and dark, they should have survived an asteroid or volcanic winter.

Climate Simulations Produce Cold Mid and High Latitude Winters

The climate at mid and high latitudes during the Mesozoic and early Tertiary, based on the flora and fauna, has been variously interpreted from cool temperate to tropical. Moreover, the climate was mostly equable—lacking seasonal or diurnal extremes. The tree rings also indicate that the precipitation was sufficient for rapid tree growth. Regardless of specific interpretations, the flora and fauna indicate that the polar areas were much warmer than at present. Douglas and Williams (1982, p. 172) state that polar warmth is a major unsolved mystery for conventional Paleobotany and palaeoclimatology:

> Frakes (1979) considered that the former existence of high-paleolatitude Mesozoic and early Cenozoic floras apparently unadapted to enforced winter dormancy during prolonged periods of darkness presents palaeobotany and palaeoclimatology with a major unresolved problem.

Plate tectonics does not solve the climate problem because the latitude of the polar areas has changed little since the Mesozoic. In the Northern Hemisphere, many continental areas were even farther north in the Cretaceous than they are today. For instance, the current latitude of the Colville River on the North Slope is 70°N while in the late Cretaceous it was supposed to have been at 85°N (Clemens and Nelms, 1993). In the Southern Hemisphere, there presumably was even more land at high latitudes than today. New Zealand and southern Australia are believed to have been within the Antarctic Circle during the Cretaceous Period (Figure 1).

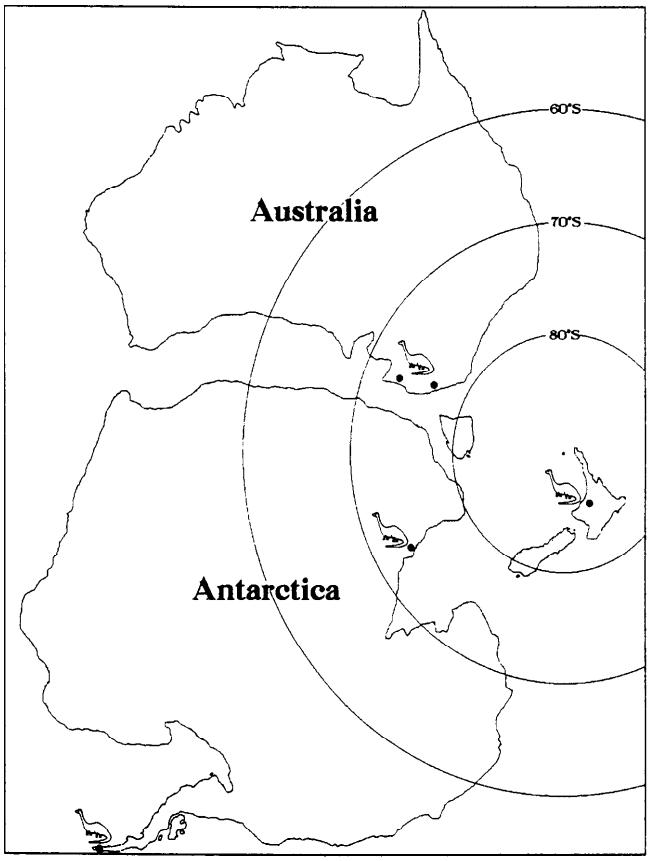

Figure 1. The presumed grouping of southern continents around the South Pole in the early Cretaceous of geological time. Picture of the dinosaur marks the locations where dinosaur fossils have been discovered (After Rich and Rich, 1991. and drawn by David Oard).

Evolutionists are scratching their heads trying to explain the mysterious occurrence of dinosaurs in a mild polar climate with months of winter darkness. Because of the presumed polar habitat of the animals and the results of climate models (discussed below). uniformitarian scientists are attempting to reinterpret the presumed Cretaceous paleoclimatic evidence as cool as the various data will allow. In southern Victoria, Rich et al. (1988, 1989) claim that oxygen isotope ratios on calcite within the sediments suggest that mean annual temperatures were less than 8°C and perhaps as low as -5°C. This is very cold, and the fossil flora and fauna do not justify such an interpretation. The floral evidence indicates a climate with no widespread freezing temperatures, even though darkness would have lasted several months at that paleolatitude. Some of the fossil vegetation, such as the tree ferns, grows today only in subtropical climates. Especially mysterious are the fossil fragments of lungfish. Lungfish today have a very restricted tropical environment, and

they cannot reproduce in water less than 10°C (Rich and Rich, 1993, p. 52).

The accuracy of oxygen isotope ratios for determining the precise paleotemperature can be questioned. The oxygen isotope paleothermometer is based on many assumptions, and there are other variables that affect the oxygen isotope ratio (Oard, 1984). For instance, Adams, Lee, and Rosen (1990) found abundant fossil evidence for warm sea surface temperatures of 20 to 28°C in the tropics during the Tertiary Period. However, oxygen isotope ratios gave values indicating a temperature of only 18°C. They suggest the oxygen isotope values must be wrong.

To explain the abundant evidence of a mild to warm polar climate, Douglas and Williams (1982) are bold enough to suggest a non-uniformitarian solution to the problem—an axial tilt of the earth less than 15° in the past. However, evolutionists as well as some creationists do not realize that a reduced axial tilt with all other variables remaining constant, causes a colder climate at higher latitudes than today, not a warmer climate.

Eric Barron (1984) modeled a lower axial tilt using both the present ocean temperatures and the presumed warmer ocean temperatures and inferred geography of the Cretaceous and early Tertiary. Although climate simulations have many simplifying assumptions, they often produce a rough indication of climate. Barron found that even in the warmer simulation of the Cretaceous and early Tertiary, temperatures over continental areas at mid and high latitudes would have been much colder than today. An ice age would have developed. This makes sense because higher latitudes would receive less solar radiation during the year with reduced tilt than today. It is the long days of summer that keep the higher latitudes today from accumulating snow and ice over the year.

Climate simulations using the current axial tilt of 23.5° with presumed Cretaceous and/or early Tertiary geography suggest that high latitudes would have been very cold in winter, especially within continental interiors (Sloan and Barron, 1990, 1992). In fact, just changing from present-day to Cretaceous geography resulted in a mean global cooling of about 0.2°C (Walker, 1993)! In an Eocene climate simulation, Sloan and Barron (1992) produced large seasonal temperature extremes in continental interiors of middle and high latitude. Average winter temperatures over much of mid and high latitude North America were colder than -10°C. Sloan and Barron (1990, p. 489) conclude:

> Eocene and Cretaceous climate-model experiments demonstrate that regardless of conditions of warm polar oceans, differences in pole-to-equator surface-temperature gradient, or topography, above freezing temperatures in winter for continental interiors at middle to high latitudes cannot be maintained.

As a result of recent climate simulations, geologists and paleoclimatologists are searching for some mechanism to warm the climate during the Cretaceous and early Tertiary. They are contemplating, as one possible solution, an order of magnitude higher concentration of CO_2 for a super greenhouse boost (Walker, 1993). However, Sloan and Barron (1990, 1992) doubt increased CO_2 will have much effect on the climate. In their simulations of Cretaceous climate, a much higher atmospheric content is already implicitly incorporated in the form of warmer high latitude sea surface temperatures. Unfortunately, increased CO_2 likely would heat the tropics too much (Barron and Washington, 1985; Wing, 1994, p. 2).

So, uniformitarian scientists have a serious problem within their paradigm. The fauna and flora indicate a mild to warm, equable climate in the Cretaceous and early Tertiary at mid and high latitudes. On the other hand, climate simulations for that time indicate cold winters with large seasonal extremes for mid and high latitude continents. This paradox suggests that the uniformitarian paradigm of earth history is seriously inadequate. Michael Benton (1991, p. 28) sums up the conundrum when he asks: "Should we now imagine dinosaurs as thermally insulated warm blooded animals that ploughed through snowdrifts and scraped the ice off the ground to find food?"

Creationist Hypotheses

Can creationists explain the existence of dinosaur fossils at high latitudes of both hemispheres? Since most creationists believe the dinosaur fossils were a result of the Genesis Flood, can that great event explain the paradox of polar dinosaurs? Since any explanation of prehistoric events cannot be scientifically documented, I will suggest three hypotheses based on the pertinent evidence.

The first hypothesis is that dinosaurs simply lived at high latitudes before the Flood and were buried near where they lived. If the fossil flora from high latitude also grew in place, the pre-Flood polar latitudes were much warmer than today.

A uniformly warm earth possibly may be due to a water vapor canopy that some creationists believe was emplaced above the atmosphere on the second day of creation (Genesis 1:7). However, it has been difficult to model the vapor canopy to produce a pleasant pre-Flood climate with enough water for 40 days and 40 nights of rain at the beginning of the Genesis Flood (Rush and Vardiman 1992). (This assumes that moderate to heavy rain for 40 days fell over all or a large part of the earth.) There is also a heat problem as a canopy with abundant precipitable water (or even ice) condenses in the Flood (Kofahl, 1977; Morton, 1986, p. 34-45). A more sophisticated general circulation model of the atmosphere with clouds in the vapor canopy may make the vapor canopy more plausible from a scientific point of view.

Much of the fossil wood found at mid and high latitudes have tree rings, suggesting seasons at these latitudes before the Flood (Jefferson, 1982; Creber and Chaloner, 1985; Wise, 1992; Taylor, Taylor, and Cuneo, 1992). However, the seasonal temperature changes may have been modest, or there may have just been a seasonal change in water supply and not temperature. Or the rings could be due to some other variable, since tree rings can sometimes form in zones of uniform climate. The fossil trees found at mid and high latitudes often lack frost rings, which implies that winter temperatures rarely dropped below freezing. Thus, the dinosaurs could have lived at high latitudes under these conditions. If they were endo-

thermic or some combination between endothermic and ectothermic (cold blooded), they of course could have tolerated more cold than if they were entirely ectothermic.

Winter darkness, itself, probably would pose few problems. Evidence that at least some animals were not bothered by long dark winters is indicated by the hundreds of thousands of woolly mammoths, plus many other animals, that thrived at the high latitudes of Siberia and Alaska during the Ice Age. They apparently were unaffected by prolonged darkness. Even today, deer and elk in Montana sleep during the day and come out to feed at night. They are conditioned to roam around and feed in the dark with no apparent problem.

A second hypothesis that may account for polar dinosaurs in a Flood model is that dinosaur carcasses simply floated to higher latitudes and were buried. This could explain the existence of fossil dinosaurs on isolated land masses surrounded by large expanses of ocean, such as New Zealand and Antarctica. However, we know that some dinosaurs were alive at high latitudes during the Flood, as indicated by fossil footprints in sedimentary rocks from Spitsbergen and the North Slope of Alaska (Colbert, 1964, Parrish et al., 1987).

In this second hypothesis, warm-climate trees and plants could also have floated to higher latitudes from lower latitudes. In this case, the polar latitudes need not have had a mild or warm, equable climate before the Flood, since the dinosaurs and trees did not originally inhabit those latitudes. The often excellent preservation of leaves, cones, and fruits at high latitudes, would seem to argue against a floating hypothesis. However, the excellent preservation could be due to many of the trees floating upright while being carried to polar latitudes. With time, the leaves, cones, and fruits would fall off and become entombed in the sediments. They would be much fresher than if they were transported in water for many days before being deposited.

The high latitude dinosaur footprints suggest a third hypothesis, which has other supporting data. This hypothesis suggests that some dinosaurs were either swept alive to higher latitudes by powerful Flood currents or walked to high latitudes from mid latitudes on exposed sediments during the Flood. In either situation, newly exposed sediments must have existed at least at high latitudes during the Flood.

Exposed Land During the Genesis Flood

The dinosaur footprints at high latitudes are in sediments most creationists believe were laid down in the Genesis Flood. This suggests that Flood sediments became temporarily exposed during the Flood. The third hypothesis suggested in the previous section will be developed, incorporating other, more recent observation of dinosaur tracks, eggs, and newly hatched babies from mid latitudes of western North America as additional support.

Some dinosaurs probably could swim or float well (Coombs, 1980), and could probably have survived in the warm Flood waters for a period of time. Possible evidence that dinosaurs floated for awhile during the Flood is the predominance of adult and older juvenile dinosaurs and their footprints in the rocks (Horner, 1979, p. 296; Coombs, 1991, p. 39). You would expect babies and young juvenile dinosaurs to succumb to the initial onslaught of the Flood.

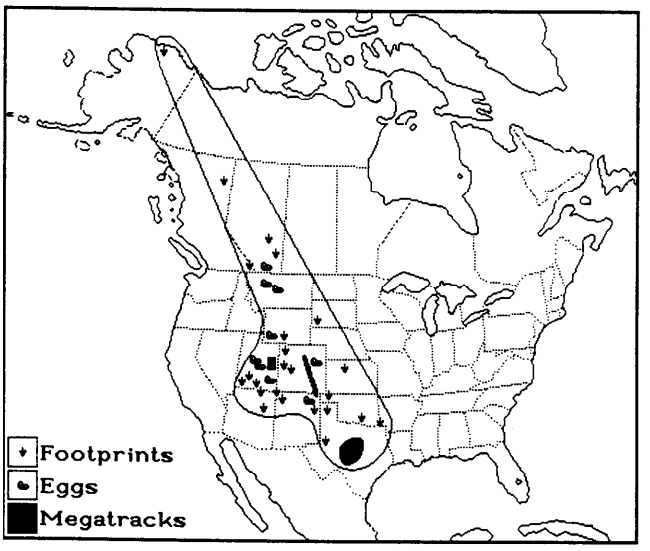

Figure 2. Location of the postulated strip of land generally parallel to the crest of the Rocky Mountains. Three megatrack sites are indicated in central Texas, east central Utah, and eastern Colorado.

Any land animal floating at sea would be desperately looking for land. The third hypothesis suggests that live dinosaurs embarked on exposed Flood sediments at high latitudes and made footprints. Exposed Flood sediments imply either that the land rose tectonically or else the sea level in a region dropped during the Flood. The exposure of land in either case would be aided if the area first collected a thick layer of sediment.

The continuity equation in fluid dynamics states that for an incompressible fluid the mass that flows into a closed volume must be balanced by the mass that flows out of the system. However, the earth is not a closed system because the volume can change due to a mineral phase change or a change in porosity. These possible changes in volume could either increase or decrease the volume of a rock and sediment unit during the Flood. Regardless, these effects should be small compared to rapid tectonic motions. Therefore, areas of the earth that sink tectonically or isostatically must generally be balanced by uplifted areas.

Western North America contains a thick sequence of sedimentary rocks interspersed with igneous intrusions. It is possible that when this thick sequence of sediments was deposited the additional weight pushed the crust downward. The depressed crust was then balanced by uplift on its eastern edge, so that a linear strip of land became exposed. I surmise that this band stretched from Arizona, New Mexico, and Texas northward through Montana and Alberta and into the Yukon Territory and northern Alaska (Figure 2). This strip of land could have already received a thick blanket of sediment before it arose. It, therefore, would not have to rise as far. The strip need not be continuously exposed but a series of islands or shoals. There also could have been vertical oscillations of this strip so

that sedimentation continued on portions of it. There likely were gigantic tsunami waves that occasionally swept over portions of this strip.

Alternatively, sea level could have dropped in regions during the Flood. Evidence for this possibility has recently been provided by the work of Baumgardner and Barnette (1994). Numerical simulation of the shallow water equations on a spherical, rotating earth that was completely flooded resulted in powerful currents and areas of lower sea level. Starting at rest, the currents and lower sea level developed rapidly over shallow continents. The shallow land masses had to be at least 2,500 kilometers in diameter and less than 1,500 meters deep. Cyclonic gyres, similar to large-scale atmospheric low pressure systems, commonly formed with water speeds of 40 to 80 meters/sec. In the center of these gyres, sea level dropped on the order of 500 to 1,000 meters and persisted for many days. This scenario could also expose newly-deposited Flood sediments. The powerful currents would rapidly sweep dinosaurs to high latitudes.

Regardless of how the exposed strip of land formed, thousands of floating dinosaurs would likely embark onto it. Dinosaurs could have directly landed on this strip at high latitudes, or else they could have landed at mid latitudes and walked to high latitudes. (It is also possible that many dinosaurs fled to higher ground at the beginning of the Flood and, as their refuges became inundated, fled to this newly arisen strip of land.)

Once on this strip of land, they would have run to and fro trying to escape the encroaching Flood waters, forming many footprints. Millions of dinosaur footprints have recently been discovered on this strip of land (Gillette and Lockley, 1989; Lockley, 1991), which lends support to the subaerial exposure of sediments during the Flood.

On this hypothetical strip of land extensive trackways, sometimes oriented in a single direction, are found in central Texas, eastern Utah, northeastern New Mexico, and Colorado. These megatrack sites have been nicknamed dinosaur freeways. Sometimes the tracks are imprinted on more than one bedding plane in an area. Tracks are also found in Oklahoma, Kansas, northern Arizona, Wyoming, western South Dakota, southern and central Alberta, and southeast and northeast British Columbia (Currie, 1989; Weishampel, 1991). As already mentioned, tracks are found in northern Alaska. These track and megatrackways are illustrated on Figure 2. Abundant dinosaur bones are also found on this strip of land.

Deep fossiliferous Flood sediments underlie the tracks. In other words, the dinosaurs were walking on thousands of meters of freshly deposited Flood sediment. John Morris (1980, p. 179-185) recognized that the dinosaurs in the Paluxy River area of Texas walked on nearly 3,000 meters of Flood sediment. The phenomenon of dinosaurs walking on newly arisen fossiliferous sediments would have been repeated in other parts of the world where dinosaur tracks are found.

The fact that many track and megatrack sites show prints of the same type of dinosaur suggests that these tracks were not made under ordinary circumstances. Very few tracks of dinosaurs sharply turning right or left have been found (Lockley, 1991, p. 66, 69). Practically all trackways are straight or close to it, and many tracksites show a preferred direction of travel. Could these dinosaur footprints have been made, not in normal foraging for food in their environment, but from trying to escape the Flood on briefly-exposed land? There is also a lack of baby and juvenile tracks (Lockley, 1991, p. 32), which may indicate the preferential escape of grown dinosaurs during the initial onslaught of the Flood. Tracks from stegosaurs, ankylosaurs, and ceratopsians are missing (Lockley, 1991, p. 57). These dinosaurs were probably poor swimmers because of the position of thick plates or bones on their bodies.

It is interesting that many of the dinosaur tracks found in Utah and Colorado are from ancient "desert" sands, according to the standard geological paradigm. In reference to one set of tracks, Lockley (1991, p. 153) states:

> The tracks occur at the top of the Middle Jurassic Entrada Formation. The main body of this formation represents an ancient sand sea of the type associated with the Sahara desert today.

Furthermore, the tracks in this particular area are all from the three-toed theropods. So, dinosaurs, including meat eaters, are now said to have lived or traveled in the desert!

It seems to me that investigators should instead question whether the cross-bedded sandstones from the Colorado Plateau were really from ancient deserts. A few uniformitarian scientists have questioned whether these large cross-bedded sandstones were ancient deserts (see Lockley, Loope, and Brand, 1992, p. 666). There is recent evidence that these sandstones were laid down in water (Brand and Tang, 1991; Lockley, Loope, and Brand, 1992). Dinosaur tracks on extensive cross-bedded sandstones fit the model of powerful Flood currents adjacent to lowered sea level (Baumgardner and Barnette, 1994). Slight changes in the configuration of the circular ocean gyres could lay down repeating cross-bedded sandstones, which are intermingled with fine-grained sediments, and expose them for the dinosaurs to walk over. This would account for the dinosaur footprints found at different stratigraphic levels in a region.

The presence of abundant dinosaur footprints in "deserts" brings up the uniformitarian question of how the tracks could be preserved in shifting sand, or in any environment for that matter. Lockley (1991, p. 132) mentions the debates these new discoveries have provoked:

> Debates over sediment saturation levels have also figured prominently in discussion of how tracks are preserved in desert dune environments. Because dry sand is loose, several researchers claim that it is hard to form crisp tracks unless the substrate has been moistened by rain or dew. Some authors have even claimed the tracks in sand dunes must have been made underwater.

Besides tracks, further evidence for a strip of land parallel to the Front Range of the Rockies is provided by dinosaur nests, eggs, embryonic dinosaurs, and even newly hatched babies that are increasingly being discovered. These sites are shown in Figure 2. They have been found in New Mexico, Utah, Colorado, Wyoming,

Figure 3. Picture of the top of "Egg Mountain," 100 kilometers northwest of Great Falls, Montana, where the first North American dinosaur nests and eggs were found. The mound is composed of three meters of green mudstone where multiple nests of *Orodromeus makelai* have been unearthed in five horizons. The people on top of the mound are looking at a newly discovered clutch burrowed in "caliche" two meters from where a meat eating *Troodon* nest was previously excavated.

Montana, and southern Alberta (Hirsch, 1989; Weishampel, 1991; Hoppe, 1992).

The best location for finding eggs and babies is 60 miles northwest of Great Falls, Montana. Figure 3 is a picture of "Egg Mountain" where dinosaur nests, eggs, embryos, and babies have been discovered. The mound seen at the top of Egg Mountain in Figure 3 contained multiple egg clutches, but few nests, of *Orodromeus makelai,* a small hypsilophodontid dinosaur. These clutches were spread out in five horizons within the three meter thick layer of green mudstone. Figure 4 is a picture of the bottom half of a reconstructed egg clutch from Egg Mountain. The eggs were laid in a spiral pattern with the pointed end down. This seems to be a common pattern in *Orodromeus makelai* egg clutches. In the Egg Mountain vicinity, 25 clutches of *Orodromeus makelai* containing around 400 eggs have been discovered. A little to the north, 45 nests or clutches of *Maiasaura peeblesorum*, a large hadrosaur or duck-billed dinosaur, have been exposed. More egg clutches are being found each year.

As thousands of dinosaurs landed on this newly arisen strip of land, many females were undoubtedly pregnant. They would anxiously lay their eggs, either in a makeshift nest or in the mud. The fact that many dinosaur eggs are unusually thin and pathological (Hirsch, 1989) possibly indicates the dinosaurs laid their eggs under unusual and stressful conditions. Another indication of unusual conditions for laying eggs is the discovery of a meat eating *Troodon* egg clutch found 2 meters away in the same layer on Egg Mountain from a clutch of plant-eating *Orodromeus makelai* eggs.

A single egg unearthed at Cleveland-Lloyd Dinosaur Quarry in east-central Utah adds even more evidence for stressful egg-laying conditions (Hirsch et al., 1989). This egg was found among a dinosaur graveyard of 12,000 disarticulated bones. The unusual feature of this egg is that it had a double shell, a sign that the egg was not yet laid and the mother held the egg an unusually long time.

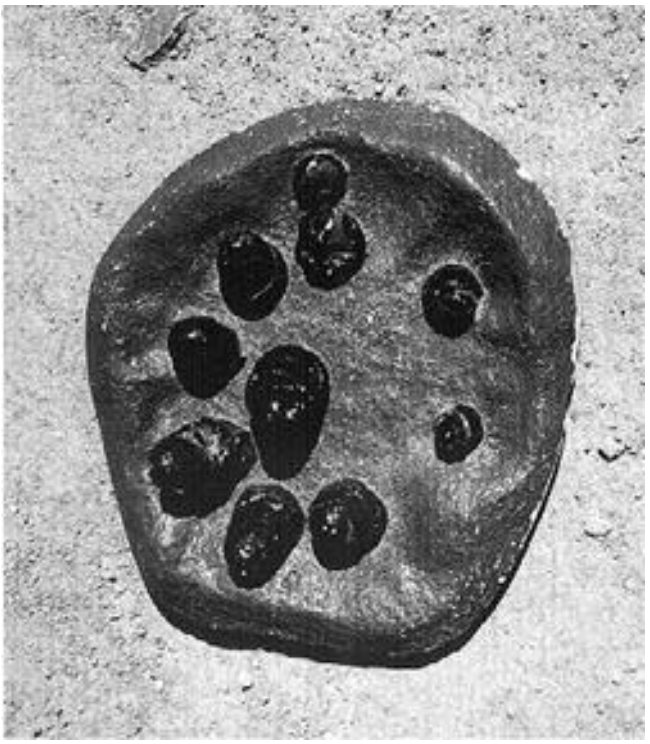

Figure 4. The underside of a reconstructed Orodromeus makelai egg clutch found at Egg Mountain. Notice that the eggs were laid in a spiral pattern with the pointed end of the egg downward.

Roy Holt (1994) has noticed that dinosaur eggs from Montana were laid with their pointed end down. This is the normal position in water or in water-saturated sediment. The developing babies or their mother should have knocked the eggs over long before they hatched. Could this be an indication of the lack of dry habitat for laying eggs and for the rapid burial of most of these eggs soon after being laid?

Many fossilized dinosaur nests and clutches just contain broken shells. A few contain unhatched eggs, sometimes with embryos inside (Homer and Weishampel, 1988). One nest in Montana has eggs in the process of hatching, just before the nest was covered by sediment. A few eggs did hatch before burial. Baby duck-billed dinosaurs up to a meter long have been found in or scattered around one nest. Babies only a few days old, associated with nests and eggs, have just recently been discovered near Canon City, Colorado.

Was there enough time during the Flood for dinosaur eggs to hatch and the babies to grow a little? It is not clear from Genesis whether every air breathing animal died in 40 days or 150 days. Because of dinosaur tracks on thousands of meters of Flood sediments and baby dinosaurs hatched from eggs, I favor 150 days before all air breathing animals on land died. Harold Coffin (1983, p. 27) writes that the Genesis account does not exclude such a possibility.

Although Genesis 7:17-24 seems like a chronological sequence in which all animals died after 40 days, a closer look at Genesis 7 shows that it is not strictly chronological. For instance, in verse 12, it states the rain fell 40 days and 40 nights. Then in verse 13, it says: "On that very day Noah and his sons, Shem, Ham, and Japheth, together with his wife and the wives of his

three sons, entered the ark." Verse 21, which states that every living thing that moved on the earth perished, could really be a summary verse for verse 24: "The waters flooded the earth for a hundred and fifty days."

Before the strip of land became exposed, thousands of meters of sediment could have been deposited in a short time, possibly as short as a few weeks or a month. Hundreds of thousands of dinosaurs embarking on this strip of land could form millions of footprints in a short time, especially if they spent much of their time escaping locally rising water. It should not take much time for the pregnant dinosaurs to lay eggs. The dinosaur eggs would need time to hatch and the babies time to grow. This need not take a large amount of time either, contrary to what some believe (Morton, 1982, p. 108). It also need not indicate a long period of post-Flood catastrophism (Mehlert, 1986, p. 107).

Dinosaur-fossil expert Jack Horner believes the baby duck-billed dinosaurs could have grown from half a meter long at birth to one meter long in just one month (Linder, 1989). He bases his belief on the unique bone structure of the dinosaurs. The bones have a characteristic texture with many Haversian canals for the rapid flow of blood (Horner and Gorman, 1988; Monastersky, 1994). They also have no growth rings, which are usually indicative of ectotherms (Horner and Gorman, 1988). These features indicate rapid growth of bone. The bones are unlike anything alive today, but are the most similar to extant warm-blooded animals. Scientists are still debating the warm blooded versus cold blooded theories of dinosaurs (Monastersky, 1994; Morell, 1994). So, at least small parts of the postulated strip of land must have been exposed for several months during the early stages of the Flood.

After the dinosaurs made many tracks and laid eggs, the final catastrophe swept over the land, burying the remaining dinosaurs, the nests, and the babies in more Flood sediments. Rising water levels would be due either to the strip of land tectonically sinking, or the cyclonic gyres in the shallow ocean shifting or decaying (Baumgardner and Barnette, 1994). As a result, powerful currents would have swept over the land.

That powerful currents buried the dinosaurs is likely from the many dinosaur graveyards found on this strip of land. One of the most impressive dinosaur graveyards is found just northeast of the Egg Mountain area (Varricchio and Homer, 1993). This graveyard is a thin layer of mudstone, about two kilometers east-west, 1/2 kilometer north-south, and one meter thick that is conservatively estimated to contain 10,000 duck-billed dinosaurs (Horner and Gorman, 1988). What is especially interesting is that all the dinosaurs are older juveniles and adults, while around the nests there are no adults fossilized. The bones in the above dinosaur graveyard are disarticulated with the same pattern of breakage and wear. Fractures are at a 90° angle and not at a 45° angle, like in a green-stick fracture. The bones have not been chewed by predators and are oriented east-west. An east or northeasterly paleocurrent direction predominates in the sediments just east of the Rocky Mountains in Montana.

Horner is puzzled by the meaning of this dinosaur graveyard. He suggests a gigantic flood: "This was no ordinary spring flood from one of the streams in the area, but a catastrophic inundation" (Horner and Gorman, 1988, p. 131). Rocks found within the bone bed attest to the powerful currents or slurries that buried these dinosaurs. However, before final burial, investigators suggest the dinosaurs first died by volcanic ash suffocation and were partially fossilized before the final flood. The evidence for partial fossilization comes from the fracture pattern of the bones and the presence of altered volcanic ash in the mudstone, which is not unusual for sediments east of the Rocky Mountains.

Seven other dinosaur graveyards of lesser extent between Great Falls and the Canadian border also contain dinosaurs predominantly of the same species and age (Rogers, 1990; Varricchio and Horner, 1993). In these graveyards, the bones vary from disarticulated to partially articulated. Many of these bonebeds are problematic to uniformitarian scientists because a local catastrophe should bury animals of many different ages (Rogers, 1990). Another dinosaur graveyard containing an estimated 10,000 duck-billed dinosaurs was just recently discovered near Newcastle, Wyoming. No details have been published as far as I know.

Why would one type of dinosaur be found in a graveyard? Could this be a clue that the catastrophe that buried them was very unusual? It is a common tendency for animals under stress to herd. Elk in Montana herd during Arctic cold spells. When the weather warms up, they tend to separate. If this is a general tendency with animals, you would expect animals of the same kind to herd during the gigantic catastrophe of the Genesis Flood.

As the final burial of the exposed strip of land became imminent, the dinosaurs would try to run away. They would abandon their nests and babies. This would account for the strange observation of nesting sites with only baby dinosaur fossils while the dinosaur graveyards are composed of adults and older juveniles. It would not be indicative of a special mothering strategy in dinosaurs as evolutionists theorize (Horner and Gorman, 1988; Coombs, 1991).

Also of interest is the fact that fossils of young hadrosaur juveniles, between a month and about one year old, are completely missing from the Egg Mountain area. Varricchio and Horner (1993, p. 1003) report: "To date, no isolated or assemblages of predominantly small animals have been found for *M. peeblesorum.*" This seems to be a pattern elsewhere. The absence of young juveniles in the dinosaur graveyards not associated with nests is consistent with the idea that the very young animals perished in the initial Flood onslaught.

So, a strip of exposed land generally paralleling the continental divide from New Mexico into Alaska seems like a good solution for dinosaur distribution in western North America during the Flood. This could allow dinosaurs to either embark on this strip at high latitudes or else walk from middle latitudes up into higher latitudes. Since this strip could have been exposed for several months, a variety of dinosaur activity would have occurred. This strip of land would explain millions of dinosaur foot prints, including the footprints in northern Alaska, and the dinosaur nests and eggs being discovered every year on this strip of land. There is also evidence that meat eating dinosaurs were hunting or scavenging other dinosaurs. Three dinosaur grave-

yards in Montana that contain the bones of plant-eating dinosaurs also contain abundant dinosaur teeth from meat-eating dinosaurs (Rogers, 1990, p. 403). This dinosaur activity could have occurred during the first 150 days of the Genesis Flood.

Summary and Discussion

Dinosaur fossils have recently been recovered from polar and presumed polar locations from both the Northern and Southern Hemispheres. Footprints are known from two high latitude sites: Spitsbergen and the North Slope of Alaska. Along with the dinosaurs, floral and other faunal remains indicate a much warmer climate than today at mid and high latitudes. Much of the focus of attention lately has been on dinosaurs and other remains from southern Victoria, Australia, which was presumed to be at high paleolatitude during the early Cretaceous.

Climate simulations are becoming more sophisticated. These models consistently indicate that very cold winter temperatures would have occurred on mid and high latitude continents, even with presumed Cretaceous geography and warm polar ocean temperatures. The contradiction between the abundant fossil evidence for warmth and the climate simulations shows that there is something seriously wrong with the uniformitarian paradigm.

Three hypotheses were presented to account for polar dinosaurs within the context of the Genesis Flood. One hypothesis is that dinosaurs simply lived at high latitudes in a warmer pre-Flood climate. When the Flood came, they were buried near where they lived. A second hypothesis suggests that dinosaur carcasses floated to high latitudes on powerful Flood currents before they were buried. The footprints in northern Alaska and Spitsbergen, however, suggest a third possibility: that live dinosaurs either floated to exposed land at high latitude or else walked from mid to high latitudes on an exposed strip of land during the Flood. It is possible all three hypotheses could be correct.

Based on the location of millions of dinosaur footprints and nests containing dinosaur eggs, this strip of land was estimated to have been exposed parallel to the crest of the Rocky Mountains, from New Mexico northward through Montana and Alberta to northern Alaska (Figure 2). Thousands of meters of Flood sediment had already accumulated in this area, and sedimentation likely continued on parts of the strip.

There are a number of unusual features associated with the dinosaur footprints and eggs that suggest escape from Flood waters on this strip of land. The tracks are usually of the same type of dinosaur, some trackways point in the same direction, and there are very few cases of turning dinosaurs. Many dinosaur eggs are very thin and pathological, indicating possible stressful or unusual conditions. Some baby dinosaurs grew from about half a meter long to one meter long. This could have occurred in as little as a month. Then the final inundation covered nests and dinosaurs. Many of the dinosaurs were herded into the same species. That is why many of these dinosaurs ended in dinosaur graveyards of mostly the same species and age.

There likely is enough time within the first 150 days of the Flood for the activity of dinosaurs on this strip of land. A long period of time or a period of post-Flood catastrophism is not required.

The timing of the above events would occur in the inundatory stage of the Flood according to a new Biblical geological model developed by Tasman Walker of Australia (1994). Footprints are one of Walker's criteria for the inundatory stage, the end of which occurred when the whole earth was completely covered and all air-breathing animals died. Walker was concerned whether the inundatory stage was the first 60 days or the first 150 days. The results of this research indicate the time for the inundatory stage was 150 days. I believe creationists will find his Biblical geological model useful for future geological research.

The results of this research also have implications for the interpretation of other geological features. For instance, if land was exposed for any length of time during the Flood, it is then possible to have subaerial mudcracks, raindrop impressions, subaerial volcanic ash, and other delicate subaerial features preserved in Flood sediments.

Another implication is that Jurassic and Cretaceous strata that contain dinosaur footprints and nests are not from the late stages of the Flood, which would be the recessive stage in Walker's (1994) classification. These strata would be deposits from the first 150 days or the inundatory stage. This means that the Flood does not follow the exact sequence of the geological column, as some creationists seem to believe, because the late Mesozoic is usually placed at the end of the Flood, or even after.

This raises the question of how, if at all, the "geological column" fits into a Flood depositional model. The geological column has been pieced together from many parts of the world by index fossils, based on the theory of evolution (Berry, 1968). If creationists believe that the geological column is an exact Flood depositional sequence, we would have to believe that each index fossils were deposited *worldwide at the same time* during the Flood year. We would have to believe that a particular type of trilobite, for instance, was deposited during week three, while a particular type of brachiopod was laid down during week seven. Why could not the trilobite be deposited in week seven in one part of the world and the brachiopod in week three in another part of the world during the Flood? Or why could not the trilobite be deposited in week three in one part of the earth and during week 20 in another part? The exact order of index fossils seems like an unnecessary constraint to a Flood model.

It still may be that the geological column represent a *general* order of Flood deposition, due to such mechanisms as ecological zonation, hydrological sorting, the differential ability of organisms to escape the encroaching Flood waters, tectonically associated biological provinces (Woodmorappe, 1983), etc. How the "geological column" relates to the Flood needs to be rigorously demonstrated.

For a Flood model, it seems more logical to think in terms of Flood stages for particular localities or regions. Walker's (1994) Biblical geological model is a logical step in that direction. If most of the sedimentary rocks are laid down by a global flood, then the strata from a region should match a Flood sequence in a more

straightforward manner. (We probably would need to be aware of the geological periods for purposes of communication with uniformitarian scientists.)

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PANORAMA NOTES

Reprinted *CRSQ* Volume 20

Introduction

The *Creation Research Society Quarterly* has been published since 1964 (31 complete volumes). In an effort to make these volumes available, all of the missing issues have been reprinted. Brief synopses have been written on volumes 1-19 and have appeared in the previous 19 Quarterlies. In each synopsis, major articles are reviewed to give a person interested in scientific creationism a general idea of the contents of that volume. Many of the articles are of continuing interest and value. This particular volume was the last one that Harold Armstrong served as editor in a term that lasted 10 years. Harold was a talented Board Member and a dedicated creationist. See Howe (1985, p. 57).

Biological Sciences

Comparative Anatomy

The pentadactyl plan (the arrangement of limbs with five digits) in vertebrate animals was examined by Brown (1983a, pp. 3-7). The author concluded that this anatomical arrangement is best viewed from the perspective of design rather than descent from a common ancestor. Several other inferior possible limb systems were illustrated and discussed as a means of showing the advantages of the pentadactyl plan. Davidheiser (1983, p. 15) briefly outlined the problems involved assuming the evolutionary postulate of similarity proves relationship when viewing the aortic arch of mammals.

Creation Model

In a detailed book review of *Darwinism Defended: A Guide to the Evolution Controversies* by Michael Ruse the reviewer (Bluth, 1983a, pp. 16-22) debunked the positions taken by the evolutionist. The topics presented in the review were population genetics, random mutations, natural selection, variation, breeding experiments, genetic potential, paleontology, gradualism vs. punctuated equilibria, ammonite evolution, *Archaeopteryx,* Cambrian explosion of life, second law of thermodynamics and biology, horse evolution, Galapagos finches and radiometric dating. Bluth noted that Ruse was not familiar with the creationist literature, a common problem of anticreationists. Smith (1983, pp. 28-30) tested his general principle of creation comparing the DNA content of organisms with their taxonomic classification. He suggested that there appears to be a trend that higher organisms contain an increased information content genetically which supports his general principle.

In a linkological study of the common frog *[Rana temporaria]* (Duffett, 1984, pp. 199-211), the author stated that the evidence indicates that the creatures were designed and have not evolved. Fossils of supposed ancient adult frogs resemble modern adult frogs. It was concluded that adult frogs were created first, not spawn or tadpoles.

Predation, Animals and Diet

Two articles dealt with possible animal kingdom vegetarianism either before the Fall or the Flood (Lambert, 1983, p. 88; Brown, 1983b, pp. 186-188). Lambert suggested that the harshness of the post-Flood ecosystem was responsible for a change in diet. Brown elaborated on the adaptability of animals when faced with dietary changes. Several examples were offered.

Mimicry

Lammerts (1983a, pp. 42-44) discussed mimicry using specific examples. He challenged creationists to develop concepts to "explain" the phenomena as he offered several possibilities himself. Several areas for creationist research were suggested.

Bristlecone Pines

Since bristlecone pine growth rings have been employed to develop chronologies extending into the past several thousand years, many creationists have speculated on the possibility of multiple growth rings per year. World famous plant breeder and founder of the Creation Research Society, Walter Lammerts, performed experiments of this nature. His results were reported in the Quarterly (Lammerts, 1983b, pp. 108-115). Multiple growth rings were obtained in some seedlings of bristlecone pines under certain conditions of growth and stress. The author related his findings to possible post-Flood environmental conditions. This is an excellent article illustrating how creationist research can offer plausible solutions within a young earth model.

Archaeology

von Fange (1984, pp. 219-226) wrote on the archaeology of words and the alphabet. There may be a connection between the alphabet and the calendar and that the arrangement of letters may have resulted from astronomical observations. It was thought that the study of words indicates the level of sophistication of ancient societies and later deterioration of their culture. No evidence of the evolutionary development of languages was found.

The Study of Man and "Ape Men"

David Kaufmann (1983, pp. 24-28) employed the first and second laws of thermodynamics in relation to human growth and development. He countered the claims of evolutionists concerning supposed increasing