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- *Paradise Kingfishers and the Founder Effect*
- *The "Waters Above" and Earth's Cosmic Choreography*
- *The Power of Energy*

# Creation Research Society Quarterly

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**Haec Credimus**

*For in six days the Lord made heaven and earth, the sea, and all that in them is, and rested on the seventh.—Exodus 20:11*

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eKINDS Project Paper

# Paradise Kingfishers *(Tanysiptera spp.)*, the Founder Effect, and Creation Research

**Jon Ahlquist and Jean Lightner***

## Abstract

The Bible provides a robust foundation for understanding the natural history of life on Earth. After Creation and again after the Flood, terrestrial animal life reproduced to fill the earth. This involved numerous founding events as new habitats were invaded and new ecosystems formed. The paradise kingfishers of New Guinea display an interesting pattern of distribution, which inspired Ernst Mayr to propose the founder principle. A previous paper discussed the founder effect in more detail; however, much work remains to be done to see what role it has played in diversification and speciation within created kinds. Here, kingfishers are examined in more detail, with a special emphasis on the paradise kingfishers (*Tanysiptera* species) of Australasia. A summary of what is known is followed by an outline of research that desperately needs to be done to better understand how various factors, including founding events, have influenced the impressive adaptive radiations within the kingfisher kind.

## Introduction

The Bible provides key details regarding the natural history of life. Living things were created according to their kinds, and designed to reproduce and fill the earth (Genesis 1:11–13, 20–31). Approximately 1650 years later, a global flood destroyed all air-breathing land animals and birds except for a pair (or more for clean animals) from each kind that was preserved on the ark Noah built (Genesis 6–8; the extra clean animals were necessary for sacrifice and possibly for food for humans after the Flood; Genesis 8:20; 9:3). From this genetic bottleneck, land animals and birds again spread out over the earth. The biblical creation model rejects the evolutionary concept of universal common ancestry; nevertheless, it must account for considerable speciation in only a few thousand years.

Jeanson and Lisle (2016) have shown that by assuming diploid creatures were created with a substantial amount of heterozygosity, and that mutation rates have remained essentially equivalent to what we have measured today, it is possible to account for the majority of genetic diversity seen today within the biblical time frame. Likewise, phenotypic diversity is readily accounted for, since many domesticated kinds (e.g., cattle, horses, pigs) have more breeds, developed through human intervention (artificial selection), than species in the wild. Even evolutionists agree

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that domestication has been recent, and therefore phenotypic diversity has developed rapidly. In fact, considerable increases of phenotypic diversity have been observed to occur within the course of a 50-year experiment (reviewed in Lightner, 2011).

In a previous paper, Lightner and Ahlquist (2017) discussed the founder effect and its importance in speciation, especially following the worldwide Flood. Land animals and birds preserved on the ark spread out around the world. In the process there was an environmentally based sorting of ancestral alleles, which is believed to play an important role in speciation. They further point out that, in contrast to how the founder effect is perceived by evolutionists, animals would have chosen environments they found most suitable for breeding, thus carrying in adaptive alleles. This means that standard statistical tools for identifying founder effect are unsuitable, since it is usually assumed alleles in the founders are random with respect to fitness.

Here, we present further data on those species of paradise kingfishers (*Tanysipera*) that first attracted Mayr's (1942) attention to the idea of a founder effect and led to his further formulation (Mayr, 1954). Morphological, behavioral, and molecular data are considered to understand the relationships within this group and to develop preliminary hypotheses to account for the dispersal and adaptive radiation of the entire kingfisher kind since the Flood. Some historical aspects relating to the study of paradise kingfishers (PKs) are covered to give insight into potential future research.

## Kingfishers and Kinds

The biblical creation model involves limited common ancestry, and considerable work has been done to identify which species today are derived from a single created kind. The tentatively identified kingfisher kind (Lightner 2013, p. 430), or family Alcedinidae, comprises around 105 species of small- to medium-sized birds (10–48 cm or 4–18 in). The birds are similar in having rather large heads, oversized bills, and short tails, thus giving them a top-heavy appearance. The PKs are somewhat of an exception, possessing elongate and attenuated central tail feathers (longer than the body) that culminate in a terminal spatulate tip.

As we consider kingfishers in general, and *Tanysiptera* in particular, it is important to examine characteristics and relationships above, at, and below the level of the postulated created kind. This allows us to more accurately estimate the boundaries of a kind and to attempt to trace the natural history of the kind since they left the ark. Therefore, we commence our discussion at the level of the order.

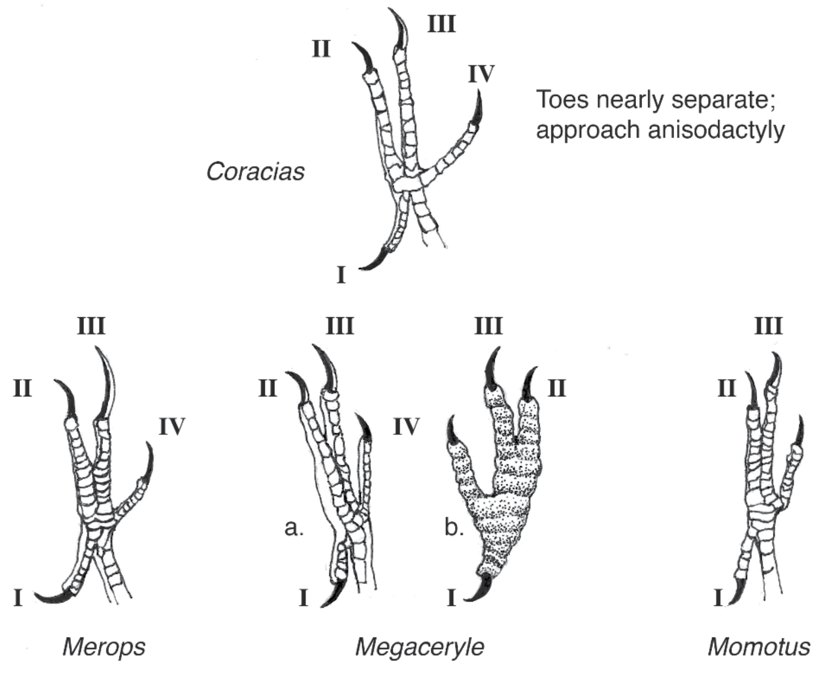


**Figure 1. Syndactyl arrangement of the toes of some coraciiform birds. Shown are a roller *(Coracias)*, bee-eater *(Merops)*, kingfisher *(Megaceryle)*, and motmot *(Momotus)*. For *Megaceryle* dorsal (a) and ventral (b) aspects are shown. All other views are dorsal and depict right feet. Original drawing by JA from various sources.**

## Morphology and Behavior

### Order Coraciiformes

Like other kinds that make up the traditional order Coraciiformes, kingfishers are characterized by a syndactyl foot in which toes three and four are united basally for part of their length (Figure 1). Whether this is a valid taxonomic character that unites the Coraciiformes is debatable in the light of conflicting morphological and molecular evidence (Hackett et al., 2008; Jarvis et al., 2014).

Perhaps of more interest is the functional design of this toe arrangement. Few have commented on this design. Many textbooks simply define syndactyly and glibly assert that it is an aid in perching, sometimes citing the work of Richard Owen (1866). Careful perusal, however, of the roughly 150 pages that Owen devotes to birds reveals no such statement.

A cogent evaluation is given by Nupen (2016, p. 37):

> In the avian world, the fleshy sheath that unites the anterior digits is thought to increase grip strength when the bird is perching, as it forces the digits to act in concert. Syndactyly is common among kingfishers, hornbills and bee-eaters (Coraciiformes) and there are many intermediate examples of birds with partly fused toes in this group. Extreme syndactyly occurs in the wood-hoopoes and hornbills and diminishes progressively through the kingfishers to only minor fusion in *Upupa* and finally the true anisodactyl feet of rollers. Similarly, among passerines it can sometimes be difficult to distinguish the syndactyl and anisodactyl conditions, as they intergrade closely.

What we can add to Nupen's statement, which was based on an examination of study skins, is that in those coraciiforms that spend the most time perching motionless, the pad, or sole, of the foot, and especially that of the fused toes, is expanded to give what one might describe as a "comfortable" grip on a perch. This is seen as an adaptation in those species that sit, only flying out to capture an insect or to seize prey from the ground. The diminished role of syndactyly in the Hoopoe (*Upupa*) and rollers is clearly related to their being more active in moving about searching for prey.

A second explanation is that the fusion of toes aids in digging the tunnel that serves as a nest. Nearly all coraciiform birds are obligate hole-nesters, using existing natural holes or those excavated by woodpeckers. Alternately, they excavate a nest hole in rotten wood, termite nests (termitaria), or mud banks of streams. The only exception is the Bucerotidae (Hornbill kind) (Lightner, 2013).

## Family Alcedinidae

Ehrlich et al. (1988) assert, "The fused toes of kingfishers help in excavating nest tunnels." Initially, this appears incongruous, since the feet of kingfishers are quite small and weak. It might seem that they would be of little value for the task. Fry et al. (1992, p. 17) described the activity for bee-eaters, and presumably it can be used by kingfishers as well: "Earth is loosened by pecking with the bill, but to spade it out of the growing hole the bee-eater supports its weight on bill tip and 'wrists', lifts body and thus frees its legs to scrabble loose earth backwards with a bicycling action." Apparently, females of some paradise kingfishers utilize the beak in removing material as they burrow. The females, but not males, also employ the tail in a sweeping motion to clear debris (Woodall, 2001).

It should be noted that the family Alcedinidae has a wide distribution, as would be expected for most creatures descended from a kind preserved on the ark (Genesis 8:15–17; Isaiah 45:18). In contrast, the genus *Tanysiptera* is confined to Australasia, consistent with its representing one lineage from a created kind. This, as well as the molecular evidence mentioned previously, which does not support the monophyly of Coraciiformes (Hackett et al., 2008; Jarvis et al., 2014), is consistent with the current creationist view of kingfishers (Alcedinidae) being a created kind.

## Genus *Tanysiptera*

The paradise kingfishers (PKs) nest in the mounds constructed by termites. For *Tanysiptera* the termitaria preferred are those of *Microcerotermes boroi* or related species that are abundant in their range. These termites are known as "carton termites." Their arboreal nests are ovoid structures built of "carton" (a mixture of fecal matter and wood fragments), which resembles cardboard or papier-mâché. They are fastened to the sides of trees with or without concealment. Carton may be papery and fragile, or woody and very hard. The inside of an arboreal nest consists of horizontal layers of cells and always maintains connections with the ground through covered runways (See Roisin and Pasteels, 2000).

According to Fry et al. (1992, p. 115) the birds select a termitarium on the side of a tree about 3–4.5 m from the ground. The pair flies repeatedly at the mound, striking it with their bills until they puncture a hole in the relatively hard outer surface. Once gaining a foothold, they are able to excavate the friable inner layers easily to a depth of about 15 cm with an egg chamber about 13 cm in diameter. The termites' response is to construct a sturdy wall around the burrow.

In Queensland, the Buff-breasted PK (*T. sylvia*) is said to utilize termitaria at nearly ground level (Woodall, 2001). This begs the question of the safety of the nest as it would easily be accessible to marsupial predators or snakes, yet the populations of the kingfishers seem not to be in jeopardy. The lack of nest sanitation on the part of the birds results in a characteristic odor to the termitaria. Whether this is an attractant or deterrent to potential predators is not clear.

It is interesting to note that an extensive literature exists regarding the use of termitaria as nest sites for birds. This occurs not only in forests but also in more open areas where termitaria exceed the number of excavated holes in trees. A generalization is that birds seek active termitaria. Brightsmith (2004) studied the nesting of several species of parrots, trogons, and jacamars in Peru. He noted that "all species apparently preferred to nest in termite mounds with termites and biting *Dolichoderus* ants" (Brightsmith, 2004, p. 327). Vasconcelos et al. (2015, p. 17) list 45 species of Brazilian birds in 16 families that use termitaria as nest sites and note that "nesting inside termitaria can offer advantages to birds, as protection against predators and propitious micro-climate."

The fecal build-up in the walls of termitaria can attract infestations of microorganisms, fungi, and pathogens that are harmful to the termite colony. In this regard it has been demonstrated that Actinobacteria, particularly *Streptomyces* species, provide a level of *in vivo* protection to the social group against fungal invaders (Chouvenc et al., 2013). While it would be far-fetched to suggest that such a mutualism would directly impact birds, it is worth suggesting that the characteristics of termitaria be examined for possible benefits to avian nesters.

## *Tanysiptera* and Founding Events

Ernst Mayr (1904–2005), who proposed the founder principle over 75 years ago, spent the early portion of his career studying birds and collecting samples for the American Museum of Natural History in New York. Mayr's field expeditions in 1928–1929 took him to western New Guinea, then under control of the Dutch; eastern New Guinea, under Australian mandate; and the Solomon Islands, a part of the British Empire (Haffer, 2007; Figures 2, 3, and 4). It was in New Guinea that he became familiar with PKs and the patterns of diversity on New Guinea and the nearby islands. This pattern did not fit well with the standard explanation of natural selection being the sole driver of morphological divergence.

Mayr's (1942) original statement of the founder principle was terse. His map of the New Guinea allospecies of *Tanysiptera* (redrawn here as Figure 5) appears on page 153, yet discussion does not occur until page 236, where he observes,

> The kingfisher *Tanysiptera galatea* (Fig. 15) has only poorly defined subspecies in the large area of the mainland of New Guinea, but it has developed 6 very distinct forms (most of them regarded as species) on the small islands where it also occurs. The potentiality for rapid divergent evolution in small populations explains also why we have on islands so many dwarf or giant races, or races with peculiar color characters.

He continued:

> The reduced variability of small populations is not always due to accidental gene loss, but sometimes to the fact that the entire population was started by a single pair or by a single fertilized female. These 'founders' of the population carried with them only a very small proportion of the variability of the parent population. This 'founder' principle sometimes explains even the uniformity of rather large populations,

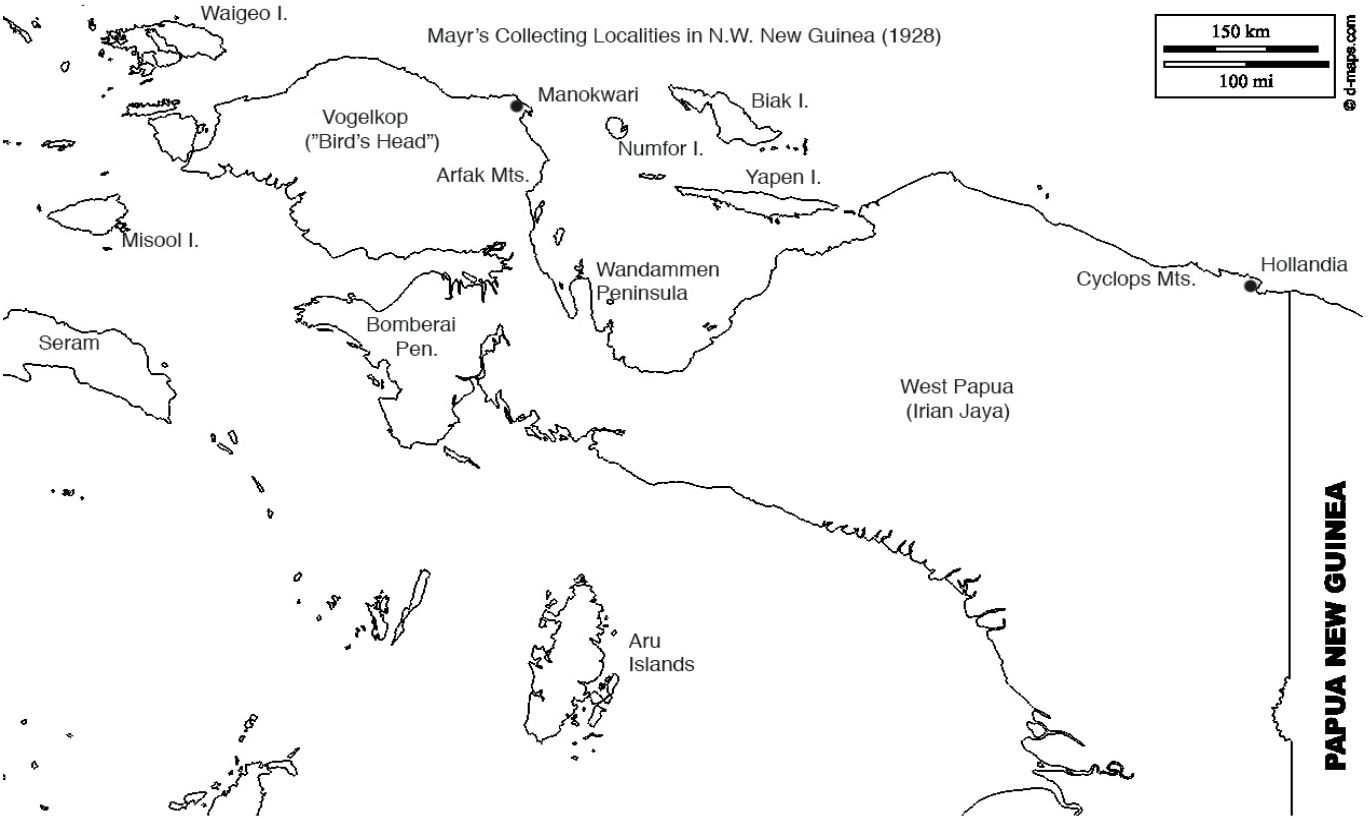


**Figure 2. Map of western New Guinea showing places where Mayr collected in 1928 (Arfak Mts., Wandiwoi Mts. on Wandammen Pen., Cyclops Mts.) and other localities mentioned in text. Map used courtesy d-maps.com with locality data added.**

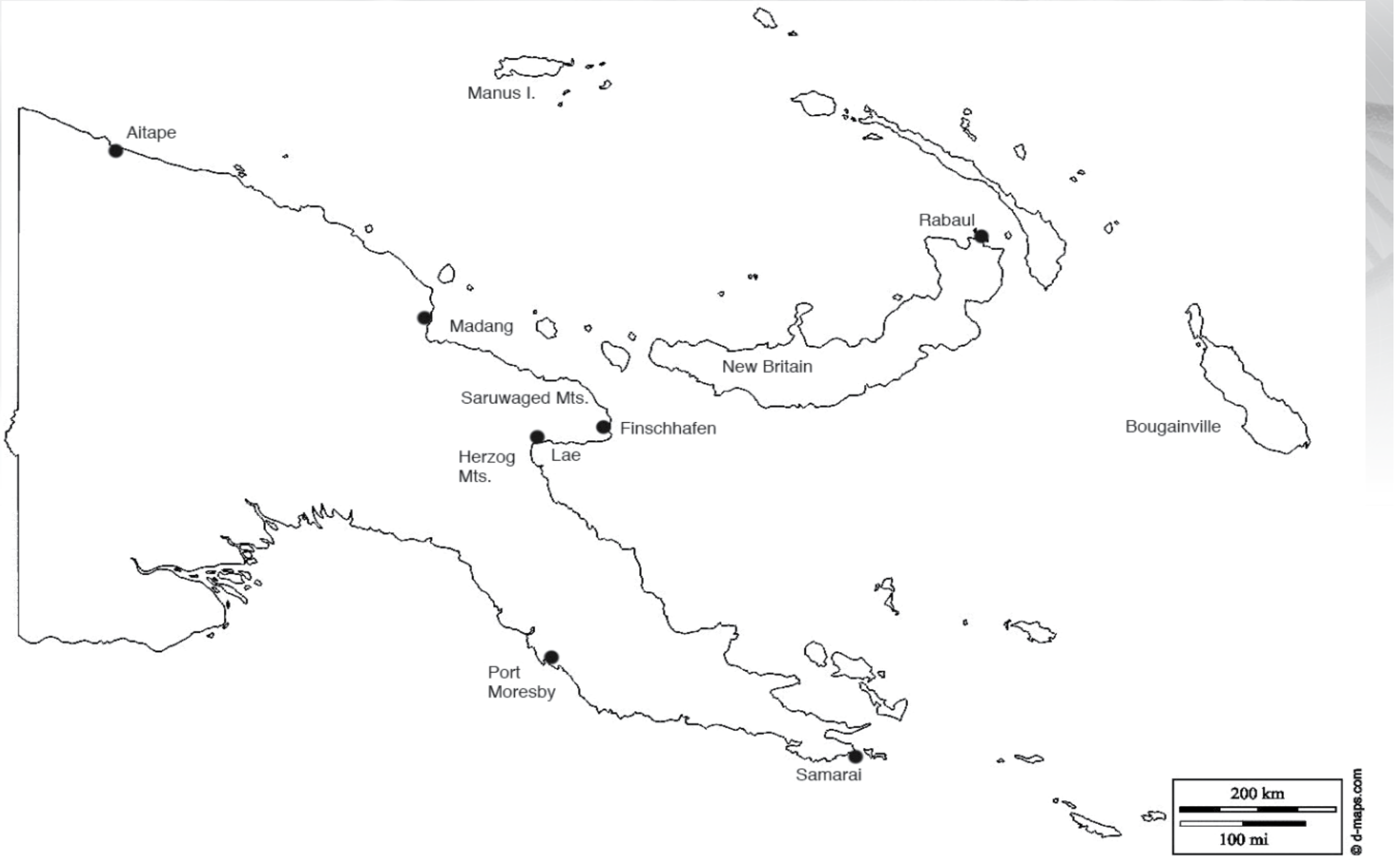


**Figure 3. Map of eastern New Guinea showing places where Mayr collected in 1928 (Saruwaged and Herzog Mts.) and other localities mentioned in text. Map used courtesy d-maps.com with locality data added.**

> particularly if they are well isolated and near the borders of the range of the species. (Mayr, 1942, p. 237)

As an example, Manokwari, the capital of the province of West Papua, at the western end of New Guinea (Figure 2) is located 52 minutes (0.87 degrees, slightly less than 100 km) south of the equator. It receives an average of 2,600mm (102.2 in) of rain per year, approximately 216 mm (8.5 in) per month. Exhibiting the same trend is Jayapura (Hollandia), the provincial capital of Papua, Indonesia, with average precipitation of nearly 2,400mm (94 inches) and no pronounced wet-dry periods. Port Moresby, the capital and largest city of Papua New Guinea (Figure 3), is located on the shores of the Gulf of Papua, on the southeastern coast of the Papuan Peninsula. It receives only 900mm rain (35in), most of which falls from January to March. The remainder of the year is dusty, hot, and humid (relative humidity above 75).

The islands on which the allospecies occur—Numfor, Biak, Kofiau, and Rossel—are all less than 100 miles from the coast of New Guinea, and all have a uniform tropical climate. Mayr (1954) details the differences between the island forms and *T. galatea* of the mainland. (See Figure 5 and Table 1). He emphasizes that despite drastic differences in climate, the mainland *T. galatea* are barely differentiated into subspecies from one end of the island to the other.

Taking Numfor Island as an example, Mayr proceeds to discount factors such as gene flow, a slightly different plant environment, and a somewhat impoverished fauna, and notes that the only serious predator is the same on the mainland, namely the Variable Goshawk, *Accipiter hiogaster*. What is different is the genetic environment, as he notes:

> The genetic environment is strikingly different. The Numfor population is geographically and hence genetically completely isolated from all other populations of the species … while *every New Guinea population is in the midst of a continuous stream of genes flowing back and forth cross the entire island continent*. While the number of possible contacts with other genes is exceedingly high in New Guinea, it is drastically reduced among the founders of the Numfor

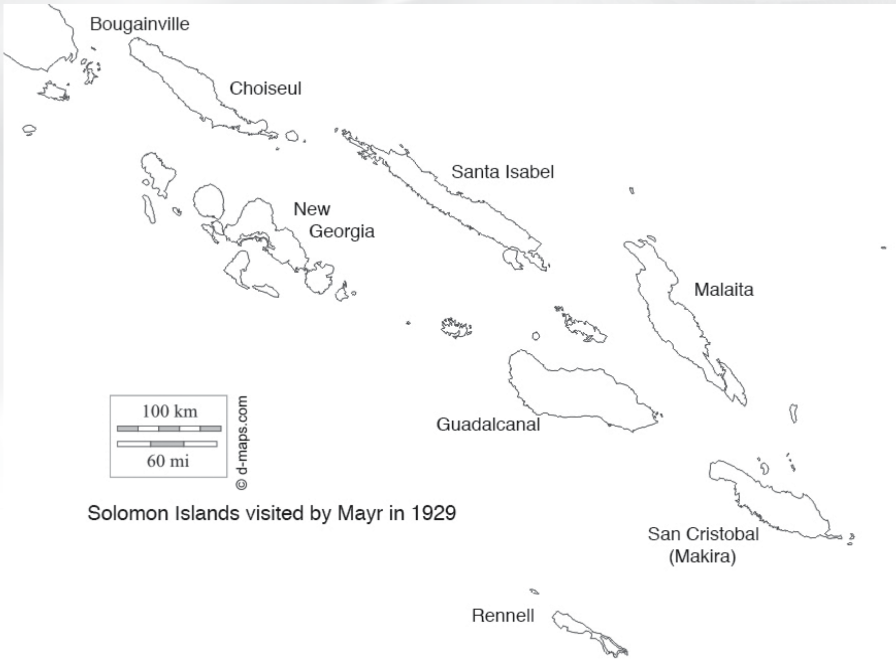


**Figure 4. Map of Solomon Islands where Mayr collected in 1929. This was the first time Malaita had been accessible due to native hostility. Map used courtesy d-maps.com with locality data added.**

> population. (Mayr, 1954, p. 168, emphasis in original)

While ideas on how and why founding events lead to such a pattern has shifted somewhat, Mayr's field observations of PKs clearly provided the basis for considering the importance of founding events in diversification and speciation. Other relevant observations and mathematical modeling that has further contributed to the topic was previously reviewed in Lightner and Ahlquist (2017). It is important to recognize that when the distance is considerable, each newly founded island population becomes a biological microcosm, adapting and multiplying as a separate entity with its own history, genetic structure, and destiny.

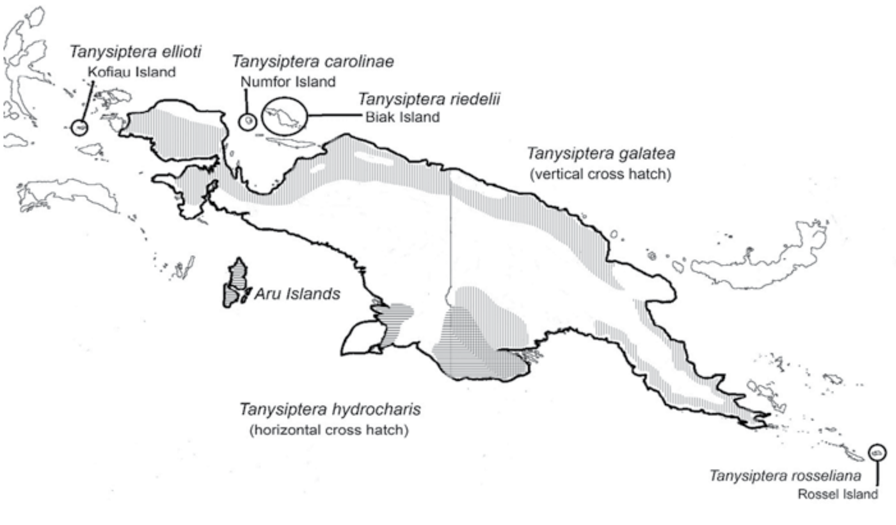


**Figure 5. Map of New Guinea and outlying islands depicting the ranges of *Tanysiptera* kingfishers discussed by Mayr (1942). Map drawn by JA.**

There remains a lacuna in our understanding of PKs and the founding of island populations. Mayr never studied *Tanysiptera* in the Maluku Islands (aka Moluccas) west of New Guinea (Figure 6). After his initial years of fieldwork, he took a job with the American Museum of Natural History and was to publish papers based on the specimens that had been collected. His supervisor, Frank Chapman, did not permit Mayr to do fieldwork, so he never returned to study PKs in the remaining Indonesian islands (Vuilleumier, 2005, pp. 391–392).

Other historical factors have played a role in this story. The Greater Sunda Islands have received good treatment in the form of monographs and field guides. Even the birds of somewhat ignored Sumatra have been nicely monographed (van Marle and Voous, 1988). Historically, New Guinea has received considerable attention owing to its considerable, and spectacular, endemic avifauna. The most recent works (Pratt and Beehler, 2015; Beehler and Pratt, 2016) represent decades of fieldwork and study.

In contrast the vast stretch of islands east of Java and Borneo and west of New Guinea has received less study. Here we include Sulawesi (Celebes), the Lesser Sunda islands, and the numerous smaller islands of the Moluccas, collectively termed Wallacea. Many detailed descriptive papers on collections made from individual islands were published before the Second World War. Among them were monographic studies such as those by Stresemann (1939–1941) on the Celebes and Rensch (1931) on the Lesser Sundas, but it remained until the definitive work by White and Bruce (1986) that the scattered literature, often in German, was brought together and synthesized. Based on the White and Bruce work is the field guide by Coates

**Figure 6. Detailed map of Moluccan Islands (Malukus). Author: Lencer, Maluku Locator Topography by user Sandalmelik. This file is licensed under the Creative Commons Attribution-Share Alike 3.0 Unported license.**

et al. (1997) with excellent illustrations of all the species. Mees (2006) filled an important gap with a comprehensive study of the birds of Flores in the Lesser Sunda Islands.

## Molecular Data

The advent of molecular data has had a mixed effect on ornithology. It some cases it has confirmed what was long held to be true based on morphological, behavioral, and zoogeographic observation. Other times, it completely disrupts previously perceived relationships. It is important to note that every molecular study produces hypotheses of relationships. Our contention is that when novel ideas are suggested, if correct, they will be supported by a number of morphological, behavioral, and ecological attributes of the birds themselves. Such characters may have been overlooked, ignored, or misinterpreted in the past.

We wish to emphasize that molecular data will not replace more traditional techniques in the foreseeable future. An interesting paper by Brusaferro and Insom (2009) points to the role that traditional characters and methods can play in an increasingly molecular age. The authors carried out a morphometric analysis of characters of the skull of kingfishers, analyzing their data phenetically. Not only did they recover the same three subfamilies as other studies, but they also were able to discern how cranial differences are correlated with feeding habits and other aspects of the birds. Thus, there will continue to be an important function for the individual who lacks access to a molecular laboratory and requisite funding but who nonetheless possesses a knowledge of and curiosity about the birds.

Based on currently available data, we are able to utilize existing molecular studies of kingfishers and the knowledge of their general morphology and ecology to postulate some probable scenarios for the migration and differentiation within the kingfisher kind.

## Synthesis of Relationships and Zoogeography in the Kingfisher Kind

Miller (1912) recognized and defined three subfamilies of kingfishers in what one might call the first "modern" revision of the group. Amazingly, the three subfamilies Cerylinae, Alcedininae, and Daceloninae (Halcyoninae), along with their constituent genera, have stood the test of time. The history of the systematics of kingfishers has been presented by Sibley and Ahlquist (1972, 1990), Moyle (2006), and Christidis and Boles (2008), among others, and is not repeated here, except to note that all lines of evidence—morphological, behavioral, molecular—basically point to three groups and agree as to the constituent genera of each.

Although Sibley and Ahlquist (1990, p. 845) found significant differences among the kingfisher groups to warrant family status for each, we retain the traditional subfamilies arrangement. Both Sibley and Ahlquist and Moyle (2006) identified the Alcedininae as the basal group of kingfishers, sister to the other clade comprising the Cerylinae and Halcyoninae.

## Subfamily Alcedininae

Gill and Donsker (2016) recognized 35 species in four genera (*Ispidina*, *Corythornis*, *Alcedo*, *Ceyx*) of Alcedininae (Figure 7). The group is morphologically uniform, consisting of tiny kingfishers with short tails, small feet, and long bills. The vernacular epithet "dwarf" or "pygmy" is appropriate. Most species have brilliant blue or green coloration accented with red-orange or buff.

In the beginning the taxonomy of the group seemed straightforward. They were divided on the basis of ecology into piscivorous (mainly *Alcedo*) and insectivores (mainly *Ceyx*) groups. The piscivorous species usually had dark-colored bills that were laterally compressed, whereas the insectivores species tended to have orange, or brightly colored bills that were dorso-ventrally flattened ("pie shaped"). A third character that seemed taxonomically important was the reduction in many species to three toes. The second digit was lost, leaving the first (hallux, or hand toe) with toes three and four united in the syndactyl condition. As we shall see, there is a lack of concordance in the distribution of these features among species, which was solved via careful and detailed molecular analyses (Moyle et al., 2007; Andersen et al., 2013).

The Common Kingfisher (*Alcedo atthis*) has a huge range, with an estimated global extent of occurrence of 10 million square kilometers (3.8 million square miles). It is found south of latitude 60 N over much of Europe, northwestern Africa, non-arid parts of Asia, India, China, southeast Asia, the Philippines, Sulawesi, and New Guinea to Makira (San Cristobal) in the Solomon Islands. Across this vast range there is some subspecific variation but none so great as to obscure the birds' identity. This was surprisingly tracked by the molecular evidence. Moyle et al. (2007) found only a 0.2% difference in the mitochondrial ND2 gene across the range. This is consistent with a recent range expansion in this species.

Parenthetically, the scientific name for the common kingfisher derives from the Latin *alcedo*, "kingfisher" (from Greek ἀλκυών, *halcyon*) and *Atthis*, a beautiful woman of Lesbos, allegedly a favorite of Sappho. We mention the name because enterprising ornithologists have perpetrated two anagrams of *Alcedo*, namely *Lacedo* and *Dacelo*, for other genera of kingfishers.

Equally interesting from a zoogeographical point of view is *Ceyx lepidus*, commonly and accurately referred to as the Variable Dwarf Kingfisher. This species has a curious and unique distribution among birds being found in the Philippines, the Moluccas (but not the Sulawesi or Lesser Sunda districts), and New Guinea (including New Britain and Manus Island) through the Solomon Islands to Makira.

The data of Moyle et al. (2007) and Andersen et al. (2013) yielded an intermingled, paraphyletic array of the traditional genera *Alcedo* and *Ceyx* with some members of one sister to members of the other. Their data resolved four clades. The first consisted of some, but not all, members of *Alcedo*. A second clade contained *all* species possessing three toes, i.e., three-toed members of both *Ceyx* and *Alcedo*.

A third clade is comprised of *Ispidina madagascariensis* and three African members of *Alcedo*. The geographical distribution unites them, as plumage pattern, ecology, and bill color differ among the four. For this group the authors use the genus *Corythornis*. The final group includes two tiny African species of *Ispidina*, which seemingly are sister to the above, but the data are somewhat ambiguous.

The second study (Andersen et al., 2013) was devoted to clarifying the relationships within the *Ceyx lepidus* complex and details of its colonization of islands in the Philippines, Moluccas, New Guinea and the Solomon Islands. The data set included 75 individuals from 27 named taxa including the 15 diagnosed subspecies of *Ceyx lepidus*. A discussion of all the details are beyond the scope of this paper, but it is worth noting that the authors list 12 variable characters for the *Ceyx lepidus* subspecies.

In sum they propose "recognizing all 15 *C. lepidus* subspecies as species for the following reasons: (1) each subspecies is morphologically distinct; (2) these taxa exhibit a relatively uniform and high degree of genetic differentiation among lineages (2.6–6.8% in ND2…), which is higher than in the two sister taxa (*C. argentatus* and *C. flumenicolus*) that are closely related to *C. lepidus*; and (3) the 15 subspecies have allopatric distributions and, therefore, are experiencing their own evolutionary fate" (Andersen et al., 2013, p. 127).

As most of the *Ceyx* species are concentrated in the Australo-Papuan region, and *Alcedo* are in southeast Asia, a plausible hypothesis is that members of this subfamily underwent an initial radiation in that region, with later migration leading to the African species and *C. erithaca* undergoing a relatively recent range expansion westward towards India.

The molecular studies have other important implications in a creationist model. Obviously, God designed the beaks of these birds to vary according to diet, and similar adaptive changes in beak morphology have happened repeatedly within this group. Further, coloration patterns in the bill and plumage can sometimes follow a similar pattern. Traits that can vary this way are not as reliable in assessing relationships between species. We discuss further the lineage-based species concept applied by Andersen et al. (2013) below with our recommendations regarding the *Tanysiptera galatea* complex.

## Subfamily Cerylinae

This is the smallest of the three subfamilies with nine species in three genera, but it is the most widely distributed, being found in North and South America,

Figure 7. Alcedininae. Small kingfishers (all *ca.* 13 cm, 5 in); considered basal, suggesting they may more closely resemble the kingfishers on the ark. Origin possibly Southeast Asia with subsequent colonization into Africa.

*Ceyx*—All 22 species have three toes; most inhabit the Australio-Papuan region and islands of the southwest Pacific.

The Oriental Dwarf Kingfisher *(Ceyx erithaca)* ranges from Indian subcontinent, through Southeast Asia to the islands of Indonesia

*Alcedo*—The seven species are piscivorous and found in the Old World.

The Common Kingfisher *(Alctedo atthis)* ranges throughout much of the Old World, including Europe, Northern Africa (mostly coastal regions), and parts of Asia. It appears this is from a recent range expansion.

*Ispidina*—These two insectivorous African species are weakly differentiated from the others but seem to form the basal genus of the group including *Alcedo* and *Corythornis*.

The African Pygmy Kingfisher *(Ispidina picta)* was earlier placed in *Ceyx* based on diet, but is now separate based on molecular data.

*Corythornis*—This genus of four species is found in Africa, including two species on Madagascar. Closely related to *Ispidina*, this genus was split off on the basis of molecular evidence.

The Malachite Kingfisher *(Corythornis cristatus)* is a common bird along watercourses of sub-Saharan Africa.

Africa, and across temperate Europe and Asia (Figure 8). Cerylines have no blue in their plumage and possess white spotting at least on the light feathers. (The Banded Kingfisher, *Lacedo pulchella*, of Halcyoninae has wing spots but much bright blue in plumage.)

It is tempting to suggest an Old World origin with one invasion into the New World, but the data preclude that. Instead, Moyle suggests two invasions of the New World as being most parsimonious. Their first clade included the members of *Megaceryle*, which invaded the New World as the Belted (*M. halcyon*) and Ringed (*M. torquata*) Kingfishers. A second clade consisted of the African and Asian Pied Kingfisher (*Ceryle rudis*), with a second New World incursion producing the four green kingfishers (*Chloroceryle*). With respect to this genus, Moyle comments (p. 494): "The two rufous-bellied species (*C. aenea* and *C. inda*) were not sister taxa, nor were the two white-bellied species (*C. amazona* and *C. americana*). Instead *C. americana* and *C. inda* were sisters, and *C. aenea* and *C. amazona* branched off successively deeper in the clade." It is not possible to suggest whether the Old-to-New World colonization was via a Bering land bridge or one in the North Atlantic.

Again, Moyle's work has creationary implications beyond just post-Flood dispersion; it clearly implies that God designed these birds with the ability to vary in plumage coloration, and similar changes sometimes have happened in several lineages. This is consistent with the patterns of variation in mammals (e.g., Lightner, 2008, 2009, 2010), although the underlying genetic basis has not been elucidated in these birds.

## Subfamily Halcyoninae

This group is the largest and most diverse group of kingfishers (Figure 9). It also exhibits its greatest extent of adaptive radiation in the Australo-Papuan region. By far the most species occur within a complex of two genera, *Halcyon* and *Todiramphus*. In the Gill and Donsker (2016) list, the two account for 31 species, or nearly 30% of all kingfishers.

Sibley and Ahlquist (1990, p. 845, see fig. 360) recovered the paraphyly within *Halcyon*, with *H. senegalensis* and *H. sancta* separated by *Tanysiptera* and *Melidora*. Although they had material from many more genera of kingfishers, time prohibited them from investigating this problem further. It was the work of Moyle (2006) and Andersen et al. (2015) that unequivocally broke apart the former large genus *Halcyon* into two genera with mainly the African and some Asian forms remaining in *Halcyon*, and *Todiramphus* containing a large number of forms extending from Borneo and the Philippines to the Marquesas islands in the east and Mariana Islands to the north.

In today's scientific writing, the word "elegant" is overused to the point of banality, but if any avian study merits that appellation, it is that of Andersen et al. (2015). In many ways this paralleled their previous study of *Ceyx* (Andersen et al., 2013) in its thoroughness. The authors assembled 155 samples from *Todiramphus* of which 93 were from *T. chloris* and 63 were from other *Todiramphus* species. They lacked only six species from islands that were difficult to collect. It is significant that the authors themselves are field ornithologists as well as competent laboratory workers.

The entire story is too complex to be detailed here, but several key points deserve mention.

(1) The colonization and differentiation of *Todiramphus* occurred extremely rapidly and recently. The situation, while not unique, is the most rapid thus far discovered in birds. Parallel situations have been observed in other species such as the Red-bellied Pitta (*Pitta erythrogaster*) throughout the Philippines, fruit doves (*Alopecoenas*), reed warblers (*Acrocephalus*), whistlers (*Pachycephala*), white-eyes (*Zosterops*), and *Ceyx* kingfishers (see this paper), all involving islands of the southwest Pacific.

(2) This rapid differentiation is shown in the molecular data by short internal distances followed by relatively longer terminal branches. In other words, once a propagule reached a new island, it stayed there and exhibited an independent history.

(3) The authors found several instances of secondary sympatry; that is, instances of two separate invasions of a single island followed by subsequent differentiation in size, coloration, and feeding habits. Such character displacement is a common phenomenon. Evolutionists generally explain it as the result of natural selection from competition for resources. From a biblical creation perspective, there are probably other mechanisms involved; it happens regularly enough it appears design is involved.

(4) *Todiramphus sancta*, one species within this complex, is highly migratory, whereas others are not, with the exception of some *T. chloris*. The scenario strongly suggests that the properties of migratory *vs.* non-migratory (vagile *vs.* sedentary) behavior can be rapidly gained as well as lost. This goes far toward explaining the expansion of *Todiramphus* over such a broad area in such a short period of time, followed by the far less fluid situation that we see at present. It is also quite consistent with the biblical concept that God designed creatures to reproduce and fill the earth, and provided the means for them to settle down once that was largely accomplished.

(5) Taxonomically, the traditional *T. chloris* was found to be paraphyletic. Depending on the criteria used, the authors uncovered 11 to 26 separate species. They were unable to examine 28 of the nominal subspecies (i.e., those described in earlier literature) of *T. chloris*, which allows for the possibility that there are even more.

Figure 8. Subfamily Cerylinae. This group is the smallest of kingfishers with only three genera and nine species but is distributed in both the Old and New Worlds. Members range from small to large, lack bright colors, and have some to many white spots on the wings and/or tail. An African origin is likely with two probable colonizations to the new World.

Genus *Megaceryle*—Four species, one in Africa, one in Asia and two in the New World. The Belted Kingfisher *(Megaceryle alcyon)* of the U.S. is familiar. Medium (28 cm, 11 in) to large size (45 cm, 18 in)

Pictured: Crested Kingfisher *(M. lugubris)*. This species lives in East Asia and Japan, inhabiting fast-moving mountain streams and remaining at the highest altitudes even during winter.

Genus *Ceryle*—One species Africa to India; the only all black and white kingfisher, distinctive on morphological and molecular grounds.

Pictured: Pied Kingfisher *(Ceryle rudis)*. This species is common, noisy, and gregarious over much of its range. It is one of the few kingfishers to employ "helpers at the nest." These are males from a previous brood (primary) or non-mated unrelated birds

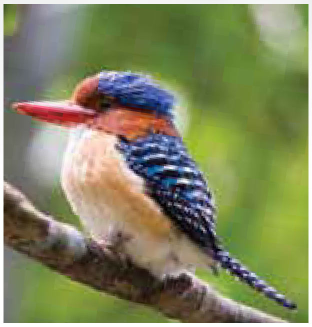
Genus *Chloroceryle*—Four species of similar green and rufous color, small to medium sized (13 cm, 5 in–30 cm, 12 in). Occur in Central and South America mainly along rivers and lakes bordered by lush vegetation. In some areas all four can be found together segregated ecologically by size.

Pictured: Green Kingfisher *(C. americana*, 20 cm, 8 in) found from extreme southern Texas through tropical Americas.

Figure 9. Subfamily Halcyoninae. Sixty-one species split into two groups, one Asian and African including *Lacedo*, *Pelargopsis*, and *Halcyon*. The Asian group includes at least nine genera occurring principally from Southeast Asia, through Australo-Papua, and to many southwestern Pacific islands. The formerly large genus *Halcyon* was split by molecular evidence into two: *Halcyon* (11 species) and *Todiramphus* (21). The latter has speciated widely and given rise to an adaptive radiation in New Guinea and Australia (see Figure 10).

Genus *Lacedo* (monotypic)

Pictured: Banded Kingfisher (*L. pulchella*); widespread in Southeast Asia and Greater Sunda Island. This species is possibly sister to the Afro-Asian *Halcyon* group.



Genus *Halcyon*—Eleven species, Africa to Southeast Asia.

Pictured: Brown-hooded Kingfisher (*H. albiventris*). Southern Africa; this species typical of the genus in open woodland.

Genus *Pelargopsis*—Stork-billed kingfishers, 3 species in Southeast Asia.

Pictured: Brown-winged Kingfisher (*P. amauroptera*), coasts of Bay of Bengal. The oversized bill likely designed for feeding on crabs.

Genus *Actenoides*—Seven species; Southeast Asia, Philippines, Sulawesi, Bougainville, and Guadalcanal. Possibly basal to the *Todiramphus* complex.

Pictured: Green-backed Kingfisher (*A. monachus*), Sulawesi. Turquoise and orange color distinctive.

Genus *Todiramphus*—Twenty-one species, Southeast Asia through Australo-Papua, but most on islands of southwestern Pacific.

Pictured: Collared Kingfisher (*T. chloris*), common and conspicuous; one of the "great colonizer" species on islands.

Genus *Cittura* (monotypic).

Pictured: Lilac Kingfisher (*C. cyanotis*) of lowland forests of northern Sulawesi. May be a sister taxon to *Tanysiptera*.

Figure 10. Adaptive radiation of kingfishers in New Guinea and Australia. This group of around 18 species in five genera seems to have split from Todiramphus and occupies montane forests to open country, embracing several niches.

Genus *Tanysiptera*—Paradise kingfishers (at least 10 species); see text for details.

Pictured: Buff-breasted Paradise Kingfisher *(T. sylvia)*. Southern New Guinea and northern Queensland.

Genus *Syma*—Mountain kingfishers. Two species in New Guinea, replace each other altitudinally.

Pictured: Yellowbilled Kingfisher *(S. torotoro)*.

Genus *Melidora* (monotypic)

Pictured: Hook-billed Kingfisher *(M. macrorrhina)*. Mountain forests of New Guinea; crepuscular and nocturnal; feeds on ground in leaf litter.

Genus *Clytoceyx* (monotypic).

Pictured: Shovel-billed Kookaburra *(C. rex)*. Mountain forests of New Guinea. Uses trowel-shaped bill to excavate soil for earthworms, etc.

Genus *Dacelo*—Kookaburras (four species in New Guinea and Australia.

Pictured: Rufous-bellied Kookaburra *(D. gaudichaud)*. Common and widespread in lowland forests of New Guinea; compare to Clytoceyx above.

Genus *Dacelo*—Kookaburras.

Pictured: Laughing Kookaburra *(D. novaeguineae)*. As symbolic of Australia as kangaroos. Inhabits open country where it feeds on snakes, lizards, large insects.

## The Genus *Tanysiptera*

As far as we are aware, no complete revision of the genus *Tanysiptera* has been made, nor has a molecular assessment been attempted. Thus, we present the following detailed discussion of what is known of the geographic variation in the genus and an assessment of the problem.

The Common Paradise Kingfisher (*Tanysiptera galatea*) lives up to its name. It is a woodland kingfisher and is almost a dooryard bird in New Guinea. Ahlquist saw his first one in 1969 in the backyard of a colleague in Boroko, a suburb of Port Moresby. It fills the "wait and capture" niche of a flycatcher, such as the Eastern Phoebe or the Great Crested Flycatcher in the U.S. and flycatchers elsewhere in the Old World.

Potentially complicating the matter, and not studied by either Mayr (1954) or Beehler and Platt (2016), are forms of *Tanysiptera galatea* in Wallacea (Indonesia), extralimital to New Guinea. They are listed in the contemporary works on that region; i.e., White and Bruce (1986), Fry et al. (1992), and Coates et al. (1997). These authors do not consider any of the forms to be allospecies, nor do they address the question of founder effects. We include them here (1) for the sake of completeness; (2) because they are differentiable to a birdwatcher and not only a museum worker armed with a pair of calipers; and (3) they could form the basis for a comprehensive treatment of the *Tanysiptera galatea* group. (Tables 1 and 2.) Although these forms have been known for some time and their taxonomic recognition is not in dispute, they have not received the attention of the New Guinea forms simply because the Moluccas and associated islands have not been investigated as thoroughly.

Of this Wallacean assemblage, White and Bruce (1986, p. 272) comment:

> The extensive polytypic variation in N Moluccas is rather remarkable. The birds of New Guinea and the W Papuan Islands exhibit very little variation, but with allospecies in Biak, Numfor, and Kofiau. The S Moluccan populations also vary only slightly. This species is particularly prone to pronounced variation in small island populations.

It is probably not wise, on the basis of incomplete plumage information, to attempt to reconstruct the history of these 10 forms, except to note that a likely route of colonization from New Guinea was through Halmahera, the largest island in the Moluccas (Figures 6 and 10). Halmahera is less than 100 miles from the westernmost population of the nominate *Tanysiptera galatea galatea* on Waigeo Island, which has an irregular shape of 17,780 square kilometers (6860 square miles), a maximum altitude of 1635 meters (5464 feet), and possesses a wide range of habitats. The allospecies on Kofiau Island (*T. ellioti*) is even closer geographically. Those subspecies inhabiting islands close to Halmahera could well have colonized from there. They include *T. g. doris* (Morotai), *T. g. emiliae* (Rau), *T. g. brunhildae* (Doi), *T. g. sabrina* (Kayoa), and *T. g. margarethae* (Bacan).

The next closest large island is Seram (17,100 square kilometers, or 6,600 square miles; altitude 3027 meters, or 9731 feet), and it is only slightly more distant from the Bomberai peninsula ("Bird's Neck") of New Guinea. Misool Island, about half-way between the Vogelkop ("Bird's Head") of New Guinea and Seram has no populations of *Tanysiptera*. Three subspecies are associated with these islands: *T. g. nais* (Seram and others), *T. g. acis* (Buru), and *T. g. boanensis* (Boano). The origin of the subspecies on Obi (*T. g. obienis*) is somewhat equivocal, in our opinion, but its plumage pattern is said to be most like that of *T. g. nais* of Seram.

## Defining species

Whether we are discussing the above example or the situations prevalent in the *Todiramphus* or *Ceyx lepidus* complexes, we are faced with the problem of defining a species. Many of the constituent populations are isolated on islands, thus reliance on the traditional biological species concept (BSC) places one in a conundrum. The core idea in the biological species concept is reproductive isolation, i.e., two separate species cannot interbreed and produce fertile offspring. With insular, allopatric forms there is no way to test the BSC in a natural setting.

Strict reliance on the BSC forces one to be arbitrary in species decisions. It comes down to a matter of taxonomic preference: one is either a "lumper" (considering the allopatric forms as subspecies of a mainland species) or a "splitter" (recognizing the insular populations as distinct allospecies).

The fact is that a "species" is an idea originating with man, not God; hence all species concepts are subjective to a degree, and the definition that one uses is determined to an extent by a given problem at hand and the data bearing upon it. Since considerable diversification has occurred within created kinds, it is necessary for creationists, like everyone else, to use the concept of species. It is also worth considering how species could be best understood within a biblical creation model.

In writing of the problem with respect to the *Ceyx* kingfishers, Anderson et al. (2013, p. 126) observe:

> We draw upon the details of genetic divergence, biogeography, and plumage pattern as the most prescient evidence. Application of the lineage-based species concepts to island systems is preferable to the biological species concept (Mayr 1963) because reproductive isolation between allopatric insular taxa cannot be assessed. Instead, we employ a lineage-based species concept to recognize ancestor-descendant populations with unique evolutionary histories.

The lineage-based species concept was developed by de Queiroz (1998,

1999) and further expanded by de Queiroz as the metapopulation lineage concept of species. De Queiroz (2005, pp. 6604–6605) elaborates:

> The proposal has two components. First, it retains the element common to all contemporary concepts and definitions of species by adopting the general concept of species as separately evolving metapopulation lineages. Second, it eliminates the conflicts among rival concepts by treating this property, existence as a separately evolving metapopulation lineage, as the only necessary property of species. In other words, all of the other properties that have previously been treated as necessary properties of species, which created incompatibilities among alternative species concepts, are reinterpreted as no longer being defining properties of the species category. Instead, they are interpreted as contingent properties not only of metapopulation lineages but also of species, properties that species as metapopulation lineages may or may not acquire during the course of their existence. In other words, metapopulation lineages do not have to be phenetically distinguishable, or diagnosable, or monophyletic, or reproductively isolated, or ecologically divergent, to be species. They only have to be evolving separately from other such lineages. Because the interpretation of various secondary properties of lineages as necessary properties of species is the cause of the incompatibilities among alternative species concepts, their reinterpretation as contingent rather than necessary properties also removes the incompatibilities. The result is a single, general, unified concept of species.

As it turns out, species often do not have clear boundaries. Interspecific hybridization occurs quite frequently, especially in plants. There are various species concepts that have been proposed to include this complication regarding gene flow and introgression. The lineage concept attempts to do this by classifying species by their phylogenetic lineages, allowing for the possibility of limited gene flow from one lineage to another.

Apart from the insular species, what else can we suggest regarding differentiation in *Tanysiptera*? It has already been

**Table 1. Mayr's species of the *Tanysiptera galatea-hydrocharis* complex of Papuan paradise kingfishers. Data from Fry et al. (1992, pp. 114–115 and Plates 3 and 4, pp. 31–33); Pratt and Beehler (2015, pp. 385–388, and Plate 59, pp. 156–157); Beehler and Pratt (2016, pp. 222–224).**

| Name | Head | Back | Wing | Underparts | Tail | Range |
|---|---|---|---|---|---|---|
| **Common Paradise-Kingfisher *Tanysiptera galatea*** | Pale blue crown contrasts with dark blue head | Solid dark blue like cheeks and head | Pale blue coverts contrast with dark blue wing | White | Tail with long white streamers; mainly white with blue outer edges; white spatulate tip | Widespread in lowland New Guinea forest |
| **Little P-K. *T. hydrocharis*** | Dark blue, little contrast with crown | Dark blue, like head | Coverts dark, not contrasting with rest of wing | White | Tail shorter; outer tail feathers dark blue with white spatulate tips | Local in riverine forest of s. New Guinea; Aru I. (?) |
| **Rossel P-K. *T. rosseliana*** | Blue crown contrasts less with paler blue head | Paler blue than *T. galatea* | Uniform blue, paler than *T. galatea* | White | Tail base broad, all white; spatulate tips prominent | Rossel I. only |
| **Kofiau P-K. *T. elliotti*** | Pale blue crown contrasts with dark blue head | Dark blue, like head | Pale blue coverts contrast with dark blue wing | White | Tail shorter with broader streamers, less prominent spatulae | Kofiau I. only |
| **Biak P-K. *T. riedelii*** | Entire head pale blue with darker scallops and streaks | Pale blue of head extends partway down back | Strong contrast of pale blue coverts with rest of wing | White | Mainly white, edged pale blue; shafts of central pair of streamers blue with white spatula | Biak I. only |
| **Numfor P-K. *T. carolinae*** | Uniform dark blue | Dark blue | Dark blue | Solid dark blue | Tail white with strongly spatulate tip | Numfor I. only |

noted that the subspecies of *T. galatea* are poorly differentiated over its wide range in New Guinea. The separation of *T. hydrocharis* from *galatea* seems well understood as a case of classic speciation via a barrier. Mayr (1963, p. 503) has explained it thus:

> During the Pleistocene the species *T. hydrocharis* was isolated on an island that ran from the Aru Islands to the mouth of the Fly River and was separated from the mainland form *galatea* by a branch of the ocean. When this strait was filled by alluvial debris from the mountains of New

**Table 2. Moluccan subspecies of Common Paradise-Kingfisher (*Tanysiptera galatea*). Descriptions from Fry et al., (1992, pp. 114–115) and White and Bruce (1986, pp. 271–272). Illustrations: *T. g. nais*, *T. g. sabrina*, and *T. g. emeliae* from Fry et al. (1992, Plate 3, p. 31); *T. g. nais*, *T. g.*, *acts*, *T. g. obiensis*, *T. g. margarethae*, *T. g. emiliae*, and *T. g. sabrina* from Woodall (2001, Plate 9, p. 192). Other material consulted: videos and photographs from www.hbw.com.**

| Name | Head | Back | Wing | Under-parts | Tail | Range |
|---|---|---|---|---|---|---|
| ***Tanysiptera galatea nais*** | Front and center of crown bluish-violet; eyebrow paler, silvery green-azure | Black, anteriorly violet with some cobalt spotting | Wing coverts of same silvery blue as eyebrow; dark blue wing | White | Mainly white with pale blue edges; streamers white with blue shafts | Ambon, Manipa, Seram, Seram Laut (Manawoka, Gorong) |
| ***T. g. acis*** | Crown darker; less contrast with head | Black; some blue streaks on rump | Coverts darker; less contras with wing | White | Tail and steamers blue, edged white | Buru I. (west of Seram) |
| ***T. g. boanensis*** | Entire crown greenish-azure, contrasting with dark blue head | Black with violet-blue wash | Azure-blue coverts contrasting with rest of wing | White | Mainly white with pale blue edges; streamers white with blue shafts | Boano I. (northwest of Seram) |
| ***T. g. obiensis*** | Crown cobalt blue, nearly as dark as head | Black with violet blue wash; blue streaks on rump | Coverts nearly as dark as rest of wing | White | Streamers long, blue with white spatulae | Obi I. (between Halmahera and Seram) |
| ***T. g. margarethae*** | Crown dark blue; pale only on eyebrow | Dark blue; rump feathers white with broad blue edges | Coverts darker; much less contrast with wing | White | Mainly blue, with spatulae white | Bacan I. (southwest of Halmahera) |
| ***T. g. browningi*** | Light blue crown with head dark blue | Bluish-black | Light blue coverts much reduced; wing dark. | White | With with blue outer webs; streamers blue with white spatulae | Halmahera I. |
| ***T. g. sabrina*** | Entire crown ultramarine with no cobalt border | White patch in middle of upper back | Light blue coverts reduced; less contrast with wing | White | Entirely white; streamers white with dark blue blue shafts | Kayoa I. (west of Halmahera) |
| ***T. g. brunhildae*** | Crown dark blue; pale only on eyebrow | Dark blue; rump feathers white with blue edges | Coverts show much less contrast with wing | White | Entirely white; streamers white with dark blue blue shafts | Palau Doi (northwest of Halmahera) |
| ***T. g. doris*** | Pale blue crown with dark blue head | Upper back white | Light blue coverts; dark wing | White | White edged with blue | Morotai I (large island north of Halmahera) |
| ***T. g. emiliae*** | Crown silvery blue, prominently crested; light blue ear patch | Upper back white | strong contrast between coverts and wing | White | White with blue edges; streamers reduced and narrow | Rau I. (west of Morotai) |

> Guinea, dry land joined the island with the mainland of New Guinea, and *galatea* was enabled to invade the range of *hydocharis*, where the two species live side by side without interbreeding or without obvious ecological competition.

Our understanding of the buff-bellied species of *Tanysiptera* is less obvious. The implication is that the underpart coloration renders them as a separate group, but this has not been clearly demonstrated. Two of the species, the Red-breasted PK (*T. nympha*) and Brown-headed PK (*T. danae*) are endemic to New Guinea and seem to replace each other geographically. *Tanysiptera danae* is widespread in the foothills of peninsular southeast New Guinea and occurs above the range of the Common PK (*T. galatea*). *Tanysiptera nympha* also occurs in the hill forest at higher altitudes than the Common PK, but significantly to the west of *T. danae*. Pratt and Beehler (2015, p. 387) give its range as "patchily distributed in Bird's Head and Neck [i.e., Vogelkop], Sepik-Ramu, Adelbert Mts., Huon, and northwestern SE Pen (Upper Watut, Wau, and Waria R), 500–900m."

A third species, the Buff-breasted PK (*T. sylvia*) breeds in both New Guinea and Australia. The Australian subspecies (*T. s. sylvia*) breeds in lowland forests of Queensland from north of Brisbane to Cape York. Uniquely for the genus, it migrates north in the Austral winter and is widespread in both southern and northern Papua New Guinea. The New Guinea race (*T. s. salvadoriana*), which can be distinguished in the field from the Australian migrants, breeds in a fairly limited area around Port Moresby in southeastern Papua New Guinea, where it is a year-round resident.

Coates and Peckover (2001) and Beehler and Pratt (2016) treat as a full species the Black-headed PK (*T. nigriceps*). This species is "endemic to New Britain, Umboi I, Lolobau I, Watom I, and Duke of York I. Lowlands to *c.* 1500m." (Coates and Peckover, 2001, p. 110.) The Black-headed PK shares with the Buff-breasted PK a *white upper back*. Thus, it is probable that it descended from the migratory Buff-breasted PK which moved to the Bismarcks, found an unoccupied niche, stayed to breed, and became sedentary.

If the buff-breasted species of *Tanysiptera* form a cohesive group, it is possible to generalize that they are representatives that occupy a higher altitudinal distribution than the white-breasted species.

It is interesting to note that the *white upper back* also occurs in three of the *T. galatea* group in the Moluccas, namely, *T. doris* (Morotai I.), *T. emiliae* (Rau I.), *T. sabrina* (Kayoa I.). The islands are all located west or north of Halmahera. Is this significant? It is possible, but unlikely, that the migratory *T. sylvia* colonized these islands and gave rise to the three species. It is improbable due to the distance involved and the fact that the buff-colored underparts would have to be secondarily lost. A more reasonable explanation is that the white upper-back color in *T. doris*, *T. emiliae*, *T. sabrina* is the result of an expression for that trait already present in the genes of *T. galatea* but simply masked. Thus, the occurrence of the three white-backed Moluccan species may indicate their close affinity and their descent from a single colonization by *T. galatea*.

These possibilities cannot be answered by present data but would be easily solved by a molecular study of the 26 species and subspecies of the *Tanysiptera* complex.

## The remaining Halcyoninae

Without following the cladograms of Moyle (2006) slavishly, it is possible to reconstruct some of the adaptive radiation of kingfishers in New Guinea and Australia.

*Lacedo pulchell*a lies at the base of the radiation of a *Halcyon-Pelargopsis* group. There is nothing immediately in its characters that give much insight into its somewhat isolated position. The *Todiramphus* complex is one of two clades sister to *Halcyon*. At the base of this clade is *Actenoides*, a widely ranging genus of six species occurring in the Malay peninsula, Borneo, Sulawesi, and the Philippines, but not in Australia or New Guinea. Curiously it has a representative, the Moustached Kingfisher (*A. bougainvillei*) on Bougainville and Guadalcanal in the Solomons. Is this species (or two) related to the others? The species has been collected (Filardi, 2015), with samples saved for molecular analysis. Perhaps an answer will be forthcoming.

The genus *Syma* is sister to the *Todiramphus* complex. The two species, sometimes subsumed into *Halcyon* (Rand and Gilliard, 1967), are distinguished by a serrated mandibular tomium (cutting edge of the bill). *Syma* represents a movement into the mid-mountain environment of New Guinea. The two species replace each other altitudinally. *S. torotoro* ranges up to 1,200 m; *S. megarhyncha* ranges up to 2,200 m with some overlap around 900–1,000 m.

*Tanysiptera* is rooted basally with *Cittura cyanotis* on the second side of the clade. *Cittura* is endemic to Sulawesi. There is not much morphological evidence to support or deny this relationship.

The remaining genera—*Melidora*, *Clytoceyx*, and *Dacelo*—provide an interesting hypothesis of adaptive radiation. The Hook-billed Kingfisher (*Melidora*) and Shovel-billed Kookaburra (*Clytoceyx*) are adaptive modifications to the basic kingfisher design. As its name suggests, the Hook-billed Kingfisher possesses a flattened bill with a strong hook at the top. It is found in mid-mountain forests of New Guinea, where it feeds mainly on the ground, digging in the leaf litter for worms and other invertebrates. It is crepuscular and nocturnal. In *Clytoceyx* the bill is broadly flattened into a shovel that the bird uses to dig into mud for prey. The birds are quite aggressive in this behavior, exposing several centimeters of art over an area of several square meters. Quite often captured birds have damp mud caked on their bills.

Digging may seem bizarre behavior for a kingfisher, but it is interesting that the Shovel-bill shares a rusty ventral color pattern with its nearest relative among the kookaburras, the Rufous-bellied (*Dacelo gaudichaud*). *D. gaudichaud* is the only true kookaburra that is a forest-dweller. The remaining kookaburras (*D. leachii*, *D. tyro*, and *D. novaeguineae*) all inhabit the drier savannah country of southern New Guinea and Australia (Woodall, 2001).

Perhaps the most extreme adaptation to arid conditions is found in the Red-backed Kingfisher (*Todiramphus pyrrhopygius*), which lives in extremely dry, inhospitable areas in interior Australia. It is said to breed opportunistically when rains occur.

## Conclusions and Perspectives

The evidence examined here suggests that the level of the kind in kingfishers is at the family: Alcedinidae. It also suggests that soon after the Flood three distinct lineages arose within this kind, which are represented today by the three recognized subfamilies (Alcedininae, Cerylinae, Halcyoninae). Some components of their migration and adaptive radiation can be discerned from available data, including two invasions of the New World by members of Cerylinae and apparent southeast Asian radiations in *Ceyx* (Alcedininae), *Todiramphus* (Halcyoninae), and other Halcyoninae.

The pattern of geographic dispersal and differentiation that we have presented for the kingfishers may seem to be conclusive, yet that is far from the case. Many details remain to be addressed. For example, the Moyle-Andersen group addressed the colonization of *Todiramphus* complex in the broad area of the southwest Pacific but did not examine in detail the genus *Halcyon* (*sensu stricto*), which ranges west from Wallace's Line to the Red Sea to Africa. Since the Sibley and Ahlquist data place African *Halcyon* at the base of the Halcyoninae, a biblical origin is suggested with a movement into Australo-Papua and beyond. The secular scenario would do the reverse, having the principal radiation in Australo-Papua with subsequent colonization westward across Wallace's Line. Such details point to the fact that any study is far from complete.

The most obvious need is a study of the 28 forms in the paradise kingfisher (*Tanysiptera*) complex. Both fieldwork and molecular evaluation are necessary components. A molecular study could show:

(1) how much genetic differentiation has occurred,
(2) the relationship between genetic variation and phenotypic variation,
(3) probable routes of colonization,
(4) the possibility of multiple colonizations. Did one founder population reach one of the larger islands first (e.g., Seram or Halmahera) and then subsequently colonize the small islands close to the large ones?

Additionally, there is a need for creationists to develop new statistical tools. For example, current methods to detect the founder effect fail to recognize the possibility that founders may select new habitats based on already possessing alleles adaptively matched to the environment. In some instances, such as where there are great distances between islands, carrying in adaptive alleles may be less common, but it nevertheless needs to be considered. Further, methods need to be developed to distinguish created heterozygosity from new alleles that have arisen via mutation.

This is an opportune time for creation research to advance beyond its infancy and make valuable contributions to our understanding of the natural world. As we do so, we can address questions from a biblical perspective showing that the diversification and speciation we observed within created kinds is a result of a loving and wise Creator who designed his creatures to reproduce and fill the earth.

## Acknowledgments

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*Alcedo atthis* Common Kingfisher
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**Figure 8**
*Megaceryle lugubris* Crested Kingfisher
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**Figure 10**
*Tanysiptera sylvia* Buff-breasted PK
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*Melidora macrorrhina* Hook-billed Kingfisher
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*Clytoceyx rex* Shovel-billed Kookaburra
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*Dacelo novaeguineae* Laughing Kookaburra
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# Genesis Flood Drainage through Southwest Montana:

## Part II: The Formation of Pediments

**Michael J. Oard***

## Abstract

**The origin of pediments is a uniformitarian mystery. Four hypotheses are described and analyzed. Pediments and one planation surface in southwest Montana are described and analyzed. Patterns in valley pediments suggest that they were formed by large-scale, high-velocity, down-valley Flood currents.**

## Introduction

Part I of this series summarized late Flood drainage, erosion, and deposition in southwest Montana (Figure 1), through both sheet- and channelized-flow phases of Walker's (1994) recessive stage (Oard, 2008, 2013, 2018; Oard and Reed, 2017). Initially, water flowed off the continents in great sheets, and these currents eroded the rising western Rocky Mountains. As mountains surfaced, sheet flow eroded their tops, and the debris was deposited in large fans and in sinking valleys and basins. When the sheet flow transitioned into channelized flow down the southwest Montana valleys, it deeply eroded the newly deposited valley fill and cut numerous pediments.

## What Is a Pediment?

A *pediment* is "a broad sloping rock-floored erosion surface or a low relief plain typically developed by subaerial agents (including running water), in an arid or semiarid region at the base of an abrupt and receding mountain front or plateau escarpment" (Neuendorf et al., 2005, p. 477). This formal definition is broad and disputed (Dohrenwend, 1994, p. 322; Thomas, 1994, p. 244). More simply, a pediment is an erosion or planation surface that lies at the foot of a mountain, mountain range, ridge, or plateau. An *erosion surface* is "a land surface shaped and subdued by the action of erosion, esp. by running water. The term is generally applied to a level or nearly level surface" (Neuendorf et al., 2005, p. 217). A *planation surface* is virtually the same, except that an erosion surface is a rolling surface of low relief, while a planation surface is flat to nearly flat. Figure 2 shows a 160 km$^2$ pediment at the foot of the western Tobacco Root Mountains of southwest Montana. Figure 3 shows its east-west cross section, and Figure 4 shows an aerial view.

Both pediments and planation surfaces are often cut across tilted sedimentary rocks or into granite and commonly capped by a thin veneer of water-abraded, resistant rocks. For instance, the pediment along the east side of the Ruby Valley (Figure 5) bevels the valley-fill sedimentary rocks, dipping about 3° toward the east (right in figure). The rocks on top of the pediment (Figure 6) are mostly well-rounded coarse quartzite gravel originating from central Idaho. The clean beveling and the exotic rocks provide powerful evidence for *down-valley* fast Flood currents.

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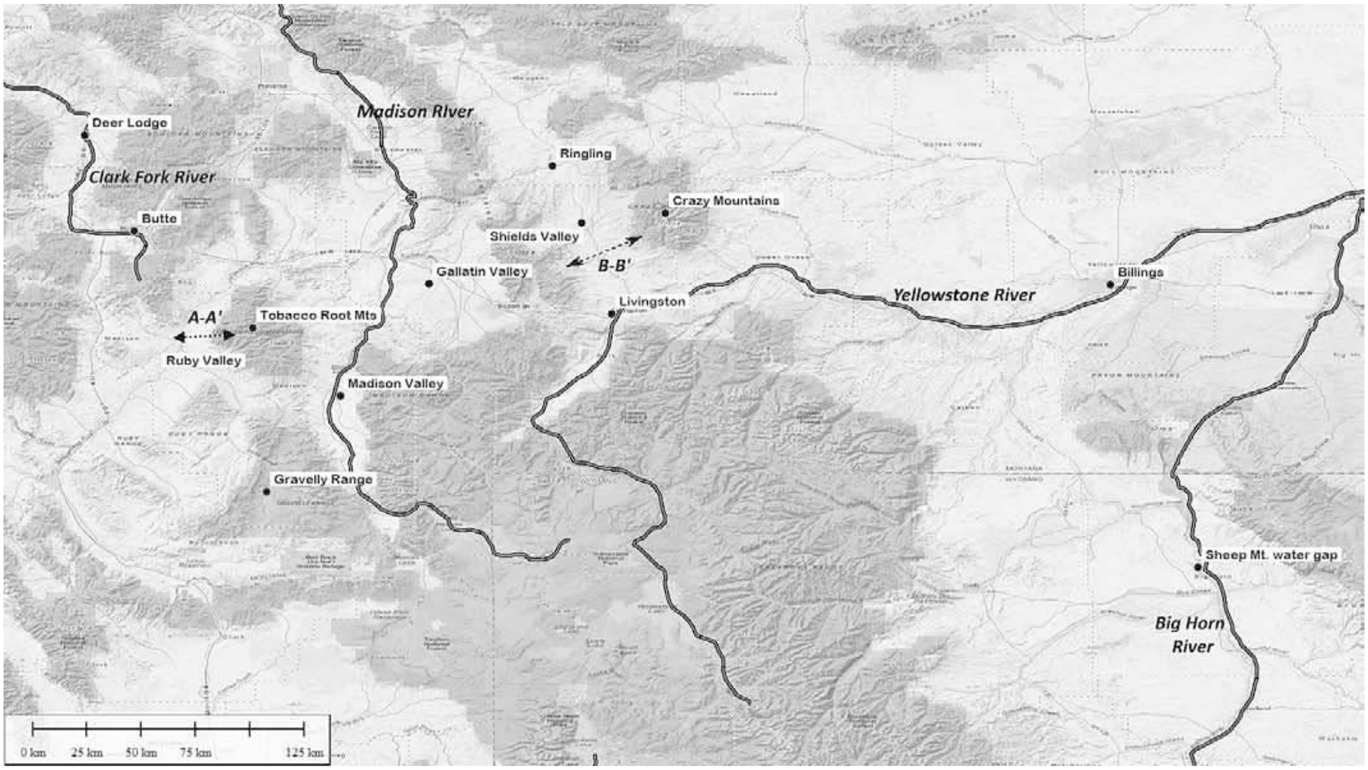

Figure 1. Location map of places mentioned in article. The thick lines indicate some of the major rivers. Dashed double-arrow lines indicate locations of profiles in Figures 3 and 21 (imagery courtesy of ESRI).

Figure 2. Pediment along the western slope of the Tobacco Root Mountains, northeast of Twin Bridges, Southwest Montana. The pediment is about 20 km long parallel to the mountain front, 8 km wide perpendicular to the front, and about 300 m higher than the adjacent river.

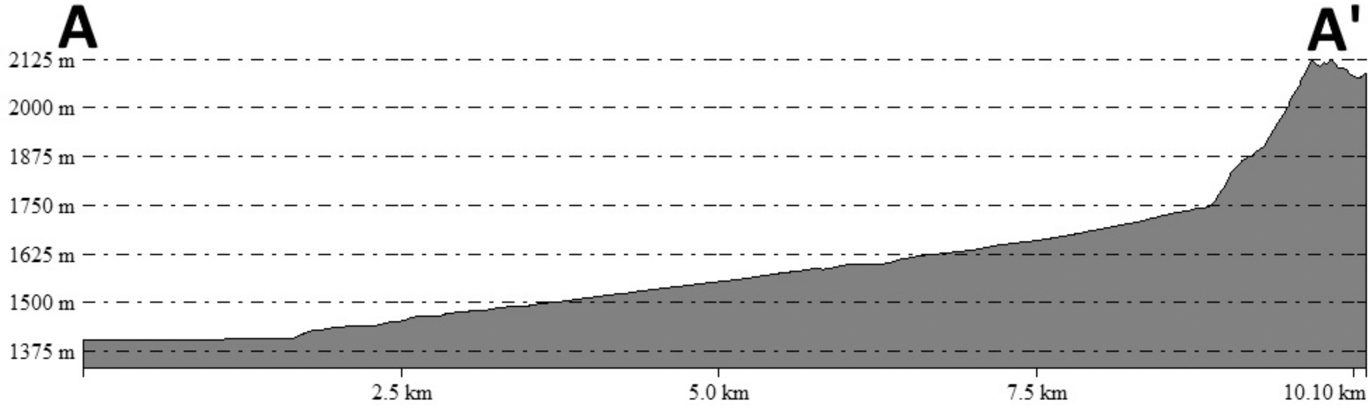

**Figure 3. Profile across the pediment west of the Tobacco Root Mountains (general location shown in Figure 1 above).**

Geologist Grove Karl Gilbert first described pediments in 1877. Some geologists thought they were alluvial fans, since fans have a similar appearance and location (Twidale and Bourne, 1998). But the hard rock surfaces below the gravel veneer proved Gilbert right (Rich, 1935). Alluvial fans are *deposits* of debris from a mountain valley, pointing to the valley entrance. *Bajadas* are coalesced alluvial fans that may appear to be pediments but are depositional and generally exhibit dips between constituent fans (Figure 7), while pediments are planar and erosional.

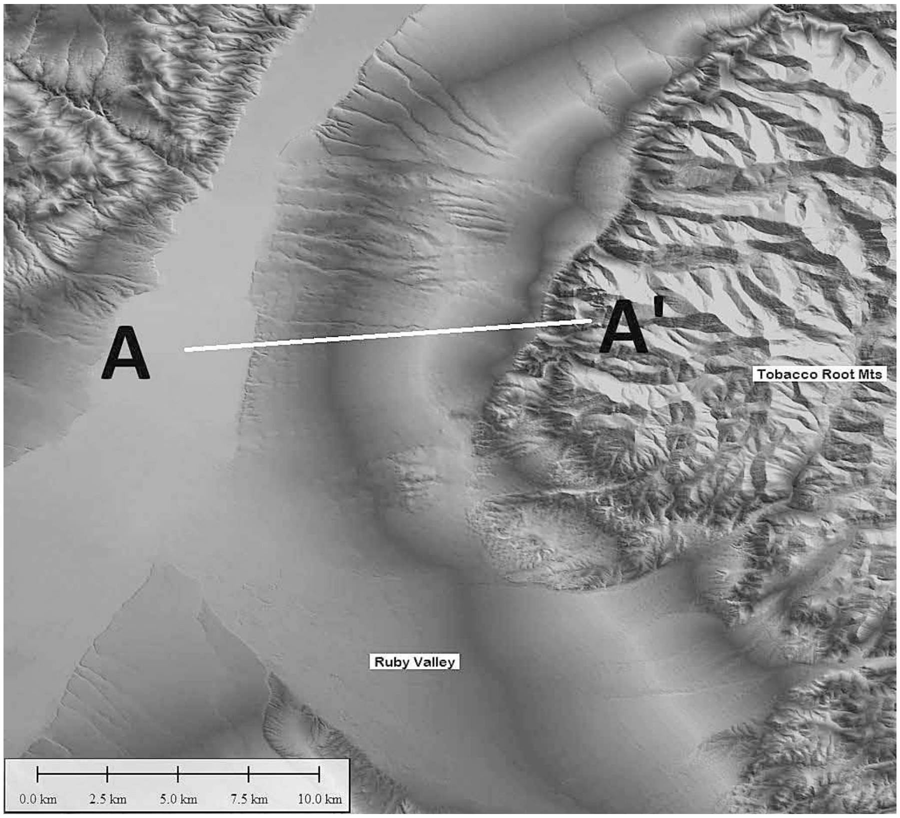

**Figure 4. Aerial view of the pediment in Figure 2, showing location of the profile in Figure 3. In this and succeeding maps, elevations change shading every 100 m in order to emphasize topography (imagery courtesy of ESRI).**

Although pediments are generally flat, they slope gently away from the elevation they abut (Figure 3), with a slightly concave upward profile, steepening sharply toward the mountain intersection (Hadley, 1967). The slope near the mountain front generally ranges from 1° to 6°, then flattens as the coarse gravel cap thickens. This sharp angle is called the *piedmont angle* or *junction* (Dohrenwend, 1994). Its origin has been the cause of much speculation (Hadley, 1967). It does not appear to be related to pediment size, drainage area above the pediment, or lithology (Cooke, 1970).

Pediments can be large; one in Arizona covers 615 $km^2$ (Tuan, 1959). The gravels capping the pediments are generally rounded, signifying *erosion by water*. Coarse gravel in a current would erode and smooth the pediment, similar to a planation surface (Crickmay, 1975; Twidale, 1981). If pediments were formed by streams flowing from tributary

Figure 5. Pediment in the Ruby River Valley along the western slope of the Gravelly Range of Southwest Montana. Note that the sedimentary beds of the valley fill sediments dip right (east), while the pediment surface dips left (west) and shears the sedimentary layers evenly.

Figure 6. Coarse gravel veneer capping the pediment shown in Figure 4. Note that the rocks are rounded to sub-rounded, and most of them are exotic quartzite.

**Figure 7. A bajada of coalesced alluvial fans east side of Madison Valley, Southwest Montana. Low areas between fans shown by arrows.**

**Figure 8. Multiple pediments on soft rock (arrows) at the Painted Hills, John Day Fossil Beds National Monument, north-central Oregon.**

valleys—a common uniformitarian hypothesis—we would expect a mixture of water-deposited and debris-flow sediments, with angular and sub-angular rocks atop the pediment. This is rarely the case.

Pediments are *not* forming today but instead are being dissected and destroyed by present-day erosion (Twidale, 1978). A few researchers believe they form today but have not observed it. Oberlander (1989, p. 70) stated:

> Until recently, these planar surfaces were assumed to be actively expanding in deserts. The processes creating such surfaces have long remained a matter of speculation and controversy.

Running water in deserts does not form pediments; it either incises them or deposits debris on their surfaces (Garner, 1974). Crickmay (1974, p. 127) commented:

> There is no reason to suppose that any kind of wasting ever planes an area to flatness: decrepitation always roughens; *rain-wash, even on ground already flat and smooth, tends to furrow it* [emphasis mine].

Sometimes there is no coarse gravel veneer or the pediment is carved on soft or unconsolidated rocks (Figure 8). These pediments must be young, since erosion at present rates (Reed and Oard, 2017) would quickly destroy them.

## Southwest Montana Pediments and Planation Surfaces

Pediments are pervasive in the valleys of southwest Montana. They exhibit many interesting features that point toward their formation in powerful, waning Floodwater channels. This is what makes them so difficult for uniformitarians; pediment formation is inherently a rapid, transient, dynamic

**Figure 9. Pediment erosional remnant in foreground (arrow), Shields River Valley east of Wilsall, Montana.**

process. They would have formed as the *last* fast, erosive currents weakened, as indicated by gravel bedload falling out (Oard, 2004). Decreasing size of the currents would have led to lateral shifts across valleys, forming pediments on one side, while eroding the other. If the currents shifted back, newly formed pediments could have been eroded too (Figure 9). Sometimes remnants appear along valley sides, but in other cases they are separated from the sides due to small, fast currents hugging the mountain. As the flow dropped, pediments might form at lower levels, resulting in multilevel pediments and remnants in one valley (Figure 10). Once formed, pediments were later dissected by smaller currents exiting tributary valleys or by post-Flood erosion. Water and wind gaps (Part III) typically formed concurrently with pediments.

Pediment gravel caps in the Rocky Mountain region, like Grand Mesa, Colorado (Figure 11), combine local and exotic rocks. That pediment is covered with quartzite gravels transported from more than 100 km to the east. A pediment west of the Sandia Mountains of New Mexico, just east of Albuquerque (Figure 12) is capped by quartzite cobbles and boulders transported tens of km from the north. The valley pediments of southwest Montana are commonly capped by quartzite cobbles and boulders from central Idaho. These exotics are a *key* to the origin of pediments.

Although there are many pediments, only one planation surface exists in the valleys of southwest Montana. This single surface is in the southwestern Gallatin Valley, north of the Madison Valley (Figure 13). Like pediments, it is capped by well-rounded, coarse quartz-

**Figure 10. Remnants of two pediment levels (arrows), Shields River Valley east of Wilsall, Montana. The Crazy Mountains are in the background.**

ite gravel (Figure 14), and was dissected by a waning channel about 2 km wide that excavated 250 m of fill. The Madison River now flows through that valley. The planation surface and its gravel cap extend east from the Madison River.

Figure 11. Dissected pediment along Grand Mesa, Colorado (arrow). Pediment has quartzite coarse gravel transported from up the Colorado River Valley.

## Failed Uniformitarian Hypotheses for the Origin of Pediments

None of the three dominant uniformitarian explanations of pediments—lateral planation, sheetflooding, and weathering—can match the power of the Flood explanation (Oard, 2013). A newer idea—Crickmay's "superflood" hypothesis—comes closer because it is more empirical and looks to high-energy events. However, it is ultimately uniformitarian, and thus veers away from its own implications. As an aside, Whitmore (2013) suggested pediments could have formed in post-Flood catastrophes by mass wasting off nearby mountains. But pediment features do not conform to this explanation. There is rarely any mass wasting debris associated with pediments—it is found at basal depositional terraces. Nor can mass wasting explain the ubiquitous, rounded, exotic gravel or the extensive flat surfaces.

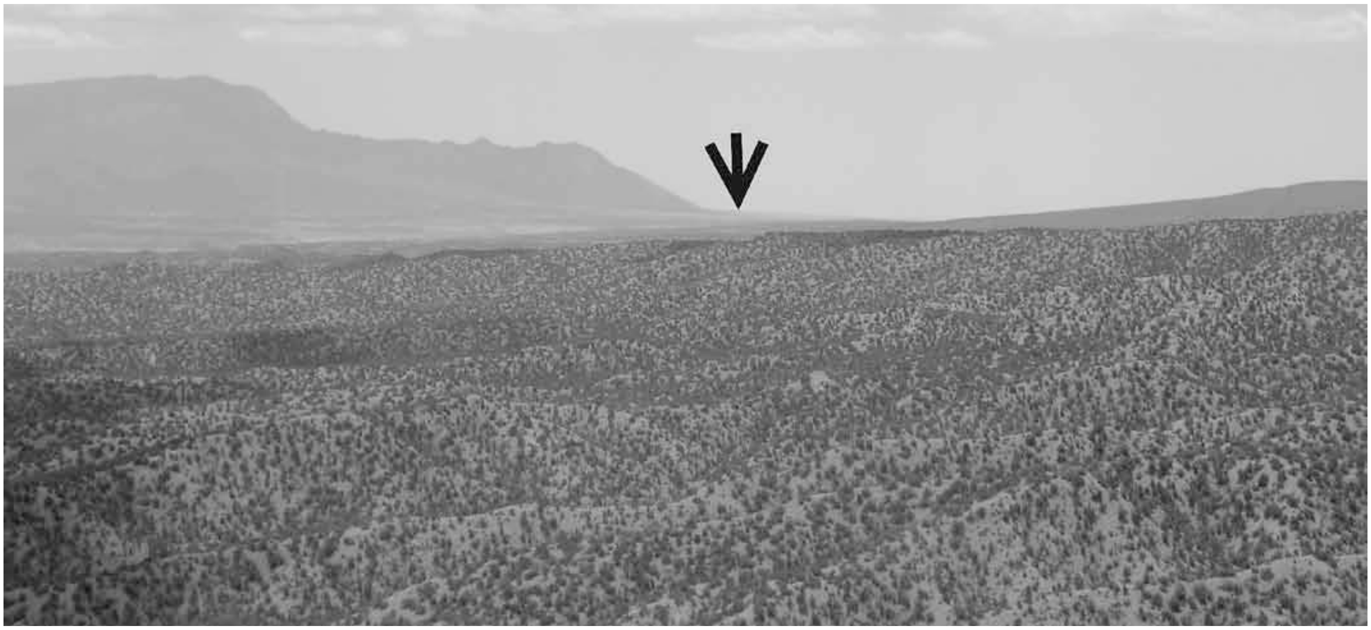

Figure 12. The Sandia Mountains (left background) with a pediment to the west (arrow) near Albuquerque, NM (view south). Pediment has quartzite coarse gravel transported from about 100 km to the north.

**Figure 13. Planation surface remnant (arrow) in the southwest Gallatin Valley, Montana. The northern Madison Range is in the background.**

### Lateral Planation Does Not Work

A popular early hypothesis suggested meandering streams from mountain tributaries eroded pediments as they swept laterally across valleys between tributaries. The repeated back and forth meandering supposedly eroded a flat surface. But observation shows that most tributary streams *dissect*, not plane, when they erode, or they deposit debris on existing pediments. This theory cannot explain the gravel veneer of pediments. Further it leads us to expect pediments to extend out from a tributary valley. However, they commonly lie *between* tributary valleys (Figure 15) or near the top of a mountain ridge (Figure 16), such as those located south-southeast of Deer Lodge, Montana (Figure 17).

**Figure 14. The quartzite gravel cap on planation surface in Figure 13.**

### Sheetflooding Cannot Plane

Another theory proposed that sheetflooding from heavy thunderstorms spread at right angles from the mountain front. Over time, multiple floods would erode and smooth the surface. This hypothesis was popular many years ago but has few advocates today (e.g., Vincent and Sadah, 1995). Shallow sheetflooding over a limited area has been observed during thunderstorms in dry environments (McGee, 1897), but such sheetfloods are rare; linear streams are more common (Ritter, 1978). Sheetfloods quickly

**Figure 15. A dissected pediment that is eroded out from the tributary valley with remnants still out from the ridges (arrows) between tributary valleys, upper Clark Fork River near Deer Lodge, Montana.**

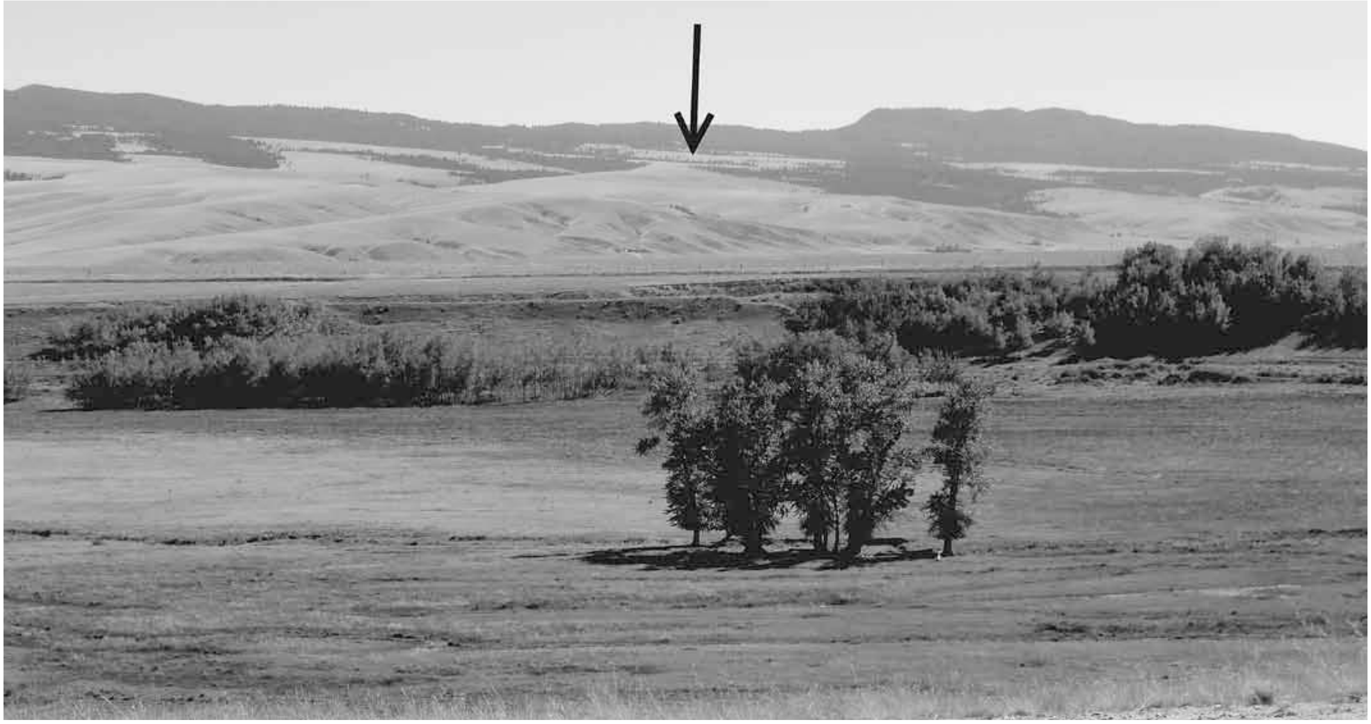

**Figure 16. Upper level pediment that starts near the tops of the mountains, upper Clark Fork River Valley near Deer Lodge, Montana (arrow).**

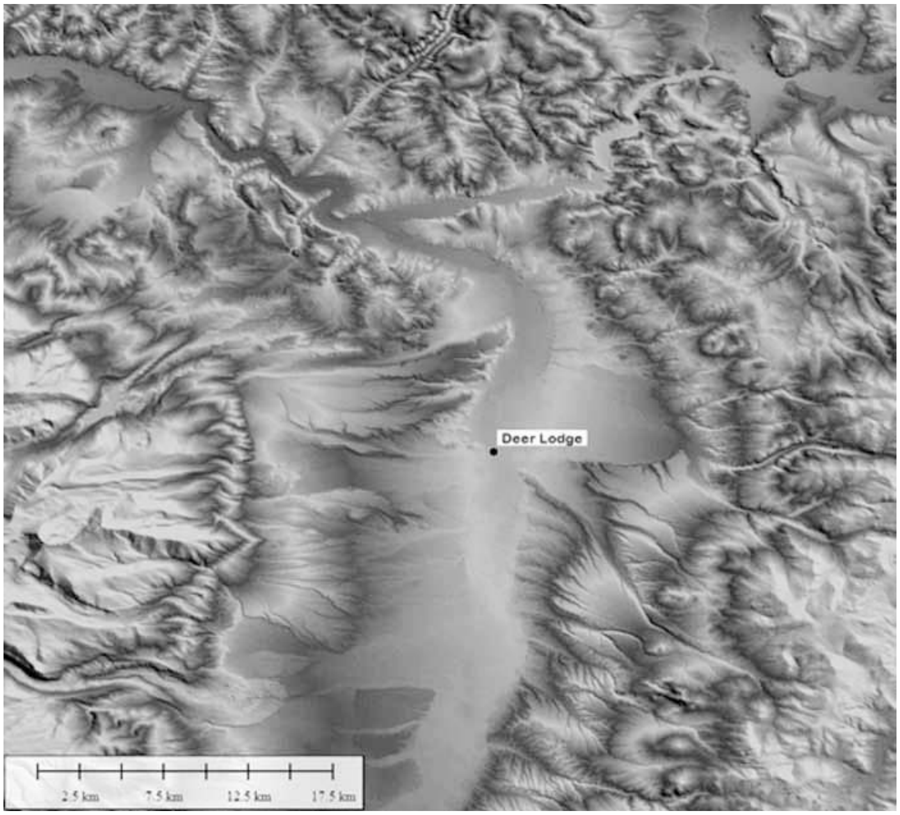

**Figure 17. The Deer Lodge Valley, Montana, showing dissected pediments on either side (view north). For the location of Deer Lodge, see Figure 1 (imagery courtesy of ESRI).**

transform into a channelized drainage network which would dissect, not plane, a surface (Bloom, 1978). The fatal flaw is the necessity of assuming a *preexisting* flat surface. Without it, there would be no surface to support sheetflooding. Many investigators have noted this. Oberlander (1989, p. 72) stated:

> Early proposals that erosive sheetfloods could form pediments are defeated by the fact that sheetfloods require planar surfaces and are a consequence rather than a cause of planation.

## Weathering Cannot Form Pediments

Finally, many geologists think weathering can form pediments, just as they mistakenly think it can for planation and erosion surfaces (Figure 18). Most geomorphologists lean toward this hypothesis. In it, pediments and planation surfaces form in two stages: (1) a landscape is chemically weathered over time, creating a subsurface *weathering front*; and (2) the weathered debris is removed by sheet wash, stream erosion, or other

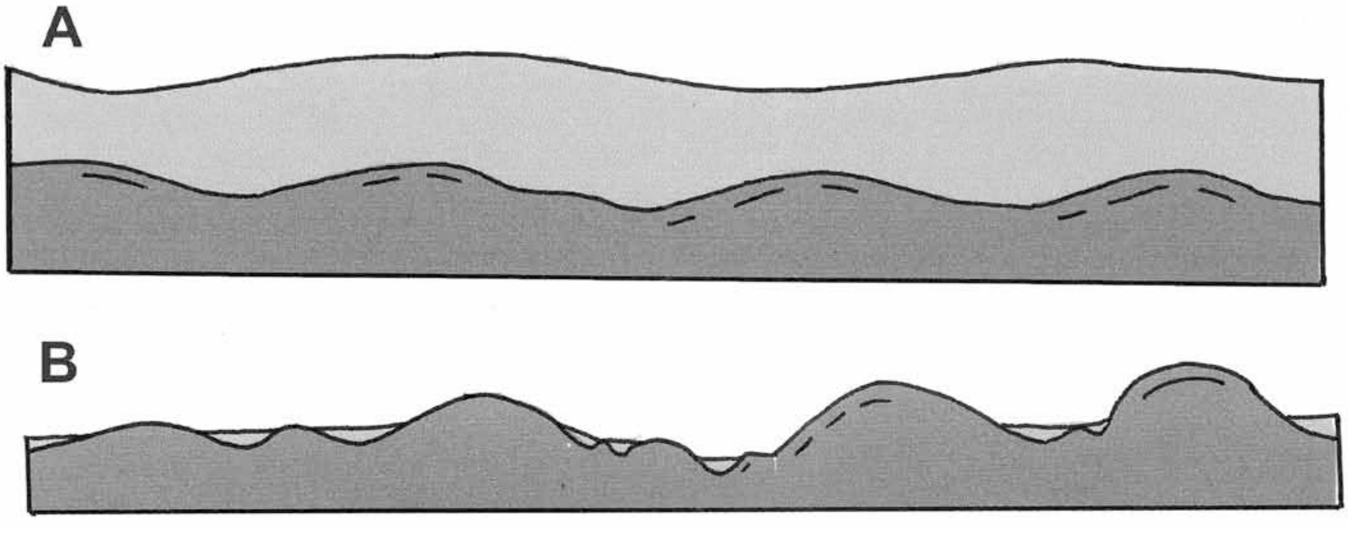

**Figure 18. Schematic of the weathering hypothesis in forming an erosion surface (etchsurface). From Thomas (1994, p. 291), redrawn by Mrs. Melanie Richard. A = deep weathering, with a subsurface boundary between weathered and unweathered bedrock being the level below the surface. It is called the "weathering front." B = the weathered material is almost totally eroded to form the "etchsurface."**

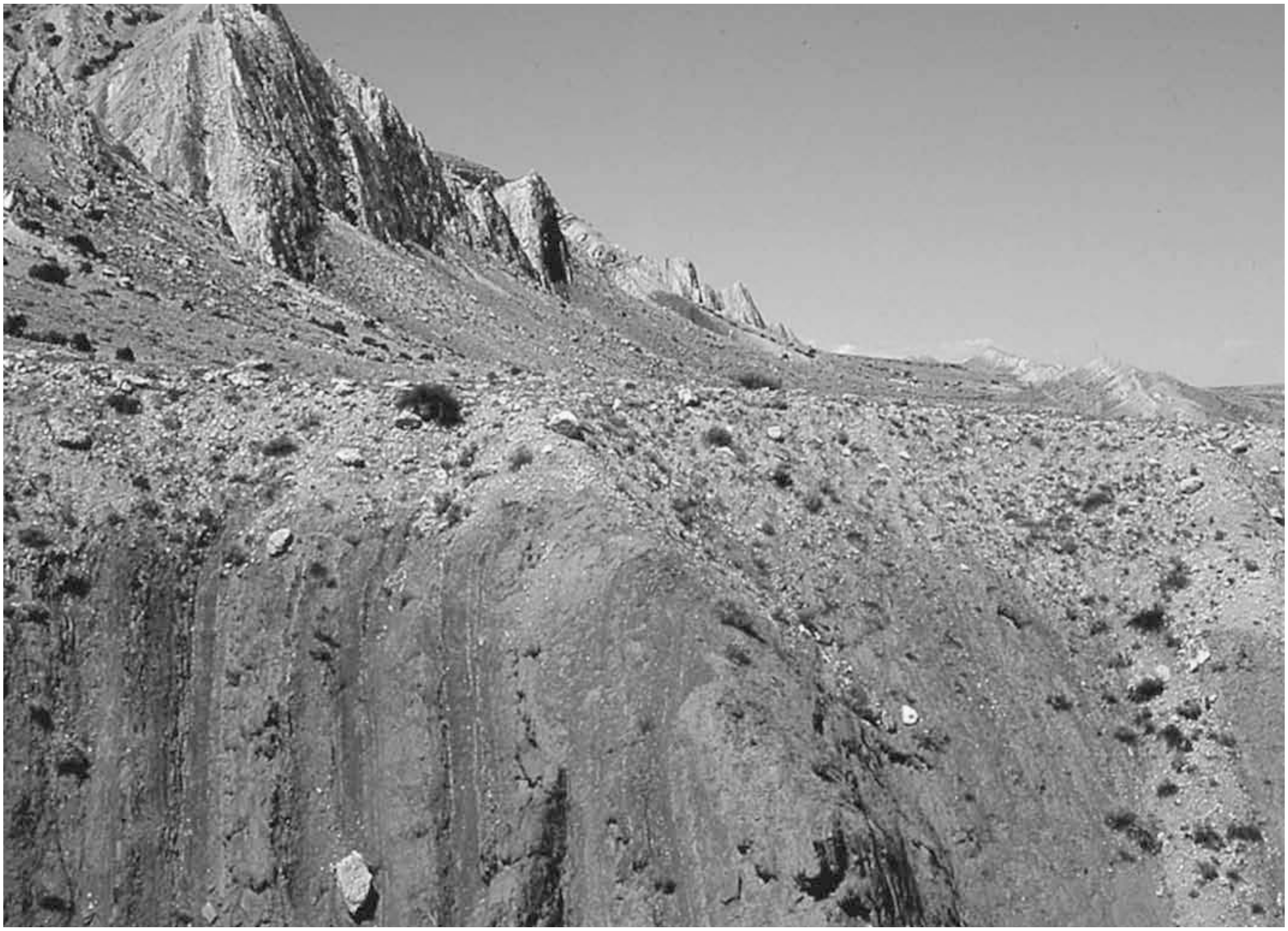

**Figure 19. Coarse gravel veneer capping a pediment on vertical strata on the east limb of an anticline at the Sheep Mountain water gap, Bighorn Basin, north of Greybull, Wyoming (for location, see Fig. 1). A minor proportion of the rocks on this dissected pediment are exotic quartzites cobbles and boulders, some with percussion marks, from at least 500 km away to the west in central Idaho.**

mechanisms, exposing the weathering front as a bedrock surface. Both stages can take place simultaneously.

But weathering does not form flat surfaces over large areas, and this theory cannot explain the gravel veneers. Weathering processes are acting on pediments today, but do these weathering processes wear down relief to form a pediment? Dohrenwend (1994, p. 343) admitted:

> Although subsurface weathering processes have strongly influenced pediment development in many areas and profoundly modified pediment surfaces in many others, it would appear unlikely that these processes actually 'control' pediment development, at least in arid and semi-arid environments.

## Crickmay's Superflood Hypothesis

A maverick theory that brushes against the truth is Crickmay's "superflood" hypothesis. Though grounded in observation, it is believed by few, if any, geomorphologists today (Twidale, 1993), possibly because of its catastrophic implications.

Crickmay was a geomorphologist not afraid to follow the data or challenge mainstream ideas. Most of his ideas are summarized in his book, *The Work of the River* (Crickmay, 1974). He concluded that water formed most of earth's geomorphology, including pediments. He wrote that rounded rocks found on planation surfaces and pediments were evidence of water action, since rocks are nearly always rounded by water.

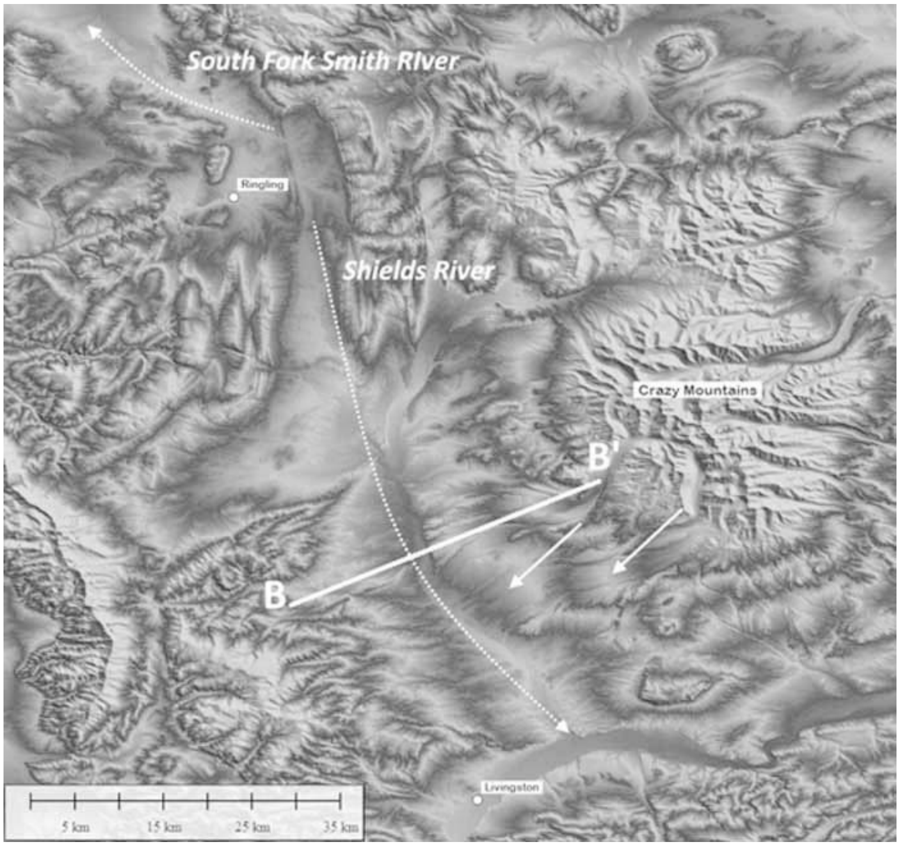

**Figure 20. Shields River Valley, Montana. Dotted lines indicate rivers, solid line indicates profile B-B', arrows point to different levels of pediments (see Figure 27 for two levels) (imagery courtesy of ESRI).**

Crickmay also noted the presence of *exotic* rocks in pediment-topping gravels (Figures 6 and 19) and concluded that pediments formed by currents flowing *parallel* to the mountain front, *down valley*, not *out* of the mountains from tributary valleys and across the foothills. This contradicted all existing hypotheses, making him unpopular with many peers, but his arguments were hard to dispute.

Other geomorphologists undoubtedly knew of exotic rocks on pediments, since they are easily observed, but amazingly only Crickmay and Twidale (as far as I know) published this fact. These exotics contradict all three major hypotheses. Many geologists avoid catastrophism, and only invoke it when obvious, and minimize it and separate it from any other catastrophe with the smothering blanket of deep time. This observational bias is why creation geologists must do their own fieldwork.

Other problems exist. *Many* superfloods would be needed to form the vast number of pediments and could still not explain pediments at high elevations, some hundreds of meters above the valley. Crickmay suggested a "900-year event" superflood. Given observational scope, we should see one in some locales every year. Even a 900-year event would be unlikely to form pediments or transport gravel over long distances, much less significantly erode the valley fill. Furthermore, such a flood could not form pediments and pediment remnants hundreds of meters above the valley bottom. Nor would they be powerful enough to erode pediments into the hard

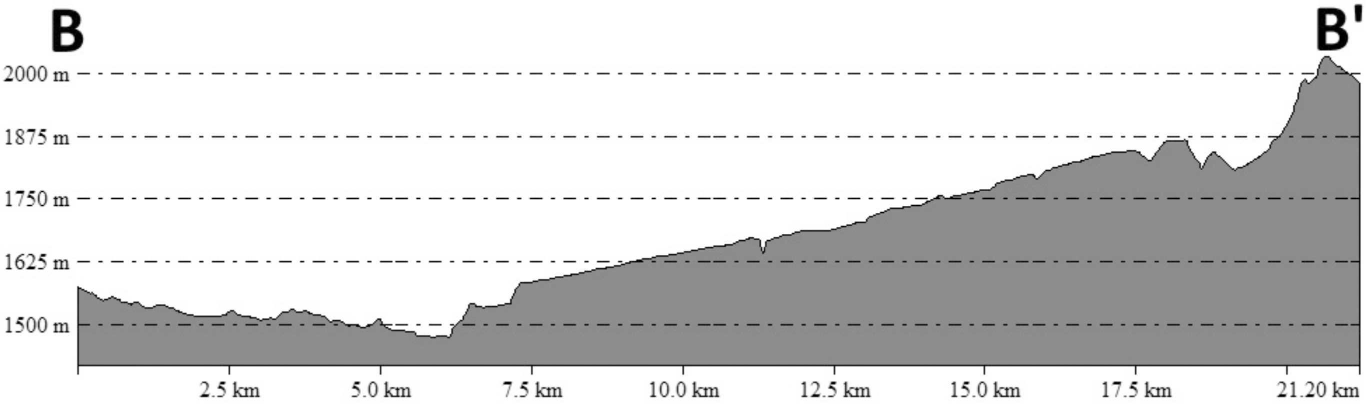

**Figure 21. Profile of line B-B' in Figure 20 showing pediment on east side of river valley.**

rock underlying many. Finally, multiple superfloods would likely erode and deposit sediment as *cut and fill structures, terraces, and floodplains on the side of a mountain and not form pediments*.

Crickmay was close to the truth, but his uniformitarian bias prevented him from visualizing the entire valley filled with fast-moving water. But he made the crucial conceptual leap of currents running parallel to the mountain front. This idea does explain the transport of exotics over some distance.

Pediments are not forming today and their unique characteristics cannot

**Figure 22. Low pediments at the north end of the Shields River drainage valley (view southeast). Crazy Mountains in the distance.**

**Figure 23. View southeast of pediment east of Wilsall, Montana**

Figure 24. View south on coarse gravel pediment just east of Wilsall. Absaroka Mountains in the background.

Figure 25. Top of a gravel pit on edge of the pediment shown in figure 19.

Figure 26. Largest rock in gravel pit is about 30 cm long.

Figure 27. View east of two large pediments, south side of the Crazy Mountains (left) and the Yellowstone River Valley, Montana (right off the picture). One large pediment in the foreground (arrow) and a second, little higher one in the background (arrow in distance).

**Figure 28. Upper Clark Fork Valley, Montana. Notice strongly defined, dissected pediments on the east side of the valley below Deer Lodge, giving way to strongly defined pediments on the west side of the valley near Deer Lodge (imagery courtesy of ESRI).**

be explained by uniformitarian geology (Dohrenwend, 1994; Oberlander, 1989). Dohrenwend (1994, p. 321) exclaims:

> Pediments have long been the subject of geomorphological scrutiny. Unfortunately, the net result of this long history of study is not altogether clear or cogent and has not produced a clear understanding of the processes responsible for pediment development.

Note all the weasel words. Simply translated, uniformitarian geologists are clueless as to the origin of pediments, to the point they call it the "pediment problem" (Oberlander, 1974). Once again, uniformitarianism hinders, not helps.

## Pediment Patterns in Southwest Montana

Pediments in southwest Montana attest to rapid down-valley flow during the recessive stage of the Flood. Currents eroded valley fill and the sides of the mountains (Fields et al., 1985). In the Shields and Upper Clark Fork Valleys, pediments exist high up along the valley sides, suggesting the erosion of hundreds of meters of valley fill. Alt (1984, p. 7) stated:

> However, we can be sure that the valley-fill sediments were formerly much deeper because they lie beneath the dry benches [pediments] that rise as much as 800 feet [244 m] above the river level along the flanks of the mountains.

These pediments show down-valley flow patterns that support formation by fast, waning currents that filled the whole valley first, then shrank and slowed, and began shifting laterally across the valley.

### The Shields River Valley, Montana

The Shields River Valley runs about 60 km from just south of Ringling to Livingston (Figure 20). Figure 21 is a cross section, showing the large pediment on the east side. The divide between the Shields River and the South Fork of the Smith River is a hilly, wide valley. As the valley descends south, the terrain flattens and pediments appear after about 5 km (Figure 22), mainly on the east side—the west flank of the Crazy Mountains. Two pediments are observed in this location (Figures 9 and 10), which merge down valley. The altitude of the pediments above the river rises slightly toward Livingston (Figure 23). Pediments are rare on the west side, probably because of east-west ridges (Figure 20) that would have slowed flow and created turbulence. The fastest flow would have been on the east side, where pediments are ubiquitous. Figure 24 shows a gravel-capped pediment just east of Wilsall, and Figure 25 shows a gravel pit on its edge. Both the eroded surface and the gravel cap are volcanic; gravel ranges from rounded to sub-angular. The largest rock observed was about 30 cm long (Figure 26).

Since pediments likely formed in waning, yet still-powerful flow conditions, the absence of pediments near the saddle at Ringling suggests lower

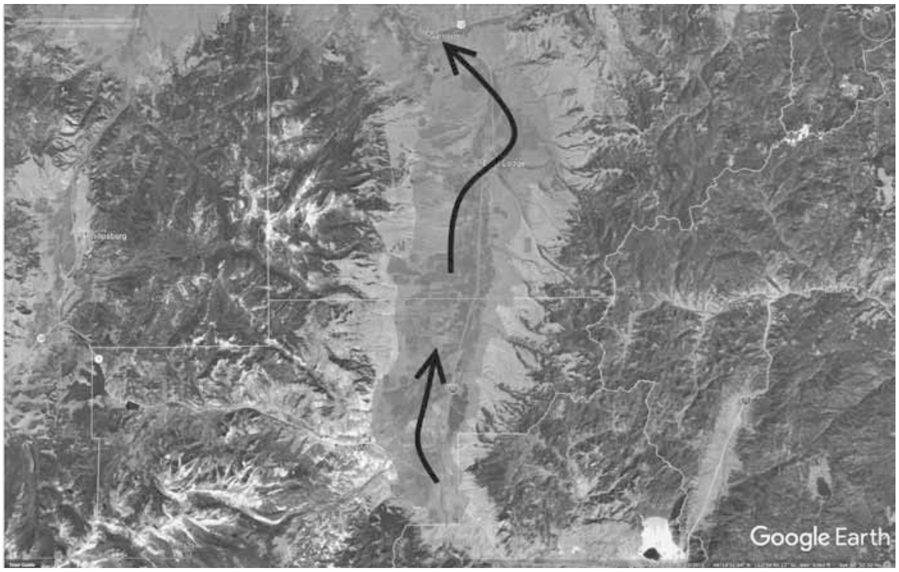

**Figure 29. Channelized Flood flow down (toward the north) of the upper Clark Fork Valley, Montana (courtesy of Google Earth). Flow turns northwest between Dear Lodge and Gold Creek and flows down the Lewis and Clark fault zone toward Missoula, Montana.**

flow there. As the Flood current flowed south down the Shields River Valley, it picked up speed. Since there were no obstacles to slow the flow on the east side, pediments first formed at high altitudes. Most of those were then eroded as water levels dropped and the valley floor was eroded. As a result, an extensive pediment formed at lower elevations. As that current was joined by another moving north out of the Paradise Valley, south of Livingston, the channelized Flood current shifted toward the east from Livingston toward Billings. In the broad Yellowstone River Valley, this current cut two large, gravel-capped pediments on the south side of the Crazy Mountains (Figure 27). Pediments and planation surfaces were carved throughout the broad Yellowstone River Valley into southeast Montana. Some have exotic quartzite cobbles and boulders on top. None of the uniformitarian theories explain the pediments associated with the Shields River Valley, but the receding Flood does so quite well.

## The Upper Clark Fork Valley near Deer Lodge, Montana

The Upper Clark Fork Valley begins near Butte, Montana, runs west about 20 km toward Anaconda, shifts north for about 50 km, and then turns northwest toward Gold Creek and Missoula (Figure 28 and 29). Just like the upper Shields River Valley, there are no pediments in the southern valley, where flow would have been slow; instead, it is a flat valley with a low nascent pediment on the southeast side (Figure 30 arrow). The pattern of pediments further north has a distinctive pattern, probably shaped as the Floodwater shallowed. The low pediment in Figure 30 increases to about 200 m above the river (Figure 16) and then disappears northeast of Deer Lodge at an escarpment (Figure 31 and 32).

There is no pediment on the southwest side of the Upper Clark Fork Valley (Figure 30, left, also lower left of valley in Figure 28), but moving north, a low

**Figure 30. Panorama of the southern part of the Upper Clark Fork Valley with a low pediment (arrow) starting on the right (view north).**

Figure 31. View northeast of Deer Lodge with the pediment on the east side of the Upper Clark Fork Valley ending at a scarp (arrow), probably because the strongest flow swung toward the northeast after passing Deer Lodge (see Figure 29).

pediment appears halfway down the valley and gradually rises to ~200 m above the river just west of Deer Lodge. This extensive pediment (Figures 28, 32, and 33) covers about 150 km$^2$. It is capped by sub-rounded to rounded coarse gravel (Figure 34). The western part of this pediment is capped by glacial debris. Then the pediment ends as the valley turns northwest (Figures 28 and 32). There are small pediments northwest of Garrison Junction, but none between there and the Pacific Ocean.

This pattern can be explained by a slower Flood current near the continental divide that accelerated north, where it carved pediments, first on the east side and then on the west. No east-west valleys impeded the current. The pattern north of Deer Lodge suggests a shallow, strong current that first swung northeast as the valley widened, and then shifted northwest (Figure 29). The wide swing of the current probably formed the scarp

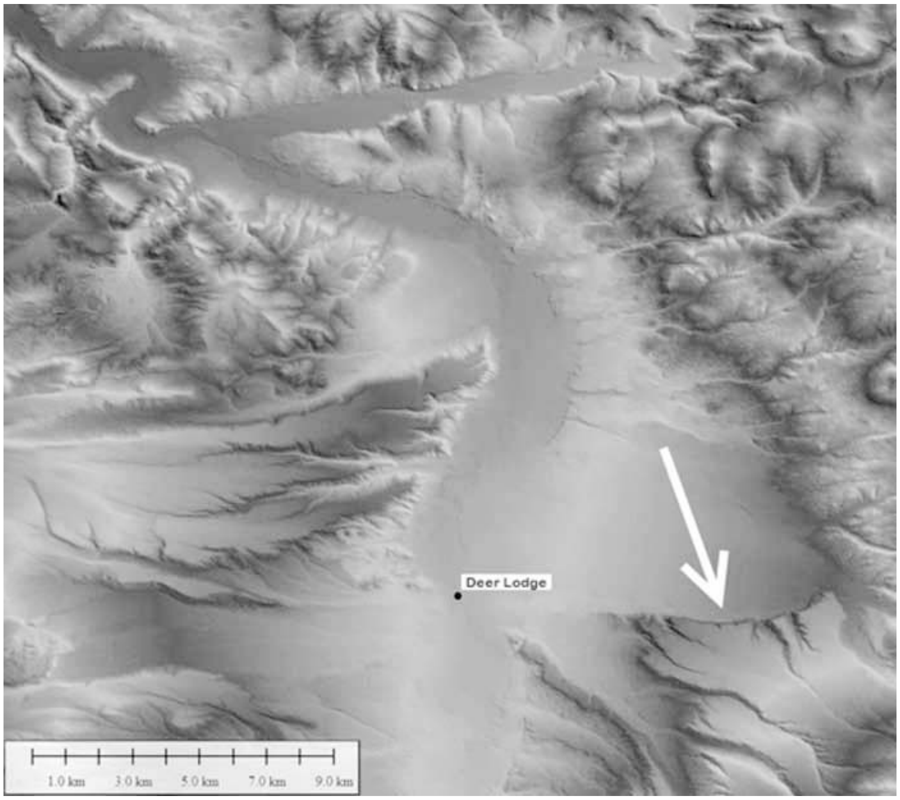

Figure 32. Location of pediment scarp in Figure 31 (imagery courtesy of ESRI).

Figure 33. The extensive pediment on the west side of the Upper Clark Fork Valley west of Deer Lodge (view southwest from about 5 km west of Deer Lodge).

Figure 34. On top of the extensive pediment on the west side of the Upper Clark Fork Valley west of Deer Lodge (view west from about 5 km west of Deer Lodge).

at the end of the east-side pediment (Figures 31 and 32) and then eroded the northern end of the west-side pediment.

The absence of pediments northwest of Garrison Junction suggests active faulting in the Lewis and Clark fault zone. Although the valley narrows, the expected rapid currents were likely disrupted by faulting, forming eddies and turbulent flow with slower currents. Some of the strata is tilted vertical. Such slow flows would be erosive but not ideal for pediments, which require steadier, rapid flow down a long fetch without obstacles.

### The Beaverhead and Jefferson River Valleys, Montana

The Beaverhead River flows north near Dillon, Montana, into the Ruby River at Twin Bridges, where they become the Jefferson River (Figure 36). The river valley is about 100 km long; it reaches about 30 km wide near Dillon before narrowing to 10 km near Twin Bridges, but widens again near Whitehall, where three currents converged. It then passes through the Jefferson Canyon water gap (see Part III), home of the Lewis and Clark Caverns.

There are no significant pediments south of Dillon, but they are common down valley (Figure 36). The flow clearly accelerated down valley. North of Twin Bridges, where the Ruby River Valley converges with Beaverhead Valley, the flow swung west, creating a large pediment (~160 km$^2$) west of the Tobacco Root Mountains (Figures 2 to 4). It ends at the northeast end of the Jefferson River Valley, but another appears on the opposite side, showing the transition of the main current from one side of the valley to the other.

Figure 35. View northeast of the edge of the pediment showing the coarse gravel cap.

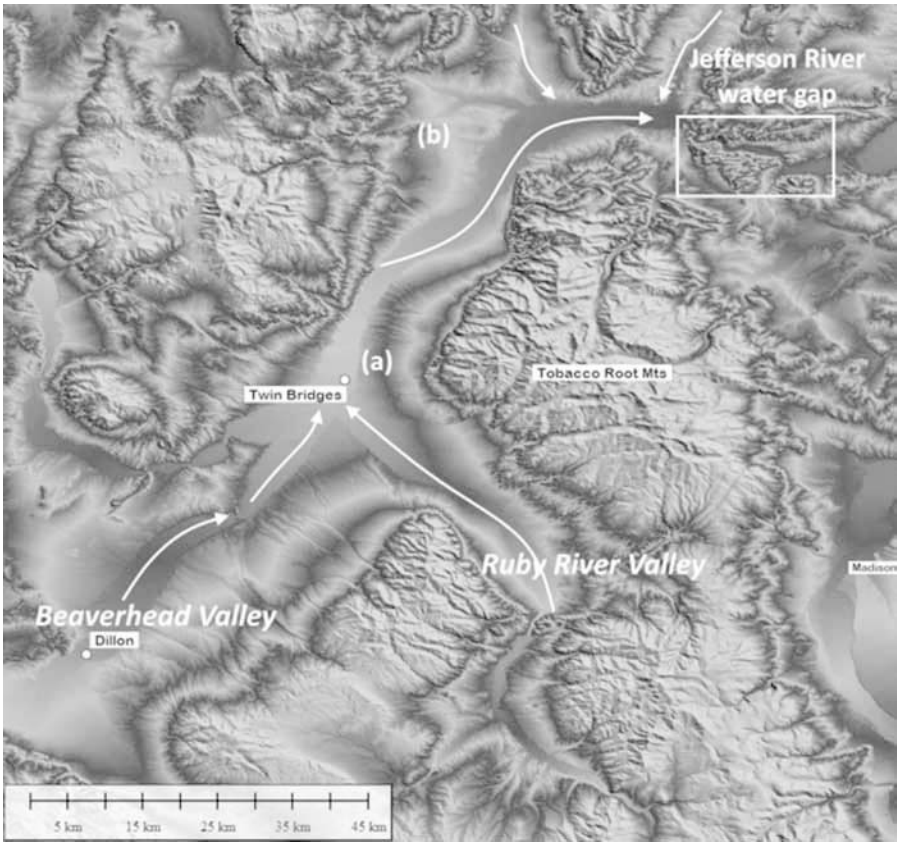

Figure 36. Flood flow down the Beaverhead and Jefferson River Valley, Montana. (a) shows pediment created to the west of the Tobacco Root Mountains (Figures 2 to 4), when flow down Ruby River Valley converged with Beaverhead Valley and then swung to the west. (b) shows pediment appearing on northwest side of valley as pediment on east side disappears. Note three converging currents at the western end of the Jefferson River water gap (see Part III) (imagery courtesy of ESRI)

## Conclusions

Pediments are landforms that are best explained as products of the ephemeral final Floodwater currents flowing down newly forming valleys. These currents were powerful enough to erode pediments, sometimes into the hard rock of the mountains, as well as erode valley fill. As the velocity slowed, the very coarse bedload that had cut into both hard rock and valley fill was deposited atop the newly-created pediments as the gravel caps. Rapid current fluctuations explain the erosion of multiple levels of pediments and the swing from one side of a valley to another. No uniformitarian theory has yet been able to match this elegant explanation, and it appears that uniformitarian blinders will not allow a breakthrough in this area until that false assumption is laid to rest.

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*Creation Research Society Quarterly* 2018 54:44–48.

# Do Isaiah 40:22 and Psalm 29:10 Speak to Cosmological Realities?

# Considering the "Waters Above" and Earth's Cosmic Choreography

**Jake Hebert and James J. S. Johnson***

## Abstract

In a recent *CRSQ* article, Hebert (2017) analyzed some biblical passages that have cosmological relevance yet appear to be overlooked by many commentators. Hebert suggested that the Bible may teach that heaven, the abode of God, is located *directly* on the other side (i.e., outside) of the waters God placed above the expanse (Hebrew *raqîa*ʻ). In other words, the "waters above" (Genesis 1:6–8) are acting as a boundary or interface between our universe and heaven itself. He also suggested that God's throne is located above these waters but in a northerly direction, most likely the direction of the north ecliptic pole.

Here we examine two additional passages of Scripture that may provide additional support for these ideas, Isaiah 40:22 and Psalm 29:10. Although these passages may be familiar to many biblical creationists, we suggest more detailed understandings of these passages, with analysis that should be informative to students of cosmology, as well as exciting to students of Scripture. In particular, a philological study of Isaiah 40:22's Hebrew noun *chûg* (translated "circle" in KJV) indicates that Earth moves in a choreographed circuit, as opposed to Isaiah 40:22 being a proof-text for Earth's roundness.

## Introduction

A previous *CRSQ* paper (Hebert 2017) suggested that "waters above" the expanse (Hebrew *raqîa*ʻ) may actually serve as an interface or boundary between our universe and heaven, the abode of God. That paper also suggested that God's throne is located on the other side of (i.e., outside) those waters but in a generally northerly direction, most likely the direction of the north ecliptic pole. In this short article, we provide additional scriptural support for these ideas from Psalm 29:10 and Isaiah 40:22.

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## The "Flood" in Psalm 29:10: The Noachian Flood or a Celestial Ocean?

Because the Hebrew word used in Psalm 29:10 is *mabbûl*, and because every other occurrence of *mabbûl* in the Old Testament refers to the Genesis Flood, it is generally assumed that this is also the case in this psalm. As one respected commentator noted:

> There are ten Hebrew words translated "flood" in the Old Testament, but the word here is *mabbul*, a word used uniquely to refer to the worldwide cataclysm in the days of Noah. In fact, this is the only place in the Bible where this word is used except in the story of the great Flood in Genesis 6–9, where it is always used. Therefore, it is certain that the writer of Psalm 29 was speaking of that great cataclysmic storm, and no other. (Morris, 1991, pp. 40–41)

Although this superficially seems to be a strong argument for this understanding of the passage, it is not airtight. There are certain words in Scripture that *almost* always have one particular application but with an exception that *does* depart from the almost-universal pattern.

For instance, in Genesis 1 the verb *mashal* ("rule" in Genesis 1:18) is used to describe ongoing imposition of physical forces (such as gravity and solar radiation) by which the sun and moon regulate many of the affairs on planet Earth, including photosynthesis in carbohydrate-producing plants, reproductive cycles of crabs and salmon, and all the ocean tides that are necessary for many life-forms to survive (Johnson 2011, 2015a, 2015b). Yet elsewhere in Scripture it is routinely used, scores of times, to describe the regulatory actions of human rulers—or of God's actions as the Ruler.

Likewise, a comprehensive review of how the Hebrew verb *bara'* ("create") is used in the Old Testament shows that it almost always refers to God's activities during Creation Week (especially on Day 1, Day 5, and Day 6; see Genesis 1:1, 21, 28), yet occasionally it refers to creative actions thereafter (e.g., see Psalm 102:18; 104:30).

So, it is not an airtight (or watertight!) argument that *mabbûl* here refers to the Genesis Flood. But if it is not referring to the Flood, to what is it referring? We suggest here that the "flood" of Psalm 29:10 is actually referring to the "waters above," which God separated from the "waters below" on Day 2 of Creation Week (Genesis 1:6–8). If these waters are indeed beyond the farthest galaxies, as suggested by Humphreys (1994a, 1994b), then the amount of water contained in such a reservoir would be truly immense, even if the thickness of the watery shell were very thin. In that case, these waters could certainly be described as a great flood, or *mabbûl*!

Likewise, this psalm testifies that "the voice of the LORD is upon the waters: the God of glory thundereth: the LORD is upon many waters" (verse 3). Of course, this is consistent with the thesis that God's throne is above this celestial ocean of water.

It is also worth noting that this psalm explicitly mentions the voice of God seven times, and states that God "thundereth." One is reminded of Revelation 10:3–4:

> And [the mighty angel from heaven] cried with a loud voice, as when a lion roareth: and when he had cried, seven thunders uttered their voices. And when the seven thunders had uttered their voices, I was about to write: and I heard a voice from heaven saying unto me, Seal up those things which the seven thunders uttered, and write them not.

Is there a connection between the "seven thunders" of Revelation 10:3–4 and the seven explicit references to the Lord's voice in Psalm 29? Such a connection has already been noted by Morris (1983, p. 178). Some might argue that "seven thunders" is a reference to seven different angelic beings, not to the Lord Himself. Note, however, that the book of Revelation repeatedly mentions the "seven Spirits of God" (Revelation 1:4; 3:1; 4:5), which seem to be a description of the Holy Spirit, *not* seven different angelic spirits. Note especially that the seven Spirits are associated with Christ Himself (Revelation 5:6):

> And I beheld, and, lo, in the midst of the throne and of the four beasts, and in the midst of the elders, stood a Lamb as it had been slain, having seven horns and seven eyes, which are the seven Spirits of God sent forth into all the earth.

This same idea is found in Zechariah 4:2–10, in which seven lamps are said to represent "the eyes of the LORD, which run to and fro through the whole earth" (verse 10). Of course, one is immediately reminded of the seven "candlesticks" [literally, "lampstands"] surrounding the glorified Christ in Revelation 1:12–20. It also recalls the statement that "the eyes of the LORD run to and fro throughout the whole earth, to shew himself strong in the behalf of them whose heart is perfect toward him" (2 Chronicles 16:9). Hence, we think it is still quite likely that the "seven thunders" in Revelation 10:3–4 could be referring to the Lord's voice, as in Psalm 29:3.

This understanding of *mabbûl* in Psalm 29:10 also makes sense of the psalmist's exhortation for the "mighty" (verse 1) to give glory and strength to the LORD. The actual phrase in Psalm 29:1 is *benê-'elîm* ("sons of mightinesses" or "sons of powers"). If this Psalm provides us a description of God enthroned above an ocean of celestial waters, this reference to the heavenly beings in God's court seems very appropriate. The scene described in Psalm 29 is quite unusual, so we do not dogmatically suggest that Psalm 29:1 refers to angelic beings in God's heavenly court. We merely suggest what Psalm 29:1 portrays is not inconsistent with that scenario.

Moreover, further supporting the heavenly scenario (understanding of

Psalm 29), it is worth noticing that David mentions God's "temple" in verse 9, even though Solomon's earthly temple was not yet in existence. The underlying Hebrew noun in Psalm 29:9 is *hêkâl*, the usual Hebrew word meaning "palace" (and "temple" when used of deity), as opposed to the Hebrew nouns routinely translated "tabernacle" (*'ohel* and *mishkan*). Hence, this seems to refer to God's *heavenly* palace, i.e., His heavenly temple (see also the multiple references to the heavenly temple in Revelation: 3:12; 7:15; 11:19; 14:15, 17; 15:5–6, 8; 16:1, 17).

## "Circle" in Isaiah 40:22: A Spherical Earth or the Earth's Orbit?

Creation scientists (although themselves not Hebrew scholars) have long cited Isaiah 40:22 as an argument against the claim that the Bible teaches a flat earth, claiming that "circle" [translating *chûg*, also spelled in transliteration as *ḥûg*] in this verse refers to the approximately spherical nature of the earth (Morris, 2006; Lisle 2006; Thomas 2017):

> It is he [the LORD] that sitteth upon the circle of the earth, and the inhabitants thereof are as grasshoppers; that stretcheth out the heavens as a curtain, and spreadeth them out as a tent to dwell in.

In fact, prior to the study that this paper is based upon, both of the present writers assumed that Isaiah 40:22 referred to the roundness of Planet Earth. But based upon a thorough philological study of the Hebrew noun *chûg*, including review of its related root verb, that assumption has been discarded. This is because that assumption does not survive a concordance-based review of how *chûg* (and its etymological kinsmen) is used in Scripture. In other words, the popular assumption that Isaiah 40:22 refers to Earth's round shape, clashes with how God has chosen to use the noun *chûg* in Old Testament passages.

Accordingly, the foundational question is whether the Hebrew noun *chûg* used in Isaiah 40:22 (and translated as "circle" by the King James Bible translators) means "round" like Earth's spherical shape. By using the word "circle," it appears that the King James Bible translators did ***not*** think so, because they selected "circle" rather than "ball," in contrast to how they translated the Hebrew noun *dûr* to refer to a round object in Isaiah 22:18 ("He will surely violently turn and toss thee like a ***ball*** into a large country"). It is worth noticing that Johannes Kepler published his Copernican heliocentrism defense, *Mysterium Cosmographicum* in 1596, and later his *Astronomia Nova* in 1609, both before the King James Version was first published. Thus, Kepler's defense of Copernican heliocentrism could have been known to someone on the King James Version translation team, since the English term "circle" roughly matches that of an elliptical orbit (befitting Kepler's first law of planetary motion). Interestingly, Earth's elliptical orbit is very close to that of a circle, with an eccentricity of 0.0167 (a circle would have an eccentricity of zero).

Moreover, if God had wanted to describe Earth as a globe (i.e., a ball-shaped object) in Isaiah 40:22, why did He not use the Hebrew noun *dûr* there? Obviously that Hebrew noun was part of Isaiah's vocabulary, because Isaiah had just used that noun (*dûr*) about 20 chapters earlier in his book.

But, more importantly, the most focal question is what *chûg* means, since that is the noun (translated "circle") in Isaiah 40:22. To determine the core meaning of the Hebrew noun *chûg*, we should compare Scripture with Scripture (Johnson 2010), especially by reviewing how that same Hebrew word is elsewhere used within Scripture.

First, consider how the noun *chûg* is used in the Old Testament. There are only two other times when this Hebrew verb is used: Job 22:14 and Proverbs 8:27.

Job 22:14 says: "Thick clouds are a covering to Him, that He seeth not; and He walketh in the ***circuit*** of heaven." In this verse the Hebrew noun *chûg* is translated (by the King James Bible translators) as "circuit." (Question: Is "circuit" an orbit-like pattern or a spherical ball?)

Proverbs 8:27 says: "When He prepared the heavens, I was there: when He set a ***compass*** upon the face of the depth." In this verse the Hebrew noun *chûg* is translated (by the King James Bible translators) as "compass." (Question: Is this "compass" an orbit-like pattern or a spherical ball?)

Next, consider the root verb that this Hebrew noun is derived from, which is the Hebrew verb *chûg*, spelled the same as the noun (similar to how our English words "report" and "record" can be verbs or nouns, depending upon context). As a verb *chûg* appears in Job 26:10 ("He hath ***compassed*** the waters") within a context that refers to waters contained within clouds, i.e., within a context that we describe using "water-cycle" terminology.

Furthermore, it is worthwhile to investigate other related Hebrew words, such as other words that utilize the consonantal stem *ḤGG*, yet doing so initially introduces more questions than answers, philologically speaking. In other words, by reviewing etymologically related Hebrew words (in the Hebrew Old Testament), we acquire supplemental data for identifying the core meaning of *chûg*. Consider, therefore, these related Scriptures, each of which provides a philological "clue" regarding the core meaning of the *ḤGG* consonantal stem that *chûg* derives from:

> And when he [Egyptian] had brought him [David] down, behold, they [Amalekites] were spread abroad upon all the earth, eating and drinking, and **dancing** [*ḥōgegîm* = qal active ptc. m. pl.], because of all the great spoil that they had taken out of the land of the Philistines, and out of the land of Judah. (1 Samuel 30:16)

> The fifteenth day of this seventh month shall be the **feast** of tabernacles [*ḥag hassūkkôth*].... Also in the fifteenth day of the seventh month, when ye have gathered in the fruit of the land, ye shall **celebrate** [*tâḥōggû* = qal impf. 2nd m. pl. of *ḥâgag*; translated "keep" in KJV here and below] a **feast** [*ḥag* = noun derived from *ḥâgag*] unto the Lord seven days: on the first day shall be a sabbath, and on the eighth day shall be a sabbath.... And ye shall **celebrate** [another verb derived from *ḥâgag*] it a **feast** [*ḥag*] unto the Lord seven days in the year. It shall be a statute for ever in your generations: ye shall **celebrate** [another verb derived from *ḥâgag*] it in the seventh month. (Leviticus 23:34, 39, 41)

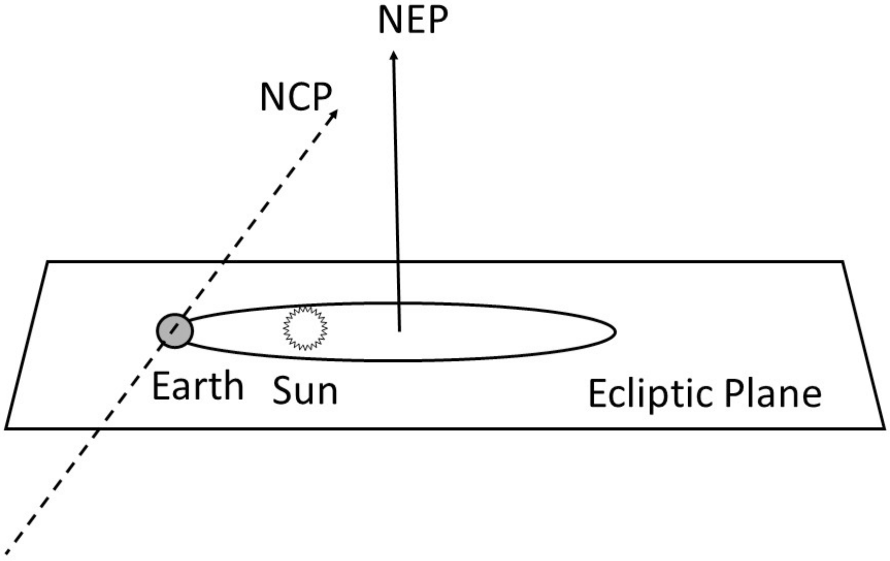

**Figure 1. If one takes Isaiah 40:22 literally, it seems to suggest that God's throne is located perpendicular to the plane of the earth's orbit around the sun (the plane of the ecliptic). Given the multiple verses that seem to link God's abode with the direction north (see text), we suggest that "above" the "circle of the earth" is either the direction of the north celestial pole or the direction of the north ecliptic pole. The direction of the north ecliptic pole (NEP) would seem to be the better choice, since it does not change due to precession, and because it is "above" the earth's "dance" in its totality, not just the spinning of the earth around its axis.**

Do these concepts of celebrating feasts and dancing fit the idea of Earth's spherical roundness? Or do these concepts of celebrating feasts and dancing better fit the idea of Earth's orbit-motions as it circles the sun, within the solar system, which itself orbits within the Milky Way galaxy? The best English word to describe the core idea here is "choreography"—an astoundingly well-ordered, orchestrated, harmonious cosmic **DANCE**. (Notice that this is like the mathematically harmonious, interactively blending, moving parts of a perfectly performed Norwegian folk dance, as opposed to a solitary frenzy of break-dancing gyrations.) It could be that this verse is simultaneously describing *both* Earth's orbital and spin motions as a whole, much in the same way a folk dancer may engage in repetitive and circuitous motion from place to place, while simultaneously spinning about a vertical axis of rotation passing through his or her torso.

Now let us return to the basic inquiry of this review of Isaiah 40:22.

If "circle" in Isaiah 40:22 refers to the earth's orbital and spin motions, this is a much stronger argument for divine inspiration than the mere claim that the earth is round. Many ancient peoples had deduced that the earth was round, but it took scientists thousands of years to realize that the earth was moving in an elliptical orbit around the sun. If the Hebrew Bible taught that the earth was undergoing some kind of circuit or dance thousands of years before the Copernican revolution, then that is *very* impressive! It is also overkill evidence to the debunking of the claim by William Dembski (and others) that the Bible demands an absolutely stationary Earth (Johnson, 2017).

As an aside, it is worth noting that Paul Seely has long contested the claim that Isaiah 40:22 refers to a spherical earth (Seely, 1997), and other creationists have responded to this charge (Holding, 2000). Seely claims that the Bible teaches a flat earth and that this particular passage is teaching that the earth is circular, although still flat. Ironically, Seely is likely correct that this passage is *not* referring to the earth's sphericity, yet he is quite wrong in failing to recognize that Isaiah 40:22 is portraying a choreographed dance in the heavens. Thus, the correct understanding of this verse, contrary to Seely's allegations, only strengthens the argument for the Bible's scientific accuracy, rather than undermines it!

Furthermore, because the term "circle" in Isaiah 40:22 refers to the earth's orbit or circuit rather than its spherical shape, the statement that God is enthroned "upon" (more literally rendered "above" in other translations) that circle indicates the direction where God's throne is located. The preposition used in Isaiah 40:22 is *'al*, routinely translated as “above” and “over,” as in Genesis 8:1 (“a wind to pass ***over*** the earth”) and Genesis 1:20 (“fly ***above*** the earth in the open firmament”). The related root verb is ‘âlâh, which indicates upward action or position, e.g., “went up” in Genesis 19:28 (“the smoke of the country ***went up***”), “came up” in Joshua 2:8 (“she ***came up*** unto them upon the roof”), “ascended up” in Judges 20:40 (“the flame of the city ***ascended up***”), etc.

In other words, Isaiah 40:22 is portraying God as “above” Earth’s choreographed circuit. The earth’s orbit lies in the plane of the ecliptic. In order to move to a position “above” the earth’s orbit, one would need to move in a direction perpendicular to the ecliptic plane, either above or below it. In other words, one needs to move in either the direction of the north ecliptic pole or the south ecliptic pole. Given the numerous passages of Scripture that suggest God’s abode is associated with the direction north (Job 37:22; Psalm 48:1–2; Psalm 75:6–7; Isaiah 14:12–14; Ezekiel 1:4), we suggest that “above the circle of the earth” is in the direction of the north ecliptic pole (Figure 1). Even if “circuit” were to refer just to the daily spinning motion of the earth, this would still indicate a generally northern direction, but in this case the direction of the north celestial pole, rather than the north pole of the ecliptic. Although both possibilities may be permitted by the text, we lean toward the possibility that the Lord’s throne is in the direction of the north ecliptic pole, as this direction is fixed, unlike the direction of the north celestial pole, which is slowly changing due to precession. Likewise, this direction is “above” the *totality* of the earth’s choreographed dance (its orbit), rather than just one part of that dance (the earth’s orbital spin). So, this passage seems to confirm that idea that God’s throne is located in a northerly direction, probably the direction of the north ecliptic pole. Hence, we can add Isaiah 40:22 to the list of scriptural passages that seem to hint at this idea. So, it appears that these Scriptures suggest a majestic theatrical scenario: from the ultimate “true north” our great God is watching over His huge creation, including the countless moving parts of its cosmic choreography.

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## Classic Reprints

**Editor's Introduction:** *In this issue we bring you another classic article from early issues of the* Creation Research Society Quarterly. *This one from one of our founding members appeared in the first issue, the 1964 Annual on pages 18–23.*

# The Power of Energy

**Henry M. Morris***

This title may at first disturb the disciplined scientific mind because of its apparent dimensional inconsistency. As a matter of fact, for our present purposes, it might just as well be titled "The Energy of Power." The point to be made, in either case, is that *energy*, as a concept, is tremendously powerful, both in the solution of technical problems and in its implications with reference to the true understanding of nature and the universe. And this is true whether we are speaking technically of energy or its time-derivative, power. Neither is an actual physical substance, of course, but each is an extremely useful and significant concept, without which the great contributions of modern science could hardly have been possible. Dr. R. B. Lindsay, director of the ultrasonics laboratory at Brown University and dean of its graduate school, says:

> Of all unifying concepts in the whole field of physical science, that of energy has proved to be the most significant and useful. Not only has it played a major role in the logical development of the structure of science, but, by common consent, it is the physical concept which has had and still has the widest influence on human life in all its aspects. Under the prevailing misnomer 'power,' it is the stock-in-trade of the engineer and that which makes the wheels of the world go round. … the interpretation of phenomena in terms of the transfer of energy between natural systems is the most powerful single tool in the understanding of the external world. (Lindsay, 1957, p. 188)

The power of the energy concept is implicit in the two great laws of thermodynamics, which are without question the two most basic and securely founded of all the laws of physical science. All real processes in the physical or biologic realms necessarily involve transformations of energy from one form into another. The first law of thermodynamics, that of energy conservation, expresses the quantitative equivalence of total energy before and after the transformations. The second law, that of energy deterioration, states that in the process some of the energy must be transformed into non-recoverable heat energy—not destroyed but rendered unavailable for use. In terms of "entropy," which is merely a measure of the non-availability of the energy of a system, any natural process or transformation of energy in a closed

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mechanical system necessarily involves an increase in the entropy of the system. According to the great Harvard physicist P. W. Bridgman,

> The two laws of thermodynamics are, I suppose, accepted by physicists as perhaps the most secure generalizations from experience that we have. The physicist does not hesitate to apply the two laws to any concrete physical situation in the confidence that nature will not let him down. (Bridgman, 1953, p. 549)

The universal validity of the first law, that of energy conservation, is also indicated by Gerald Feinberg and Maurice Goldhaber. Feinberg is associate professor of physics at Columbia University, and Goldhaber is director of the Brookhaven National Laboratory. They write:

> The physicist's confidence in the conservation principles rests on long and thoroughgoing experience. The conservation of energy, of momentum, and of electric charge have been found to hold, within the limits of accuracy of measurement, in every case that has been studied. An elaborate structure of physical theory has been built on these fundamental concepts, and its predictions have been confirmed without fail. (Feinberg and Goldhaber, 1963, p. 36)

With respect to the second law, the following evaluation by A. R. Ubbelohde, professor of thermodynamics at the Imperial College of Science and Technology of the University of London, is typical:

> In its most modern forms, the Second Law is considered to have an extremely wide range of validity. It is a remarkable illustration of the ranging power of the human intellect that a principle first detected in connection with the clumsy puffing of a steam engine should be found to apply to the whole world, and possibly even to the whole cosmic universe. (Ubbelohde, 1955, p. 146)

It would be difficult to point to any of our basic methods or formulas in any branch of mechanics or engineering which are not intimately related to these energy requirements. Though the working scientist or engineer may be inclined to overlook them, being engrossed in a tangle of technical details and specific procedures, he will find that both his techniques and basic insights will be greatly strengthened if he maintains a continual awareness of the fundamental energy relationships to which his designs and decisions must conform.

It is not too surprising, then, to find that these relationships and the very concept of energy itself lead to tremendous inferences far beyond the realm of mechanics and thermodynamics to which they were first applied. The basic nature of "energy" or "power" is still enveloped in mystery. Energy can appear in many quantitatively interchangeable forms—electrical energy, chemical energy, sound, heat, light, pressure, magnetic energy, mechanical energy, etc. And one of man's greatest scientific discoveries has been that of the identification of matter itself as merely one form of energy, so that the law of mass conservation becomes only a special case of the law of energy conservation, and matter becomes under the proper conditions interconvertible with other energy forms.

Since all the physical universe, including matter, is ultimately energy, and since energy can be neither created nor destroyed, according to the conservation principle, the inference is that the totality of energy in the universe has never changed since its origination. Either the universe has always existed in its present state (and this is contradicted by the second law of thermodynamics), or it was at some time in the past brought into its present state, necessarily by means of laws or principles not now operative in the universe. Once these latter laws were superseded by the present conservation-deterioration laws, there could have been no additional creation or destruction of the physical stuff of the universe.

This fact is not obvious from a superficial examination of nature, which exhibits numerous cases of *apparent* causeless origins and *apparent* increases of order, reflected in the many crude notions of spontaneous generation and evolution held by ancient philosophers. The conservation law has only been accepted within the past 120 years, after much scientific labor and against much opposition. It is remarkable, therefore, that in the first chapter of Genesis, following the familiar biblical account of Creation, appears the following:

> Thus the heavens and the earth *were finished*, and all the host of them. And on the seventh day God *ended his work which he had made*; and he *rested* on the seventh day *from all his work which he had made*. (Genesis 2:1–2).[1]

With reference to the energy balance of the earth, which of course depends almost wholly upon the influx of solar radiant energy, the further significant statement is made that the function of the sun, relative to the earth, was "to give light upon the earth" (Genesis 1:17).

Whether or not the writer understood the significance of this assertion, the fact remains that the sun's "light," or radiant energy, provides all the earth's usable energy except that of its own rotation and the nuclear energy of its atomic structure. The sun's light maintains the physical and biologic life of the earth. It has been calculated that all the stored-up energy sources of the earth—its coal, oil and gas reserves, its peat and timber, even its fissionable uranium—would only suffice to keep the earth going for

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[1] All Scripture quotations are from the King James Version of the Bible.

about three days if the sun's energy were to be cut off (Ayres and Scarlott, p. 186)!

The energy of light, in fact, may be considered as the most basic of all the forms of energy. It includes all radiant energy, from the X-rays and cosmic rays and other short-wave-length radiation at one extreme, through visible light, heat, and the electromagnetic rays at the opposite end of the spectrum. The energy of matter is basically light energy, with matter and energy related by the Einstein equation through the fundamental and universal constant of the velocity of light. The first creative command of God, according to the Genesis record, is thus very significantly said to have been: "Let there be light: and there was light" (Genesis 1:3).

The energy conservation law is occasionally said not to have proved universally successful when applied to phenomena on the subatomic scale. Quite possibly this is because of the still very incompletely understood nature of these phenomena, and in fact the somewhat still mysterious relation between matter and energy. Of course, this area of investigation is so complex and specialized and so rapidly changing that no one but a very up-to-date nuclear physicist should hazard any definite statement about the basic significance of nuclear phenomena.

However, within the accuracy of all pertinent experimental evidence, it is true that the energy conservation principle has been demonstrated true on the subnuclear scale no less than on the scale of ordinary experience. As Feinberg and Goldhaber (1963, pp. 39, 42) have recently pointed out:

> Thousands of laboratory experiments, performed in different ways and measuring all the quantities involved, have confirmed that the laws of conservation of energy and momentum do hold true in the domain of elementary particles. … It is clear that the laws of conservation of energy and momentum, introduced … to describe collisions between macroscopic bodies, also apply with remarkable accuracy to the collisions and interactions of sub-atomic particles.

One thing is certain, and that is that the energies associated with the various nuclear particles are tremendous and, when partially converted into other forms of energy through nuclear fission or thermonuclear fusion processes, the physical effects can be cataclysmic. The source and nature of the binding energy that normally maintain the integrity of the atomic structure against the powerful electrical forces tending to disintegrate it are yet quite uncertain, although many of its characteristics have been determined.

Physicist R. E. Peierls, professor of mathematical physics at the University of Birmingham in England, and past president of the Atomic Scientists Association, says:

> The next fundamental problem that arises is that of the nature of the forces which hold the neutrons and protons in a nucleus together … the attractive energy that holds any one particle in the nucleus is, in general, of the order of 6 to 8 million volts … to obtain the precise laws of the nuclear forces is one of the central problems of nuclear physics, which is not, as yet, completely solved. (Peierls, 1956, p. 240)

And the problem today seems as far from solution as ever. As modern research has thrown more and more light on the nature of the nucleus, with its 20 various subnuclear particles, the more complex does its nature seem to be. Even if its physical character is eventually completely understood, its basic origin and source would still be at best a matter of pure speculation. Peierls admits:

> Even if one day we find our knowledge of the basic laws concerning inanimate nature to be complete, this would not mean that we had 'explained' all of inanimate nature. All we should have done is to show that all the complex phenomena of our experience are derived from some simple basic laws. But how to explain the laws themselves? (Peierls, 1956, p. 275)

Another quite remarkable assertion of the Scriptures is pertinent here. The writer of the epistle to the Hebrews mentions that, having first made the worlds, God (through His Son) now is continually "upholding all things by the word of his power" (Hebrews 1:3). A legitimate paraphrase of the Greek original here would be that He is "maintaining the physical integrity of the matter of the universe by means of the continual efficacious outflow and outworking of His innate infinite reservoir of basic energy."

The same intimation of the maintenance of the integrity of matter by a certain basic and primal form of energy (and therefore of the essential equivalence of matter and energy) is suggested also by St. Paul, when he says, "By him [i.e., Christ] all things consist [hold together]" (Colossians 1:17), and by St. Peter, who says, "The heavens and the earth which are now, by the same word are kept in store" (2 Peter 3:7).

But the full import of the energy concept cannot be grasped until we consider also the second law of thermodynamics. In any closed system, in which energy transactions take place, the availability of the energy for the performance of useful work must always decrease. The total energy remains unchanged, but its usefulness has decreased.

This physical phenomenon is not at all obvious on the surface of things and had to overcome much opposition before it became generally accepted as scientific truth. It seemed to contradict the philosophy of progress and developmental evolution. Nevertheless, the brilliant theoretical and experimental researches of Carnot, Clausius, and

Lord Kelvin, followed by numerous others in more recent decades, have definitely proved this second law to be of essentially equal validity with the first. In recent times, it has even been possible to analyze and predict in some cases actual rates of energy dissipation (or entropy increase). This sort of study, of course, becomes of great practical importance in engineering design and analysis. Energy dissipation is often of paramount importance in the mechanics of the conversion process and its efficiency, and therefore in its cost of operation. The second law of thermodynamics precludes the design of any process or machine 100% efficient, as well as any sort of perpetual motion device.

Because of the historical background, it has been customary to think of these two laws of thermodynamics as more or less interdependent. However, there does not seem to be any necessary connection between them. The fact that the totality of energy remains constant does not in itself imply at all that its availability should continually decrease. In fact, there now exists a considerable body of evidence that this so-called second law of thermodynamics is only a particular application of a much more general law which deals not only with the phenomena of physical energy but also with many other categories of phenomena in the physical, biological, and perhaps even in the psychological and sociological realms. This broader law has been called by the British physicist Dr. R. E. D. Clarke (1948, p. 150) the "law of morpholysis," a term derived from two Greek words, and meaning simply "loosing of structure."

This term seems admirably adapted to describe a very important and apparently universal phenomenon, namely that there always exists a tendency in nature towards disorder or disorganization. The law of morpholysis merely formalizes the everyday observation that any evidence of order or organization requires some sort of explanation to account for it, whereas anything exhibiting randomness or disorder or 'heterogeneity' is *per se* "natural" and does not call for any explanation as to how it was thus arranged. The natural tendency is always from the state of maximum improbability to that of maximum probability, from the organized to the disorganized. Any sort of ordered arrangement requires some sort of external agency to bring it about. Harold F. Blum, professor of biology at Princeton, says:

> All real processes go with an increase in entropy. The entropy also measures the randomness or lack of orderliness of the system, the greater the randomness the greater the entropy; the idea of a continual tendency toward greater randomness provides the most fundamental way of viewing the second law. (Blum, 1962, p. 15)

Even from an engineering viewpoint, this is now recognized as the real significance of the second law of thermodynamics. This concept of entropy explains energy deterioration in terms of decreased order of molecular or atomic structure. In discussing the entropy concept and some of its newer application, Dr. W. L. Everitt, dean of engineering at the University of Illinois and past president of the American Society for Engineering Education, points out:

> It may be inferred that entropy is a measure of randomness, confusion, or lack of organization. Such a term can be applied not only in a thermodynamic sense, but also to information problems. (Everitt, 1957, p. 658)

This tendency toward disorder is, of course, apparent in many realms beside that of energy dissipation. There is the phenomenon of aging and death in living creatures, for example, still very incompletely understood but apparently related to the breakdown of complex and unstable protein molecules into simpler and more stable ones, less able to transmit free energy for biologic processes.

Similarly, the primary mechanism of biologic evolution of species, that of mutation of genes in the germ cells, operates when some disorganizing medium such as short-wave-length radiation, certain powerful chemicals, etc., penetrate the germ cell and disturb its previously highly organized chemical structure. The reshuffling of genetic factors thus induced would nearly always decrease its degree of order and organization and therefore result in a less viable and efficient organism. This is why almost all, perhaps all, mutations are either lethal or harmful to the creatures experiencing them in their struggle for existence. This is supported by no less an authority than Dr. H. J. Muller, perhaps the world's outstanding living geneticist and authority on mutational mechanics:

> It is entirely in line with the accidental nature of natural mutations that extensive tests have agreed in showing the vast majority of them to be detrimental to the organism in its job of surviving and reproducing, just as changes accidentally introduced into any artificial mechanism are predominantly harmful to its useful operation. According to the conception of evolution based on the studies of modern genetics, the whole organism has its basis in its genes. Of these there are thousands of different kinds, interacting with great nicety in the production and maintenance of the complicated mechanism of the given type of organism. Accordingly, by the mutation of one of these genes or another, any component structure or function, and in many cases combinations of these components, may become diversely altered. Yet in all except very rare cases the change will be disadvantageous, involving an impairment of function. (Muller, 1955)

It is probable that such mutational deteriorations account for many phenomena of paleontology and morphology, such as vestigial organs and the fact that most modern creatures are represented in the fossil record by larger and more highly developed individuals than their modern counterparts. Mutation, isolation, inbreeding, etc., also may account for the historical deterioration of once virile sociological units of peoples and cultures, encountered so frequently in the study of history.

But it is the cosmological implication of morpholysis that is of greater significance. If the entropy or disorder of any closed system must continually increase, and since the universe may be regarded as a very large, but finite, closed system, it follows that the universe as a whole is becoming progressively more disordered. Its reservoir of physical energy is continually degrading, tending ultimately to a state where all energy will have deteriorated to unavailable heat energy. The universe, in other words, is "running down"; it is growing old, wearing out.

It cannot, therefore, be infinitely old; if it were, it would already have attained this state of maximum entropy. It must have had a beginning. If it is growing old, it must once have been young; if it is wearing out, it must have once been new. A universe now running down must first have been "wound up."

This is the inexorable conclusion of the second law, unless one is disposed to assert a continual evolution of fresh matter or energy out of nothing somewhere in space (according to the theory of Fred Hoyle and others) or to insist that the universe is pulsating, with the entropy periodically reversed to permit its rewinding. Neither of these alternatives, of course, is supported by a shred of *direct physical evidence*, but only by assumptions as to what, in the judgment of their proponents, the nature of things *ought* to be. See, for example, the cogent criticism of theories of this kind by Herbert Dingle, professor of the history and philosophy of sciences at the University of London (Dingle, 1956, pp. 224–236). On the other hand, there is literally a tremendous mass of direct physical evidence supporting the entropy law.

However, these alternate hypotheses do point up one fact, namely that the morpholysis principle is not inherent in the basic nature of things. The very fact that men of intellect can conceive and support alternative theories proves this. This tendency toward disorder seems somehow, intuitively, to be an unwelcome intruder into the ideal nature of things, something that *ought not to be* but which nevertheless *is*. Just *why* this deteriorative principle is an apparently universal law is seemingly beyond the reach of scientific discovery.

But here it is possible that the Scriptures, already seen to contain remarkable intimations about the fundamental nature of things, may again have something significant to say. The basically spiritual nature of energy has already been inferred, so that the principle of deterioration of energy may likewise involve spiritual overtones.

Thus, the Christian doctrine of the Fall of man and the resultant curse of God on His creation, as taught in Genesis (Genesis 3:17–19; see also Romans 5:12; 1 Corinthians 15:21–22), although often rejected as mythological by modern intellectuals, is able to provide at least a causal explanation for the universal phenomenon of morpholysis. At the same time, it refutes the hopelessly pessimistic future of the universe implied by the second law of thermodynamics by reminding us that He who established the creation and who later imposed upon it the curse of corruptibility and decay is yet Himself outside the creation and therefore not subject to its laws. For example, quoting again the author of Hebrews, who in turn is quoting Psalm 102:

> And, Thou, Lord, in the beginning hast laid the foundation of the earth; and the heavens are the works of thine hands: they shall perish; but thou remainest; and they all shall wax old as doth a garment; and as a vesture shalt thou fold them up, and they shall be changed: but thou art the same, and thy years shall not fail. (Hebrews 1:10–12; see also 1 Peter 1:24–25; Matthew 24:35; Isaiah 51:6; etc.)

A future time when the curse shall be removed from the earth, and when, therefore, the law of morpholysis will presumably be "repealed," is often promised in Scripture. In the classic eighth chapter of Romans, said by Martin Luther to be the greatest chapter in the Bible, St. Paul says:

> For the creature was made subject to vanity, not willingly, but by reason of him who hath subjected the same in hope, because the creature itself also shall be delivered from the bondage of corruption [literally "decay"] into the glorious liberty of the children of God. For we know that the whole creation groaneth and travaileth in pain together until now. (Romans 8:20–22; see also Revelation 21:1, 4; 22:3; Isaiah 66:22; 2 Peter 3:13)

But for the present we must continue to live with the entropy principle. The engineer must continue to design his machine or process with full allowance for the effects of energy dissipation. Great strides are being made in the broader application of these concepts of energy conservation and deterioration in atomic energy, computers and automation, rocketry, inertial guidance, and even in such fields as information theory. A more incisive and inclusive understanding of the real character of the second law, especially, will undoubtedly result in still more remarkable technological advances, in probably every area of science.

But one cannot help but sense a danger, even perhaps a probability, that new scientific and technological breakthroughs may, as has often been true in the past, only accelerate the sociological and moral morpholysis. Energy and entropy are, we repeat, basically nonmaterial, even spiritual, in essence.

As to sources of strictly physical power, it appears that the so-called Christian West is rapidly being overwhelmed by the anti-Christian forces of the world. In manpower, it has long been obvious that the West is immensely inferior. In potential energy sources, considering the vast and largely untapped resources of Russia, Asia, and probably Africa, the reservoir of the East is again far larger than that of the West. Even in the non-material resources of intellectual and moral power, there is no little evidence today that the Eastern peoples are at least the equals of those in the free world.

In a day and age in which the balance of power in a technological sense has been superimposed upon the old concept of the balance of power in a military sense as determinative of the world's future, we have suddenly come to realize that our Western delusion of perpetual superiority may be tragically unrealistic. Evidences are multiplying that the true balance of power in the world henceforth may favor those forces that are being arrayed in opposition to us.

But there does remain one largely unused source of power, access to which is more to be valued than all others combined. The One who inhabits eternity, who has created and who "upholds all things by the word of his power," is Himself the source of all physical, intellectual, moral, and spiritual energy. Access to this spiritual power (and often even to physical and intellectual strength) is obtained through prayer and a Christ-centered faith, according to the testimony both of biblical revelation and of millions of individual Christians across the centuries, including the writer of this paragraph. In the words of St. Paul, "For I am not ashamed of the gospel of Christ: for it is the *power* of God unto salvation to every one that believeth" (Romans 1:16).

Therefore, for instruction in the matter of power sources for those who deal in science and technology, for insight into the universal significance of the concepts of energy and power, for encouragement to all who are disturbed over world conditions, and for personal exhortation to those individuals who would seek for roots in eternity, we close with the words of Him who, after dying in atonement for the sins of fallen man and then after winning the ultimate triumph over the universal rule of decay and death by His bodily resurrection from the tomb, could say with all assurance:

> *All power* is given unto me in heaven and in earth. … and, lo, I am with you alway, even unto the end of the world. Amen." (Matthew 28:18, 20)

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# Letters to the Editor

## CRS Membership

As part of his response to a Letter to the Editor, Lee Anderson states that the Creation Research Society has a double standard for membership (*CRSQ*, vol. 54, p. 222). He further suggests that this double standard discourages nonscientists from contributing to creation studies, including publishing in the creation literature. We believe this assessment is inaccurate.

The Creation Research Society (CRS) was founded as a scientific organization with the purpose of providing scientific research that supports the biblical account of creation. As with any scientific society, the CRS leadership consists of trained scientists selected from among its members. Unlike many scientific societies, however, CRS also offers membership to nonscientists. This inclusion of nonscientists as Society members is an acknowledgement of their strong and necessary contribution to the activities of the Society.

Other than voting for board members and sponsoring conference abstracts, nonscientists have full membership privileges. These include participation on CRSnet, the opportunity to conduct CRS-funded research, contribute to CRS publications, and attend the CRS Conference. What is more, CRS membership is not even required for presenting at the CRS Conference or publishing in *CRSQ* or *Creation Matters*. There is nothing in CRS membership policy that should discourage or diminish quality contributions from any of its members.

We hope this clarifies the subject of membership, and we look forward to continued contributions from all supporters of CRS.

**Donald DeYoung, Ph.D.**
**President, CRS Board of Directors**

**Robert Carter, Ph.D.**
**Membership Secretary, CRS Board of Directors**

**Kevin Anderson, Ph.D.**
**Director,**
**Van Andel Creation Research Center**

## "Literal" Interpretation

I am writing in response to the exchange between Nick Sabato and Jake Herbert that appeared in the spring 2018 issue of the *Creation Research Society Quarterly*. If you will allow my comments, I believe that I can bring some clarity (and hopefully, harmony) to the discussion.

First of all, I believe that it is important to realize that the word "literal" has changed meaning. At the time of the Reformation, the "literal" meaning of the words of Scripture was what we would call the grammatical meaning today. And far from excluding any legitimate figure of speech, the "literal" meaning included every legitimate figure. Here is what Dr. Robert Preus has to say about it:

> The literal sense of Scripture is the meaning, or tenor, that the words directly and obviously convey. For instance, in John 3:16 the literal sense is immediately clear. But there is also a literal sense to those passages that are tropical and figurative. Such passages we do not read superficially according to the surface tenor of the words, as when Herod is called a fox or when we are to cut off a hand that offends us—such an interpretation would be absurd. In figurative statements of this kind, not only the words according to their native sense but also the thing or point (res) that the words express according to their quondam imagery must be considered. The literal sense, then, is the sense intended by the writer, whatever trope or

> genre is used. Figures of speech, words, and even ideas all have their literal sense. And the literal sense (meaning, intention) of a pericope is drawn from all these ingredients. Glassius makes it quite clear that the literal sense of a Scripture passage or pericope is not necessarily identical with the surface meaning of the words, but the genre of the text or the tropes therein must also be ascertained, when necessary, to determine the literal sense of a text. (Preus, 970, pp. 321–22)

Secondly, I believe that we need to make a clear distinction between the "literal" meaning of the words and any dream or vision that is being described by the words. For example: Genesis 41:1–7 describes a dream in which Pharaoh saw seven thin cows eat seven fat cows. There is nothing figurative about the words of the text. Those words give us a straightforward literal description of what Pharaoh saw in his dream. However, that does not mean that the dream itself is a literal description of the events which were to take place. On the contrary, the dream was highly figurative as Joseph's interpretation revealed.

Thirdly, I believe that it is important to distinguish between interpretations of the text, interpretations of dreams or visions described in the text, and man-made stories and explanations invented to support a particular interpretation (2 Peter 1:20; Mark 7:9–13). Let me give some examples of how what I have just said might be applied.

On page 268 of that same issue of the *Creation Research Society Quarterly*, John C. Whitcomb, Jr. deals with the "Gap Theory" and its claim that the words, "And the earth was without form, and empty," should be translated, "And the earth became without form, and empty" (Genesis 1:2). If we apply the distinctions that I made earlier, any discussion about whether the Hebrew word *hayah* should be translated "was" or "became" has to do with the meaning of the text. However, when gap theorists make up a story about a long period of time transpiring while "the earth became without form," or a story about Satan and his angels living on the earth and even fighting wars during that time, that is just a man-made story. Moreover, because it is just a man-made story, those who pass it off as God's Word are adding that story to God's Word. And, because God has told us not to add to His Word, we know that story is not of God. It either comes from the flesh or the devil, or both, but not from God. Furthermore, because it is religious fiction, it is not substantially different from the religious fiction contained in the Koran or the Book of Mormon. It should hold for us about as much credibility as the story of Snow White and the Seven Dwarfs.

Now let us apply what I just said to Revelation 13:1: "And I stood upon the sand of the sea, and saw a beast rise up out of the sea, having seven heads and ten horns, and upon his horns ten crowns, and upon his heads the name of blasphemy." The first thing I want you to notice is that the words of the text give us a straightforward literal description of something that John saw in his dream or vision. However, that does not mean that the dream is to be taken literally. On the contrary, when we look at what Scripture says elsewhere, we find that the Book of Daniel depicts governments as beasts. So that is one possible explanation. However, when someone makes up an explanation, saying that the beast John described is really a man, and the antichrist, that is religious fiction, not an interpretation of the text. The text means just what it says! And any explanation of John's dream or vision that is not plainly stated in the text is the figment of someone's imagination. Of that sort of imagining, Dr. John Theodore Mueller had this to say:

> In whatever matter Holy Scripture has definitely spoken the Christian theologian must suppress his own views, opinions, and speculations and adhere unwaveringly to the divine truths revealed in Holy Scripture. In no case is he permitted to inject into the body of divine truth his own *figments and fabrications*, and at no time must he allow his reason the prerogative of doubt, criticism, or denial, but every thought must everywhere be brought into captivity to the obedience of Christ, 2 Cor. 10:5. (Mueller, 1955, p. 39)

## Conclusion

Because the Creation movement includes believers from many different backgrounds, if we are to work together without theological controversy, we need to stick to the words of the text without confusing those words with dreams, or even stories made up to support a particular interpretation.

**Gary Ray Branscome**
**www.branscome.org**

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# Media Reviews

## *Contested Bones*

**by Christopher Rupe
and John Sanford**

FMS Publications, London,
2017, 333 pages, $25.00

In a personal prologue, John Sanford admits that he, as a mature scientist in the field of genetics, accepted the story of human evolution without question until he determined that his own field showed the impossibility of that scenario. Sanford collaborated to write this book because when he presents the case against evolution as laid out in his book *Genetic Entropy*, people argue that he must be wrong because the fossils clearly show ape-to-human evolution. In tackling that topic, he answers the objection that neither he nor Christopher Rupe have degrees in paleoanthropology by pointing out that paradigm-challenging ideas never come from within a field, where "groupthink" rules. The book systematically analyzes the data, picking up the thread begun in the 1992 book *Bones of Contention* by Marvin Lubenow. Time has not helped the evolutionist cause, as more specimens and better analytical techniques have solidified the case for creation.

The Neanderthal has been shown to be fully human and from the archeological record, Homo erectus also makes tools, art and buries its dead, despite having physical deformities. Essentially, genus Homo, including Nadeli and "Hobbit" are all humans, some degenerate, due to small population size, inbreeding, starvation, and changes in the population that result from those conditions. If one uses modern forensic computer programs to reconstruct the appearance of these individuals, instead of evolutionarily biased artistic reconstructions, one gets features similar to people on the street today.

"Lucy," the archetypical human precursor, is a very incomplete skeleton. The hands and feet are missing and the skull and pelvis fragmented. Thus a lot of latitude occurs in the reconstruction of the anatomy. Overall, Australopithecus is clearly an ape but at this point in the narrative a more disturbing element is introduced. Some of the bones found with Lucy appear to belong to a Homo species. Then a track of footprints was found (far away from Lucy) and even slightly older but *fully human* in form. The largest would have worn a size 11 shoe and probably been over 6 feet tall, while Lucy was about 3 feet tall. Disputes arose about the dating, but eventually the prints were attributed to Lucy's kind. Museums today depict Lucy with human feet and hands (and a thoughtful expression on her face). As more specimens indicated that Australopithecus had ape-like hands and feet, it was proposed that there was sexual dimorphism—the males were humanlike, and the females were apish. That ought to bring a feminist response: If there is a difference in humans, usually the men are the more ape-like.

The expose of the dating controversies should attract lawyers. The dating and redating, rejection and rationalization of dating techniques shows that the theory drives the data rather than the reverse. Perhaps psychologists should get in the mix too, because every fossil hunter clearly thinks that his is the key discovery and bends heaven and earth to support it. Political intrigue and clever marketing are rewarded. But as a result, every time a new discovery is supported, human evolution is thrown into turmoil.

After dismantling the fossil evidence, the book reviews the genetic evidence, which is devastating to any possible positive change and conclusive that every species is deteriorating. Having removed all other possibilities, the authors suggest the only rational conclusion: Humans did not evolve but were created. Rupe and Sanford deal graciously with the usual objections to that possibility and end with a personal appeal.

**Ross S. Olson, MD**
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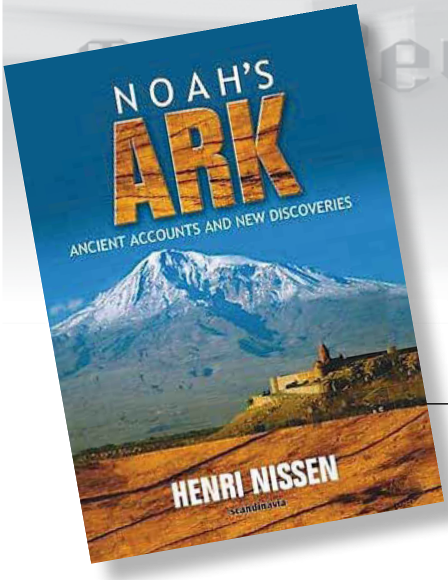

# *Noah's Ark: Ancient Accounts and New Discoveries*

**by Henri Nissen. Translated from Danish by Tracy Jay Skondin and others.**

Scandinavia Publishing House, Copenhagen, 2017, 332 pages, $34.95.

This full color hardbound book is a thorough review of the history of the ark and flood legends. Author Henri Nissen is editor-in-chief of the Danish Christian magazine *Udfordringen* (The Challenge). Nissen has also worked as a press secretary in the Danish Parliament. The first section of this densely documented book includes a summary of many of the ancient beliefs, both biblical and nonbiblical, of the worldwide Flood in ancient and modern times (pp. 19–21). A summary of the known 212 flood accounts concludes that 88 percent are about a family that was saved, 70 percent of them include a boat that saves those on board, and 30 percent mention some other type of rescue (p. 21). Fully 73 percent include a worldwide flood in the account and 67 percent include accounts of animals being saved. Even Fiji in the South Pacific has a Flood account.

The second section of the book (p. 142–201) focuses on the circumstances surrounding the ark's alleged discoveries by Asian and other expeditions. The Asian discovery involves a group of Chinese Christians from Hong Kong working with local Kurds. In 2008 they discovered a series of seven more or less contiguous wood lined spaces located approximately 4,000 meters up on Mt. Ararat. The discovery includes several rooms or compartments encased in ice (p. 177–181).

The find was formally announced in 2010. As is true of most discoveries related to the ark, strong evidence exists that this finding is a hoax.

The chapter titled "Ark Fever" covers dozens of expeditions, many dangerous, some lethal, to locate the ark. Nissen includes four trips taken by astronaut James Irwin. Irwin found that a trip to the moon was safer than Mt. Ararat where he was seriously injured. Other ark expeditions (pp. 119–126) include those by John Morris of ICR.

The third portion of this book discusses peripheral topics including the epic of Gilgamesh (p. 307–321) and how the Old Testament relates to the dating of events (p. 219). The author also writes a section on Velikovsky's catastrophic theories and how they relate to the flood account (p. 241–246). Lastly, the author discusses in detail a modern Dutch nearly full-size reproduction of the ark (p. 322–328).

Nissen reviews the most recent claims of finding the ark including disproved sightings and others that he deems credible. Covered were numerous examples of distortion, con-men and atheist sabotage (pp 116–118). Nissen attempts to separate fact from fiction, detailing the fact that this goal is not easy, and we may never know the truth of some ark claims. Nissen concludes the book by writing, "I hope that it has become clear that the Bible is, in fact, *surprisingly trustworthy* when compared to other sources" (p. 329, emphasis in original). This book is recommended for those interested in the biblical flood account as well as its history and influence on worldwide cultures.

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# Instructions to Authors

## Submission

Electronic submissions of all manuscripts and graphics are preferred and should be sent to the editor of the *Creation Research Society Quarterly* in Word, WordPerfect, or Star-Office/Open Office (see the inside front cover for address). Printed copies also are accepted. If submitting a printed copy, an original plus two copies of each manuscript should be sent to the editor. The manuscript and copies will not be returned to authors unless a stamped, self-addressed envelope accompanies submission. If submitting a manuscript electronically, a printed copy is not necessary unless specifically requested by the *Quarterly* editor. Manuscripts containing more than 35 pages (double-spaced and including references, tables, and figure legends) are discouraged. An author who determines that the topic cannot be adequately covered within this number of pages is encouraged to submit separate papers that can be serialized.

All submitted manuscripts will be reviewed by two or more technical referees. However, each section editor of the *Quarterly* has final authority regarding the acceptance of a manuscript for publication. While some manuscripts may be accepted with little or no modification, typically editors will seek specific revisions of the manuscript before acceptance. Authors will then be asked to submit revisions based upon comments made by the referees. In these instances, authors are encouraged to submit a detailed letter explaining changes made in the revision, and, if necessary, give reasons for not incorporating specific changes suggested by the editor or reviewer. If an author believes the rejection of a manuscript was not justified, an appeal may be made to the *Quarterly* editor (details of appeal process at the Society's web site, www.creationresearch.org).

Authors who are unsure of proper English usage should have their manuscripts checked by someone proficient in the English language. Also, authors should endeavor to make certain the manuscript (particularly the references) conforms to the style and format of the *Quarterly*. Manuscripts may be rejected on the basis of poor English or lack of conformity to the proper format.

The *Quarterly* is a journal of original writings, and only under unusual circumstances will previously published material be reprinted. Questions regarding this should be submitted to the Editor (CRSQeditor@creationresearch.org) prior to submitting any previously published material. In addition, manuscripts submitted to the *Quarterly* should not be concurrently submitted to another journal. Violation of this will result in immediate rejection of the submitted manuscript. Also, if an author uses copyrighted photographs or other material, a release from the copyright holder should be submitted.

## Appearance

Manuscripts shall be computer-printed or neatly typed. Lines should be double-spaced, including figure legends, table footnotes, and references. All pages should be sequentially numbered. Upon acceptance of the manuscript for publication, an electronic version is requested (Word, WordPerfect, or Star-Office/Open Office), with the graphics in separate electronic files. However, if submission of an electronic final version is not possible for the author, then a cleanly printed or typed copy is acceptable.

Submitted manuscripts should have the following organizational format:

**1. Title page.** This page should contain the title of the manuscript, the author's name, and all relevant contact information (including mailing address, telephone number, fax number, and e-mail address). If the manuscript is submitted by multiple authors, one author should serve as the corresponding author, and this should be noted on the title page.

**2. Abstract page.** This is page 1 of the manuscript, and should contain the article title at the top, followed by the abstract for the article. Abstracts should be between 100 and 250 words in length and present an overview of the material discussed in the article, including all major conclusions. Use of abbreviations and references in the abstract should be avoided. This page should also contain at least five key words appropriate for identifying this article via a computer search.

**3. Introduction.** The introduction should provide sufficient background information to allow the reader to understand the relevance and significance of the article for creation science.

**4. Body of the text.** Two types of headings are typically used by the *CRSQ*. A major heading consists of a large font bold print that is centered in column, and is used for each major change of focus or topic. A minor heading consists of a regular font bold print that is flush to the left margin, and is used following a major heading and helps to organize points within each major topic. Do not split words with hyphens, or use all capital letters for any words. Also, do not use bold type, except for headings (italics can be occasionally used to draw distinction to specific words). Italics should not be used for foreign words in common usage, e.g., "et al.", "ibid.", "ca." and "ad infinitum." Previously published literature should be cited using the author's last name(s) and the year of publication (ex. Smith, 2003; Smith and Jones, 2003). If the citation has more than two authors, only the first author's name should appear (ex. Smith et al., 2003). Contributing authors should examine this issue of the *CRSQ* or consult the Society's web site for specific examples as well as a more detailed explanation of manuscript preparation. Frequently-used terms can be abbreviated by placing abbreviations in parentheses following the first usage of the term in the text, for example, polyacrylamide gel electrophoresis (PAGE) or catastrophic plate tectonics (CPT). Only the abbreviation need be used afterward. If numerous abbreviations are used, authors should consider providing a list of abbreviations. Also, because of the variable usage of the terms "microevolution" and "macroevolution," authors should clearly define how they are specifically using these terms. Use of the term "creationism" should be avoided. All figures and tables should be cited in the body of the text, and be numbered in the sequential order that they appear in the text (figures and tables are numbered separately with Arabic and Roman numerals, respectively).

5. **Summary.** A summary paragraph(s) is often useful for readers. The summary should provide the reader an overview of the material just presented, and often helps the reader to summarize the salient points and conclusions the author has made throughout the text.

6. **References.** Authors should take extra measures to be certain that all references cited within the text are documented in the reference section. These references should be formatted in the current *CRSQ* style. (When the *Quarterly* appears in the references multiple times, then an abbreviation to *CRSQ* is acceptable.) The examples below cover the most common types of references:

Robinson, D.A., and D.P. Cavanaugh. 1998. A quantitative approach to baraminology with examples from the catarrhine primates. *CRSQ* 34:196–208.

Lipman, E.A., B. Schuler, O. Bakajin, and W.A. Eaton. 2003. Single-molecule measurement of protein folding kinetics. *Science* 301:1233–1235.

Margulis, L. 1971a. The origin of plant and animal cells. *American Scientific* 59:230–235.

Margulis, L. 1971b. *Origin of Eukaryotic Cells*. Yale University Press, New Haven, CT.

Hitchcock, A.S. 1971. *Manual of Grasses of the United States*. Dover Publications, New York, NY.

Walker, T.B. 1994. A biblical geologic model. In Walsh, R.E. (editor), *Proceedings of the Third International Conference on Creationism* (technical symposium sessions), pp. 581–592. Creation Science Fellowship, Pittsburgh, PA.

7. **Tables.** All tables cited in the text should be individually placed in numerical order following the reference section, and not embedded in the text. Each table should have a header statement that serves as a title for that table (see a current issue of the *Quarterly* for specific examples). Use tabs, rather than multiple spaces, in aligning columns within a table. Tables should be composed with *14-point type* to insure proper appearance in the columns of the *CRSQ*.

8. **Figures.** All figures cited in the text should be individually placed in numerical order, and placed after the tables. Do not embed figures in the text. Each figure should contain a legend that provides sufficient description to enable the reader to understand the basic concepts of the figure without needing to refer to the text. Legends should be on a separate page from the figure. All figures and drawings should be of high quality (hand-drawn illustrations and lettering should be professionally done). Images are to be a minimum resolution of 300 dpi at 100% size. Patterns, not shading, should be used to distinguish areas within graphs or other figures. Unacceptable illustrations will result in rejection of the manuscript. Authors are also strongly encouraged to submit an electronic version (.cdr, .cpt, .gif, .jpg, and .tif formats) of all figures in individual files that are separate from the electronic file containing the text and tables.

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Submission of letters regarding topics relevant to the Society or creation science is encouraged. Submission of letters commenting upon articles published in the *Quarterly* will be published two issues after the article's original publication date. Authors will be given an opportunity for a concurrent response. No further letters referring to a specific *Quarterly* article will be published. Following this period, individuals who desire to write additional responses/comments (particularly critical comments) regarding a specific *Quarterly* article are encouraged to submit their own articles to the *Quarterly* for review and publication.

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Occasionally, the editor will invite individuals to submit differing opinions on specific topics relevant to the *Quarterly*. Each author will have opportunity to present a position paper (2000 words), and one response (1000 words) to the differing position paper. In all matters, the editor will have final and complete editorial control. Topics for these forums will be solely at the editor's discretion, but suggestions of topics are welcome.

### Book Reviews:

All book reviews should be submitted to the book review editor, who will determine the acceptability of each submitted review. Book reviews should be limited to 1000 words. Following the style of reviews printed in this issue, all book reviews should contain the following information: book title, author, publisher, publication date, number of pages, and retail cost. Reviews should endeavor to present the salient points of the book that are relevant to the issues of creation/evolution. Typically, such points are accompanied by the reviewer's analysis of the book's content, clarity, and relevance to the creation issue.

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## *Creation Research Society*

**History**—The Creation Research Society was organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly publication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a need for an association devoted to research and publication in the field of scientific creation, with a current membership of over 600 voting members (graduate degrees in science) and about 1000 non-voting members. The *Creation Research Society Quarterly* is a peer-reviewed technical journal. It has been gradually enlarged and modified, and is currently recognized as one of the outstanding publications in the field. In 1996 the *CRSQ* was joined by the newsletter *Creation Matters* as a source of information of interest to creationists.

**Activities**—The Society is a research and publication society, and also engages in various meetings and promotional activities. There is no affiliation with any other scientific or religious organizations. Its members conduct research on problems related to its purposes, and a research fund and research center are maintained to assist in such projects. Contributions to the research fund for these purposes are tax deductible. As part of its vigorous research and field study programs, the Society operates The Van Andel Creation Research Center in Chino Valley, Arizona.

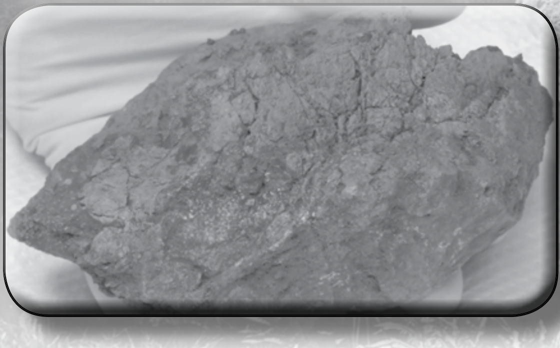
**Membership**—Voting membership is limited to scientists who have at least an earned graduate degree in a natural or applied science and subscribe to the Statement of Belief. Sustaining membership is available for those who do not meet the academic criterion for voting membership, but do subscribe to the Statement of Belief.

**Statement of Belief**—Members of the Creation Research Society, which include research scientists representing various fields of scientific inquiry, are committed to full belief in the biblical record of creation and early history, and thus to a concept of dynamic special creation (as opposed to evolution) both of the universe and the earth with its complexity of living forms. We propose to re-evaluate science from this viewpoint, and since 1964 have published a quarterly of research articles in this field. *All members of the Society subscribe to the following statement of belief:*

1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.
2. All basic types of living things, including humans, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.
3. The Great Flood described in Genesis, commonly referred to as the Noachian Flood, was a historical event worldwide in its extent and effect.
4. We are an organization of Christian men and women of science who accept Jesus Christ as our Lord and Savior. The act of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Savior for all people. Therefore, salvation can come only through accepting Jesus Christ as our Savior.

# iDINO II

## Investigation of Dinosaur Intact Natural Osteo-tissue



**A fragment of the *Triceratops* brow horn. Fragments, such as this one, still contain tissue and cells.**

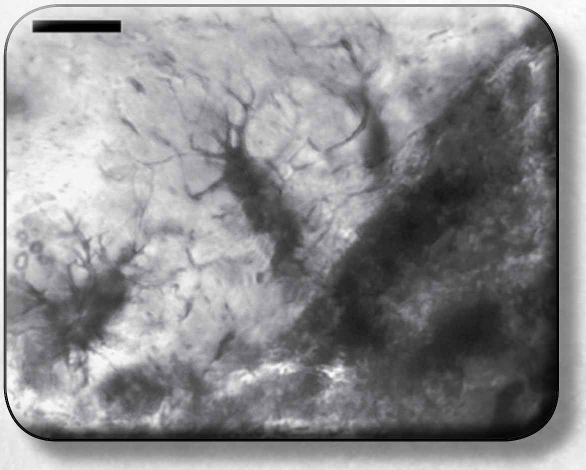
**How can pliable, stretchable tissue survive inside dinosaur fossils for over 65 million years?**

**How can this tissue still contain intact cells and even dinosaur proteins?**

**How can this fragile biological material survive for so long?**

The answer to these questions directly challenges the current, evolutionary-biased, geologic timescale.

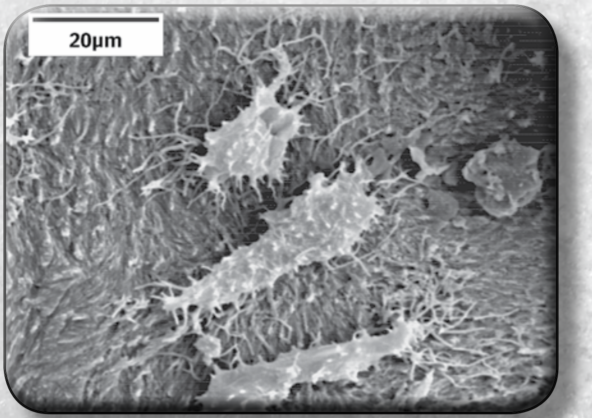
The Creation Research Society began its iDINO research initiative for the purpose of studying soft tissue in dinosaur fossils. The first phase of the project detected pliable, unfossilized tissue in a brow horn of a *Triceratops*. Within this tissue were intact osteocytes (bone cells). Some results from the iDINO project have been published in a technical microscopy journal and presented at an international microscopy conference. The Spring 2015 issue of the *Creation Research Society Quarterly* also features a special report of the iDINO project. Plus, to further spread the important information about soft tissue, the Society is developing a video (Echoes of the Jurassic).



**Microscopic examination of tissue extracted from a *Triceratops* horn reveals bone cells still present.**

The **second phase** of the project (iDINO II) will look more extensively at the process of tissue preservation. Evolutionists have offered various theories of how this tissue could survive for millions of years. iDINO II will methodically investigate these preservation claims, assessing their plausibility.

The iDINO results have already provided a strong challenge to the evolutionary worldview. More extensive and detailed examination may provide even stronger evidence that the age of dinosaur fossils is far less than 65 million years. To this end, the Society continues to seek those willing to fund this project with either one-time gifts or monthly donations.



**Electron microscope picture of intact bone cells still in tissue extracted from a *Triceratops* horn.**

*For more information contact us at (928) 636-1153 or crsvarc@crsvarc.com.*

*Also visit http://tinyurl.com/nphm2c4 for project updates and details.*