ARE HUMAN AND MAMMAL TRACKS FOUND TOGETHER WITH THE TRACKS OF DINOSAURS IN THE KAYENTA OF ARIZONA? PART II: A FIELD STUDY OF QUASIHUMAN, QUASIMAMMALIAN, AND DINOSAUR ICHNOFOSSILS NEAR TUBA CITY

PAUL O. ROSNAU,* JEREMY AULDANEY,** GEORGE F. HOWE,*** AND WILLIAM WAISGERBER****

Received 17 December 1988; Revised 17 July 1989

Abstract

Possible tracks of humans, mammals, and dinosaurs were located, mapped, and studied in rocks of the Kayenta Formation at seven localities within two study sites near Tuba City, AZ. Several fossil bones, teeth, and shells were located and tentatively identified as representing phytosaurs, lizards, and the mollusc genus Unio. The dinosaur prints are ascribed to Dilophosaurus and other genera. The quasihuman tracks are discussed in relation to various criteria. Each author has written his own estimation of the possible authenticity of the supposed human tracks.

Introduction

In a previous paper (Rosnau, *et al.*, 1989) we reviewed the history of research on humanlike impressions ("quasihuman ichnofossils") found in Mesozoic and other strata that are believed by many to have been deposited millions of years before the appearance of man. In that report we described two general locations (site 1 and site 2) near Tuba City, Arizona where such man-like prints are found together with tridactyl (three toed) dinosaur impressions, dinosaur bones, and other fossils. We published photographs of marks in the rocks resembling the prints of human hands and feet. In this present paper we are publishing the details of observations made at sites 1 and 2 near Tuba City, Arizona on several field trips.

In this paper we describe and evaluate possible man tracks, possible mammal tracks, and dinosaur tracks. We designate alleged man tracks as "quasihumanoid ichnofossils" since this neutral term conveys the proper degree of objectivity and even uncertainty involved in trying to deal with marks and imprints in rocks. For purposes of literary variety, however, we will refer to them alternately as footprints, impressions, humanoid imprints, humanoid tracks, or man tracks. Thus we have labeled our study localities as "humanoid site 1" (H1), "humanoid site 2" (H2), etc. These alternate references are not to be taken as implying positive identification but only as referring to appearance. All such marks are to be understood to be quasihuman ichnofossils—rock marks that are being evaluated as regards their proper origin.

We are grateful to the Motion Picture Office of the Navajo Nation for granting us photographic permit No. 001047, and to the Navajo Nation Minerals Department for granting us the field trip permit. Any persons proposing to conduct geological, paleontological or related investigations on the Navajo Reservation must first apply for and receive a permit from the Navajo Nation Mineral Department, P.O. Box 146, Window Rock, Arizona 86515. The permit application fee of $100.00, a map detailing the area of investigation and a description of all proposed activities is required for processing the application.

*P. O. Rosnau, B.A., is a minister in the Lutheran Church-Missouri Synod. He receives mail at 14927 Amar Rd., La Puente, CA 91744.

**J. Auldaney, A.A. is an experienced paleontological researcher and lecturer who has visited many fossil sites. He is President of the Bible-Science Association of Riverside and is a member of the Southern California Paleontological Society. He receives mail at 10926 Hole, Riverside, CA 92505.

***G. F. Howe, Ph.D., is Director of the Creation Research Grand Canyon Experiment Station, Paulden, AZ. He receives mail at 24635 Apple St., Santa Clarita, CA 91321.

***W. Waisgerber, M.S., is a consulting geologist. He receives mail at P.O. Box 1115, Mt. Shasta, CA 96067.

Methods and Field Observations

Humanoid Studies and Mapping Methods

Three field trips in 1987 and one in 1989 were made in order to observe and map possible foottracks and fossils at study sites near Tuba City, Arizona. See Rosnau *et al.* (1989) for a discussion of the geology of this general area. In that paper we discussed stratigraphy and concluded that all our study sites were in the Kayenta formation which is generally accepted as having been formed during the Mesozoic Era of historical geology. It lies beneath the Navajo Sandstone and above the Moenave Formation, all of which are part of the Glen Canyon Group.

Many of the track-like impressions found in humanoid study areas H1 through H7 are tabulated (Tables I-VI) and mapped (Figures 1, 5, 11, 14, 17, 18 and 23). Humanoid track areas H1, H2, and H3 are located at site 1 while H4 through H7 are at site 2. Size and certain other track data are found in Tables I-VI while further details about tracks appear in the respective figure captions.

Maps were prepared by magnetic compass and metric tape traverses. Azimuths were not corrected for true north. Details within each map were also prepared using magnetic compass and metric tape traverses. Closeup photographs and photographs of small areas accompany this report in many figures. A number of photographs labeled "n.p." within the tables were not used herein because of space limitations. These are available to other researchers upon request.

In addition to these possible humanoid impressions in areas H5 through H7, Rosnau discovered a four-toed track exhibiting a well delineated human-like outline (Figure 28). This natural ichnofeature is about 180 m northerly of H1. The four-toed impression is considered along with other humanoid tracks. It was a solitary print located in whitish limey sandstone in an area surrounded by red sand.

Other variable-sized and variable-shaped impressions are associated with the dinosaur and humanoid

Table I. Area H1. Use this table in conjunction with map in Figure 1. Area H1 is 100 m from the Navajo jewelry structures on a line 45° west of south. A possible dinosaur track (Figure 37) is 12.4 m on a line 70° west of north from track 3 of H1. Another dinosaur track (see Figure 38) is 9.7 m on a line 28° west of south the aforementioned dinosaur track. One of our 3 X 3 quadrats was in H1 and included 4 tracks. The symbol "n.p." under the "Figure Number(s)" column signified that we have a photograph of that print but did not publish it.

Imprint Number	Size (cm) [length X width of ball]		Figure Number
1	29 x 14	This right foot together with track 3 was in our quadrat study. They appear to be two right feet in stride. A circle of rocks has been maintained around tracks 1, 3, and 7. To make an easy stride, one must assume that either 1 or 3 footprints are missing between these two rights as the distance between 1 and 3 is 2.2 m.	2
2	19.5 x 12	Not shown on Figure 1. Two items were here. They were about 4 m on a line 45° west of south from prints 1 and 3. The two slabs were side by side, about 15 cm apart. See Figures 1 and 2, Rosnau *et al.* (1989). Loose prints here of one hand and one foot on top of a hand.	
3	29 x 16	Right foot. See comments for track 1.	3
4	27 x 10	Small right foot skid track which fits a 12 year old child's foot as tracks 5 and 6 also do. The distance between tracks 4 and 5 is 39 cm.	n.p.
5	25 x 10	Second small skid track. Near track 5 are some non-track marks.	n.p.
6	21 x 12	A spot where a double left foot-track was present. See Figure 5 and 6 of Rosnau *et al.* (1989).	
7	——	The location of an unidentified three-toed skidding track, possibly of a dinosaur (34 X 23 cm) that was removed sometime between June and December of 1986. Stone circle around track still remained.	39
8	29 x 13	Track is loose and cracked.	n.p.
9	30 x 10	Looks like a barefoot human track that skidded. Together with track 10 it may form a u-turn series. The distance between tracks 9 and 10 is 66 cm.	4
10	22 x 11	Another skid track possible showing toes.	4

3m quadrats. As an experiment these quadrats were analyzed for every possible shaped impression to determine if the humanoid shapes were produced only by random non-human means. One quadrat each was located at the following humanoid track sites: H1, H2, H4, H5 and H6. The quadrats combined represent a total of 45 square meters of special study, within which there were the following 137 distinct sandstone impressions:

32 were humanoid (including one possible knee and one possible hand print)
35 were jagged or irregular,
18 were oblong,
11 were like tiny human feet,
10 were heel-like,
9 were "U" shaped or "C" shaped,
6 were pockmarked bodies,
4 were peanut-shaped or bean shaped,
3 were triangular,
3 were circular,
2 was club-shaped,
1 resembled a duck's foot,
1 was rectangular
1 was trapezoidal, and
1 was diamond shaped.

Out of the 137 total marks on these quadrats, 22% (30 in all) were shaped like a human foot.

Dinosaur Tracks

Principal dinosaur track areas at site 1 are designated D1, D2 and D3. Other possible dinosaur tracks are within site 2, near humanoid areas H4 through H7. The D1 dinosaur area lies westerly and northwesterly of the Navajo sales structures which are themselves west of the public gravel road—see Rosnau *et al.* (1989). D3 is reached by traveling 0.25 miles northerly on the

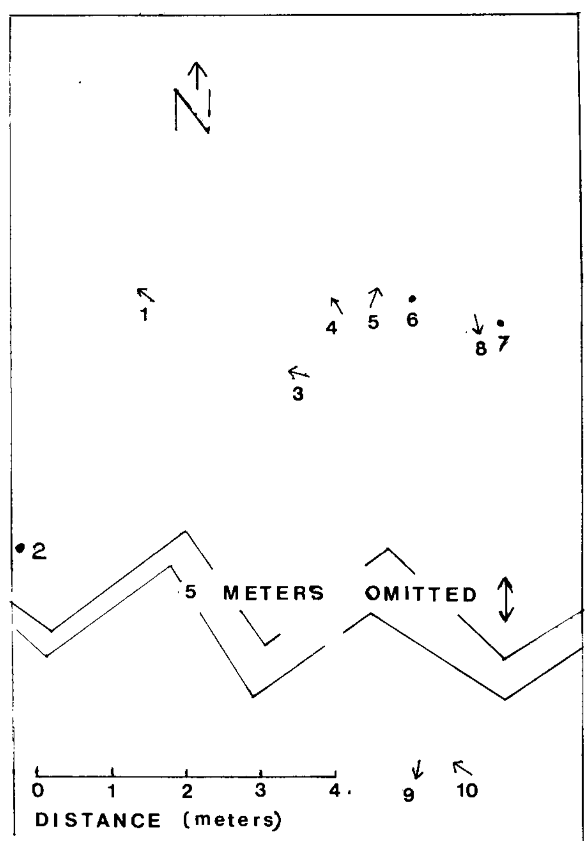

Figure 1. Map of H-l. Use in conjunction with Table I.

Table II. Area H2. The data of this table correspond to the map in Figure 5. Area H2 lies 47 m from H1 on a line 46° east of south. Lying 21 m between H1 and H2 (not shown on either map) are 2 track-like depressions. Also not shown on the maps, 16 m on line from H1 and H2 was an impression resembling a hammer (see Figure 6). One of our 3 X 3 quadrats containing 5 tracks was in H2.

Imprint Number	Size (cm) [length X width of hall]	Comments	Figure Number
11	30 X 13	Numbers 11 through 14 form a trail of right, left, right, left respectively. The trail heads in the direction of 60° west of north while some of the tracks point about 20° west of north, as shown. From track 11 to 12 is 47 cm.	7
12	20 x 12	The distance from 12 to 13 is 32 cm. Track 12 has a very deep heel.	7
13	30 x --	The distance from track 13 to 14 is 26 cm.	7
14	30 x 12	——	7
15	23 X 10	This is a rather clear print.	8
16	35 x 15	This impression with a fish-like shape could be a sliding human track.	n.p.
17	35 X 15 & -- x 18	Two large tracks pointed 16° west of north.	
18	—	Overarched area over one track where rock actually arches up over the track—perhaps indicating the erosional character of some impressions.	9
19	29 x 13	Possible barefoot print	10

gravel road beyond the sales structures and then walking due west about 92 m.

All positively identified dinosaur tracks are tridactyl forms like those shown in Figures 30, 31 and 32. While some of the dinosaur tracks reveal a clearly visible claw mark (Figures 33 and 34), other similar tracks appear not clawed, as in Figure 30. At D1 there are at least 300 dinosaur prints, closely spaced. Most are randomly oriented but there are a few elongated dinosaur trackways at Dl and site 2. D1 is the largest dinosaur track site presently known in the Kayenta. Also at D1 there is another, less common, tridactyl track with much narrower digits—see Figure 35. Only one of the narrow digit tracks was seen and photographed at D1. Humanoid tracks were not discovered at D1 but are about 120 m south, at H1. Within D1, there are other impressions in rock, one of which resembled the pad of a large cat. This cat-like impression, which has disappeared, was on a loose rock, along the border of a footpath.

Within D3, 14 broad-toed, tridactyl dinosaur tracks appear on limey sandstone slabs. The slabs are north of a shallow, westerly descending gully. Eight of the tracks were measured. Average length of the center toe is 29 ± 2.2cm (± standard deviation, n = 8). Average length of side toe is 22 ± 1.6 cm (n = 8). Average width of track is 24 ± 2.4 cm (n = 8). These data compare closely with Welles' measurements at these same sites (1971, pp. 24-25).

D2 is about 10 m from H1 and includes only two putative dinosaur prints (Figures 37 and 38). Explicit directions to D2 are given in the caption of Table I. The two D2 possible dinosaur prints are of interest because they are located near quasihuman ichnofossils within H1. At H1 several years ago there was an imprint in stone which appeared to be a skidding or elongated dinosaur track (Figure 39). The print was near the man tracks and was also marked by a circle of float rocks. Before the 1987 studies. were undertaken, the print-bearing rock slab had disappeared.

There are several possible dinosaur prints at site 2 near H4, H5, H6, and H7. Two are large 30 cm tridactyl tracks with toes that are thicker and broader than any of the tracks at D1 or D3. Also at site 2 there are 3 similar but smaller possible dinosaur tracks—see Figures 45 and 46. The large tracks are not clawed (see Figure 40 with directions on caption of Table VI). Also there are possible dinosaur tracks which are somewhat circular in shape (Figures 41 and 42).

Rosnau and a Navajo guide, F. Sellers, located a trail of 25-30 quadruped tracks (Figure 43). These were seen along the southerly side of a 15 meter wide, tributary valley to Moenkopi Wash. The tracks were indicative of quadrupeds. Associated with the quadruped sequence were clear, positively identified dinosaur tracks of the more narrow toed variety, *Kayentapus hopii*, believed to be made by dinosaurs of the genus *Coelophysis* (Figure 44, front arrow.) Rosnau recorded the site as being 1830 m southwest of site 2. These tracks are identical to Grallator (track name) tracks commonly found in similar strata in the Connecticut Valley, Massachusetts.

Possible Mammal Tracks

Within site 2 imprints in rocks clearly resemble the cloven hoof print of a mammal—see Figure 47. These prints compare favorably with tracks of modern domestic or bighorn sheep, to be seen in loose sands nearby—see Figure 48.

Table III. Area H3, located by Auldaney near site 1. See Figure 11 for a map of this area. H3 is about 1.8 km from H1 and H2. Specific details of the location for H3 will be mailed to qualified researchers who write requesting directions.

Imprint Number	Size (cm) [length X width of ball]	Comments	Figure Number
20	28 x 12	Could be a footprint. There is also a human-like left footprint on float rock 0.5 m S of #20.	12
21	25 X 10 26 X 10	Two tracks overprint each other here. Could be erosion marks.	—
22	20 x 5	A right and a left track near each other, pointing in opposite directions.	—
23	27 X 11 20 x 10	Two tracks are near each other here.	—
24	27 X 10	There is a pock-marked left foot track here. Might have formed by erosion.	n.p.
25	26 X 13	There are two tracks pointing over each other here.	13

Table IV. Area H4. Use in conjunction with map on Figure 14. Areas H4 to H7 are located at site 2, about 1.8 km from site 1. Qualified workers may write to learn the exact location of these areas. One of our 3 X 3 m quadrats was at H4. It contained 8 possible man tracks as well as a possible knee and human hand print. The distance from H4 to the trail at H5 (Figure 17) is 13.5 m 85° W of S from print 26.

Imprint Number	Size (cm) [length X width of ball]	Comments	Figure Number
26	25 x 10	There is a double print here, 2 feet next to each other, of sandal or nondescript shape.	15
27	36 x 11	This adult left track could be in a series with track 34 with two tracks missing in between.	-
28	20 x -	Possible child's track here.	
29		Only the heel of this track shows, the ball is covered by rock.	n.p.
30	27 x 10	Adult track is here.	
31	22 x 8	This child's track near possible knee (32) and hand (33) prints may be a place where someone slipped. There are other footprints near print 31, some much larger. One is a sandal-like impression 1.3 m 30° W of S from 31.	16 (Cover)
32	8	This may be a knee print involved in a fall. The distance from 32 to 33 is 33 cm.	n.p.
33		Possible hand print involved as someone fell.	n.p.
34	32 x 10	Large adult track here.	
35	26 x -	Possible right foot track here.	-
36	27 x 12	Barefoot print here.	n.p.

Areas of Concretions

Waisgerber located concretion-bearing sandstones. One site is about 67 m west southwest of H2. The concretions are varied in size and shape. Some resemble a human foot as seen in Figure 29. The base of the sandstone which envelops the concretion often resembles a quasihuman ichnofossil. Another concretionary sandstone stratum exists about 300 m east of site 2. Such concretions exist in part because of localized calcitic cementation of sand grains within the sandstone stratum. Coarse grained sandstones are often permeable and water flowing through can introduce such cementing agents as calcium carbonate or silicon dioxide. Concretions form within sandstones over time when the cementing agent (most often calcium carbonate) is deposited interstitially surrounding a central core. The resultant concretions tend to be more resistant to erosion than enclosing uncemented sands. Hence concretions tend to remain while less cemented parts are removed by processes of erosion.

Fossil Clams

During the four trips Auldaney located mollusc-bearing strata which are overlying the dinosaur track layer. Those found on the second trip are shown in Figures 49 and 50. The clams were found within eroded strata which are respectively about 30 m (C1) and 92 m (C2) east of the gravel road from the previously mentioned Navajo sales structures. In situ clams at these locations vary in size from about 1.5 cm x 1 cm to 6.5 cm x 1.75 cm. The clams are found in a pale green and reddish bentonitic sandstone and are internal casts.

These Pelecypods are also found within a greenish conglomeritic sandstone located about 19 m northeasterly of an intersection of two footpaths next to D1. The sandstone at this location (C3) is in a mound-like plateau the top of which is nearly 1.5 m higher than the

Table V. Area H6. Use in conjunction with Figure 18. H6 lies 55 m along a line 70° west of north from H4. The distance from a nearby limestone ledge of eroded back overlying strata to H6 is 6.5 m on a line 56° east of south. About 24 m northwest of track 39 is a large track (46 X 22 cm) not listed here or on Figure 18, see Figure 19. One of our 3 X 3 m quadrats was at H6 and contained 7 human-like foot impressions.

Imprint Number	Size (cm) [length X width of ball]	Comments	Figure Number(s)
37	29 x 12 29 x 12	Two prints occur here side by side.	-
38	28 x 13	Here is a left footprint.	
39	31 x 13	This is the best single print located in this entire study. A right foot which has the clear appearance of a sandal print with a heel, it was located by Rosnau and we call it the "classic" track. A photograph of this "classic track" appears in our earlier paper, Figure 13, Rosnau *et al.* (1989).	20, 21
40	31 x 13	West of 39 is a similar light left foot track with a clear heel, similar to 39 and in a natural standing angle to it. Located by Auldaney, track 40 is 49 cm from the classic track, a a line 45° west of north. The ball of 40 is less clear than its heel.	20
41	21 x 7	A child's or woman's foot track is found here. Imprint 46 may have been made by the same individual.	21
42	26 x -	Three sandal prints are located here near each other. These have sharp shoe-shaped lines.	22
43	23 x 12	At this spot is a single print of a right sandal.	-
44	29 x 13	This might be a right foot, paired with 45.	-
45	29 x 12	This is an adult track, possibly a left.	-
46	19 x 6	This is another child-size print almost identical to impression 41.	-
47		This is the possible print of the ball of the foot, maybe in stride with 48.	-
48	29 X 13	This is another print resembling the classic, number 39. On this mound are several other unmapped but temptingly foot-shaped impressions.	-

Table VI. Area H7. See Figure 23 for map of H7 which is located 57 m from H6 on a line 75° west of south. 49.4 m along that line from H6 to H7 and 1 m north of the line at that point is a large dinosaur track—see Figure 46. H7 contains a possible trail that starts in the south and points 12° west of north, having an overall trail length of 1.7 m, from print 49 to print 52. Auldaney noted that there were two other tracks before imprint 49. One of these was a ball of a foot sliding left into a curved track with a mud push-up around it, appearing as if a person were picking his way in soft, slippery mud. It was 61 cm away from track 49. The other was an almost perfect barefoot track, typical of tracks made in soft mud. It has a deep heel, an arch almost level with the surface, a deep ball, and toe angle. It was 91 cm from that track to the other just discussed. If these two extra tracks are included, the trackway at area 7 contains up to 7 imprints in stride.

Imprint Number	Size (cm) [length X width of ball]	Comments	Figure Number(s)
49	23 x 9	The distance from track 49 to 50 is 50 cm. Foot points 10° west of north.	24
50		This is the ball only of a possible right foot. If so, it is strangely placed and makes an awkward stride. From track 50 to 52 is 52 cm.	24, 25
51	27 x 13	This is a left foot skid, pointing down a slight hill. A possible mud splash occurs in front of this track. From 51 to 52 is 70 cm. 51 points 55° west of north.	24, 25
52	27 x 10	Here is a right foot which points 21° west of north. From 52 to 53 is 44 cm.	24, 25
53	- x 12	Here is a possible left heel. Note other foot-like marks and marks of other shapes on the nearby landscape.	24

nearby dinosaur track layer, which continues under the mound. With these pelecypods at C3 Auldaney discovered small bone fragments and joints. In this same mound he noted tiny bones (possibly from ancient lizards), fossil teeth fragments, and a small jaw fragment (see Figure 50).

Fossil Bones and Teeth

Auldaney also found a complete jasperized fossil rib bone in two pieces in float rock. The discovery site is about 102 m from the sandstone mound described in the previous paragraph. The site can be found by traversing the terrain north and 25° east from the sandstone mound.. The site is westerly of the public gravel road shown in Figure 7, Rosnau *et al.* (1989). The rib appears similar to a rib previously collected by Auldaney at Moab, Utah—Figure 51. The rock in which the bone resides is the same rock which contains the clams and resembles the Jurassic Morrison Formation at Vernal, Utah (Dinosaur National Monument) and the rock in which Auldaney has found dinosaur bones at Moab, Utah. The rock appeared to have been broken open by someone else and then dropped on the surface of fossil ripple marks at the area described. Auldaney discovered three possible phytosaur teeth fragments in another plateau within D1. The top layer of this mound is rock like the rocks in which the other bones were found—see Figure 52. A tooth, more bone fragments, and more articulated clams were also found in the plateau north of H3, down Moenave Rd.

Discussion
Identity of Dinosaur Tracks

Figures 30 through 33 display certain dinosaur imprints within D1 and D3 that are like tracks assigned originally by Welles (1971) to *Dilophosauripus williamsi* which were the genus and species names he gave to the tracks only and not to the dinosaur that made them. Welles (1971) implied that these prints were made by a theropod (flesh eater) dinosaur, *Dilophosaurus wetherilli*, skeletons of which had been discovered near our site 1—Welles (1970, 1971). This was a carnivorous dinosaur with two crests on its head (Welles 1984). Welles has investigated tracks within D1 and has discovered actual dinosaur remains to the east of the public gravel road—Welles (1984). Tracks pictured in Welles (1971) and Lockley (1986b) are the same tracks found in D1 of this present paper.

Figure 35 displays narrow toed tracks which resemble those of the *Kayentapus hopii*, the name of tracks described by Welles (1971) and Lockley (1986b). Bones of the dinosaur that perhaps made the *K. hopii* tracks were found to the north of Moenkopi Village, miles away from site 1 of this study at an area that is believed to be higher in the stratigraphic column than our D1 locality.

In a sequence of *K. hopii* tracks discovered by Welles (1971, p. 36) the pace was twice as long as the acknowledged pace of *Dilophosauripus williamsi*. According to Welles (1971, *p.* 36), *K. hopii's* ". . . angled claws . . . are quite different from the straight ones of *Dilophosauripus* . . ." see Figures 35, 43, and 44. Welles believed that the *K. hopii* tracks were made by a species of the dinosaur genus *Coelophysis.*

Figure 2. Track 1, H1, Table I. This track could have been a right foot in stride with track 3, Table I, map Figure 1.

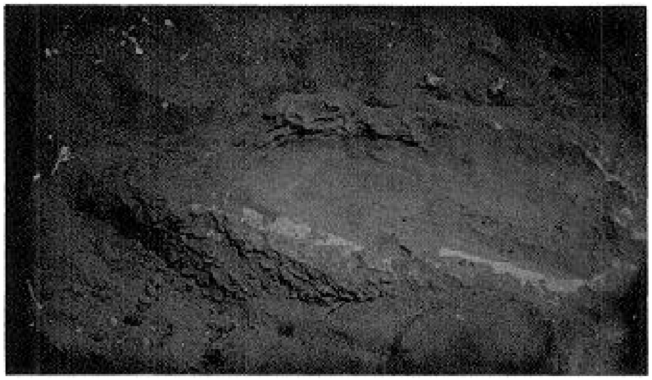

Figure 3. Track 3, H1, Table I, map Figure 1. This track could have been the impression of a right foot in stride with track 1. But it fits equally well with a left foot pointed to the right. If one will assume that there is one print missing between them, tracks 1 and 3 could be part of a trail. These tracks at H1 could have been made by two individuals as there are large and small prints in the vicinity. The clear impressions of a hand and feet figured in our earlier paper (Figures 1-6, Rosnau, *et al.)* are located 12 m on a line southwest as shown in Table I. Stones have been placed around tracks 1 and 3 to mark them.

Lockley also argued that one of the coelurosaurs was responsible for *K. hopii* tracks (1986b, p. 14). Likewise Colbert concluded in 1970 that many of the tracks from Connecticut Valley in Massachusetts, previously assigned the name Grallator are the same as *K. hopii* and were made by a species of *Coelophysis.* Thus a coelurosaur may have produced *K. hopii* tracks (see Colbert, 1961, p. 64; Fisher, 1981, p. 6; and Fenton and Fenton, 1958, p. 331-33). Colbert noted that the tracks of coelurosaurs from Utah and Arizona are ". . . essentially similar to the one found in the eastern states" (1961, p. 191).

Colbert (1981) identified a nearly complete skeleton of a new ornithischian dinosaur, *Scutellosaurus lawleri,* of the family Ornithomimidae, similar to the duck-billed plant-eating dinosaurs. A species of *Scutellosaurus* may well have left tracks within D1 and D3. He also indicated that the tracks of *Coelophysis* are extraordinarily similar to bird tracks and were originally thought to have been made by birds (Fisher 1981, p. 7).

Within D1 certain claw prints of *Dilophosauripus* appear fresher than in other prints (see the center toe in Figure 34). It is our opinion that the claw print on some of these tracks may have been enhanced (chiseled) during recent times. Other supposed dinosaur tracks may have been manufactured also. There are very large prints outlined in chalk which are of unknown derivation (see Figure 36).

It was mentioned previously that H1 contained what appeared to be a dinosaur skid mark (see Figure 39). However, the mark does not match any of Welles' 1971 tracks. It does resemble G. Kuban's (1986) elongate tracks in the Paluxy River, Texas; but it is the only one found. At D2 one of the two possible dinosaur prints near H2 (Figure 37) may be a partly obliterated *Dilophosauripus* print. However the other print (Figure 38) has an elongated center toe somewhat like *Kayentapus hopii.*

Thick Dinosaur Prints

Figure 40 exhibits a possible large, thick-toed, 30 cm tridactyl print within humanoid site 2. The print is one of two prints which are circular in overall outline as are prints of ornithopods, the duck-billed dinosaurs. The track is similar to that discussed by Colbert (1961, p. 192) who explains how a dinosaur print about the size of the track in Figure 40 correlates nicely with foot bones of a hadrosaurian dinosaur. Other possibilities for the possible footprints shown in Figure 40 would be that of a species of *Camptosaur* — see Lockley (1986b, p. 33).

At a site in the Purgatory River, Colorado, there is every fossil found at our sites plus tracks like these identified as *Camptosaurus.* The tracks might also be an *Ammosaur,* as fossil bones of these dinosaurs that stood on their hind legs are known from similar strata in Connecticut and Arizona. Or the marks may be fortuitous nodules.

Circular Marks

The circular impressions at site 2 (Figures 41 and 42) are about the size that immature sauropod dinosaurs would make. Some (Figure 41) are nearly round while others (Figure 42) display a single blister-shaped toe. According to Fenton and Fenton (1958, p. 338) sauropods at the Paluxy River bore no claws on their forefeet and *Camarasawus* had only one toe on its forefoot (p. 334). The hind feet of sauropods, on the other hand, bore 3 or 4 claws (Lockley 1986b, p. 45), unlike the circular tracks under discussion. Thus it would be premature to consider our finds a new record—sauropods in the kayenta. We invite the views of others. The presence of toe-like marks on some of the round impressions is evidence against formation by volcanic gas escaping from below the earth or by some other means such as concretion. To raise yet another possibility, these prints look like ground-sloth tracks in Pliocene strata illustrated by Mossman and Sarjeant (1983, p. 82). Such a suggestion is at odds with the view that sloths had not yet evolved in Mesozoic time.

Site 2 contains many round craters of various sizes and having pushed up edges. While theories of origin for the larger circular marks range from sauropods to sloths, many of these marks are unlike quasihuman ichnofossils or dinosaur tracks in that they do not follow a pattern. Therefore it is likely that most, or perhaps all, of these circular prints at site 2 are merely bentonite nodules. They may have been caused by volcanic gas bubbling up through soft strata.

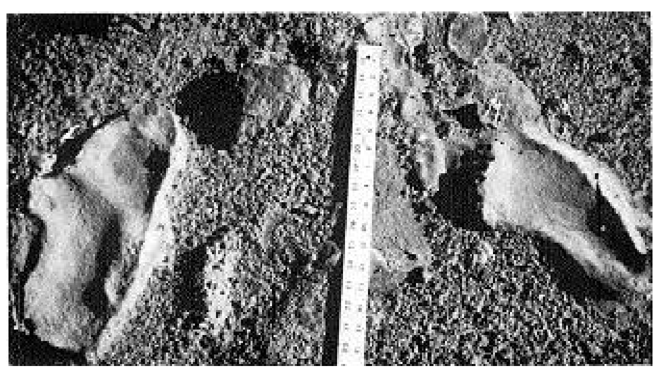

Figure 4. Tracks 9 and 19, H1, Table I, Figure 1. These footlike impressions suggest a U-turn in which the left foot made the track at the right (10) and then turning, the individual made a sliding right print (see left track). Track 9 shows possible overprinting of one track upon another, a phenomenon discussed in the literature.

Small Dinosaur Tracks

Small possible tridactyl prints can be seen in Figures 44, 45 and 46, within humanoid site 2. These may be the track of species *Hopiichnus shingi.* These 5 cm impressions may have been made by a plant-eating ornithopod, perhaps a young camptosaur of the species that made the two large tracks, Figure 40. Tracks in Figure 43, south of site 2 appear to have quadruped related features. We have been unable to identify them beyond this general description, since the tracks have been covered by a mudslide. The bipedal 15 cm tracks crossing them are positively identified as *Kayentapus hopii,* made by a species of coelurosaur.

Identity of Mollusc Fossils

Pelecypods observed within C1, C2 and C3 are a species of freshwater bivalve *Unio complanatus* representatives of which still live in lakes and streams in North America. Fossil *Unio* clams have been found in close association with *Coelophysis* remains—Fisher (1981, p. 11) and with phytosaurs.

Fenton and Fenton also reported species of *Unio* clams from late Jurassic strata in Pennsylvania, Massachusetts, and the American Southwest (1958, p. 176). Fenton and Fenton believed that members of *Unio* could be traced as far back as late Jurassic times.

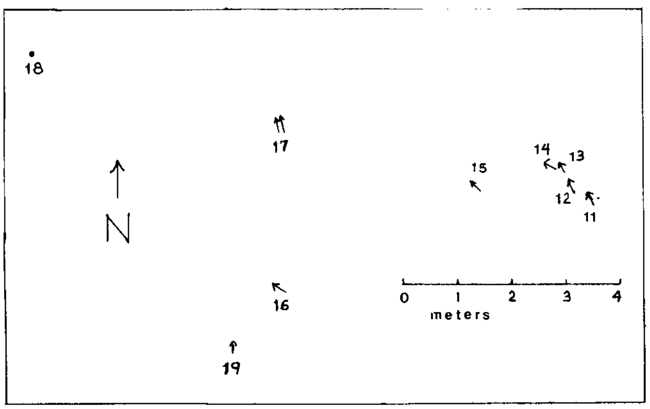

Figure 5. Map of H2. Use in conjunction with Table II

However, Moore, Lalicker and Fischer (1952, p. 429) indicated that these clams are found in strata from Triassic to Recent. *Unio* is but one of any number of non-evolving genera of "living fossils" which appeared suddenly in the geologic record. Species of the genus then continue to exist largely unchanged to this day.

Identity of Rib Bone, Teeth, and Other Bones

The rib bone found by Auldaney resembles the rib bone of *Machaeroprosopus adamanensis,* a phytosaur. Although smaller, it is very similar to a fossil dinosaur rib from Utah in Auldaney's collection—see Figure 51. Phytosaurs are extinct reptiles that resemble modern crocodiles (Camp, 1930, p. 88, Figure g). Camp (p. 5) lists *Machaeroprosopus* remains as being "abundant" in the lower Chinle. At Tanner Crossing, near Cameron, Arizona, a short distance south of Tuba City, Camp reports that:

> At all localities where identifiable fossils have been taken, with the exception of the fish localities at Zion Canyon and Kanab, the bones of phytosaurs constitute the greater part of the identifiable remains (1930, p. 6).

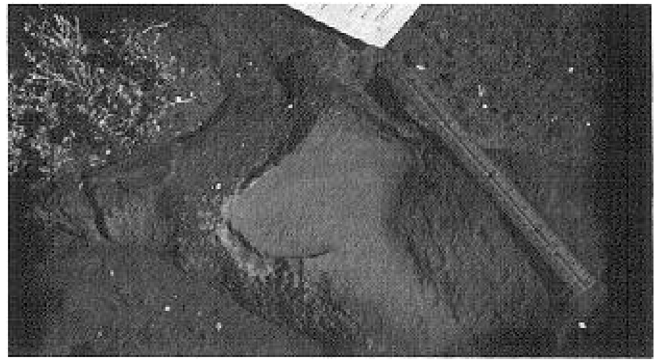

Figure 6. Hammer-shaped print. This print illustrates the fact that there are some depressions in the rock that do not resemble feet. This unmapped impression is located between H1 and H2, specific directions in caption, Table II.

Auldaney's *Machaeroprosopus* rib bone was found in the stratum containing *Unio* fossils. Biostratigraphic correspondence of the Tuba City site with the Tanner Crossing site is apparent as Camp writes that:

> Nearly everywhere these phytosaur bones are associated with large amphibians, lungfishes and the shells of the mollusc *Unio,* indicating freshwater animal habitats of considerable uniformity throughout the region, and possibly similar climatic conditions over a wide area (1930, p. 6).

The fragments of knife-blade like teeth found above H-3, right below the Navajo Sandstone at the top of the mesa, cannot be firmly identified at the time of this writing. According to Auldaney the following possibilities exist in this order: amphibian, phytosaur, or dinosaur. The small bones discovered by Auldaney at C3 were confirmed by a San Bernardino County Museum paleontologist as fossil lizard bones. The round teeth found in the mound at D1 resemble teeth of the *Machaeroprosopus* phytosaur. Fish scales and other bones located there are still unidentified.

What About Chirotherium Tracks?

There are quadruped tracks in the geological records which are known as "Chirotherium." They were first believed to be an amphibian and later shown to be reptilian. Front foot prints of Chirotherium resemble human hand prints. A history concerning interpreta-

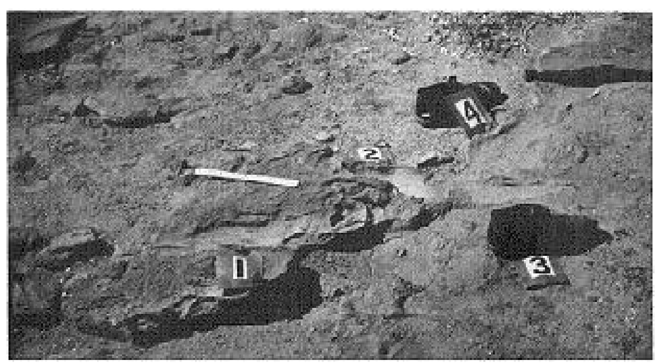

Figure 7. Trail of four tracks at H2, tracks 11, 12, 13, and 14 of Table II, map Figure 5. 1, 2, 3, and 4 of this photograph are tracks 11-14 respectively. Eleven and 13 are right feet with 12 and 14 left impressions. The pattern of movement does not fit with a normal walking stride.

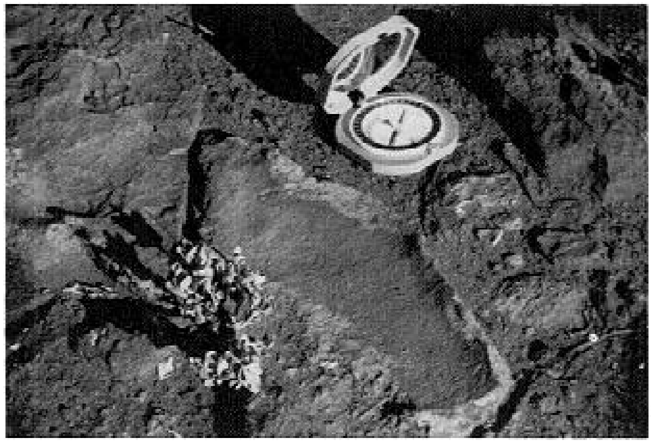

Figure 8. Track 15, H2, Table II, map Figure 5. This impression clearly resembles the print of a right shod foot.

tion of Chirotherium prints has been offered by various writers (see Peabody, 1948; Wendt, 1968; Frey, 1975 and Mossman and Sarjeant, 1983.) Some Chirotherium tracks may be phytosaur impressions. As we will note in later paragraphs, our quasihuman ichnofossils can in no way be confused with Chirotherium impressions.

The Kayenta and Catastrophism

Evolutionary paleontologists and geologists have had difficulties in placing the Kayenta Formation (1) into the geologic column and (2) into a proper ecological environment. Most believe that the Kayenta Formation was deposited during the late Triassic times. Opinions about the environment follow.

The simultaneous fossilization of dinosaurs and molluscs supports the concept of catastrophe in the Kayenta. Fisher emphasized the need for catastrophe in the formation of all such beds when he wrote: "Ideally, a relatively catastrophic death with immediate burial is necessary for fossilization to occur" (1981, p. 4). Fisher's observation is interesting because he wrote that flood-geological catastrophism is: ". . . an archaic and paleontologically implausible opinion still held by some nonscientists" (1981, p. 2). According to Fisher the late Triassic environment in which coelurosaurs like *Coelophysis* species and *Dilophosaurus* species were fossilized was one of violently alternating wet

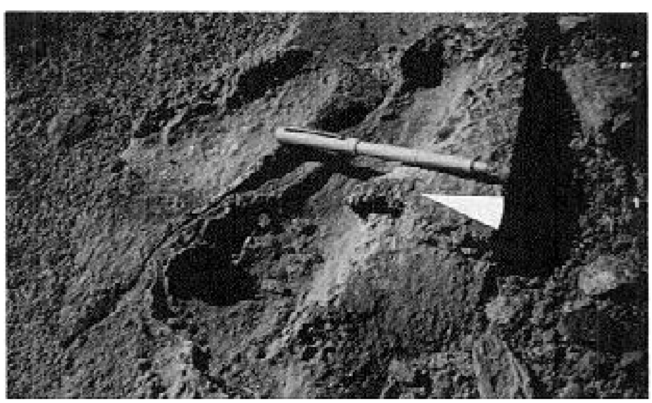

Figure 9. Track 18, H2, Table II, map Figure 5. A "track" with rock arching over it. At arrow below pen, note the finger of surrounding rock that arches up over the track, suggesting that erosion removed the softer material, leaving a track-like mark.

and dry cycles in which torrential rains alternated with rainless periods (1981, pp. 10-12). On page 11 he further suggested that the coelurosaurs and the phytosaurs were: ". . . the most voracious and feared Triassic predators . . ." Fisher also envisions the late Triassic world of *Coelophysis* species as having: ". . . frequent earthquakes, dislocating faults, and outpourings of lava . . ." (1981, p. 17).

According to Colbert coelurosaurs like *Kilophosaurus* species were carnivorous dinosaurs walking across drying mud flats (1961, p. 191). Concerning the role of catastrophe in producing *Coelophysis* fossils at a site near the village of Abiquiu, New Mexico, consider Colbert's description (1961, p. 61) and its catastrophic implications:

> They were found in the greatest profusion, piled one on top of another, with heads and tails and feet and legs often inextricably mixed in a jack-straw puzzle of bones. Some of the skeletons are absolutely complete, down to the tiniest bones and must rate as among the most perfect dinosaur skeletons ever discovered. They represent a range of ages, from very small animals to those obviously fully adult. All this rich material, coming from a single quarry that was perhaps thirty feet square, certainly indicates the remains of animals belonging to a single species that may have been overwhelmed by some local catastrophe and buried together . . .

Figure 10. Track 19, H2, Table II, map Figure 13. Possible barefoot right print. Note great toe mark and ridge separating great toe from other toes. Having both raised margins and the marks, this track satisfies 5 out of the 7 criteria supporting the belief that it was made by a human.

Colbert states further on that same page that the great number of perfect skeletons suggests some: ". . . unusual mode of death and burial for these little dinosaurs." Fisher concurred that fossil density may have resulted from: ". . . a panic situation in which a frightened horde experienced entrapment in a quagmire, or quicksand and perished" (1981, p. 7). These observations and those listed below support the belief that the Kayenta strata did not form in a placid ecological zone from a geological time period but were the results of a monumental catastrophic upheaval. These and similar evidences are found at all

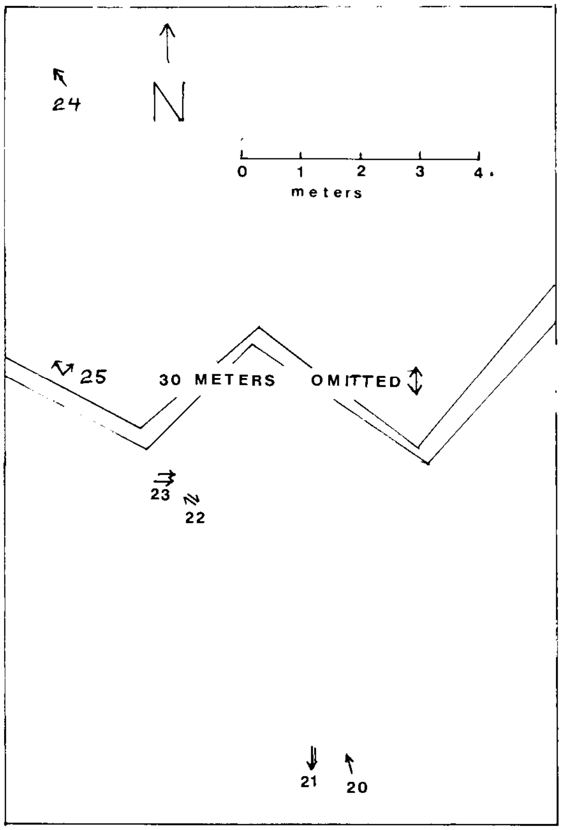

Figure 11. Map of H3. Use in conjunction with Table III.

fossil sites, in spite of the emphasis on local cataclysms implied by these quoted scientists.

Volcanic Ash and Absence of Paleoerosion Support Catastrophism

The existence of volcanic ash (bentonitic) layers within the Glen Canyon Group of Formations and within the Chinle gives rise to thoughts concerning its origin as a volcanic element during the Mesozoic Era (late Triassic to Early Jurassic). The enormity of ash deposits covering 200,000 square miles 300 to 3500 feet deep in the Chinle alone would suggest catastrophic volcanic activity in the general area. Concerning the magnitude of this process, Decker and Decker (1981, p. 116) write that:

> Some of these deposits give every indication that they were poured out of a single enormous eruption that would dwarf Krakatau. The volume in these deposits is on the order of 100 to 1000 cubic kilometers compared to 18 cubic kilometers of Krakatau . . . was prehistoric vulcanism . . . greater than now?

Because there are no internal signs of mountain ranges, badlands, or river canyons throughout a sequence of strata that is believed to have involved 70 million years of depositional history, one might ask "where are the Grand Canyons of the past?" Clark proposes that "red beds" (of which the Kayenta strata of Tuba City are a part) were formed catastrophically (1968, p. 125). Clark relates that scientists are unable to account for the origin of these massively laid red beds (p. 126).

Carnivorous Dinosaurs Predominate

At the Tuba City sites, and elsewhere at related sites. tracks of carnivorous dinosaurs predominate. Under natural conditions herbivores should be represented as the larger part of a biomass. Did the carnivores come to shore to eat animals left dead by cataclysmic tidal devastation? Fisher (1981, p. 7) makes the suggestion that a species of *Coelophysis:*

> . . . hunted on expansive mudflats, shores of lakes and rivers, selecting those creatures who became stuck-in-the-mud or were too slow to escape the accurate thrusts of its powerful flexible neck and ripping teeth.

Catastrophism

Another tribute to catastrophic activity in the formation of the Chinle strata comes from Camp, a believer in long ages and macroevolutionism (1930, p. 8) who writes that:

> Occurrences of fossil wood and bone in the Chinle are so distributed that they might be taken to indicate periods of cataclysmic extinction. From the presence of great volcanic ash deposits and the frequent occurrence of pure charcoal lumps and charcoal encrusted logs in these deposits, it would seem at first thought that the bone beds and fossil forests may have been due to sudden destruction of life by volcanic outbursts, accompanied by fire and flood.

Camp also noted that the petrified wood in nearby deposits (see Figure 11 of Rosnau *et al.*, 1989) had the bark, limbs, and twigs completely consumed possibly by fire before fossilization occurred.

Vulcanism may also have been occurring nearby while the human and dinosaur fossil prints were forming along the Paluxy River, Texas. Fields (1978, pp. 40-45) and Beierle (1979, p. 89) reported finding a charred branch fossilized in Glen Rose dolomites near the fossil tracks. This branch was given a C-14 date of 12,800 years—far too young for its assumed Mesozoic origin. The branch left bubbles in the surrounding rock as if it had been hot when fossilized—Beierle (1979, p. 89).

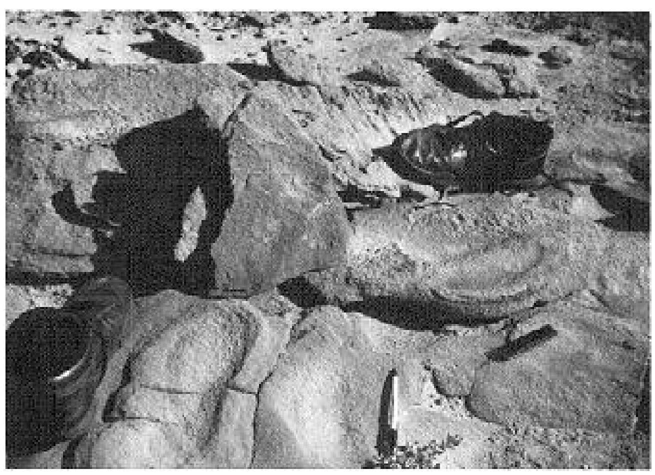

Figure 12. Track 20, H3, Table II, map Figure 11. Left foot. The print at lower left resembles a left shoe print. There are other prints on a loose rock at right.

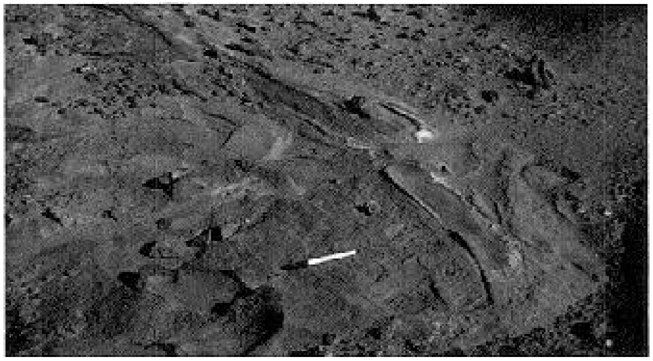

Figure 13. Track 25, H3, Table III, map Figure 11. Two tracks over each other. Here a left and right track point over each other at top of pen. The weathered limey sandstone interspersed with sand as seen here is typical of H-1, 2, and 3.

Did Men and Dinosaurs Coexist Outside of Motion Pictures?

Clark (1968, p. 120) states that:

> The Chinle consists of sandstones, shaley mudstones and conglomerates. These various types integrate. They show considerable irregularity in local bedding, as if strong streams and whirling waters had dumped their loads into bodies of water. This 'delta' bedding is true also of the Moenkopi.

This catastrophic scenario of Clark's fits with the fact that the calm water *Unio* clams were somehow fossilized with their valves closed, strongly suggesting that they were buried suddenly while still alive.

In support of paleontologic orthodoxy Fisher asserts that about 200 million years elapsed between the late Triassic reign of *Coelphysis* species and the Pleistocene origin of man (1981, p. 17). He further asserts:

> . . . to correct a misconception created by the movies and television shows, the last types of living dinosaurs had vanished from the Earth more than 60 million years before paleontologically late-comer humans made their appearance.

It is obvious that Fisher's evolutionary view denies analysis of alternative theoretical scenarios. One scenario would be where *Homo sapiens* and *Coelophysis* species entertained each other, on occasion. It could be that Hollywood is right, after all.

Catastrophism and Human Tracks

Elements of catastrophism during Kayenta Formation depositional times thus cannot be denied, even by the most orthodox of evolutionists. Catastrophism may well have been global in its outreach in the not so distant past. If *Homo sapiens* were present in such violent surrounding (fires, floods, earthquakes and volcanics, according to Camp) one should expect to find evidence of random tracks, reversals in direction, and the making of abrupt turns as observed at first glance at H1 and H2. One would also expect the mature and immature to congregate as for example at site 2.

A Scenario for Site 1 and Site 2 Origin

At sites 1, 2, and vicinity volcanic ash may have fallen from the sky to mix with existing flooded streams on broad floodplains. Ash could have been washed into the sediments by contemporaneous overflowing rains as volcanism is usually attended by rains. Altered volcanic ash (bentonitic clay) is found surrounding the previously described freshwater molluscs, *Unio* species which likely came from overflowing lakes.

Living organisms could have experienced a catastrophic demise from drowning, ashfall, and poisonous volcanic gases while their footprints were instantly preserved. Sudden extinction of life forms by volcanism is part of the recorded history of man.

Criteria for Evaluating Quasihuman Ichnofossils

Fossil prints cannot be designated as human or nonhuman by first hand witness. However, criteria can be established by which to compare fossil prints with modem human tracks. The more abundant the relationship between a fossil print and established criteria, e.g. repeated tracks and clear trackways, the more likely it is that the print is authentic. Nevertheless all conclusions must remain tentative as footprint derivation is never a settled question.

What follows is a list of characteristics suggested for use in ichnofossil studies:

1. The fossil print is within the *size* range of the foot of modern man.
2. The print is *shaped* like a modern footprint.

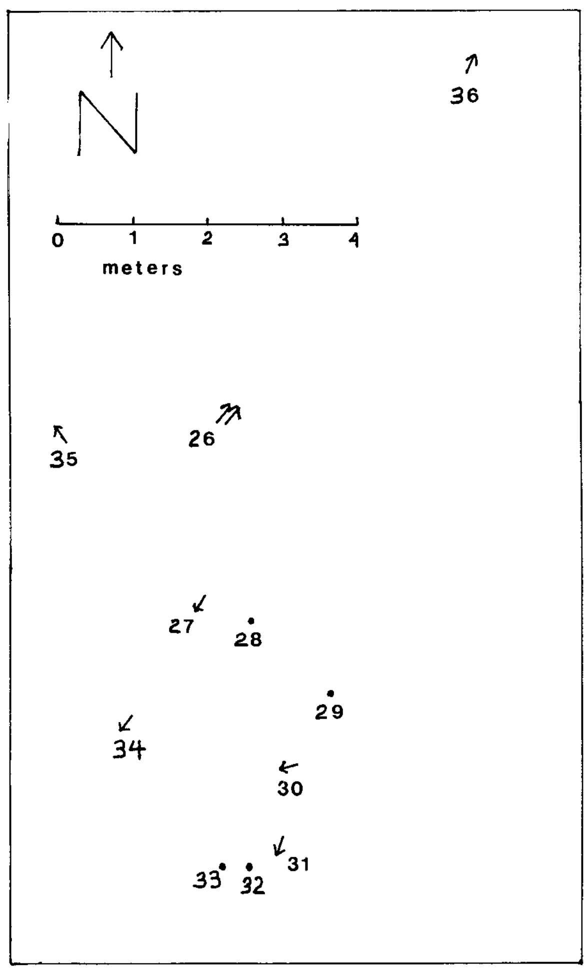

Figure 14. Map of H4. Use in conjunction with Table III.

3. The print is one of *many* of similar size and shape.
4. The print is part of a *trail* or series of tracks which suggest a natural human gait or stride.
5. The print manifests some *internal detail* suggestive of human toes or shoe marks.
6. The print is *bordered* by *mud* which was squeezed out from under it as it was formed.
7. Fossil human *bones* and / or *artifacts* are known to exist within the same formation as the print.

Other criteria affecting track quality would include the nature of the sediments themselves. The more plastic the sediments the more readily that a print will be created. Also the more plastic the original sediments, the more likely that the sediments will resist future obliteration of prints. If a particular imprint compares satisfactorily with the first of these criteria or the first and second, the print should not necessarily be considered as authentic. Spalling, concretions, and erosion are factors which can produce features which resemble the human foot (Rusch, 1971, and Howe, 1982). Concretions near site 1 and site 2 (Figure 29) equate readily with the first criterion and with the second.

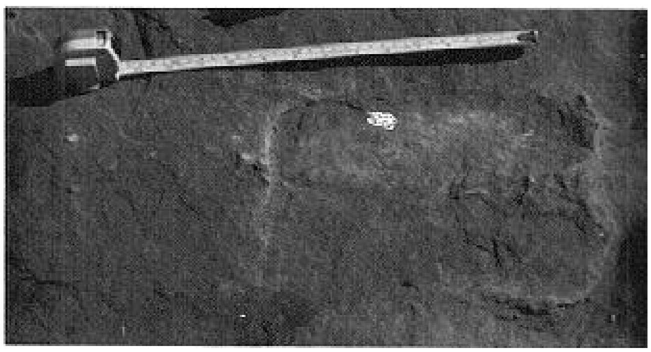

Figure 15. Track 26, H4, Table IV, map Figure 11. In this double print the shapes are parallel and footlike but lacking in detail.

Figure 16. Cover photograph.

If a print satisfies between three and seven of these criteria, the likelihood for human origination becomes progressively stronger, especially if toe prints exist. The existence of criterion 7 (proximity of human bones or artifacts) puts demands on an investigator to consider the *probability* that the marks are human-made prints provided that other conditions exist which are conducive to the making and preservation of such prints.

Evaluating Arizona Humanoid Ichnofossils in Terms of Criteria 1 and 2—Size and Shape

Many of the impressions mapped in this paper fit criteria 1 and 2. Such impressions attracted the attention of Cummings, Rosnau and L. Austin, originally. Some of the prints appeared to have been made by the left foot or the right foot—see Figures 2, 10, 19, 20, 24 (Track 51 and 26). In the same study areas impressions were seen which roughly resembled a hammer (Figure 6), a fish (Track 16), or a tiny human foot. These little feet suggest that a variety of shapes can exist as a result of natural causes in sedimentary strata other than human origin.

Figure 17. H5. Auldaney stands here with his left and right feet near steps 1 and 2 respectively of a 4-step trail, H5. Arrows from left to right designate the 4 tracks in reasonably comfortable stride. This trail is 13.5 m along a line that is 73° west of north from print 26, H-4. While the prints themselves lack definition, the trail is one of the best trails observed in our study. At the lower right-hand corner of this photo is the first foot (a left) of the series. It is 20 x 9 cm, pointing 22° east of south. The distance from track 1 to track 2 is 23 cm. Track 2, a right shoe, is 30 x 13 cm and points 22° east of south. There are 48 cm from track 2 to track 3. The third track presumably a left foot seen near bottle, is 26 x 10 cm and points 40° east of south. There are 23 cm between tracks 3 and 4, the fourth being a right which is 25 x 15 cm and points 48° east of south. The direction of the overall trail is 5° east of south, and the trail length is about 1.2 m. At H5 we laid out one of our 3 x 3 m quadrats and it contained 6 foot tracks, including the 4 shown here.

Criterion 3—Numbers of Prints

Many quasihuman ichnofossils exist within H1 and H7. Their omnipresence would tend to satisfy the third criterion. Over 60 ichnofossils were mapped and photographed here while many others were not mapped. Quasihuman imprints corresponding in size and shape to human footprints were the second most abundant of the forms on the quadrats. Thirty-two out of 137 forms are deemed possibly humanoid forms.

Our special study quadrats yield numbers of humanoid prints because they were chosen to include areas with numbers of such prints. Quasihuman marks are ubiquitous, however, throughout Kayenta formation strata. One cannot help but ask the following question: With so many human-like impressions about, what is the likelihood that *all* humanoid prints here were created by inorganic means? On the other hand, it must be emphasized that concretions (some of them foot-shaped) are also numerous—(see Figure 29). Likewise, in Figure 9 there is a finger-like arch over a track. The arch appears to be the derivative of natural erosion processes.

Within the special study quadrats mentioned earlier, 11 of the 137 forms in the special studies quadrats resemble small human feet and seem to arise from non-human creation. Thus numbers themselves are not conclusive. These small impressions support the belief that nodules and erosion can form small footlike shapes, leaving one to wonder how many of the larger footlike impressions could have arisen that way too.

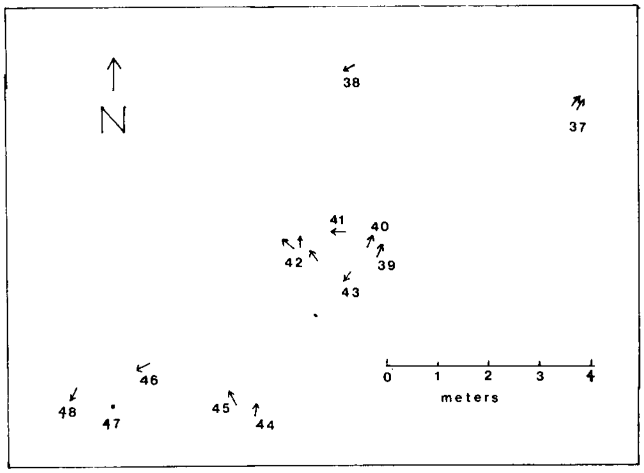

Figure 18. Map of H6. Use in conjunction with Table V.

Criterion 4—Part of a Natural Trail

Of the 60 or more tracks that were mapped in the Kayenta Formation strata near Tuba City, 22 resembled sequential tracks or standing pairs. All sequences were placed into 6 pronounced trails or pairs, the longest of which we nicknamed the "downhill trail" at H7 (see Figure 24). That trail exhibits 6 or 7 consecutive prints. Trails at H2 and H5 have yielded 4 prints each, the latter trail having a natural stride of left and right feet—see Figure 17.

The tracks at H4 are not actually classified as a "trail" as there is one footprint associated with possible knee and hand impressions—see Figure 16 and its caption for possible explanation.

But at H6 there is a sequence of two tracks, one which Rosnau discovered and we nicknamed as the "classic" track, resembling a shoe—see Figure 13 of Rosnau *et al.* (1989). The other is not an identical impression, but a mirror image of the same length, width, and shape including the heel discovered by Auldaney on the third trip—see Figure 20. It appears that a person stood here leaving two tracks. There are other "side by side" impressions at H3 which is nearby (Figure 13 double print) and at H4 (Figure 15). The latter is about 6 meters east of the classic pair and this other pair look as if they were made by a person who was standing and perhaps looking out over the Moenkopi Wash.

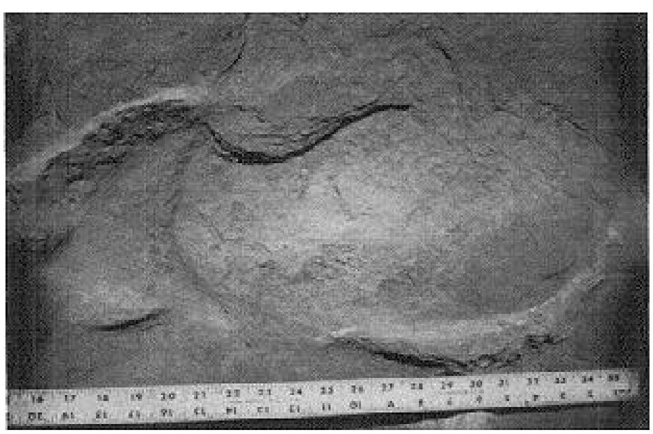

Figure 19. Large impression. See caption of Table V, H6 for description. Note raised edges and general human-like shape. (46 x 22cm).

Since our average trail length was 3.7 tracks per trail, these Tuba City trails appear shorter than the trails reported by Taylor (1973) and others in the Glen Rose Formation along the Paluxy River, in Texas. The movement pattern at H2 appears somewhat inconsistent with a normal walking stride. The most natural walking trail is within H5—Figure 17. The clearest set of two prints together is the classic set at H6, Figure 20. Auldaney tested the trail at H7 and found that it fit his stride—see Table VI, caption.

Criterion 5—Toe or Shoe Marks

Relative to criterion 5, above, a number of impressions were seen that contained toe marks and / or shoe marks—Figures 10, 19, 20, 26, 28 here and Figures 1, 3, 5 and 6 of Rosnau (1989). Of these quasihuman tracks showing detail, only the "classic" print previously referenced in Rosnau 1989 is also part of a presumed pair of two prints—see Figure 20. As noted above, in slanting rays of the sun, these two impressions look like they were made by a shod human. There is a big toe impression in imprint 51 of the trackway seen in Figures 24 and 25.

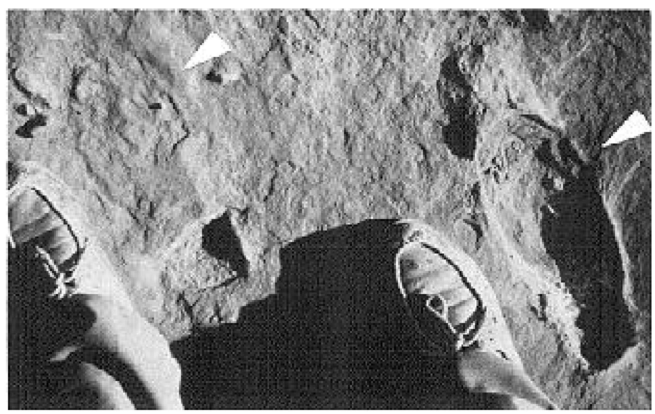

Figure 20. Tracks 39 and 40, Table V, H6, map Figure 18. Classic sandal track and light track in standing stride. The classic track (right arrow) appears in stride with a very light print (left arrow). At first we thought the track at left was a heel only, pointing toward the toe of track on right. But Auldaney discovered and photographed the faint track as seen here on the left.

Another factor in support of the authentic human origin of this classic pair of prints is the fact that near them are are several footlike impressions (see Figures 18, 19, 20, 21 and Table V). These include what appear to be numerous smaller prints, two of which are the same size as the classic pair, and another which is a larger footlike impression. The small track-like impression in Figure 21 is a 20 cm long print. Four and one-half m away, headed in the same direction is another identical impression.

The large track west of area H1 seen in Figure 28 also appears strikingly human. It offers a tapered toe line, rounded toe tops, and a prominent great toe. This four-toed track near D1 and H1 displays the tapered progression of human right foot toes, the most forward toe being on the left, unlike dinosaurs. The toes are close together, like those of a human foot, not separated as with dinosaur tracks.

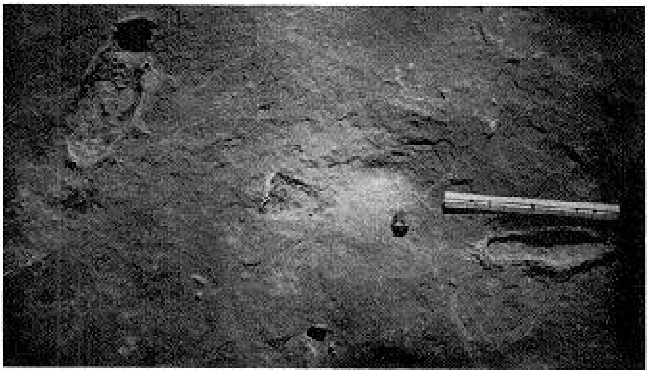

Figure 21. Track 41, Table V, H6, map Figure 18. A child's track in lower right corner below ruler. Note the "classic" track visible in upper left.

Tracks of five-toed reptiles, dubbed "Chirotheria," do not match this four-toed track of Figure 28 or any of our humanoid tracks. The former are sharply clawed, have bulbous joints, and the toes are widely separated, so they are quite different from our objects of discussion and they resemble hands, not feet, as their name Cherotherium means "hand creature." Frey (1975, p. 301) displays a good photograph of a "Chirotherium" track for comparison.

In summary, our quasihuman ichnofossils 19, 39 and 49 (see the Tables) as well as our unmapped tracks in Figure 26 compare favorably with Baugh's published Paluxy impressions (1987) as regards detail of toes or shoes.

Criterion 6—Raised Margins

Several of the marks in this study show raised margins as per criterion 6—Figures 10, 12, 16 (cover), 19, 20, 24, 25 here and Figure 6 of Rosnau *et al.* (1989). The best examples of mud squeezed out around the print are in tracks 51 and 52 on the downhill trail—Figures 24 and 25. Many marks other than foottracks at site 2 show these raised margins—Figures 24, last arrow.

Lockley (1986a, p. 43) suggests that fossil tracks can be important indicators of "paleoslope" in that there is a "downhill sand crescent" formed below the track, if it was made on a slope. Such sand crescents are present on tracks 50-52 in the "downhill" trail, Figures 24 and 25. It may be that impressions at H7 were formed by a person walking up and down moist mounds that had recently formed and been partially eroded.

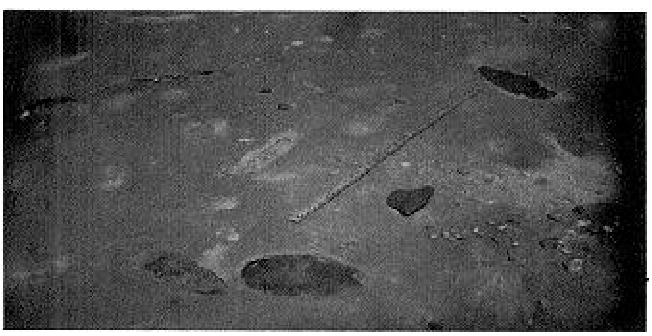

Figure 22. Track 42, Table V, H6, map Figure 18. Three sandal prints. These are among the many tracks near the classic pair, proving that the latter are not isolated from other prints.

Criterion 7—Human Remains or Artifacts

As of the date of submission of this paper, human bones or human artifacts have not been reported from the Kayenta Formation strata near Tuba City. Consequently quasihuman ichnofossils near Tuba City do not yet satisfy criterion 7.

In Summary of the Criteria

The "classic" impressions in Figure 20 (see also Figure 13 of Rosnau *et al.* —-1989) come the closest to corresponding with all the criteria listed above than any other track in our Arizona study. The classic tracks reveal what may be a heel and a sole from a sandal or boot-like foot covering. Track 39 (Figure 20) looks like the imprint of a right boot with great clarity of the heel. Some western cowboy boots have a similar concave curved bottom in front of the heel. The print is also part of a pair as noted earlier. The rim of the right print appears to be mud which was squeezed into a periphery by pressure from a human foot. Thus the "classic" prints seemingly satisfy 6 of the 7 criteria.

Marks shown in Figures 10, 26, 28 and Figure 5 of Rosnau *et* al. (1989) also appear humanoid. Each reveals apparently clear toe or foot marks. Figure 26 is a side-by-side print, the others (Figures 10, 28 and Rosnau *et al.*, 1989) are solitary prints and consequently meet only 3 or 4 of the 7 criteria enumerated, not as many as the classic pair.

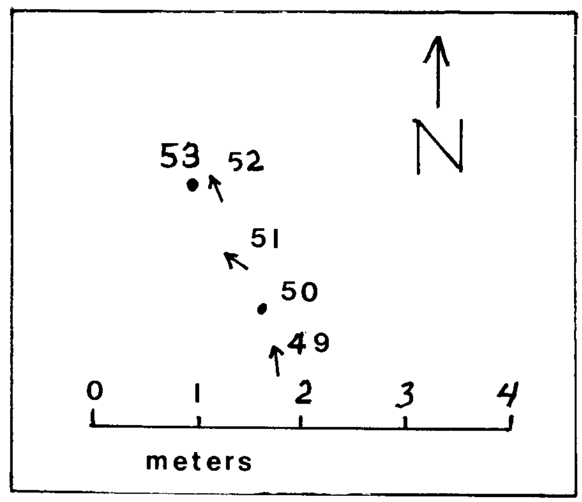

Figure 23. Map of H7. Use in conjunction with Table VI.

The best known sequence of quasihuman ichnofossils is to be found within H5 (see Figure 17) and the longest sequence of tracks (7) is at H6 (Figure 24). At H5 there are 4 consecutive prints, each of which looks like a left or a right foot imprint. The absence of toe marks and shoe marks at H5, however, results in a correspondence with only 4 of the 7 criteria.

Ichnofossils along the Paluxy River, in Texas appear now to be associated with a tooth of presumed human origin (Baugh 1987). Therefore Texas mantracks may fit criterion 7 above. Also some of Baugh's Paluxy tracks offer a great clarity of toe detail. This detail may relate to the fact that the Paluxy prints were freshly excavated while those at Tuba City have been exposed to destructive natural elements for considerable time.

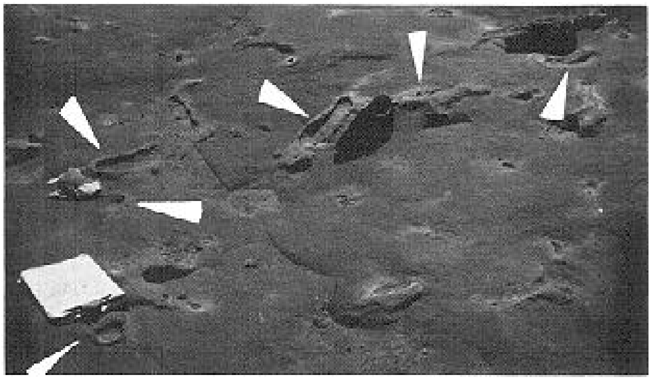

Figure 24. Tracks 49-53, Table VI, H7, map Figure 23. The downhill trail. The arrows from right to left signify tracks 49, 50, 51, 53 and 52 respectively. The final arrow, lower left, points to one of the many pockmarks with ridges around them at site 2. This photo is taken from the west, looking easterly. See caption of Table VI for information regarding two more possible human tracks to the right of print 49. These extra tracks make the downhill trail 6 or 7 imprints in length.

Changes in Tracks after Imprinting

Lockley insists that tracks can undergo alteration after they are formed (1986a, p. 44). Perhaps the sequence of imprints within H5, for example was altered by water thus obliterating original details. Lockley also suggests that overprinting can occur, where one impression is made directly on another—see Figures 4, and 13 herein, and Figure 9 of Rosnau *et al.* (1989) for possible examples of overprinting.

Relation of Depositional Material to Print Quality

Because of the coarser nature of the sedimentary rock, Tuba City ichnofossils are perhaps plastically inferior to those of the Paluxy River, Texas. Mossman and Sarjeant (1983, p. 7) list two conditions which appear ideal for track formation including (1) moist adhesive sediments (2) over which an animal traveled leisurely. Mossman and Sarjeant further indicate that sediments which are too coarse in grain size or too wet will not hold the print. Winds and rising tides may also disturb the impressions very shortly after they are made. Thus the possible tracks at Tuba City may have experienced less than ideal print making conditions during and / or immediately after imprint intervals.

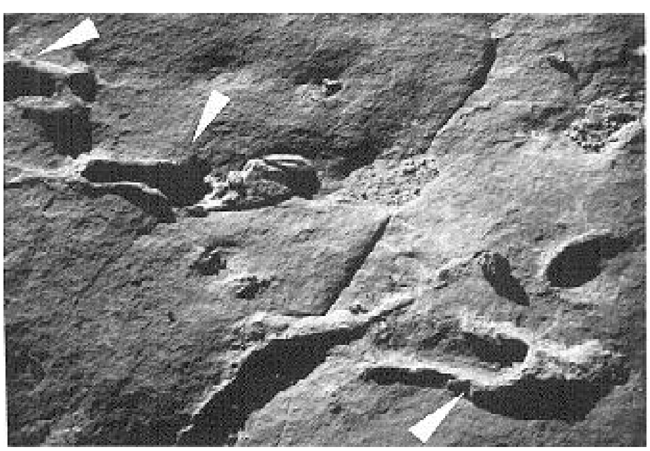

Figure 25. Tracks 50-52, Table VI, H7, map Figure 34. A portion of the downhill trail. The arrows from left to right indicate tracks 50, 51, and 52 respectively. This photo was taken from the east looking westward.

Comparing Tuba City Impressions with Pleistocene and Pliocene Ichnofossils

Behrensmeyer and Laporte (1981) excavated Pleistocene strata in northern Kenya, along the northwestern shore of Lake Turkana. A sequence of 8 humanoid tracks in stride, some partial, others complete were discovered—a longer trail than our discoveries. Yet these appear to be less impressive when compared with Tuba City tracks as regards their shape and intimate detail. Although our downhill trail (Figure 24, Table 6) has up to 7 imprints, Tuba City trackways generally also have fewer prints per trail than trails reported by Leakey and Hay (1979) from Pliocene Laetolil beds in Africa. Leakey and Hay observed and recorded three trails of 6, 12, and 22 prints respectively. Also present in Laetolil beds are human teeth and jaw fragments.

Where Does the Research Go from Here?

Dinosaur skeletal remains found by current and earlier investigators confirm the presence of dinosaurs during the depositional phase of Kayenta Formation Sediments. The discovery of dinosaur remains helps authenticate dinosaur tracks.

Figure 26. Possible toes? These two unmapped tracks from site 2 show hints of toe marks. These are two of the many imprints in this area showing toe-like patterns present.

Authenticity of quasihuman ichnofossils in the Kayenta formation is not so well established as it is for the nearby dinosaur impressions. It is recommended that a large-scale, long term, Navajo-authorized effort be made to search for Cenozoic kinds of mammalian and humanoid remains as well as possible human artifacts within the Glen Canyon Group of Formations. If Navajo permission could be secured, it would be well to remove and section some of the dinosaur and quasihuman prints. These sections could be analyzed, as Neufeld (1975) did with certain Texas tracks to see if granular lines in cross section conform to the shape of the track. If Cenozoic or more "recent" remains were found, this would supply further authentification of quasihuman tracks neither entirely classified nor understood at present. The clarity of some of the prints found, which include an impression resembling the human right hand in Figure 1 of Rosnau *et al.* (1989), suggests the need for continuation of studies in the Tuba City, Arizona region.

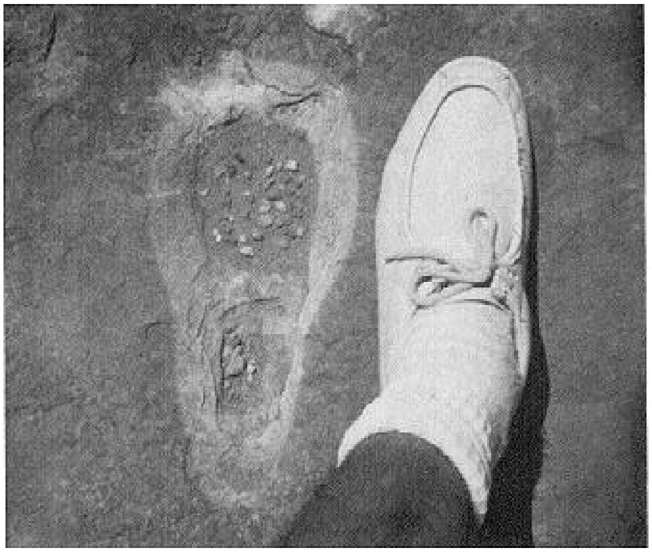

Figure 27. Track-shaped impressions with color change. Many of the surface marks and some of the tracks at site 2 were light yellow contrasting in color but not in composition with surrounding sandstone.

Conclusions

After collecting and analyzing the data of this paper, the co-authors hold slightly different shades of opinion as to the conclusions we should draw at present. The paragraphs which follow contain the opinions of the four workers who have observed these discovery sites. They are presented in the order of amount of time each writer has spent viewing the study areas from greatest to least: Rosnau, Auldaney, Howe, and Waisgerber.

Conclusions by Rosnau

Laurie Godfrey and John Cole (1986, p. 10) in their critique of the work of C. Baugh and other creationists at the Paluxy River, offer two characteristics of authentic human footprints: (1) on hard surfaces they will assume an hourglass shape; (2) on wet surfaces the heel and ball of the foot will make prominent impressions while the arch will not be prominent. I submit that at site 2 at Tuba City there are tracks that meet both these qualifications. As their first criterion Godfrey and Cole state in detail that:

> On hard surfaces such as a fairly dry lime mud, human footprints are extremely shallow and assume hourglass shapes . . . The entire sole does not print because the raised arch in the middle of the foot does not touch the surface. . . On a hard surface, one can expect to see little more than the outline of the heel, the outside of the foot, and impressions of the ball of the foot and big toe. The little toes typically leave only slight impressions on hard surfaces.

Impression 51 (Figures 24 and 25) meets the qualifications. While the surface on which it was made was not hard as glass, the matrix was hard enough to sustain the essential hourglass shape and to preserve more of the print of the big toe than of the other toes. The second criterion of Godfrey and Cole is that:

> On wet sand or mud, human footprints do not assume hourglass shapes because the entire undersurface of the foot sinks into the ground . . . Footprint depth is great throughout but greatest at the heel and ball and most shallow at the arch.

The peripheral ridge around our track 39 (Figure 20 and 21) indicates that it was made in soft, wet mud. The ball of the foot and the heel areas are concave and at the arch there is a prominent ridge. The sharp periphery suggests the maker of the track wore a soft-soled moccasin. Here again a Tuba City track meets the prescribed qualifications.

Since limestone concretions resembling the human foot are present at both our study sites it is well to ask whether such concretions, embedded in soft mud, could have formed the tracks we have catalogued. Likewise many of the tracks at site 1 which we have considered to be possibly human are indistinct. We could hardly make a case for human presence based on these tracks alone. Some could indeed be mere concretions. But the fact that the less distinct prints appear in trail with more distinct tracks lends credibility to them all, as with the Pleistocene prints of Behrensmeyer and Laporte (1981). Similarly, a lone indistinct, eroded dinosaur track would not be considered authentic, but in an area of distinct tracks it would be accepted as one of many genuine tracks. The trails of mantracks we have located together with the details of the human foot-toes, ball of foot, arch, heel and taper of toes—rule out chance formations of nature in a great many of our discoveries.

Figure 28. A four-toed, unmapped, humanoid track. Striking toe detail shows in this print found about 186 m north of H1 in reality to be a skid mark. The four toes slide forward leaving impressions like miniature gutters in a bowling alley. The toes excavated material as they slid forward. The fourth toe has left two impressions of its tip, indicating that its owner probably moved backward slightly as he caught his balance. Material has been gouged from under the fourth and from under where a fifth toe could have been, indicating that the maker of the track used his fourth and fifth toes to regain balance. Thus the fourth and fifth toes seem as one. Another indicator is the absence of an arch impression and a heel impression. The four-toed skid track measures 36 cm x 16 cm.

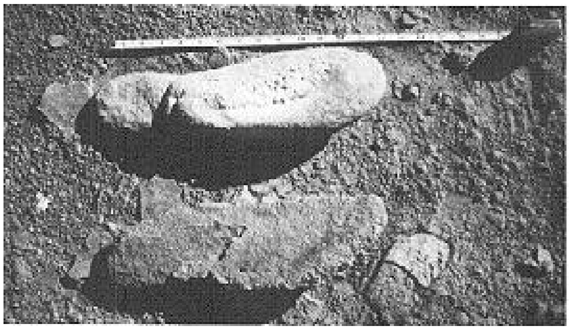

Figure 29. Concretions found near H2. Concretions are located in a bed about 70 m west of H2. Some of the tracks at the humanoid study areas may be the "negatives" of such concretions.

Thus the greatest obstacle to authenticating the Tuba City tracks and mantracks elsewhere is not the physical evidence but man himself. Few, except the creationists, are willing to take the steps to upset current assumptions about the age of the earth and man. Kurban Amanniyazov, Russian geologist who headed an expedition in which mantracks were found in Mesozoic strata in the Soviet Turkmen Republic, acknowledged in 1983:

> We've imprints resembling human footprints, but to date have failed to determine, with any scientific veracity, whom they belong to, after all. Of course, if we could prove that they do belong to a humanoid, then it would create a revolution in the science of man. Humanity would 'grow older' thirty-fold and its history would be at least 150 million years long. (Baugh and Wilson (1987, pp. 125-26).

What more scientific evidence need there be?

Conclusions by Auldaney:

After a great deal of personal research, I found the following evidence that indicates some of these impressions *are* human tracks:

1. There are trackways with repeated barefoot tracks while others have shoe prints which are always headed in the same direction and in reasonable stride with each other.

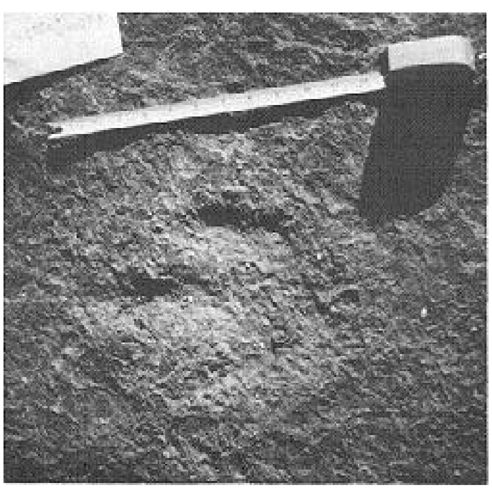

Figure 30. Tridactyl dinosaur track near Navajo sales structures, area D1.

2. Some are almost identical, existing side by side with the right distance and angles to each other.
3. There are impressions with sharp, shoe-shaped outlines.
4. There is an unusually high percentage (22%) of foot and shoe-like impressions in groups, including 7 good human-like track impressions at site 1 and 23 at site 2.
5. There is an amazing resemblance of the track-like impression I discovered next to the classic print itself. It resembles a left foot track, closely matching the right foot of the classic track.
6. There are three ungulate-like impressions, two together which I identified as matching only the tracks of domestic sheep or wild big horn sheep.
7. There are two 20 cm identical-appearing prints, 4 1/2 m apart, pointing the same direction. The first is found at right angles to the classic print.
8. There are other print pairs with strikingly identical features, always near each other.
9. Many impressions had a surprising fit for my foot, while others fit my shoes.
10. There are toe prints in the side, and in the front of the double track which I discovered (Rosnau *et al.*, 1989, Figure 5). These fit a 12-year-old very well. Among these impressions there are 30 that are better than the accepted human tracks displayed in the San Bernardino County Museum in Redlands, California from Oro Grande near Victorville, California; accepted because they are dated as only 6,000 years old.

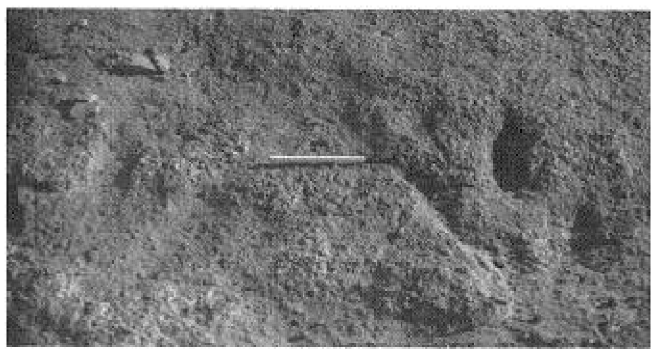

Figure 31. Two tridactyl dinosaur tracks, area Dl. See a track both at left and right of pen.

The evidences against these impressions being tracks of any kind are:

1. At site 1 the sandstone is cemented by varying amounts of silica, calcite and iron oxide causing erosion to remove softer material, leaving odd shapes behind.
2. At site 2 there are numerous nodules and burrows of whitish bentonite which is rhyolitic volcanic ash, sometimes called clay or tuff. This is cemented by calcite which is softer than the red sandstone in which it is embedded. The red sandstone is harder, being cemented by iron oxide. The nodule cores erode away, leaving various impressions, some that are track-like in shape.
3. Mounds at site 2 are of unstratified massive red sandstone, different from the level surface layer at sites containing dinosaur tracks. I do not believe it is a different stratum from site 1 as dinosaur tracks are found near site 1 and 2 at the same level. The site 2

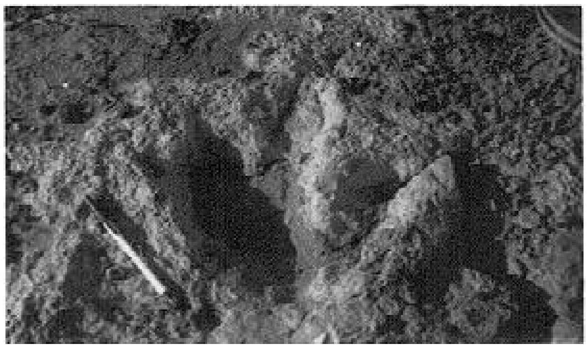

Figure 32. Representative dinosaur track, area D1.

material does not give evidence that it was a surface area where tracks could have been made.

4. Unstratified sedimentary rock is the poorest preserver of fossils of any kind, let alone tracks.

5. There is a lack of definite detail to positively identify most of these impressions as tracks.

6. Tracks are missing in some of the trailways.

7. There are six pairs of track-like impressions that are side by side, in a trackway, or near each other that look identical. However, there are never more than two exactly identical among all the impressions, not enough to make a positive identification.

8. Most are only solitary impressions. Even the side by side prints and the trackways have no tracks leading to them or away. This leaves the evidence inconclusive with so few repeated, clear trackways.

The most conclusive evidences I discovered were the following:

1. The *Unio* clams I found were almost all articulated (valves together). Since the valves of dead clams separate, this indicates the clams were alive when they were buried.

2. I found clams and bones buried directly over dinosaur tracks at D1 and these show cataclysmic circumstances of origin.

Figure 33. Tridactyl print, probably made by *Dilophosaurus wetherilli*. Note clarity of claw prints. Area D1.

3. There was a mass burial of millions of animals, as indicated by the common discovery of bones, clams, and trees throughout strata formed from a floodplain that spreads through Wyoming, Utah, Arizona, New Mexico, and parts of California and Colorado.

4. Most of these strata are made of volcanic ash (bentonite clay) covering 200,000 square miles and averaging 1400 feet deep in the Chinle formation alone.

5. *Unio complanatus* clams, *Valvata gregorii* as well as *Lymnaea hopii* snails, the lungfish *Diplurus*, and the phytosaurs are all calm-water pond animals. These same genera of snails and clams live in lily ponds today and thus are "living fossils." Yet as fossils they are found violently buried alive in huge rivers with rapidly flowing mud of volcanic origin.

6. Fossil trees with their surfaces *burned* to charcoal are found jammed into piles surrounded and buried in volcanic ash deposited in water.

Figure 34. Tridactyl print, probably made by *Dilophosaurus wetherilli*, area D1. Note clarity of claw print. Possibly the extreme clarity of claw print resulted from human activity long after track was fossilized.

7. There is a predominance of fossil bones and tracks of flesh-eating animals such as the phytosaurs, dinosaurs *Dilophosaurus*, and *Coelophysis*. In normal ecological systems there are always more plant-eaters. Does this indicate that these carnivorous animals had come down to the area to eat the dead killed in a cataclysm?

8. Fossils in these deposits are replaced, and the sediment is cemented by volcanic minerals such as silica, iron, calcite, sulphur, copper, and uranium.

9. Coprolites (fossil pieces of manure) are found at most fossil bone sites, and are common at bone deposits near our sites. This material indicates the animals were alive shortly before burial, and they did not travel far before deposition.

10. Some of these evidences are found at *all* fossil sites of *all* geologic periods world wide.

These evidences of cataclysm support the sudden formation of strata leaving no evidence for millions of years and thus no evidence of or time for macroevolution. However, I believe that most of the quasihuman impressions in this study are not fossils but odd shapes formed by nodules, etc. in soft carbonate-rich sedimentary rock, similar to the formation of oolitic limestone

Figure 35. Tridactyl dinosaur print, perhaps *Kayentupus hopii,* area D1.

or travertine by hot volcanic springs of ground water coming up through quartz sand.

Some of the impressions at site 1 and 2 may be human tracks but there is insufficient diagnostic evidence to establish it firmly one way or the other. The impressions which I believe may be human tracks are at site H1 imprints 1, 3, 4, 5 and 6; at site 2 some of the impressions at H4, several impressions and trails at H6 and H7. Other impressions are typical weathered sandy limestone formations.

Nothing in science is absolute; only the Bible claims absolute truth. The Bible says men and all land animals (which includes dinosaurs) were created together on the same day of creation—Genesis 1:24. A gigantic creature, the dinosaur is the only animal which fits the description given in Job 40:15; further proven by the statement "Behold now behemoth *which I made with*

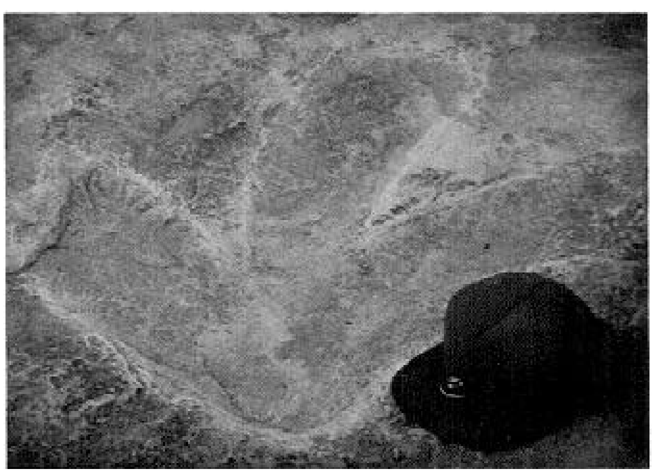

Figure 36. Rock depressions outlined in chalk presumably by Navajo proprietors. Some of the items heralded as dinosaur prints at D1 are evidently chance markings in rocks, as seen here.

thee." This is a strange statement demonstrating that God created *all* land animals and then man on the same sixth day (Friday). Maybe God did it this way because He knew macroevolutionists someday would say that man never saw a living dinosaur. Therefore according to the Bible the discovery of fossil men and dinosaurs is possible. This project is only the beginning. We urge anyone with information or knowledge of other possible human fossil bones, tracks or artifacts in supposedly ancient layers to contact us.

Conclusions by Howe:

While some of the marks in the Kayenta beds at Tuba City may be the result of concretions, spalling, or erosion, a few appear to be in normal human stride or to contain certain details strongly suggestive of human toes or shoes. Probably some of the latter are authentic human ichnofossils. Future research by interested parties should involve permits to excavate at site 1 and site 2. Concerted effort should also be made to see if any possible human artifacts or bones exist in the Kayenta. Many of these quasihuman ichnofossils in our study remain as challenging unidentified marks. A few look very authentic. Even if only one of these clear tracks were real, it would present an overwhelming challenge to the orthodox tenets of "historical" geology. These and other quasihuman ichnofossils deserve further serious study.

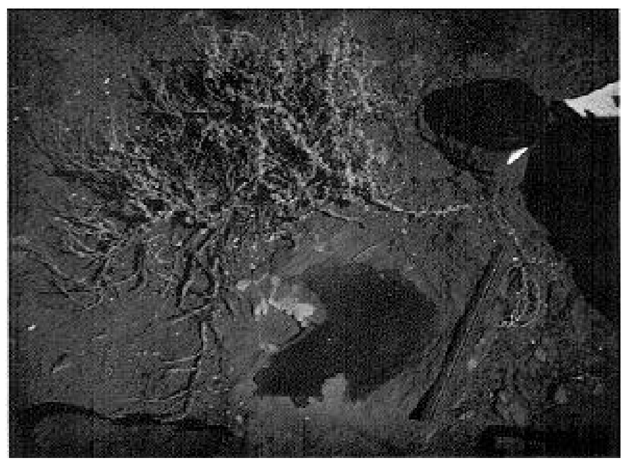

Figure 37. Tridactyl dinosaur track from D2, near H1 humanoid area. See caption Table I for specific directions. This may be an eroded print made by *Dilophosaurus wetherilli.*

Conclusions by Waisgerber:

Since I participated in only one of the field trips, I will discuss principally those parts of site 1 and site 2 with which I am familiar.

Authenticity and Implications of Dinosaur Impressions

Many of the dinosaur tracks which are within site 1, D1, near the Navajo jewelry sales structures, appear authentic. They suggest a fixing of dinosaur tracks into a plasticized stratum after deposition of quartzitic sediments within that stratum. The sands were sufficiently fine-grained and cohesive so as to retain the imprint until each could be covered and preserved by overlying sediments. It is presumed that Kayenta Formation dinosaurs were caudate life forms. Yet caudal appendage imprints (dinosaur tail trails) were not

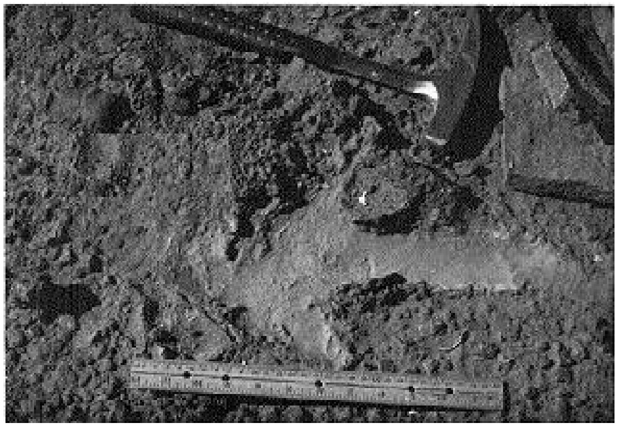

Figure 39. Tridactyl dinosaur track from D2, near H1 humanoid area. See caption Table I for specific directions. We were unable to identify this possible dinosaur print from existing literature.

observed along with dinosaur tracks. One explanation is that the *Coelophysis* dinosaurs walked with tails erect. One would imagine that they would drop their tails when standing motionless, however. Another explanation could be that the sediments were under shallow water. Only a few yards away are shallow water ripple marks. Thus existing plastic sediments yielded to surcharge of dinosaur feet. However caudal appendages, being buoyant, did not mar the sediments. There could be other explanations also.

The distribution of dinosaur tracks beyond D1, within site 1, presumes imprinting on different sedimentary horizons. Imprinting on different horizons suggests a space-time continuum. At some point in Kayenta Formation geologic time, dinosaurs walked across this area after deposition of sediments. An initial imprint interval was followed by covering of dinosaur tracks with additional sediments. Then later sediments would have been repetitiously imprinted, then concealed.

Apparently Navajo owners of D1 swept away loose clasts of varied sizes in order to better reveal dinosaur tracks in the basal stratum. Numerous "allocthonous" clasts were observed about the perimeter of D1. Many clasts are concretionary in appearance. In my opinion the clasts are as diverse in size and shape as those

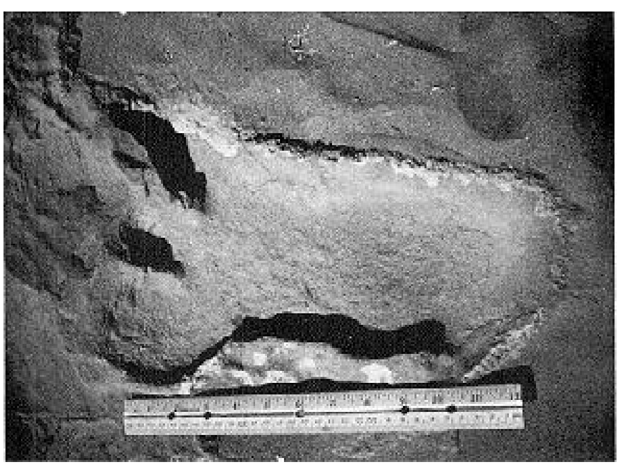

Figure 39. This three-toed print may represent a skidding dinosaur track in humanoid area H1, imprint 17, Table I, map Figure 1. This impression worked loose and has disappeared.

humanoid and other imprints which were observed in the small designated quadrats that were studied by my colleagues.

Authenticity of Mantracks

Quasihuman ichnofossils found in the general area west of D1 are not in the same stratum as are the dinosaur tracks of D1 itself. The quasihuman ichnofossil sandstone strata appear more feldspathic and more coarse-grained. Coarse-grained sands rarely exhibit a plasticity index sufficient to retain footprints for an extended interval of time. Sand accumulations often lack sufficient finer grained clay and silt constituents to render sandy sediments more cohesive.

Quasihuman ichnofossils to the west of D1 are not imbedded in a basal sandstone stratum as are the dinosaur tracks of D1. Rather the ichnofossils often occur within large, loosened, tabular clasts that lie above the basal layer. In fact these large loosened clasts contain concretions, several of which were seen to imitate the human foot—Figure 29. Concretion "casts" which have been eroded from concretion "molds" associate with the large tabular remnants of an overlying stratum. Loose concretions and loosened tabular clasts exhibiting the bottom of the concretionary "mold" lie on a basal stratum.

Strewn about the landscape at H1 and H2 are small fragments of siliceous rock. These dark, hard, lustrous, mostly pebble-sized particles appear to be remnants of erosion of higher strata. Also the particles appear to be remnants of a past, water transmissive, petrification process. The pebbles lie loosely on exposed strata.

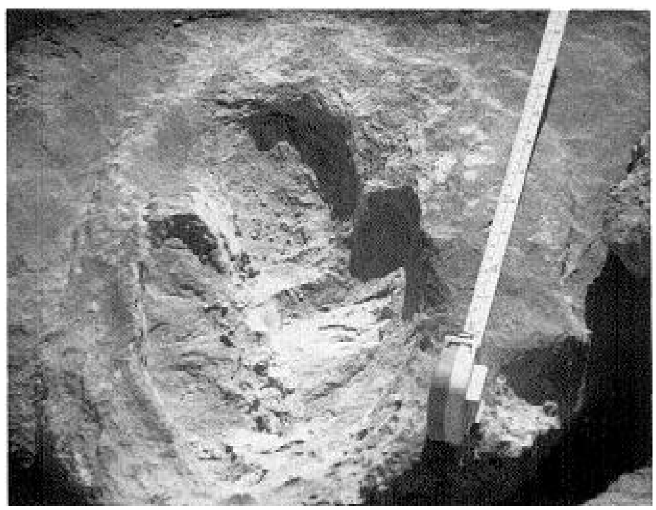

Figure 49. Large, thick-toed, tridactyl print from site 2. For exact location see caption Table VI. Resembles track correlation called "hadrosaurian dinosaur" by Colbert (1961, p. 192).

Dinosaur Bones Support Recency

It is scientifically inconceivable that the fragile dinosaur bones found in Kayenta Formation strata would have resisted geochemical processes of destruction during the past 150 million years to 200 million years. The clastic nature of Kayenta Formation strata suggests that these strata are permeable. Thus the mere existence of fragile reptile bones in water-transmitting Kayenta Formation sandstones demands a shorter geologic time span than that conceived by evolutionary geologists.

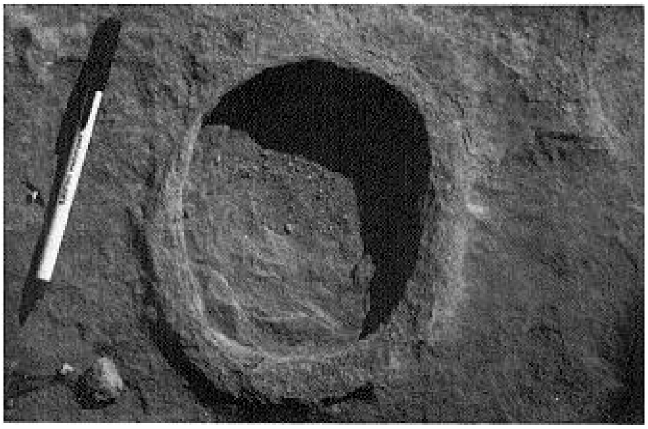

Figure 41. Rounded impression found at site 2.

Puzzling Stratigraphy

Site 2 may well be underlain in part by cross-bedded elements of the Navajo Sandstone. The various ichnofossils I observed within site 2 seemingly transgress successive strata, existing along the slopes of mounds. Their varied relationships to stratigraphy and topography indicate that the prints developed during a post-depositional phase; after the sands had been deposited, inured and eroded. Thus the suggested probable repetitious nature of dinosaur tracks within site 1 is not readily observable for ichnofossils within those parts of site 2 which I saw.

Figure 42. Series of rounded impressions, site 2. Are these sauropods in the Kayenta escaping volcanic gas, ground-sloth tracks, or chance markings?

Color Complications at Site 2

Many of the alleged prints seen in parts of site 2 occur in cross bedded, deeply stained, iron-red sandstones. Yet the prints themselves are underlain by decolorized sands—see Figure 27. Sandstone decolorization is evident only where prints are to be found. I offer the tentative conclusion that whatever decolorized the iron-red sandstones locally also caused the imprints in sandstone at site 2. One natural answer could be that root systems for native vegetation are chemically reductive. This should be determined.

Figure 43. Single print at arrow, possible print of *Kayentapus hopii* perhaps made by coelosaurian dinosaur *Coelophysis*, previously called "Grallator." Quadruped series of tracks in background unidentified, 1830 m southwest of site 2, along Moenkopi Wash. Presently the trail is covered by a mud slide.

Coexistence of dinosaurs with alleged more modern mammals and with *Homo sapiens* has not yet been satisfactorily demonstrated in the Glen Canyon Group of Formations. Even so, the search for anachronistic evolutionary fossils and their footprints should be continued by creation scientists and hopefully others. If the Leakeys can spend years searching for evolutionary remains in Olduvai Gorge, Kenya, Africa, then creationists have every right and responsibility to spend years investigating the Glen Canyon Group of Formations.

In my opinion, evidence against evolution geology and evolutionary paleontology will be found within the Glen Canyon Group of Formations. I caution creationists not be hasty in publicizing opinions as if these opinions were scientific conclusions, a practice that prevailed after Glen Rose, Texas, studies. They should ruminate carefully at length and continue field research before spewing fixed opinions. Time is on the side of the creationist.

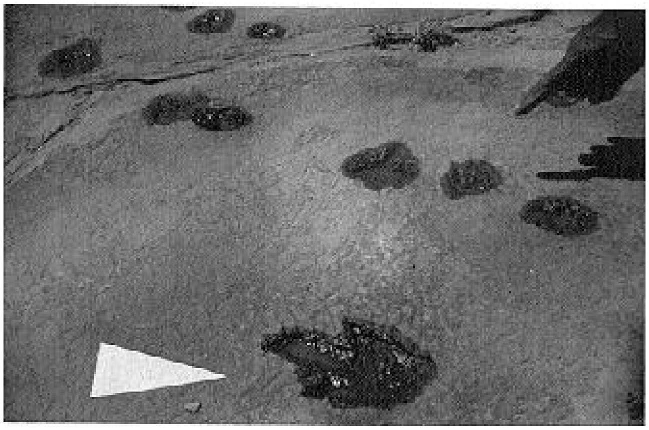

Figure 44. Single print in foreground (arrow) same as Figure 43, with smaller, unidentified tracks in background.

Acknowledgements

We are grateful to the many people who have contributed to the CRS Laboratory Endowment Fund, interest from which has been used to support certain aspects of this research. We thank W. Horrmann for financing one of the early trips to Tuba City. In addition, we wish to express gratitude to the following individuals for help in various phases of the field study or in supplying items of information: D. Drage, R. Freborg, G. Kuban, R. Horrmann, W. Lang, E. Cummings, R. Saunders and Lorraine Austin. We thank the Navajo Tribal Motion Picture Office for granting us Permit No. 001047 and the Navajo Nation Minerals Department for granting us the geological field trip permit under which these studies were undertaken. The Navajo Nation Minerals Department in no way condones or supports this research by issuing us a field trip permit. The permit does not indicate approval or disapproval of our conclusions by the Navajo Nation. We thank F. Sellers and the several other native Americans from Tuba City who graciously helped us locate both dinosaur impressions and quasihuman ichnofossils. We thank Phyllis Hughes for assistance in preparing the manuscript.

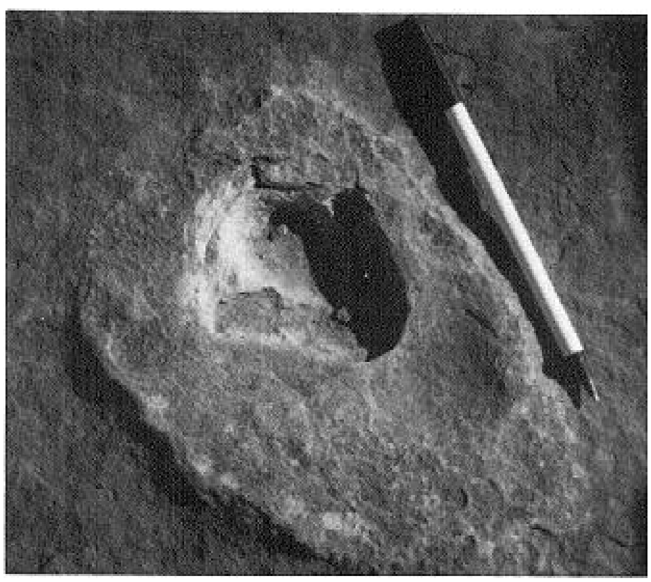

Figure 45. Single clear tridactyl print, site 2.

References

CRSQ—Creation Research Society Quarterly

Baugh, C. E. and C. Wilson. 1987. Dinosaur. Promise Publishing. Orange, CA.

Behrensmeyer, A. D. and L. F. Laporte. 1981. Footprints of a Pleistocene hominid in northern Kenya. *Nature* 289:167-69.

Beierle, F. P. 1979. A new kind of evidence from the Paluxy. *CRSQ* 16:87-88, 131.

Camp, C. L. 1930. A study of phytosaurs. University of California, Berkeley.

Clark, H. W. 1968. Fossils, flood, and fire. Outdoor Pictures. Escondido, CA.

Colbert, E. E. 1961. Dinosaurs, E. P. Dutton and Co. New York.

Colbert, E. H. 1970. Fossils of the Connecticut Valley; the age of dinosaurs begins. State Geology and Natural History Survey Bulletin 96 (revised edition).

Colbert, E. H. 1981. A primitive ornithischian dinosaur from the Kayenta Formation of Arizona. Museum of Northern Arizona Bulletin No. 53. Museum of Northern AZ, Flagstaff, AZ.

Decker, R. and B. Decker. 1981. Volcanos. W. H. Freeman. San Francisco.

Fenton, C. L. and M. A. Fenton. 1958. The fossil book. Doubleday and Co. Garden City, New York.

Fields, Wilbur. 1980. Paluxy River explorations. 2313 E. 20th St., Joplin, MO 64801.

Fisher, D. W. 1981. A New York dinosaur of 200 million years ago. New York State Geological Survey. New York State Museum, Albany.

Frey, R. W. 1975. The study of trace fossils. Springer-Verlag. New York. p. 292.

Geologic Map of Coconino County, Arizona. 1969. Arizona Bureau of Mines. Tucson.

Godfrey, L. R. and J. R. Cole. 1986. Blunder in their footsteps. *Natural History* 95(8):4-12.

Howe, G. F. 1982. Not all footprints should be dismissed lightly. *CRSQ* 19:141-42.

Kuban, G. J. 1986. The Taylor site "mantracks." *Origins Research* 9(1):1 ff.

Leakey, M. D. and R. L. Hay. 1979. Pliocene footprints in the Laetolil beds at Laetoli, northern Tanzania. *Nature* 278:314-23.

Lockley, M. G. 1986a. The paleobiological and paleoenvironmental importance of dinosaur footprints. *Palaios* 1(1):37-47.

Lockley, M. G. 1986b. Dinosaur tracksites. University of Colorado at Denver Geology Department Magazine. Special Issue No. 1.

Moore, R. C., C. G. Lalicker, and A. G. Fischer. 1952. Invertebrate fossils. McGraw-Hill. New York.

Neufeld, B. 1975. Dinosaur tracks and giant men. *Origins* 2(2):64-76.

Mossman, J. D. and W. A. S. Sarjeant. 1983. The footprints of extinct animals. *Scientific American* 248:74-85.

Peabody, F. E. 1948. Reptile and amphibian trackways from the lower Triassic Moenkopi Formation of Arizona and Utah. University of California Publications. *Bulletin of the Department of Geological Sciences* 27(8):295-421.

Rosnau, P. O., J. Auldaney, G. F. Howe, and W. Waisgerber. 1989. Are human and mammal tracks found together with the tracks of dinosaurs in the early Triassic Kayenta of Arizona? part I: a history of research and site description. *CRSQ* 26:41-48.

Rusch, W. H. Sr. 1971. Human footprints in rocks. *CRSQ* 7:201-13.

Taylor, S. A. 1971. Mystery tracks in Dinosaur Valley. *Bible Science Newsletter* 9(4):1-6.

Taylor, S. A. 1973. Footprints in stone. Films for Christ. Mesa, AZ.

Welles, S. P. 1970. *Dilophosaurus* (Reptilia: Saurischia), a new name for a dinosaur. *Journal of Paleontology* 44:989.

Welles, S. P. 1971. Dinosaur footprints from the Kayenta Formation of Northern Arizona. *Plateau* 44:27-38.

Welles, S. P. 1984. *Dilophosaurus wetherilli* (Dinosauria, Theropoda), osteology and comparisons: *Paloeontographica. Abteilung A: Palaeozoologie—Stratigraphie* 185(4-6):85-120.

Wendt, H. 1968. Before the deluge. Doubleday. Garden City, New York.

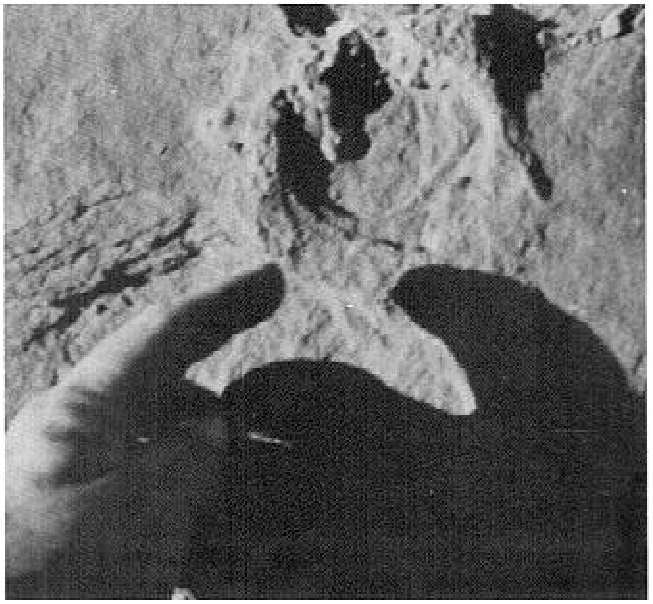

Figure 46. Small tridactyl dinosaur print from site 2. This was one of two tracks going up a mound in the same direction. This may be *Kayentapus hopii* made by dinosaurs of the genus Coelophysis.

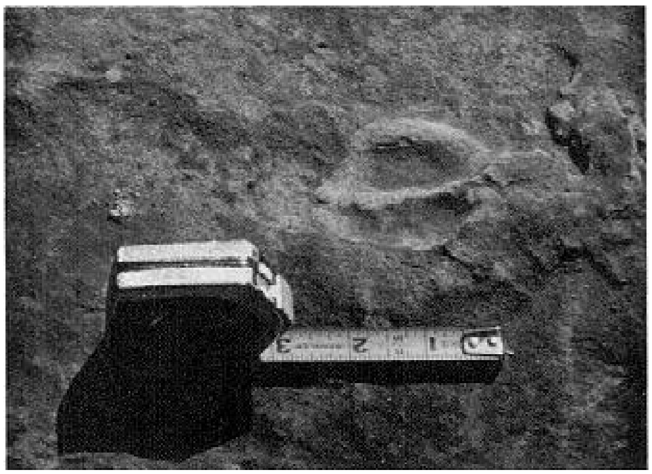

Figure 47. At site 2 there are many clear, raised marks including this one which closely resembles the track of a cloven hoofed mammal such as a sheep.

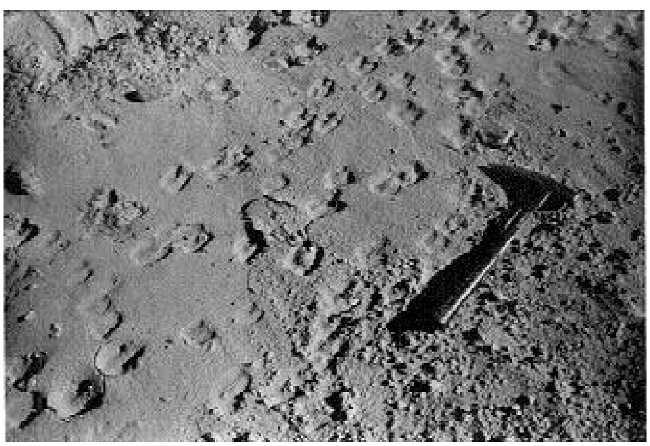

Figure 48. Sheep tracks in the sand nearby, for comparison with the putative fossil sheep print of Figure 47.

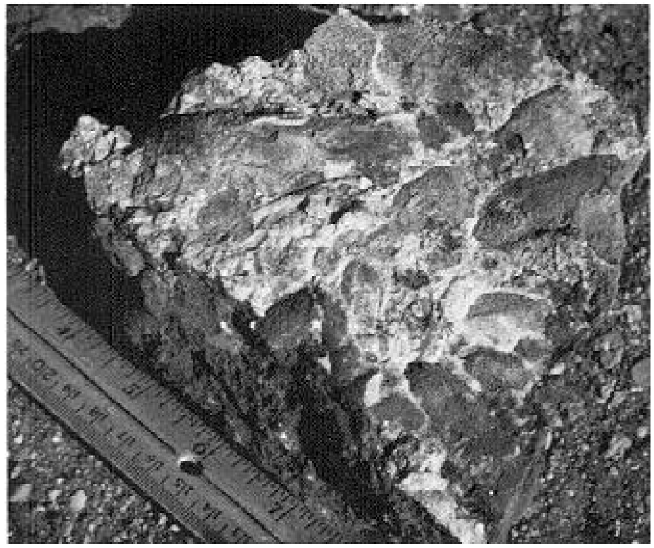

Figure 49. At several knobs near D1 there are fossil clams of the genus *Unio.* Rock containing these is shown here.

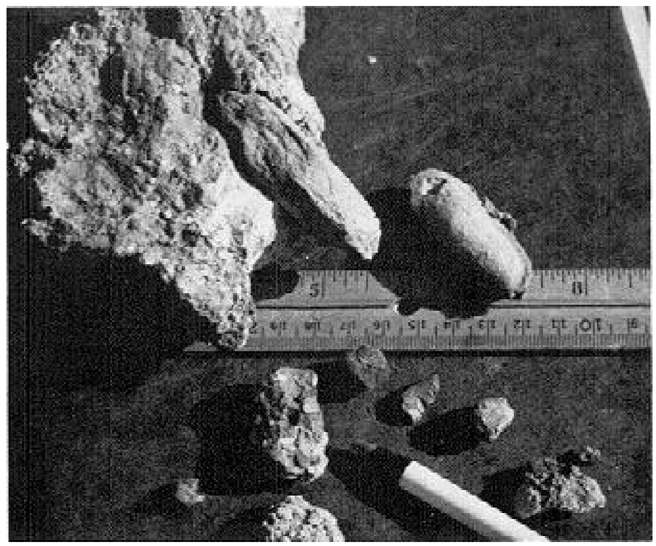

Figure 50. Above the ruler are *Unio* clams found in Kayenta rock matrix. At pen tip is a jasperized fragment of bone imbedded in same rock.

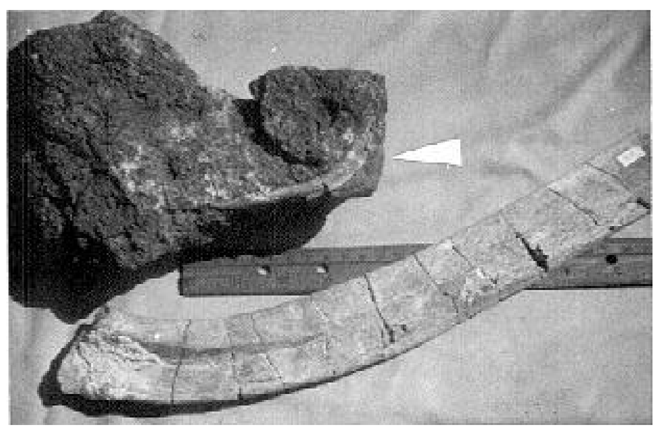

Figure 51. Small phytosaur bone above (see arrow) located in rock north of C3. A larger dinosaur rib bone below from Moab, Utah is shown for comparison.

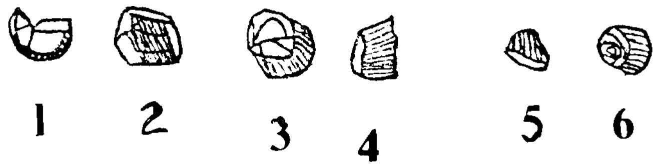

Figure 52. Fragments of round teeth resembling the teeth of a phytosaur, *Machaeroprosopus*. Auldaney saw these fossil teeth on top of the mound at C2, in conglomerate sandstone, 3 m above the dinosaur tracks. Sketches 1 and 2 are different views of one fossil tooth while 3 and 4 are of a different tooth also located at C2. Sketches 5 and 6 are different views of a fragment from the same tooth shown in 3 and 4. Auldaney also saw other fossil teeth (possibly from thecodonts) at C2 and some small fragments of a fossil leg bone. At H3, in a similar layer of conglomerate sandstone, he noted an additional fossil tooth fragment and some surface fragments of a large bone. Sketches were made of these bone fragments and other teeth not shown here.

PANORAMA OF SCIENCE

Notochord and the Acorn Worm

The notochord is thought to be an important factor in the evolution toward vertebrates. In supposed pre-vertebrate forms, the structure prevents telescoping of the body during the muscular contractions of locomotion. The structure is postulated to have developed in evolutionary terms into the backbone of vertebrates. Indeed, the structure is well developed in all vertebrate embryos, being replaced by the vertebral column of bone or cartilage in the adult. Because of the supposed presence of a notochord in the Acorn worm, this creature has been presented in many textbooks as a link between invertebrates and the phylum Chordata, the typical possessors of the structure. However, the notochord of the Acorn worm has been shown to be a diverticulum, a 'blind alley' of the gut, bearing no relationship to a true notochord (Dales, pp. 22-23). This replaces firmly the Acorn worm in its true position with the invertebrates. The case is representative of many, where so-called links between groups of animals have been merely wishful thinking of over-zealous evolutionists, needing reappraisal when more accurate data appeared, which leaves creatures firmly within their Genesis kinds. No doubt, in time, all other so-called links will suffer the same fate, leaving organisms in their rightful place as part of Creation and a testament to a glorious Creator.

Reference

Dales, P. R. 1978. Encyclopedia of the animal world. Bay Books. London.

Contributed by Colin Brown

Light and Communication (Bertman)

While the history of technology can be traced along many lines, one of the most intriguing lines of development is that of phototechnology, the technology of light. From the prehistoric invention of fire to laser beams and fibre optics, light has continually occupied the minds of inventors. Their inventions fall into two categories: the use of light to aid vision and, more fascinatingly, the use of light for purposes of communication.

The use of light for communication is one of the major directions that technology has taken since the middle of the 19th century. From still photography to motion pictures to television (with a progression from black-and-white to color imagery in each), phototechnology has had a profound effect upon mass communication and mass education. Unlike the printed word, visual images have more impact because they are more immediate. They simulate reality in a way that the printed word cannot. Unlike alphabetic shapes, they are not abstract; unlike words, they require no symbolic interpretation by the mind. Coupled with the widespread and uniform dissemination of such images, phototechnology affects the thinking of vast audiences and shapes their perception of reality.

Ironically, this was all anticipated by our friend, Plato, for the prisoners in the cave are not conditioned by darkness per se but by images projected through the use of light. Nor should the prisoners be termed a captive audience only. So conditioned are they by their lifelong education, they would challenge anyone who denied their shadowy truth. And if somebody went into that cave and tried to free them and pull them from their seats and bring them into the sunlight, they might even kill such a person, Plato says, recalling the fate of his very own teacher, Socrates.

Like the prisoners in Plato's cave, millions of Americans are simultaneously affected by the commercially-inspired electronic manipulation of artificial images. We call it "entertainment" and can't wait to get more. Lest the shadows slip through our fingers, we set our VCRs to record what we "missed."

As the number of commercially available television channels multiplies, the viewer's freedom of choice increases, but so does the burden of that choice. Increasingly he is confronted with multiple stimuli and is asked to make instantaneous choices of growing complexity—all in the name of personal fulfillment.

More significantly, the ease and rapidity of mass communication has created a regenerating supply of information greater than can readily be absorbed. Inundated by a surfeit of information, the individual struggles to swim through a sea churning with random data.

Though "decision stress" and "information overload" were identified almost two decades ago by Alvin Toffler in his book, *Future Shock*, they continue to be symptomatic of our social condition.

In the face of overstimulation, the distinction between what is more important and and what is less important can easily be lost. But just as threatening are the mechanisms that have been developed, both personal and social, to protect the psyche from this overload. Forced to handle too much data, the individual may practice "psychological absenteeism": avoiding responsibility and decisions, chemically insulating his psyche from reality, and seeking various forms of sensual gratification and substitutes for understanding. Just as the pupil of the eye contracts in response to excessive light, so the receptors of the mind contract in response to excessive information.

In addition to these mechanisms, there is also the tendency to deliberately over simplify, to jettison data because there is simply too much on board. In mass communications, such 'simplification can soothe the harried brain. The use of the "happy talk" format for local television news, the minimal treatment of world issues on such programs, the reduction of complex stories to headlines and captions, and the rise of the picture-oriented newspaper, . . . all illustrate this phenomenon. The nourishment given by such superficial images cannot sustain the health of a democracy.

Reference

Bertman, Stephen. 1988. Classical perspectives on the 21st century. *Imprimis* 17(9):2. Hillsdale College.

Evolutionism: Primordial Airs

A number of Biblical creationists* have accused evolutionists of assuming the conditions they should be required to demonstrate in order to make the evolutionary fairy tale come true. We believe the accusation is well founded. Assumption and inference are two parts of the same pseudoscientific technique that puts the evolutionist in a no-lose position. Such retrospection, of course, effectively manipulates the loudly-touted evolutionist claim of predictability for his model of origins. Nowhere, in our experience, has this process been employed any more obviously than in the attempt at explanation for the origin of biological life on earth.

> Assuming that terrestrial life did evolve on the earth, what was the planet like when the process began? One thing is certain: the atmosphere contained little or no free oxygen and hence was not strongly oxidizing as it is today. The organic matter that must accumulate as the raw materials from which life could evolve is not stable in an oxidizing atmosphere. One tends to forget that oxygen is a dangerously corrosive and poisonous gas, from which human beings and other organisms are protected by elaborate chemical and physical mechanisms (Dickerson, 1978, p. 70).

The recognition of the need for a reducing or oxygen-free primordial atmosphere to allow for evolution at all, is accredited to Russian biochemist A. I. Oparin (Dickerson, 1978, p. 71). Yet, one of the most emphatically proclaimed strengths of evolutionary "science" is its tentativeness. There is no doubt that such a claim has a certain validity at least in some instances. Medical research for the cure and/or prevention of disease comes immediately to mind. Recent field work would seem to render the definition of strength less than applicable in the instance just quoted.

> Geological evidence often presented in favor of an early anoxic atmosphere is both contentious and ambiguous. The features that should be present in the geological record had there been such an atmosphere seem to be missing. Many of the features advanced in support of an anoxic model can be ascribed to diagenetic alterations, and most diagenetic environments are reducing. Recent biological and interplanetary studies seem toatmosphere (Clemmey and Badham, 1982, p. 141).

Empirical (observable) testing of hypotheses, in the here and now, would seem to be a necessary ingredient in scientific activity. Speculation, on the basis of inference, concerning events (unobserved) that allegedly took place in the remote past is a historical, perhaps even pseudoscientific activity. Yet, the typical evolutionist grasps at the the flimsiest of straws for no other reason than it appears to support his evolutionary bias.

> While the primeval atmosphere of the earth lacked oxygen, it must have had methane, ammonia, water vapor, and other elementary gases such as carbon monoxide. Because there was no ozone shield, ultraviolet light provided an intense source of energy. When these conditions are duplicated in the laboratory, as Stanley Miller and Harold Urey did in 1951, and as many other chemists have done since then, an enormous variety of organic molecules are formed spontaneously (Futuyma, 1983, p. 95).

We never cease to be amazed at the glibness with which the typical evolutionist will use the term, "spontaneous," in relation to a set of complex laboratory apparatus used, by design, to obtain an equally complex, predetermined result. Furthermore, it seems we are in good company.

> Ever since the work of Oparin (1957) and Rubey (1955) and the success of the experiments conducted by Miller (1955), the dogma has arisen that Earths early atmosphere was anoxic, probably highly reducing, and consisted essentially of N_2, CH_4, H_20 and possibly NH_3. Furthermore, it is widely accepted that natural electrical discharge into or irradiation of such a mixture gave rise to organic compounds and eventually to life itself. However, the achievements of Miller (1955) and others (for example, papers in Buvet and Ponnamperuna, 1978), while being triumphs for experimental biochemistry, may have little relevance concerning the origin of life on Earth or the composition of the early atmosphere. Conjecture and speculation, based on a knowledge of the chemistry of living matter, gave to them the composition of their starting materials, and it

*Editor's Note: Chemical evolution has been a fruitful topic for Quarterly articles. See a bibliography of 10 prior articles in *CRSQ* 22:6 (1985). Also more recent articles may be of interest: Moore, J. N. 1985. Teaching about origin questions: origin of life on Earth. *CRSQ* 22:20-25; Heyes, G. B. 1986. Stereochemical design in lipids. *CRSQ* 23:20-27; Anderson, K. L. 1989. Prebiotic formation of the first cell. *CRSQ* 26:55-60.

> would have been surprising if they had not achieved the results they did (Clemmey and Badham, 1982, p. 141).

Such testimony constitutes an admission that "evidence" for evolution is really the forced interpretation of observable data. We fail to see how the imposition of a prejudicial viewpoint on an experiment can constitute proper scientific methodology.

References

Clemmey, H. and N. Badham. 1982. Oxygen in the Precambrian atmosphere: An evaluation of the geological evidence. *Geology* 10:141-46.

Dickerson, R. E. 1978. Chemical evolution and the origin of life. *Scientific American* 239(3):70-66.

Futuyma, D. J. 1963. Science on trial: the case for evolution. Pantheon Books. New York.

Bill Crofut and Raymond M. Seaman*

*Catholic Creation Ministries, P.O. Box 997, Jordan, NY 13080.

Minutes of the 1989 Creation Research Society Board of Directors Meeting

On Thursday, 4 May, a meeting of the Executive Committee was held at the Wolverine Best Western Motel, Ann Arbor, Michigan, from 2000 to 2200 hours to plan the agendas for the committee meetings on Friday. On Friday 5 May, between the hours of 0800 and 1600, the Constitution and Bylaws, Financial, Publication, Quarterly Editorial and Research Committees held meetings each of approximately two hours. The chairmen recorded the discussions in preparation for the Saturday business meeting.

The official annual meeting of the Board was opened at 1900 hours by President Frair in Room 102 of the Science Building at Concordia College, Ann Arbor, Michigan. Present: E. Chaffin, D. DeYoung, W. Frair, D. Gish, G. Howe, D. Kaufmann, J. Klotz, J. Meyer, D. Rodabaugh, W. Rusch, E. Williams, G. Wolfrom, P. Zimmerman. Absent by prior arrangement: D. Boylan. Also present were 62 visitors. The President welcomed everyone to this meeting of the 26th year of the Creation Research Society. This was followed with a silent prayer.

Dr. Paul Marshke, Academic Dean of Concordia College welcomed CRS members to the College. Meyer reported that the Research Committee was possibly funding two research projects: an image processing system using halos of the Grand Canyon and radiometric data of lava flows in the Grand Canyon. He also presented the architectural plans for the building at the CRS Research Center 20 miles north of Prescott, Arizona.

Williams reported on geological research at Big Bend National Park in southwest Texas and Providence Canyon in southwest Georgia. His slides showed signs of rapid erosion in unconsolidated sedimentary material. Howe gave a report on research done at Tuba City, Arizona. His slides showed apparent human footprints with dinosaur footprints preserved in rock. Frair gave a report on the status of the creation/evolution controversy throughout the country. Kaufmann gave a presentation on "How To Get Tenure at a Secular University."

The President expressed gratitude of the CRS to Mr. Ralph Lohrengal, Treasurer of the Southeastern Michigan Creation Science Association (SECSA), for providing refreshments. Mr. Lohrengal spoke briefly expressing his appreciation for the work of the CRS. The meeting was recessed at 2045 hours for refreshments. The meeting was reconvened at 2110 hours by President Frair. Rodabaugh introduced the speakers of the mini-symposium on rapid changes. DeYoung gave a mini-lecture on rapid changes by stellar evolution which indicated degeneration. Gish showed slides of the degenerative results of the Mt. St. Helens eruption. Chaffin gave a mini-lecture explaining radiometric dating. The meeting was adjourned at 2230 hours.

On Saturday, 6 May, the closed business meeting of the Board was called to order at 0820 hours. Present: E. Chaffin, D. DeYoung, W. Frair, D. Gish, G. Howe, D. Kaufmann, J. Klotz, J. Meyer, D. Rodabaugh, W. Rusch, E. Williams, G. Wolfrom, P. Zimmerman. Absent by prior arrangement: D. Boylan. The minutes of the 1988 meeting were read and adopted. The following were elected to the Board for a three-year term: Boylan, DeYoung, Gish, Kaufmann, Williams and Zimmerman.

The Treasurer's report by Meyer was as follows: The total income for 88/89 was $89,612. The total expenses for 88/89 were $55,463. The auditor's report was accepted by the Board. The total net assets (membership, general fund, book sales, textbook, research, lab endowment and Quarterly endowment) of the Society were $285,824, The membership report by Wolfrom was given as follows: total membership was 1764, down eight from 1987. The membership breakdown is: Voting 36% Sustaining 41% Subscriber 19%, Student 3%.

The Editor's report by DeYoung was given as follows. Fifty-three manuscripts were received, 30 were published, six were returned for revision and 17 were rejected. The Editor utilizes over 100 peer reviewers in our process. The Board acknowledged the work of former editor Williams for his outstanding past service. The report of the Constitution and Bylaws Committee was given by Rodabaugh. The officer's position descriptions were received and approved. It was moved and passed that once a year the Editor place in the Quarterly that those members who desire a copy of our Constitution and Bylaws can write the Secretary for a copy.

As recommended by the Finance Committee it was moved and passed that we acquire a $25,000 liability policy for the Financial Secretary, Treasurer and Membership Secretary. It was also agreed that Frair pursue insurance for the entire Board as that had lapsed. The Quarterly and Editorial Committee report by DeYoung was as follows: The Quarterly will publish a symposium on changing constants, a feature on "Who's Who in the CRS," and start an abstract service.

The Research Committee report by Meyer gave information on the zoning of our property in Northern Arizona. Zoning will be acquired before any building is started. The Publications Committee report was