

# ***Chirotherium* and the Quarry Men: The 1838 Discoveries at Storeton Quarry, Cheshire, U.K.**

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In 1838 the hand-like footprints that had been named *Chirotherium* (and which are today known to be of reptilian origin) were recognized in Triassic sandstones being quarried at Storeton Hill in Cheshire. The Liverpool Natural History Society, alerted by local architect John Cunningham, helped to preserve a number of footprint-bearing slabs. However, it is clear from contemporary correspondence that the workforce at Storeton quarry was also involved, first by informing John Cunningham of the footprints' existence and then in determining which specimens were saved. The quarry owner, the site foreman, and the quarry workmen all played crucial, if sometimes conflicting, roles in this. Eight specimens from the 1838 workings, some with inaccurate attributions, have been traced to U.K. museums.

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**Keywords** Cheshire U.K., *Chirotherium*, footprints, Storeton Hill, Triassic

## **STORETON QUARRY IN THE 1830s**

During the 19th century, Triassic sandstones were quarried for building stone at Storeton Hill on the Wirral peninsula of Cheshire. The oldest of these quarries was the South Quarry (O.S. Grid ref. SJ 315842) which lay to the south of the village of Higher Bebington (Fig. 1). The quarry face here was some hundred feet (30 meters) high. Two thin seams of clay could be seen in the quarry face, 37 feet and 39 feet (11.4 and 12 meters) below ground level. These bore the impressions of footprints which also stood out clearly as casts on the underside of the overlying beds of sandstone. The upper clay layer in particular was characterized by prints which, in size and shape, bore a curious resemblance to those of human hands. Such footprints had first been discovered at Hilburghausen, Germany, in 1833, and had been given the name *Chirotherium* ('Hand Animal' in Greek). William Buckland of Oxford University described and illustrated these German footprints in the 1836 volume of the series of scientific textbooks collectively known as the "Bridge-

water Treatises" (Buckland, 1836). Two years later, in 1838, he would be shown similar footprints on Storeton Hill.

## **THE LIVERPOOL NATURAL HISTORY SOCIETY**

Credit for identifying the Storeton footprints must go to John Cunningham, a Scottish-born architect who was a member of the Liverpool Natural History Society (L.N.H.S.). In a letter to Richard Owen, written 20 years after the event, he described what happened:

In the spring of 1838 I went across to Storeton Quarry to select some blocks of stone I required for a building I had the superintendence of. I pointed out to the Foreman several beds or seams of clay between the strata and requested when he lifted the strata reposing on the clay beds he would examine the under surfaces of the slabs that rested on the clay beds and if he found any impressions of vegetables or animals he would immediately communicate to me the circumstance. In the course of 10 or 12 days after I had made the request he sent a person over to my office in hot haste with the intelligence that he had found the impressions of a 'man's hands and knees.' I of course lost no time in getting over to the Quarry and was much gratified with the spectacle presented on the slab which I at once saw were the impressions of the animal called by Professor Kaup the cheirotherium similar to those found at Hilburghausen. (Letter Cunningham to Owen, 13 December 1858, quoted in full in Tresise 1991.)

Realizing the importance of the discovery, he persuaded quarry owner John Tomkinson to donate one of the most striking footprint-bearing slabs (Fig. 2) to the L.N.H.S. On July 3, 1838, he reported the discovery to the Society, and it was decided that they would publish a lithograph of the slab donated to them and that the slab itself should be passed on to the museum of the Liverpool Royal Institution, in whose premises they held their meetings.

By July 1838, the working floor at Storeton quarry had exposed the second clay band. *Chirotherium* prints were few at this lower level which instead showed a mass of smaller footprints of many different kinds. Three slabs from this lower foot-

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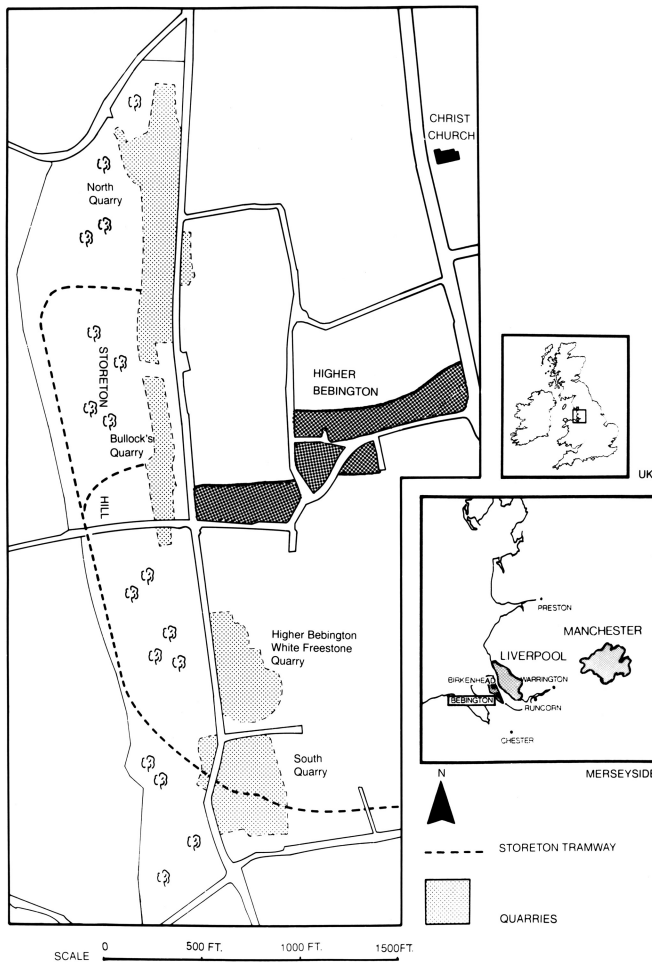


FIG. 1. The site of the Storeton Hill quarries.

print bed (Figs. 3, 4, and 5) were also acquired for the Royal Institution Museum, this time at the Natural History Society's expense.

The following month there were two further developments. A lecture on the footprints was given to the Liverpool Mechanics Institute by Robert Grant, Professor of Zoology at University College, London. Almost forgotten today, Grant was at the time regarded as one of the foremost scientists of the day; in 1836 the medical journal *The Lancet* had called him "the English Cuvier". An account of his lecture appeared in a local newspaper *The Liverpool Mercury* on August 24, 1838 and was reprinted in *Annals & Magazine of Natural History* the following year (Grant, 1839). In that same month, the footprints were brought to the notice of an even more illustrious scientist, Professor William Buckland. He visited Storeton quarry in Cunningham's company while en route to Newcastle-upon-Tyne where he was to attend the annual conference of the British Association for the Advancement of Science. He was thus able to carry news of the find to the British Association, confirming that the footprints did indeed correspond to the *Chirotherium* prints from Germany. He also persuaded Cunningham to write a paper on the finds which Buckland read to the Geological Society of London on December 5, 1838.

Meanwhile the L.N.H.S. had published not the single lithograph agreed at their meeting on July 3 but a set of four, and had also produced two plaster casts, one showing the *Chirotherium* trackway from the Royal Institution Museum slab, the other a selection of the smaller footprints from the lower bed. Thirty sets of prints and casts were set aside for distribution to public institutions and prominent scientists.

At the Society's Annual General Meeting the following year, President Francis Archer, declared:

Our casts and drawings have been sent to all the principal museums in the three kingdoms, as well as the continents of Europe and America, and the discovery has given a notoriety and rank to our Society which it might otherwise have been long in attaining.

### THE QUARRYMEN'S CONTRIBUTION

The Liverpool Natural History Society were rightly proud of their success in publicizing and preserving the finds at Storeton, and their contribution has been considered in more detail in an earlier paper (Tresise, 1989). However, it is clear from the contemporary accounts and correspondence that the quarry workforce, along with the site foreman and quarry owner, also played a significant role in determining which specimens survived and which did not.

Cunningham, in his 1858 letter to Richard Owen, quoted above, gave no hint of this. Elsewhere, however, he gave a rather different account of the events, as was recorded by G. H. Morton, the founder of the Liverpool Geological Society. In a Presidential address to this Society in 1870, Morton stated:

It is not desirable to introduce newspaper reports of scientific investigations. I must, however, refer to a lecture on 'The Geology and Water Supply of the Hundred of Wirral' by John Cunningham, delivered several years ago in Birkenhead. I have no date attached to the printed slips cut from a local paper at the time, but it may be found somewhere about 1863, or perhaps rather later. In this lecture Mr. Cunningham says . . . that the Storeton footprints had been exposed to the gaze of the quarrymen and other people for 15 or 20 years before he gave publicity to them. (Morton, 1870)

The point that the quarrymen had long been aware of the footprints had also been made by Francis Archer in his 1839 address to the L.N.H.S.:

[Mr. Cunningham] being in the neighbourhood of Storeton happened to hear that there had been blocks of stone turned up in the quarry with the impressions of men's hands upon them: these had been ascribed in the simplicity of the workmen, to some antediluvian members of our race who, attempting to escape from the influx of the waters, had thus left their track upon the rock; the smaller marks being ascribed to the hands of children. Mr. Cunningham immediately visited the spot, took an impression in clay of one of the most perfect footprints, and gave such directions as secured the specimens from mutilation. Had it not been for his activity, the probability is, that these slabs would have shared the fate of many others which had been previously raised, and which were afterwards found built up in the stone fences of the neighbourhood.



FIG. 2. Slab showing *Chirotherium storetonense* trackway (133 x 87 cm). Upper footprint bed, South Quarry, Storeton. (Bootle Museum specimen 10).



FIG. 3. Slab showing *Chirotherium* and a range of small footprints including *Rhynchosauroides* spp. and chelonoid forms (c. 110 x 85 cm). Lower footprint bed, South Quarry, Storeton. (The former Bootle Museum specimen 4).



**FIG. 4.** Slab showing one partial *Chirotherium* print and small footprints, mainly *Rhynchosauroides* spp. and chelonoid forms (111 x 77 cm). Lower footprint bed, South Quarry, Storeton. (Bootle Museum specimen 8).

An even more telling point was made by Robert Grant in his Liverpool lecture of August 1838:

In Storeton Quarry there are two distinct strata of these footmarks, about 2 feet [c. 0.6 metres] from each other, and the workmen believe that there is a third stratum of the same impressions a very little lower in the rock; but I have been able to examine only the two upper strata of these remarkable impressions. (Grant 1839)

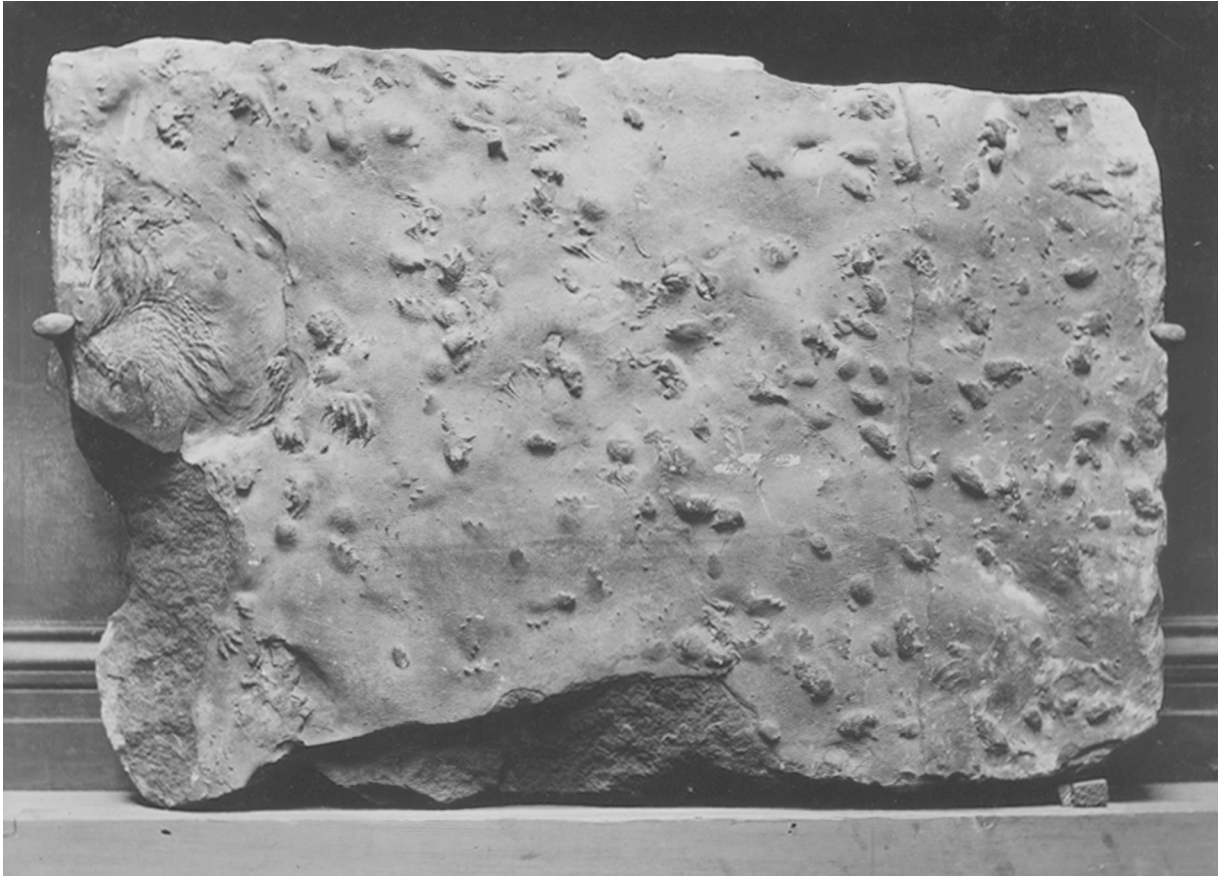
Other authors followed Grant in regarding the possible existence of a third footprint bed as unproven. Throughout the 19th century, the literature refers only to an “upper” and a “lower” footprint bed. It was not until Henry Beasley began his detailed investigations of the Storeton quarries at the turn of the century that it was confirmed that there was indeed a third footprint bed some 10 inches (0.25 m) below the “lower” bed, just as the quarrymen had claimed. (Beasley ledger note dated September 13, 1899. L.G.S. archive, N.M.L.)

It is thus clear from Grant’s account that the quarrymen had not just noticed the footprints and explained them to their own

satisfaction, but had also pinpointed the levels at which they were found. The probability is, therefore, that when he visited the quarry in the spring of 1838, Cunningham (in Archer’s words) “happened to hear” from the quarrymen of these strange relics of Noah’s Flood and was also told that the current working floor was now very close to the levels at which the prints were found. Hence his request to George Forrester, the quarry foreman, to “examine the under surfaces of the slabs that rested on the clay beds,” far from being the inspired guesswork that his 1858 letter to Richard Owen seems to suggest, would have been based on the precise information which the quarrymen had given him.

The Storeton workforce thus deserve some credit for the discovery, and it is pleasing to report that the L.N.H.S. minutes for their meeting on July 3, 1838 record that:

It was resolved that the Society was deeply indebted to Mr Cunningham for . . . bringing the circumstances of the discovery before the meeting, and also that the sum of twenty shillings be placed at his disposal to distribute among the workmen of the quarry.



**FIG. 5.** Slab showing small footprints, principally *Rhynchosauroides* spp. (108 x 76 cm). Lower footprint bed, South Quarry, Storeton. (Bootle Museum specimen 9).

### JOHN TOMKINSON'S CONTRIBUTION

The minutes of the L.N.H.S. meeting of July 3, 1838, also report that:

Mr. Tomkinson the proprietor of the quarry had presented the Society with the most perfect of the slabs, and had offered to place it free of charge in the museum of the Royal Institution. It was resolved that the best thanks of the Society are due to Mr. Tomkinson for this handsome present.

In fact, John Tomkinson brought to Liverpool not just the slab he had promised to the Royal Institution Museum but at least three other slabs from the upper footprint bed. No explanation was given of his reasons. However, John Tomkinson was in partnership with his brother William, and the head office of their business was in Liverpool. It may be that the brothers felt that displaying some of the choicest Storeton slabs in their office would help to publicize the firm and bring in new business. Whatever the reasons may have been, it was to prove a most fortunate action.

One immediate effect was that the L.N.H.S., who had decided at its July meeting to publish a lithograph of the slab presented to the society (Fig. 6), produced instead a set of three

lithographs, the two additional plates showing three of the slabs in the Tomkinsons' care (Figs. 7 and 8). A fourth lithograph was added a month later to complete the set (Fig. 9). This showed a selection of the smaller footprints from the three slabs from the lower footprint bed which the Royal Institution Museum had acquired in July, plus a "fossil reed" added to the Museum's collection on September 10, 1838.

One of the specimens held by the Tomkinsons was also used to illustrate Robert Grant's lecture to the Liverpool Mechanics Institute in August. Grant described this slab:

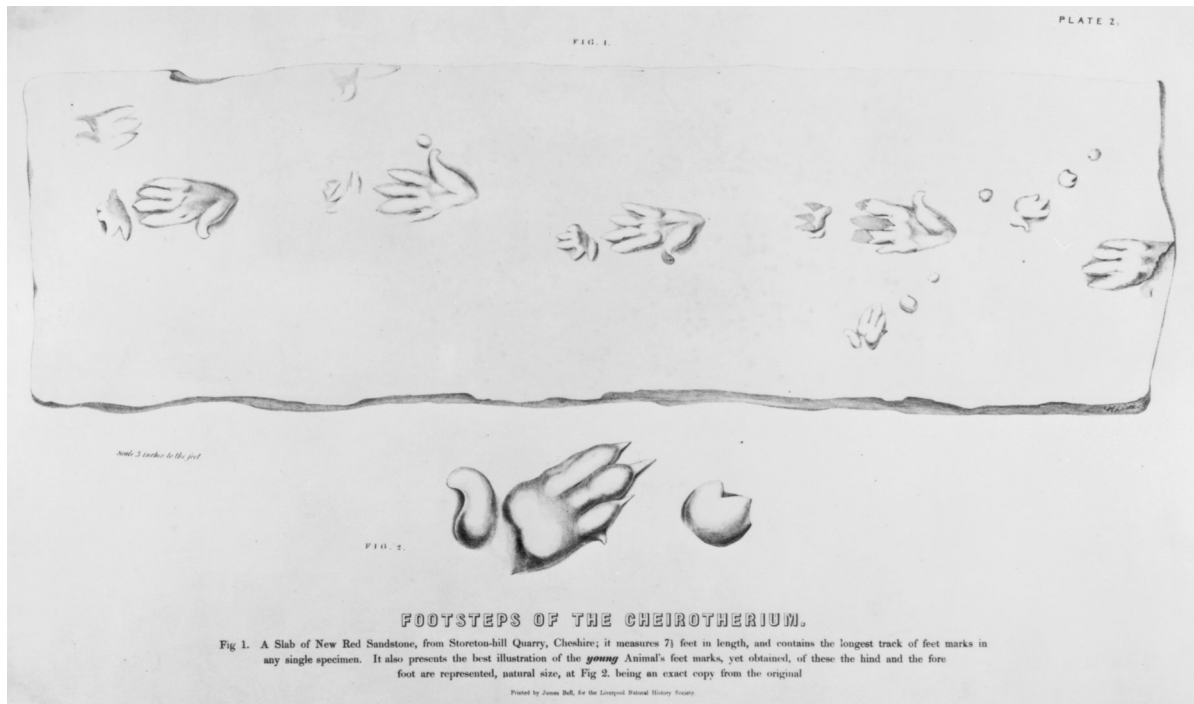
Sometimes the impressions are crowded together in a small space, as in the specimen before you. . . . Towards the upper part you observe four large footprints passing in a curving direction to the right side and below them three similar large footmarks directed to the left side; but both above and below these two lines, near the margins of the block, you perceive numerous other large footmarks of the same kind.

This was the slab on the right of the L.N.H.S. lithograph no. 3 (Fig. 8).

For several months after Buckland's August visit to the Storeton quarry, he and Cunningham were in regular corre-



**FIG. 6.** Liverpool Natural History Society Plate 1 lithograph. The caption reads: FOOTSTEPS OF THE CHEIROTHERIUM. Fig. 1. A Slab of New Red Sandstone, from Storeton-Hill Quarry, near Bebington, Cheshire. The footprints are in excellent preservation and high relief; the centre one, natural size, is shown in Fig. 2; the small toe of the hind and the greater portion of the fore foot being restored from other specimens. In Fig. 1 there are also two long tracks made by some small footed Animal. This Slab presented to the Natural History Society by JOHN TOMKINSON, Esq. has been deposited in the Liverpool Royal Institution.

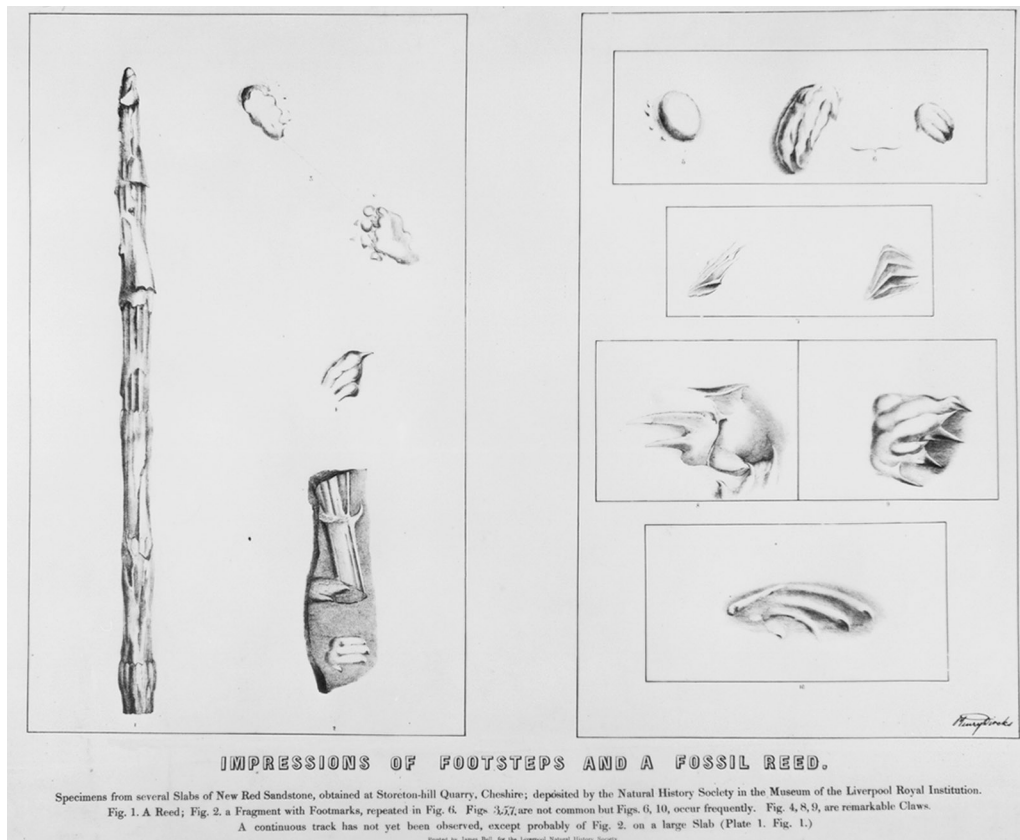


**FIG. 7.** Liverpool Natural History Society Plate 2 lithograph. The caption reads: FOOTSTEPS OF THE CHEIROTHERIUM. Fig. 1. A Slab of New Red Sandstone, from Storeton-hill Quarry, Cheshire; it measures 7 1/2 feet in length, and contains the longest track of feet marks in any single specimen. It also presents the best illustration of the **young** Animal's feet marks yet obtained, of these the hind and the fore foot are represented, natural size, at Fig. 2. being an exact copy from the original.





**FIG. 8.** Liverpool Natural History Society Plate 3 lithograph. The caption reads: FOOTSTEPS OF THE CHEIROTHERIUM. Fig. 1 and 2. are Slabs of New Red Sandstone, from Storeton-hill Quarry, Cheshire. Fig. 2. though the least perfect, contains several interesting impressions, viz. a good specimen of the fore foot; tracks of the hind feet, **without** the fore feet, and also of a substance resembling a tooth.



**FIG. 9.** Liverpool Natural History Society 'Plate 4' lithograph showing prints from the lower footprint bed and *Equisetites keuperina*. The caption reads: IMPRESSIONS OF FOOTSTEPS AND A FOSSIL REED. Specimens from several Slabs of New Red Sandstone, obtained at Storeton-hill Quarry, Cheshire; deposited by the Natural History Society in the Museum of the Liverpool Royal Institution. Fig. 1. A Reed; Fig. 2. a Fragment with Footmarks, repeated in Fig. 6. Figs. 3, 5, 7 are not common but Figs. 6, 10 occur frequently. Fig. 4, 8, 9 are remarkable Claws. A continuous track has not yet been observed, except probably of Fig. 2 on a large Slab (Plate 1. Fig. 1.).

spondence, and Cunningham's share of this correspondence is preserved in the Buckland archive held by Oxford University Museum. It is clear from these letters that John Tomkinson had agreed to present footprint-bearing slabs to both the British Museum and Oxford University. It also appears that, when Buckland reported the discovery at the B.A.A.S. meeting in Newcastle, a number of Association members expressed an interest in acquiring Storeton specimens. However, when Cunningham was informed of this, his reply was not overly optimistic. Letter to Buckland, September 5, 1838:

... I will if possible procure for the Societies and Museums you mention slabs containing footmarks in relief and the reverse, but Mr. Tomkinson has of late become so very careful of them that I am afraid they will be obtained with considerable difficulty. Be that as it may, I had before receiving your letter secured for you the best specimen that had been found in the stratum you had a portion of upraised the day you was there. This with the other slab will be sent to Oxford by the Pickford boat.

However, there was to be a more serious problem than Tomkinson's reluctance to part with specimens. Following Robert Grant's lecture, visitors were coming to the quarry in search of souvenirs and the foreman, no doubt in exchange for a coin or two, was happy to accommodate them. Cunningham's letters to Buckland and to Charles Konig, who had charge of the geological collections at the British Museum, show his increasing concern. Letter to Buckland, October 18, 1938:

I am sorry to inform you that the pair of slabs which I selected for you were broken in bringing from the quarry to Liverpool. I have now however taken the precaution to prevent the like occurrence by sending over to the quarry a strong case which I expect here in the course of the next week. And will immediately be sent off by the Pickford boat to Oxford. It contains a pair of slabs that I selected out of the few which now remain in the quarry and these are none of the best.

The fact is that George Forrester the foreman has allowed many of the best slabs to be broken and mutilated by a number of persons who go to the quarries for the sake of supplying themselves and friends with a single impression or so.

As to the other slabs for the Museums you mentioned I can give no satisfactory account in consequence of Mr. Tomkinson being quite undecided as to what to do with them.

Letter to Konig, October 29, 1838.

Immediately on receipt of your letter of the 25th inst., I waited on Mr. Tomkinson to ascertain when he intended sending the slab he promised me in June for the British Museum. He after some hesitation said 'that when the slabs that are lying in the quarry are sent over to Liverpool he would let me know, and then we would select a slab for you'. When these slabs may be sent here I cannot tell. . . . At all events I will do what I can to procure for you the most perfect among them.

One thing I would take the liberty of suggesting to you which is that you write to Mr. Tomkinson and give him the honour alone for the slab. This would have a much better effect on him than anything I can promise.

Letter to Buckland, November 16, 1838:

I have to express my sincere regret at the disappointment you must have experienced at not finding the slabs I promised at Oxford on your return from the Continent. The cause is simply this: Mr. Tomkinson would neither allow them to be taken from the quarry nor would he bring them himself. He has acted in a most ridiculous manner and kept me in suspense by fair promises until I lost all patience. I at last wrote a very severe letter to him which had the effect of bringing the boxes with the slabs over but you can easily conceive my consternation and anger when I beheld them in pieces after the precautions I had taken to preserve them whole. . . .

If you see Mr. Konig would you be kind enough to inform him of the disagreeable circumstances in which I am placed regarding the slabs.

Over the next week Cunningham must have brought all the moral pressure at his command to bear on John Tomkinson. It is not difficult to imagine the thrust of his argument: Cunningham had, with Tomkinson's consent, promised footprint slabs



**FIG. 10.** Slab showing *Chirotherium storetonense* trackway (154 x 108 cm). Upper footprint bed, South Quarry, Storeton. (Oxford University Museum specimen G55).



to Buckland and Konig, but all the slabs from the lower footprint bed left in the quarry were now broken up and useless. However, the slabs from the **upper** bed which Tomkinson had brought to Liverpool in July remained intact.

Whatever arguments Cunningham used, they were successful and he was able to write to Buckland and Konig with better news. Letter to Buckland, November 26, 1838:

I have great satisfaction to inform you that Mr. Tomkinson has at length come to the magnanimous resolution of allowing me to fulfil my promise to you but not with the slabs from the bed you wished. The slab I have selected is one of the originals which contain the most distinct impressions of any yet obtained. The others being all broken in pieces, I had no alternative left. I trust, however, that you will be pleased with it. Another of the originals will also be forwarded this week to the British Museum. . . .

Letter to Konig, November 26, 1838:

I have the pleasure of communicating to you the favourable result of a tedious and disagreeable correspondence that I have had with Mr. Tomkinson the proprietor of the slabs from the Storeton Hill quarries, viz that you may expect one of them this week and I think that you will be pleased with it.

Please let me know by what conveyance you will have it. Railway or canal? And be sure to give Mr. Tomkinson the credit of presenting it to the Museum.

In the end, despite Cunningham's fears, things had worked out well. By bringing the slabs from the upper footprint bed to Liverpool in July, John Tomkinson unwittingly saved them

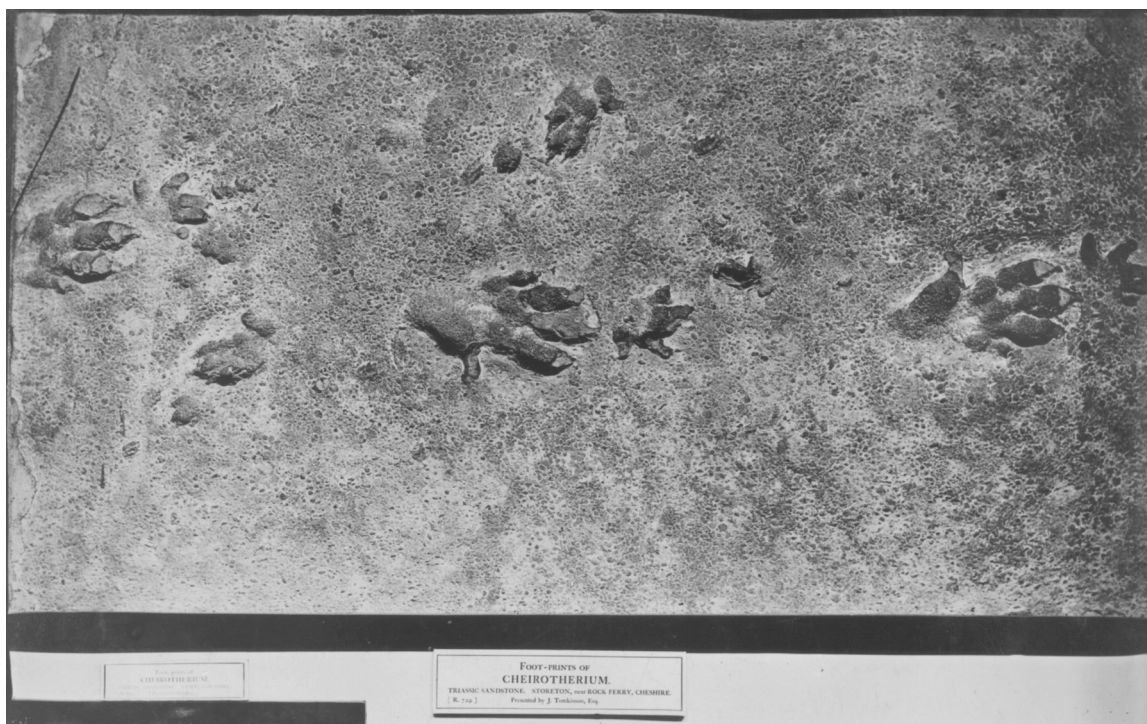
from the depredations of the souvenir hunters who visited Storeton later that year. By another stroke of good fortune, Henry Johnson, acting curator at the Royal Institution Museum, had visited Storeton on July 31 to select three of the best specimens from the lower footprint bed and arrange for their conveyance to Liverpool. (He was later given the sum of nine shillings [45p] from the L.N.H.S. funds to cover the cost.)

Thus the best specimens from both upper and lower beds were taken safely to Liverpool, and two of the former were soon passed on to Oxford University (Fig. 10) and the British Museum (Fig. 11). It is gratifying to note that both these slabs are currently on display in Oxford and London, the British Museum slab being in the centre court of the Natural History Museum alongside the *Diplodocus* skeleton.

### THE ROYAL GEOLOGICAL SOCIETY OF CORNWALL SLAB

After the slabs had been sent to Oxford University and the British Museum, one still remained in the Tomkinson brothers' possession and this too was soon to find its home in a museum.

Early in the 1840s, Triassic footprints were discovered in a quarry at Lymm, a mile or so to the east of Warrington, Cheshire. Sir Charles Lemon, Bart. was, at the time, the President of the Royal Geological Society of Cornwall (R.G.S.C.), and in 1842 he visited Liverpool to attend a meeting of the Agricultural Association. There he met John Cunningham, who agreed to try to obtain a footprint slab for the R.G.S.C. The slab that Cunningham sent them the following year was the last of those collected from the upper footprint bed in July 1838 (Fig. 12).



**FIG. 11.** Slab showing *Chirotherium storetonense* trackway crossed by *Chirotherium sickleri*; the surface is studded with casts of rain pits (132 x 69 cm). Upper footprint bed, South Quarry, Storeton. (Natural History Museum specimen R.729).



**FIG. 12.** Slab showing *Chirotherium* tracks (142 x 120 cm). Upper footprint bed, South Quarry, Storeton. (Royal Geological Society of Cornwall specimen).

Unfortunately Sir Charles assumed that Storeton was the quarry near Warrington which was then in the news as a source of footprints. Mislead by its President, the R.G.S.C. recorded the slab as having been “found near Warrington”. It is, of course, indisputably a Storeton specimen since it is one of the two depicted by the L.N.H.S. lithograph no. 3. It was to be a century and a half before its true place of origin was recognized (Tresise, 1989).

### THE EVIDENCE OF “FOSSIL SHOWERS”

Even without the evidence of the L.N.H.S. lithograph it would still be possible to identify the R.G.S.C. slab as a Storeton specimen.

The Storeton footprints were impressed into thin seams of clay within the desert sandstones. These clays had formed from wind-blown dust which settled on the beds of temporary lakes formed on the desert floor in periods of flood. The beds of sandstone tended to split apart along the lines of weakness formed by the clays, and the “footprints” were normally seen, not as impressed prints, but as raised casts on the undersurface of the overlying sandstone bed. The sandstone which overlay the upper footprint bed also showed a characteristic “warty” appearance which puzzled Cunningham greatly. He concluded that it must have resulted from the pitting of the underlying clay by showers of rain. His suggestion that so ephemeral a feature as raindrops might be preserved in the fossil record was greeted with derision by other members of the L.N.H.S.

Notwithstanding this, Cunningham plucked up enough courage to put this theory to Buckland on his visit to Storeton:

He stood for several minutes looking earnestly at the impressions but said not a word. I was afraid I had subjected myself to his ridicule also and for some two or three weeks afterwards was very *quiet* on the subject of my fossil showers. (Letter, Cunningham to Owen, dated December 13, 1858)

However, once he had thought the matter over, Buckland delighted Cunningham by endorsing his suggestion. Thus encouraged, Cunningham wrote a paper on the rain-drop impressions. This was read to the L.N.H.S. by Cunningham on February 5 and (in a somewhat amended form) to the Geological Society of London by Buckland on February 27, 1839.

It was only the footprint slabs from the South Quarry at Storeton which showed this feature. The rain drops pitted a strip of still moist clay exposed along the margin of a shrinking lake and this strip alone. On one side they would have splashed down into the lake waters, while on the other, the clay, baked hard by the sun, would have been intractable. It is unsurprising, therefore, that Henry Beasley found no trace of rain pitting when he studied the footprint beds in the Higher Bebington White Freestone Quarry, some 200 m to the north.

The “water marks” seen on the R.G.S.C. slab thus indicate a South Quarry, rather than just a Storeton, origin.

### THE “GUY’S CLIFFE” SPECIMEN

The Royal Institution Museum (R.I.M.), in which the Storeton specimens were originally housed, closed down in 1877. Its geological collections were purchased by Bootle Town Council who was planning to open a museum of its own. Bootle Museum in turn closed in 1953; some of its specimens (including three large Storeton slabs) are now in the collections of the Sefton Museum Service at Southport. Others were acquired by Liverpool University and were thereafter passed on to the National Museums Liverpool. (N.M.L.)

These include a specimen acquired by the R.I.M. on September 10, 1838 and described at the time as a “fossil fucus” or a “fossil reed.” It is depicted on the L.N.H.S. lithograph no. 4, and is now the type specimen of *Equisetites keuperina* Morton (Fig. 13).

Two footprint specimens were acquired at the same time and one of these is also believed to be in the N.M.L. collections. This slab shows the footprints of *Chirotherium sickleri* Kaup, and it shows every sign of originating from the South Quarry at Storeton, including the characteristic rain pitting (Fig. 14). It may indeed be part of the same *C. sickleri* trackway which is seen on the Natural History Museum slab (Fig. 11). However, in 1901, when it was photographed by Henry Beasley in Bootle Museum, it was displayed with a label stating that it came from “Guy’s Cliff, Warwick” (Fig. 15).

The ‘Guy’s Cliff’ attribution results from Richard Owen’s claim that the *Chirotherium* footprints had been left by the group of amphibians he called Labyrinthodonts (“labyrinth toothed”) because of the intricate folding shown by the dentine. This claim, which Owen first put forward in 1842 and repeated in his popular text-book *Palaeontology* (1860), was generally accepted in the 19th century. Owen’s tell-tale tooth, on which he based his identification, had indeed been found at Guy’s Cliffe in Warwick but no footprints were ever recorded from this locality. Since any such find would have been seen as a triumphant vindication of Owen’s theory, it could hardly have failed to attract widespread publicity.



FIG. 13. *Equisetites keuperina* Morton: type specimen. South Quarry, Storeton (46 x 26 cm). National Museums Liverpool specimen 1969.131.

The label thus appears to result from a simple misunderstanding on the part of the Bootle Museum staff. In full it reads:

Labyrinthodon (footprints). A lizard-shaped amphibian, so-called from the labyrinth pattern exhibited by the enamel in a section of their teeth. Guy's Cliff, Warwick. Trias.

In fact, it was the labyrinthodont tooth which had been found at Guy's Cliffe; the footprint slab itself came from Storeton.

Owen's high reputation ensured that the theory that the *Chirotherium* footprints were of labyrinthodont origin persisted in the literature, even after it became clear that the dominant animals of the Triassic period had been reptiles, not giant amphibians. Eventually, however, a more plausible theory was postulated. In 1925 Wolfgang Soergel pointed out the similarity between the *Chirotherium* footprints and the foot skeleton of the pseudosuchian reptile *Euparkeria* found in the Triassic rocks of South Africa. There were two obvious drawbacks: no pseudosuchian fossils were known from the northern hemisphere, and *Euparkeria* was much too small—it would have left footprints 5 cm long compared with *Chirotherium*'s typical length of c. 21 cm. Undeterred by these objections, Soergel

postulated that the still-undiscovered originator of the *Chirotherium* tracks had been a giant pseudosuchian reptile (Soergel, 1925).

Forty years later, his theory was convincingly confirmed. In 1965 the skeleton of a new species of pseudosuchian was found in the marine Triassic rocks of Monte San Giorgio, Switzerland. Bernard Krebs, the German palaeontologist who described it and named it *Ticinosuchus ferox*, also stressed how closely it matched Soergel's predictions (Krebs, 1966).

At the time this paper was published, work on vertebrate footprints had fallen out of fashion in Britain. A renaissance of interest began in 1974, when Bill Sarjeant published his comprehensive review of British footprint finds. In this paper he reported that Hartmut Haubold (Haubold 1971) "considered *Chirotherium storetonense* to be a junior synonym of the type species of the genus *Chirotherium barthii* Kaup, sad news indeed for Cheshire geologists." (Sarjeant, 1974, p. 311) Sarjeant pointed out, however, that he regarded Haubold's many reattributions as highly questionable (*ibid.*, p. 311).

The case for *Chirotherium storetonense* to be considered a valid species was stressed in the 1990s by both the author (Tresise, 1996) and by Michael King in an unpublished thesis (King,



FIG. 14. *Chirotherium sickleri* on a 'warty' surface produced by rain pitting of the underlying clay (45 x 26 cm). Upper footprint bed, South Quarry, Storeton. (National Museums Liverpool specimen 1972.169.A).



**FIG. 15.** *Chirotherium sickleri* (45 x 26 cm). Photographed in Bootle Museum, c. 1900 and wrongly attributed to 'Guy's Cliff, Warwick'. (Beasley archive photograph no. 38. Liverpool Geological Society & National Museums Liverpool).

1997). It is reiterated in a major paper by King, Sarjeant, Thompson, and Tresise currently in press. Taxonomy in the present paper is in accordance with that proposed by King et al. (in press).

#### THE SEDGWICK MUSEUM SPECIMEN

In addition to the specimens discussed above, there is one further rain-pitted footprint slab that appears to be a South Quarry specimen (Fig. 16). It is on display in the Sedgwick Museum of Cambridge University, but there is no record as to how or when it reached the museum.

One possibility is that this is another slab raised from the upper footprint bed in 1838. Grant, in his 1838 lecture, noted:

The workmen have traced these large footprints in a continuous single line, produced by the walking of one animal, for 20 or 30 feet [6 or 9 m] over the surface of the rock.

It is possible that John Tomkinson brought *five* slabs from this 6 m trackway to Liverpool. Of four we can be sure, since they were figured in the L.N.H.S. lithographs, but there could also have been an unillustrated fifth slab which Tomkinson subsequently presented to the Woodwardian Museum (as the Sedgwick was then known).

A second possibility is that the slab came from the South Quarry at a later date. By the middle of the 19th century, the huge North Quarry was the main commercial supplier of Storeton stone although operations continued in the South Quarry on a smaller scale. In December 1860, J. H. Mitchener described his visit to Storeton to the newly-formed Geologists' Association. It was in the South Quarry that:

... capital casts of [footprint] impressions are found, which find their way into the various museums of the country. By far the best specimen the writer has yet met with might some little time since have been seen on the top of a *pig-sty* belonging to one of the workmen. No geologist that visited Storeton Quarry but was dragged up its steep and rugged sides to view this unique scientific gem on its rather inelegant setting.

Even if it was not the Sedgwick slab itself which once roofed a pig sty, it is clear from Mitchener's account that footprint slabs were still being raised from the South Quarry in the middle of the nineteenth century, and that these might "find their way into the various museums of the country."

#### CONCLUSION

We know from contemporary accounts of ten specimens collected from Storeton in 1838: the four slabs from the upper footprint bed figured in the L.N.H.S. lithographs; three slabs from the lower bed brought to the Royal Institution Museum at the end of July, and three additional R.I.M. specimens acquired in September.

Of the ten specimens collected in 1838, all but one can still be accounted for. The four upper bed slabs are now in museum collections in Southport, London, Oxford, and Penzance. Two of the lower bed slabs are in the collections of the Sefton Museum Service based at Southport, along with fragments of the third. This last (formerly Bootle slab 4, Fig. 3) was broken while still at Bootle Museum; the three fragments that survive comprise less than half of the original slab. One of the September specimens, the "fossil reed" shown in L.N.H.S. lithograph 4, is in the National Museums Liverpool. Another N.M.L. specimen, the "Guy's Cliffe" slab, was almost certainly also acquired at this time, but the fate of the third slab is unknown.

Eight specimens thus survive intact, along with part of a ninth; only one appears to have been lost. Credit for their rescue and preservation is largely due to the Liverpool Natural History Society, and John Cunningham in particular, but that is not the whole story. If Cunningham had not "happened to hear" the quarry workers' tales of the victims of Noah's Flood, the 1838 discoveries might have gone unnoticed. Following their recognition, it was the quarry owner who decided to bring to



**FIG. 16.** Slab showing *Chirotherium storetonense* trackway and cast of rain pits (98 x 67 cm). [Upper footprint bed, South Quarry, Storeton] (Sedgwick Museum specimen, no accession data).

Liverpool the slabs which he would later present to four (or possibly five) museums. Even the quarry foreman could be said to have played a positive role, despite allowing casual visitors to break up the trackway slabs at Storeton. Because all available slabs from the lower footprint bed had been destroyed in this way, the slabs sent to the British Museum and Oxford University came from the upper bed with its more spectacular trackway. For good or ill, the quarry workforce played an important part in the rescue operation and, on balance, it was overwhelmingly for good. More than a century and a half after the event, recognition of their role is long overdue.

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The minute book of the Liverpool Natural History Society is part of the archives of the Liverpool Literary & Philosophical Society, which are housed in Liverpool City Libraries. Cunningham's letters to Buckland, and those to Konig and Owen, are in the archives of Oxford University and the Natural History Museum, respectively. I am grateful to Philip Powell of Oxford University Museum and the late John Thackray of the

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