

The author concludes by calling attention to some general principles, which arise out of the present inquiry, but which are applicable to all departments of Natural History, regarding the *kind* and *extent* of comparison on which alone specific distinctions can be securely based.

June 21, 1855.

The LORD WROTTESELEY, President, in the Chair.

A. Follett Osler, Esq., Charles Vincent Walker, Esq., and Robert Wight, M.D., were admitted into the Society.

The following gentlemen were elected Foreign Members of the Society :—

Gustav Lejeune Dirichlet.
Julius Plücker.
Heinrich Rathke.
Carl Rümker.

Pursuant to notice given at last Ordinary Meeting, the question of the readmission of Edward Tuson, Esq., was put, and, the ballot having been taken, decided in the negative.

The following communications were read :—

- I. "On a supposed Aërolite or Meteorite found in the Trunk of an old Willow Tree in the Battersea Fields." By Sir ROBERT IMPEY MURCHISON, F.R.S., Director-General of the Geological Survey of Great Britain. Received June 21, 1855.

In bringing this notice before the Royal Society, it is unnecessary to recite, however briefly, the history of the fall of aërolites or meteorites, as recorded for upwards of three thousand years, though I may be

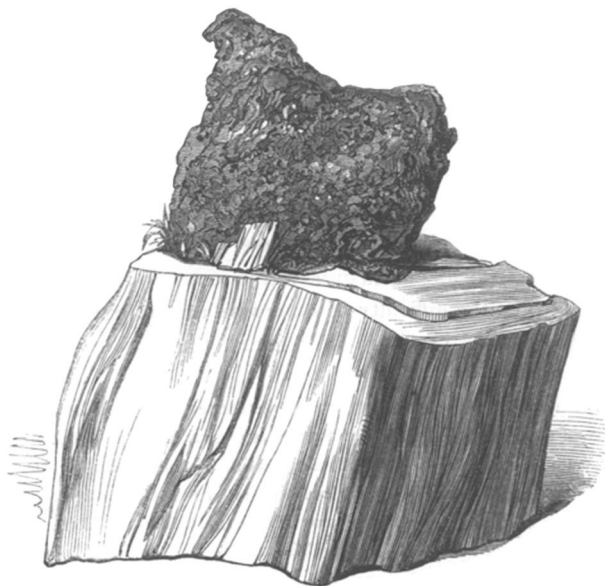
pardoned for reminding my Associates, that the phenomenon was repudiated by the most learned academies of Europe up to the close of the last century. The merit of having first endeavoured to demonstrate the true character of these extraneous bodies is mainly due to the German Chladni (1794), but his efforts were at first viewed with incredulity. According to Vauquelin and other men of eminence who have reasoned on the phenomena, it was in 1802 only that meteorites obtained a due degree of consideration and something like a definite place in science through the studies of Howard, as shown in his memoir published in the Philosophical Transactions.

Vauquelin, Klaproth, and other distinguished chemists, including Berzelius and Rammelsberg, have successively analysed these bodies, and the result of their labours, as ably brought together in the work of the last-mentioned author, is, that whilst they have a great general resemblance and are distinguishable on the whole by their composition from any bodies found in the crust of the earth, each of their component substances is individually found in our planet. They are also peculiarly marked by the small number of minerals which have collectively been detected in any one of them; nickel and cobalt, in certain relations to iron, being the chief characteristics of the metallic meteorites.

Of the various theories propounded to account for the origin of these singular bodies, it would indeed ill become a geologist like myself to speak; and referring in the sequel to some of the various works in which the subject has been brought within formula, I will at once detail the facts connected with the discovery of this metalliferous body in the heart of a tree, as now placed before the Members of our Society, feeling assured that, whatever be their ultimate decision, my contemporaries will approve of the efforts that have been made to account for this singular and mysterious phenomenon.

On the 2nd of June, a timber merchant, residing at North Brixton, named Clement Poole, brought the specimen now exhibited to the Museum of Practical Geology, when it occurred to Mr. Trenham Reeks, our Curator, that it might be a meteorite, and on inspecting its position in the mass of wood, and having heard all the evidence connected with it, I was disposed to form the same conclusion. On submitting a small portion of the metallic part to a qualitative test in the metallurgical laboratory of our establishment, the presence of

nickel, cobalt and manganese was detected in the iron included in the mass, and as the surface was scorified, indented, uneven, and partially coated with a peculiar substance, the surmise as to the meteoric nature of the imbedded material seemed to be rendered much more probable. Again, in looking at the wood which immediately surrounded that portion of the mass which remained, as it is now, firmly inserted in the tree, a blackened substance was observed to be interpolated between the supposed meteorite and the surrounding sound wood. On the outside of this substance (which had somewhat a charred aspect) we observed a true bark, which follows the sinuosities of the wood wherever the latter appears to have been influenced by the intrusion of the foreign mineral matter. [The specimen is represented in the annexed wood-cut.]



Seeing thus enough to satisfy our conjecture, if sanctioned by other evidence, I desired Mr. Poole to bring all the fragments of the wood he had not destroyed which surrounded this body. On placing the ends of some of these (also now exhibited) on the parts from which they had been sawed off, they indicated that the space between the mineral substance and the surrounding sound wood widened upwards; the decayed wood passing into brown earthy

matter with an opening or cavity into which rootlets extended. On interrogating Mr. Poole, who cut down the tree and superintended the breaking up of its timber, I learnt from him all requisite particulars respecting its dimensions, the position of the ferruginous mass, the quantity of wood above and below it, a description of the place where the stool of the tree was still to be seen, and of the parties who, living on the spot, were acquainted with every circumstance which could throw light on the case.

At this period of the inquiry, the Museum in Jermyn Street was visited by Dr. Shepard, Professor in the University College, Amherst, United States, whose researches on meteorites are widely known, and who has furnished an able classification of them by which they are divided into the two great classes of stony and metallic. Having carefully examined the specimen, Dr. Shepard expressed his decided belief that it was a true meteorite, and the next day wrote to me the following account of it; at the same time referring me most obligingly to a series of interesting publications on the subject as printed in America and Europe*:

“Concerning the highly interesting mineral mass, lately found enclosed in the trunk of a tree, and of which you have done me the honour to ask my opinion, I beg leave to observe, that I have no hesitation in pronouncing it to be a true meteoric stone.

“Aside from the difficulty of otherwise accounting for it, under the circumstances in which it is found, the mass presents those

* Dr. Shepard's numerous memoirs on meteorites are all to be found in the volumes of the *American Journal of Science and Art*, and in the same work the reader will find not only the general classification of these bodies by this author, who possesses a collection from 103 localities, but also essays on the same subject by his countrymen Dr. Troost, Professor Silliman, jun., and Dr. Clark.

In our own country, Mr. Brayley published some years ago a comprehensive view of this subject in the *Philosophical Magazine*, and recently Mr. Greg has in the same publication put together all the previous and additional materials, with tables showing the geographical distribution of meteorites. Among the well-recorded examples of the fall of metalliferous meteorites, no one is more remarkable than that which happened in the year 1851, about sixteen leagues S.E. of Barcelona in Spain. In describing that phenomenon, Dr. Joaquim Balcells, Professor of Natural Sciences at Barcelona, has illustrated the subject with much erudition, whilst his theoretical views are ingenious in his endeavour to explain how meteorites are derived from the moon.

peculiar traits that are regarded as characteristic of meteorites. It has, for example, a fused, vitrified black coating, which is quite continuous over a considerable part of the mass, and contains several grains and imbedded nodular and vein-like portions of metallic iron, in which I understand nickel and cobalt have been detected.

“The general character of the body of the stone is indeed peculiar; and as a whole, unlike any one I have yet seen; it being principally made up of a dull greyish yellow, peridotite mineral, which I have nowhere met with among these productions, except in the Hommoney Creek meteoric iron mass, and which exists in it only in a very limited quantity. It is singular to remark also, that the stone under notice strikingly resembles in size, shape and surface, the iron above alluded to.

“The absence of the black, slaggy coating on one of the broad surfaces of the stone, may arise from its having been broken away, by the violence to which it must have been subjected in entering the tree; for it appears to have buried itself completely at its contact, an operation which would probably have been impossible, in the case of a stone, but for its wedge-shaped configuration, and the coincidence of one of its edges with the vertical fibres of the wood.”

In reply to a question I subsequently put to Dr. Shepard as to whether he knew of any examples of meteorites having struck trees in America, he replied as follows:—

“I think you will find in the volume I left with Mr. Reeks at the Museum, an account of the fall of Little Piney, Missouri, February 13th, 1839; in which it is stated that the stone struck a tree and was shattered to fragments, it being one of a brittle character. In the interior of the Cabarras county, N. Carolina, a stone (October 31, 1849) I know struck a tree, and I found it was difficult, indeed impossible, to separate completely the adhering woody fibres from the rough hard crust of the meteorite. The stone in this case is a peculiarly tough one, having a decidedly trappean character, rendering it as nearly infrangible as cast iron.”

Aware that some time must elapse before the precise analysis, which I wished to be made in the laboratory of Dr. Percy, could be completed, and that the last meeting of the Royal Society was to be held this evening, I announced the notice I am now communicating. At the same time I resolved to visit the locality where the tree stood,

and to obtain on the spot all the details required. Having done so, accompanied by Mr. Robert Brown, Sir Philip Grey Egerton, Professor J. Nicol, and Mr. Trenham Reeks, the information ultimately obtained was as follows :—

The man who helped to cut down the tree confirmed in every respect the evidence of Mr. Poole as to its position, height, and dimensions, and pointed out to us the stump or stool we were in search of which is to be seen at nearly 200 yards to the east of the St. George's Chapel, Lower Road, Battersea Fields, and at the eastern end of a nursery garden, between the railway and the road, occupied by Mr. Henry Shailer.

The tree was a large willow, probably about sixty years of age, which stood immediately to the east of the old parsonage house recently pulled down. Its stem measured about 10 feet in circumference at 3 feet above the ground, and had a length of between 9 and 10 feet; from its summit three main branches extended, one of which, pointing to the S.W. or W.S.W., had been for many years blighted, and was rotten to near its junction with the top of the main trunk; a portion of this blighted main branch is exhibited. The other two main branches, which rose to a height of 50 or 60 feet, were quite sound; a part of one of these offsets is also exhibited.

The stool of the tree was visibly perfect and without a flaw, and at the wish of Mr. R. Brown, a section of it has been obtained since our visit, which is also here, and the rings of which seem to confirm the supposition as to the age of the tree.

Mr. Poole having conveyed the tree to Brixton, cut the trunk into two nearly equal parts, intending to make cricket-bats out of each. In doing so, he perceived that the upper portion of the lower of the two segments was in a shaky or imperfect condition, and hence he resolved to saw off the upper part of it, intending thereby to obtain wood large enough for the "pods" of his cricket-bats, but not such entire bats as he was making out of the upper segment.

In dividing the tree, the saw was stopped at about 8 inches from the surface on one side (or the breadth of a large saw) by a very hard, impenetrable substance, which was supposed to be a nail, and hence Mr. Poole resolved to break up the portion of the wood he had previously condemned as of inferior quality, and hewing it down

from the sides he uncovered, to his astonishment, the great lump of metalliferous matter, as now seen. Attaching little value to it, much of the surrounding wood was thrown away or used up before the specimen was brought to Jermyn Street; but enough has been obtained to throw light on the probable or possible origin of the included mass.

On interrogating Henry Shailer, a market gardener, who has long lived on the spot and managed the ground where the tree grew, when it was part of the garden of the former clergyman (Mr. Weddell), I learnt from him that he had known the spot for sixty years, that in his days of boyhood it was a fellmonger's yard, before it was attached to the garden. He had observed that the tree was blighted in one of its main branches for many years, and had always supposed that it was struck by lightning in one of two storms, the first of which happened about 1838 or 1839, the other about nine years ago.

So far the evidence obtained might be supposed to favour the theory that this ferruginous mass* had been discharged near to the blighted branch, and had penetrated downwards into the tree, to the position in which we now see it, charring and warping the wood immediately around it in its downward progress; whilst in the sixteen years which have elapsed, the wood renovating itself, produced the appearance which has so much interested the eminent botanists who have examined it, viz. Mr. R. Brown, Dr. Lindley, Professor Henfrey, Dr. J. Hooker, and Mr. Bennett.

On the other hand, I must now point out some features of this extraordinary case which check the belief in the included mass being a meteorite.

We found lying near the root of the tree two fragments, one of which is similar to the substance included in the tree, while the other is decidedly an iron slag. On bringing these fragments, weighing several pounds, to Jermyn Street, and on breaking one of them, it was found, like the supposed meteorite, to contain certain small portions of metallic iron, in which both nickel and cobalt were also present; and hence the scepticism which had prevailed from

* The ferruginous mass is, it is supposed, about thirty pounds in weight; but as one of its extremities is still imbedded in the wood, the precise weight cannot be stated.

the beginning of the inquiry in the minds of some of my friends, was worked up into a definite shape.

The occurrence of stones enclosed in wood is not a novel phenomenon. Mr. Robert Brown has called my attention to two cases as recorded in the following works:—

“De lapide in trunco betulæ reperto. G.F. Richter in Acta Phys. Med. Acad. Nat. Curios. volume 3, page 66*.”

“Descriptio Saxi in Quercu inventi. Kellander, Acta Literaria et Scientiæ Sueciæ.” 1739, pp. 502, 503.

Since the Battersea phenomenon was announced, Professor Henslow, to whom I had applied, wrote to me saying, that he possessed a remarkable example of a stone which was found imbedded in the heart of a tree, in sawing it up in Plymouth Dockyard; and he has obligingly sent up the specimen, which is now also exhibited. In this case, judging from the mineral character of the rock, and its being slightly magnetic, Professor Henslow supposed that it was perhaps a volcanic bomb. On referring it to Dr. Shepard, that gentleman entertains the opinion that it is also a meteorite, and states that it resembles certain meteoric stones with which he is acquainted; suspicions of which had also been entertained by Professor Henslow. From the examination of a minute fragment which I detached from this stone, it appears to be composed of a base of felspathic matter, with minute crystals of felspar and of magnetic iron pyrites. Externally it has a trachytic aspect, though, when fractured, it more resembles, in the opinion of Mr. Warrington Smyth, a pale Cornish elvan or porphyry than any other British rock with which it can be compared. Whatever may have been the origin of this stone, which is of the size of a child's head, it is essentially different from the metalliferous mass from Battersea, to which attention has been specially invited, and its position in the heart of an oak is equally remarkable. Like the Battersea specimen, the segment of wood from Plymouth Dockyard is characterized by an interior bark which folds round the sinuosities of the included stone.

In respect to the envelopment of manufactured materials in trees,

* “Lapis prædurus subalbicans et manifeste siliceus pruni ferme aut juglandis minoris magnitudine.*** Nidus ad figuram lapidis non plane accommodatus, sed quadrangulus, et hinc illinc in mediocres rimas desinens, corticeque imprimis notabili, non multum ab exteriori cute diverso, maximam partem vestitus.”

my friend, Mr. H. Brooke, the distinguished mineralogist, tells me that he perfectly remembers the case of an iron chain which had been enclosed in the heart of a tree, the wood of which was sound around the whole of the included metallic body. This specimen was to be seen some years ago in the British Museum. Again, he informs me that at Stoke Newington he recollects to have seen a tree, the trunk of which had grown over and completely enclosed a scythe, except on the sides where its ends protruded*.

Whatever may have been the origin of the metalliferous mass from Battersea, its discovery has at all events served to develop certain peculiarities in the growth of plants which appear to be of high interest to the eminent botanists who have examined the parts of this tree which surrounded the supposed meteorite. Unwilling to endeavour to anticipate the final decision as to the origin of the body in question, I may be permitted to feel a satisfaction that its discoverer brought it to the Establishment of which I am the Director, and which numbers among its officers a Fellow of this Society, who is so well calculated, by his analytical researches, to settle the question on a permanent basis. Should the metallurgical analyses now under the conduct of Dr. Percy lead to the inevitable conclusion that the composition of this body is different from that of well-authenticated meteorites, and is similar to that of undoubted iron slags, we shall then have obtained proofs of the great circumspection required before we assign a meteoric origin to some of these crystalline iron masses, which though not seen to fall, have, from their containing nickel, cobalt and other elements, been supposed to be formed by causes extraneous to our planet.

Postscript, 30th June 1855.—The following are the analyses above referred to, which have been given to me by Dr. Percy since the preceding notice was read:—

“*The slag-like matter* (1) attached to the metal in the tree, as well as the similar matter (2) with adherent metal which was found by

* Many other examples of extraneous bodies found enclosed in the heart of trees have been brought to my notice since this account was written. The most curious of these is perhaps that of an image of the Virgin, which having been placed in a niche had become imbedded by the growth of the tree around it.

Mr Reeks in the vicinity of the tree, has been analysed. The results are as follow :—

	No. 1.	No. 2.
Silica	58·70	63·52
Protoxide of iron	35·46	32·30
Lime	0·30	0·59
Magnesia	0·74	0·21
Protoxide of manganese	trace	trace
Alumina	3·40	2·85
Phosphoric acid	0·43	0·57
Sulphur as sulphide	trace	trace
	<u>99·03</u>	<u>100·04</u>

“No. 1. was analysed by Mr. Spiller, and No. 2. by Mr. A. Dick, chemists who have been incessantly engaged at the Museum during the last two years and a half in the analyses of the iron ores of this country, and whose great experience renders their results worthy of entire confidence. Cobalt and nickel were not sought for in either case, but the metallic iron enveloped in both specimens contained a minute quantity of cobalt and nickel. Another piece of slag-like matter, which was found on the ground near the tree, and which from its external characters I have no hesitation in pronouncing to be a slag, was examined for cobalt and nickel, and gave unequivocal evidence of the former in minute quantity, though not satisfactorily of the latter.

“The metal previously mentioned is malleable iron. That which was detached from the slag-like matter, found outside the tree, was filed and polished, and then treated with dilute sulphuric acid. After this treatment, the surface presented small, confused, irregularly-defined crystalline plates, and was identical in appearance with the surface of a piece of malleable iron similarly treated after fusion in a crucible.”