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陕西銅川的足印化石

楊 钟 健
（中国科学院古脊椎动物与古人类研究所）

最近由西北煤田地质局送来一块灰绿色细砂岩，其上保存有两个足印，要求鉴定。化石是由一野外队的成员程树森采集的，地点为陕西铜川焦坪煤矿前河露天东北邦坡。地质年代被认为是属于中侏罗世的直罗群的下部。因为陕北一带的中生界地层中，脊椎动物化石很少，所以这一发现具有重要意义。

我们很感谢西北煤田地质局的负责人把这一化石交我们鉴定，并把这一标本赠交我所。

标 本 記 述

陕西足印 *Shensipus*（新属）

用以下描述的代表种铜川陕西足印的特性，作为本属的特性。

铜川陕西足印 *Shensipus tungchuanensis*（新种）

正型标本：印于一块细砂岩上的两足印。古脊椎动物与古人类研究所标本编号 V. 3229。

地点与地层：在铜川焦坪煤矿前河露天东北邦坡。时代为中、下侏罗世（直罗群下部）。

特征：具有三趾，各趾都很细长。趾 II 与趾 IV 十分分开。趾末端具有枪弹状的爪，跟部较小。

记述：两足印保存于长约 340 毫米，宽约 450 毫米的灰绿细砂岩石块上。保存化石的面，一般很平，只有近化石处有些起伏不平。此外在面上还有一些条纹和小点，后者极可能为雨点印痕。关于前者，还不能有充分证据说明是生物遗留的（虽然可能性很大）。在石块的背面，有一些植物茎，保存欠佳，似难鉴定。

两足印都是正的，也就是凹入处为动物直接遗留的。但有一些部分还为其上的一些岩石所盖。上边一个应为左脚，下边一个为右脚。两者相距只有 97 毫米，可能即代表步的长短。两个脚的中轴，不在一个方向，后者和前者（由中趾判断）约相差 38° 左右。尽管如此，两个足印还应当是一个动物所遗留的（两足方向可以有相当差别，如一些足印所表示的）。沒有留下可以归于前肢的“手”印，表示这动物是用两足行走的。两足印距中轴非常之近。照我们的解说，和中趾较近的为第二趾，而较远的为第四趾。第二趾和第四趾长度很近，末端位于中趾的二分之一以下。

左足的 II 和 IV 两趾，分开度较小于另一足印（小于 90°）。第二趾和第四趾，略向外弯，而中趾则微向內弯。在每趾的末端枪弹状的爪可以清楚地看到。跟部一部分仍为岩石所盖，但其轮廓很清楚，后沿略有弯曲。右足印的一般性质和左足相同，不过较小，而

II 与 IV 分开度较大(约为 90°)，II 趾较宽，IV 趾较短，可能由于为岩石遮盖之故。第四趾的末端尖状构造，特别清楚，而 II 与 III 的少差。在两足的趾间，由受行动时全身力的挤压而使泥面高出的情况，十分清楚说明行走的力量主要集中在趾部。

足印的大小尺度见下表：

测量(单位：毫米)

	左 Left	右 Right
从第三趾趾尖到脚跟后缘全长 Total length from tip of III to the posterior margin of the heel	98	81
第二、四趾趾尖间距离 Distance between the tips of II and IV	89	91
第二、三趾趾尖间距离 Distance between the tips of II and III	46	45
第三、四趾趾尖间距离 The same between III and IV	67	63
第二、三、四趾长 Length of II, III and IV	37, 61, 40	41, 55, 44
第二、三、四趾中部宽 Breadth of the same at the middle	13, 11, 10	12, 10, 10

鉴定与討論

以上所描述的两个足印，同到现在为止，在中国发现的所有足印都不一样(杨，1960)，即在外国，侏罗纪的足印知道的比较少，也都和这新的足印不同 (孔，1958)。由形状来判断，这两足印只能是由瘦小的，细长的，行走较快的一种恐龙造成的。由两足间距离较短来判断，可能是由动物站立时造成，而不是行走时造成的。无论如何，这个足印，大概为虚骨龙类或小的兽足类造成。由于形状特殊，初次发现，特命名为铜川陕西足印，其特征已见上述。

关于含这足印化石的地层的年代，并非沒有问题，野外地质工作者把它当作产于属于中侏罗世的直罗群。其依据为一些植物化石。这新的发现，未能提出正面或反面的见解。原因是上述的可能造成那足印的恐龙在侏罗纪和白垩纪均有。事实上这两足印在大小上和一般形状上还有和上三迭统的一些足印不无相同之处 (当然细节方面很不相同)。因此，我们只能希望发现更多更好的脊椎动物化石，以期对地层问题有肯定的意见。在目前我们只能依照野外队所规定的年代。

虽然这两足印对于地层年代未能提供多的证据，但丝毫不減低这一发现的重要性。在陕北一带分布很广的陆相中生代地层，脊椎动物化石一向是十分少的。目前的发现至少加強了新的发现的希望。铜川陕西足印，是自从在陕西神木首次发现中国足印化石三十六年以来(杨氏中国足印，孔)，第二次在陕西找到的足印化石。这就说明了它的重要性。

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TWO FOOTPRINTS FROM THE JIAOPING COAL MINE OF TUNGCHUAN, SHENSI

YOUNG CHUNG-CHIEN
(*Institute of Vertebrate Paleontology and Paleoanthropology, Academia Sinica*)

Recently a slab of fine greenish sandstone containing two well preserved footprints was sent to our Institute for determination. It was collected by Mr. S. S. Chen of the field party of the Bureau of Coal Geology of North-west from the vicinity of the Jiaoping Coal Mine of Tungchuan, N. Shensi. The age of the fossil bearing beds, according to field geologists, is Middle Jurassic, the Chiloo Group. Since the Mesozoic beds of North Shensi are practically bare of vertebrate remains it is interesting to discover such well preserved footprints. We like to thank the authorities of the said Bureau for sending this interesting specimen to us for determination and for presenting it to the Museum of our Institute.

DESCRIPTION

Shensipus, new genus

With the diagnosis of the type species as the generic diagnosis.

Shensipus tungchuanensis, new species

Type: Two footprints impressed on a slab of fine sandstone. Cat. No. V. 3229.

Locality and Horizon: The vicinity of Jiaoping Coal Mine, Tungchuan, Shensi. Lower part of Chiloo Group, Middle Jurassic.

Diagnosis: Tridactylous with rather slender digits. Digit II and digit IV considerably divergent. Tip of the fingers with distinct pellet-like claw. Heel small.

Description: The prints are impressed on a slab of fine greenish sandstone about 340 mm long and 450 mm wide. The surface of the slab is nearly flat except the part near the prints is somewhat undulating. Besides, the surface of the slab is marked by numerous striations and spots, which are probably the marks of rain drops. And there is no sure evidence to say that those striations are organic in origin. On the under side of the slab there are some broken stems of plants, unfortunately indeterminable.

Both the two footprints are positive ones but some part of them are covered by overlying rocks. The upper one is the left pes and the lower one is the right pes. They are only 97 mm apart indicating a short pace. The axis of both prints is not in the

same direction, the right one pointed (as judged by the middle finger) more medially in about 38 degrees. In spite of such difference it is almost certain that both footprints belong to the same animal. No indication of the handprint is observed. Both footprints are very close to the median line. According to our interpretation, the one closely situated to the middle finger should be considered as the digit II which is closer than the widely apart III and IV. II and IV are subequal in length and ending at the level below half of III.

The upper left one is less divergent than the other imprint. Both II and IV bend somewhat sidewards while that of III more to the medial side. In the tip of the imprint, the pellet-like claw can be clearly observed. The part of the heel is covered partly by rocks but its outline can be seen clearly with the posterior end rather arched. The right imprint is essentially the same as the left one but a little smaller and more divergent. Its II is more broad and the heel is shorter, and this may be caused by the still covered matrix. The pellet end of IV is especially clear and less in III and II. In both feet the slight elevation of the mud caused by the pressure of the feet is finely indicated between the fingers but not the part of the heel, indicating that the essential weight of the animal was concentrated in the finger part and not in the heel during walking.

Measurements see table in Chinese text.

DETERMINATION AND DISCUSSION

The foregoing described two footprints differ widely from all the known forms so far recorded in China (Young, 1960). As for Jurassic footprints it is comparatively less abundant also outside China (Kuhn, 1958). As can be judged by the characters of the two imprints, it can only be produced by a sort of dinosaur with slender, slim and quick walking legs. It is evidently bipedal. The short pace may indicate that the animal may eventually stand in producing such imprints instead of walking. In any way it is very likely that these footprints were made by coelurosaurian or small theropodious dinosaur. It is so far the only record of this type of fossil footprint for which we propose to name it as *Shensipus tungchuanensis,* new genus and new species. Its diagnosis is already given in foregoing lines.

The geological age of the imprints bearing strata is, however, still a question to debate. According to the field observation it is considered as the lower part of the Chiloo group of Middle Jurassic age. This is also evidenced by many plant fossils. The present discovery gives no positive clue either to prove or to disprove this conclusion, as the bird-like coelurosaurian dinosaurs are known both in Jurassic and in Cretaceous. As a matter of fact, dinosaur footprints of similar size and form were known even in Upper Triassic both in China and abroad (of course quite different in many details). We may hope to find more dinosaurian remains or other vertebrate fossils for a better understanding of the stratigraphical problem. At present we like to follow the conclusion in regarding the age of the strata reached by the local geologists.

In spite of the equivocal character of the age problem of the present footprints, the interesting find is by no means deducted. In the vast distribution of the continental beds of N. Shensi the fossils are very rare especially vertebrates. Our find increases the hope to get more of such remains. This is the second find of fossil footprints found in Shensi 36 years after the discovery of the first fossil footprint in China. (*Sinoichrites youngi* Kuhn) from Shenmu of the same province.


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