

in my opinion the only hope of safety for the South is in a withdrawal from the Union before he shall be inaugurated; before the sword and treasury of the Federal Government shall be placed in the keeping of that party. I would suggest that the several State legislatures should by law require the governor, when it shall be made manifest that the black Republican candidate for the Presidency shall receive a majority of the electoral vote, to call a convention of the people of the State, to assemble in time to provide for their safety before the 4th of March, 1861. If, however, a black Republican should not be elected, then, in pursuance of the policy of making this contest within the Union, we should initiate measures in Congress which should lead to a repeal of all the unconstitutional acts against slavery. If we should fail to obtain so just a system of legislation, then the South should seek her independence out of the Union."—Speech of W. L. Yancey before the Alabama Democratic Convention, January, 1860.

The authors copy this declaration of Mr. Yancey from a campaign pamphlet issued by the central committee of the Douglas party, in Washington, in 1860. They have been unable to find the original newspaper report, but the corroboration and fulfillment of the plot here indicated are found in the official proceedings of the Alabama Convention and the Alabama Legislature. The convention on January 13th, 1860, expressly instructed its delegation at Charleston to secede in case the ultra-Southern doctrines were not incorporated in the National Democratic platform, and sent Mr. Yancey as a delegate to execute their instructions, which he did as the text states. The Alabama Legislature, on its part, passed a joint resolution, which the governor approved, February



W. L. YANCEY. (FROM A PHOTOGRAPH BY COOK.)

24th, 1860, providing "that upon the election of a President advocating the principles and action of the party in the Northern States calling itself the Republican party," the governor should forthwith call a convention of the State. This convention was duly called after the election of Lincoln, and passed the secession ordinance of Alabama.

IS IT A PIECE OF A COMET?

"Of star-dust and star-pilgrimages"—



HERE has recently come into my possession *the ninth* iron meteorite whose fall to the earth has been observed. It is, moreover, the first meteorite which seems to evidence a direct connection with a star-shower. The mass acquires still further interest from the fact that it is presumably a fragment of the famous comet of Biela.

A brief account of this celestial wanderer will doubtless be of interest to the readers of THE CENTURY, in which magazine the essays of the astronomer Langley have recently appeared.

Astronomers have waited patiently for the

fall to the earth's surface, at the time of the periodical star-showers, of something *tangible*, but until now they have waited in vain.

In looking over a considerable amount of astronomical literature, only one record can be found of the falling of a body to the earth at such a time; this was near Paris, on the 10th of April, 1094, when "many shooting-stars were seen, and a very large one was said to have been found on the ground as a glowing substance."

From the 24th to the 29th of November, 1885, the earth was passing through a train of meteors that proceeded from the constellation Andromeda, and once formed a part of Biela's comet. These meteors are now known to astronomers as Andromedes or Bielids. The

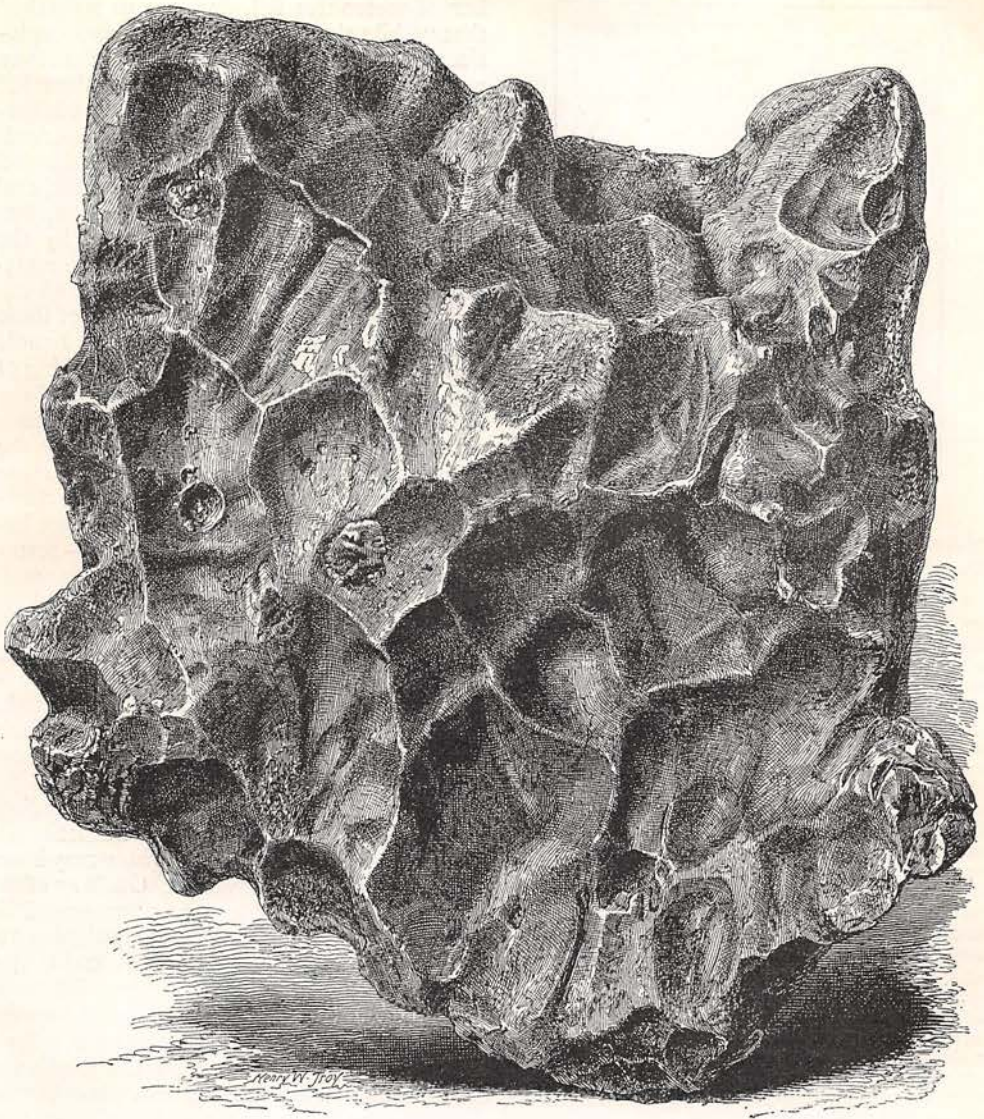


FIGURE 1. THE MAZAPIL METEORITE; NATURAL SIZE.

maximum of this shower occurred on the 27th, while it was yet broad daylight over America, and at an hour corresponding to 11 A. M. at Mazapil, Mexico. Thus, at the time of the fall of this meteorite, ten hours after the maximum number of meteors was observed, the earth was meeting with only the stragglers of the train. It cannot be doubted that the cosmical dust proceeding from the disintegration of Biela's Comet wholly enveloped the earth and was seen as meteors from every part of it. Such was the magnificence of the celestial phenomenon that in some parts of the Eastern Continent uneducated people believed there would be no stars left in the sky.

Of the countless host of meteors which crossed the earth's path on this 27th of November, only one is as yet known to have reached the earth's surface, and this fell near the village of Mazapil, in the state of Zacatecas, Mexico (see map, Fig. 2), at about 9 o'clock in the evening. It is of the rare iron-nickel variety, and weighs ten and a quarter pounds troy. Fig. 1 shows it in natural size, full view.

This meteorite was presented to me by Sr. José A. y Bonilla, Director-Professor of the Zacatecas Observatory, who received it, five days after its fall, from the ranchman who saw it descend from the heavens. This ranchman



FIGURE 2. MAZAPIL AND VICINITY.

related the strange occurrence as follows (translated from the Spanish):

"It was at about 9 o'clock on the night of November 27th, when I went out to the corral to feed certain horses; suddenly, I heard a loud sizzling noise, exactly as though something red-hot was being plunged into cold water, and almost instantly there followed a somewhat loud thud. At once the corral was covered with a phosphorescent light, while suspended in the air were small luminous sparks as though from a rocket. I had not recovered from my surprise before I saw this luminous air disappear, and there remained on the ground only such a light as is made when a match is rubbed. A number of people came running toward me from the neighboring houses, and they assisted me in quieting the horses, which had become very much excited. We all asked each other what could be the matter, and we were afraid to walk in the corral for fear of being burned. When, in a few moments, we had recovered from our fright we saw the light disappear, and bringing lanterns to look for the cause, we found a hole in the ground and in it a ball of light. We retired to a distance, fearing it would explode and harm us. Looking up to the sky, we saw from time to time exhalations or stars, which soon went out without noise. We returned after a little, and found in the hole a hot stone which we could barely handle; this on the next day, we saw, looked like a piece of iron. All night it rained stars, but we saw none fall to the ground, as they all seemed to be extinguished while yet very high up."

Upon further inquiry we learn that there was no explosion or detonation heard, and that the mass penetrated the earth only to a depth of twelve inches.

This very circumstantial account leads us to believe that this meteorite is the first one to be secured and preserved that has come to the earth during a star-shower.

That no explosion or loud detonation accompanied the fall, as is usually the case, is paralleled by similar occurrences at Wold Cottage, in Yorkshire, England, on December 13th, 1795, and at Ghent, in Flanders, on June 7th, 1855; also at Stålldalen in Sweden, on the 28th of June, 1876, when a num-

ber of meteorites fell, and it was remarked that "while the luminous meteor and explosions were noted over nearly all Sweden, they were not observed at the locality of the fall."

Perhaps never, previous to this fall at Mazapil, were such peculiar phenomena observed. The phosphorescent light, seen in the air and on the ground, has special significance, and was probably caused by surface fusion, due to friction with the atmosphere, and by the detached matter falling along with the meteorite as an incandescent powder. The oft-expressed wish that we might have one of these meteoroids from the star-streams to handle and to analyze and thus to learn something of its history, seems now to be gratified; and the remark of Professor Langley "that the advance of science is much more likely to show the kernel or nucleus of the comet is but some large meteorite" is seemingly proved. Furthermore, that there is no material difference between shooting-stars—great or small—seems now established. If these meteors are small—no larger than pebbles—they would be entirely volatilized in their journey through the earth's atmosphere; but if they were larger, only the outer portion would be consumed, and the mass would strike the earth. That they are solids is plainly shown by their luminosity. That they are not liquified gases, as has been suggested, is clearly proved by the absence of the necessary surrounding pressure so essential to such a condition.

As to the light seen, the following may have a bearing on that observation: On May 26th, 1751, two masses of iron (now preserved in the Imperial Cabinet at Vienna), weighing 16 and 71 pounds, whose surfaces resemble the Mazapil iron in a marked degree, fell near Hraschina, in Croatia, in daylight. A vapory cloud survived the fall for fully an hour, before being entirely dissipated. Had this cloud been seen at night, it might have been phosphorescent like the luminous air which followed the Mazapil meteorite.

The crust on this mass of iron is very interesting, and on all meteorites is an ever-present and uniform characteristic. Its black color and lines of flow are due to superficial fusion while the mass is whirling and rotating in its rapid flight. Ordinarily the crust is very thin—say the fiftieth of an inch—and is rarely over one-tenth of an inch; fusion is written in unmistakable terms in every part of it. Of special interest is Fig. 3, as showing the flow of the melted crust over a projecting edge of the meteorite's surface. The hollowed depressions are unusually well marked. They have often been compared to thumb-marks, and are probably due to the scooping action of the air which the meteorite enters, at first, with

enormous speed. When we consider the thin dark crust of this mass of celestial iron, we cannot refrain from comparing it to the soil of this earth, which is really all of earth men know. With all the record of the rocks, we cannot yet claim acquaintance with more than the one-three-hundredth of the earth's thickness; or far less proportionally than is the shell to the egg.

Wishing to show the internal structure of the Mazapil iron, the writer had a slab sawed from the side opposite to that shown in Fig. 1, and this surface being acted upon by dilute nitric acid resulted in the appearance shown in Fig. 4 (natural size). These markings are known as the figures of Widmanstätten, and are peculiar to meteoric irons; they serve as a means of ready identification of such masses. This map-like plan resembles much that of a city, and is in strange contrast to the meteorite's rough exterior. The cause of these lines is the selective affinity of the metal molecules and the extrusion of the rejected matter; or, in other words, these lines show the uniform crystallization of the mass; which process of arrangement is always a purifying one.

A complete chemical analysis of the meteorite of Mazapil merits a place here, if only as a comparison with the iron meteorites of other dates. Mr. James B. Mackintosh, E. M., of the Lehigh University, detached with no little difficulty a compact and unoxidized portion of the mass which was free from the associated graphite and obtained the following results,—iron, 91.26%; nickel, 7.84%; cobalt, 0.65%; phosphorus, 0.30%, with traces of carbon, sulphur, and chlorine. Strangely, this composition pertains to the majority of meteoric irons, as if it were the normal composition of this class of celestial bodies. With very slight differences (often less than one per cent.) the iron meteorites which were seen to fall have this same composition.

With the spectroscope the Bielid meteors were seen to be rich in carbon and iron. The above analysis substantiates beautifully the spectroscopic tests. The Mazapil iron has large compact nodules of carbon in the form of graphite (black-lead). Eleven of these nodules can be seen extruding from the surface; one is nearly an inch in diameter. While this feature is interesting in the extreme, it is not unique, since several of the meteoric irons contain included carbon in nodular form.

We are thus led to think that this earth and the meteorites are all of one common parentage, especially as we find in the meteorites nothing new or strange. To be sure the iron, nickel, and cobalt are uncommon terrestrial occurrences, but these elements are found on

the earth, in a metallic condition, in basaltic and other plutonic rocks which are closely related to the stony meteorites.

As to the place of impact, or the spot on this mass which struck the earth first, the abrasion was very slight. The resistance of the earth's atmosphere—which we move through as though it were nothing—offered, as it were, a buffer, which reduced the speed of the meteorite to little more than that which would be due to

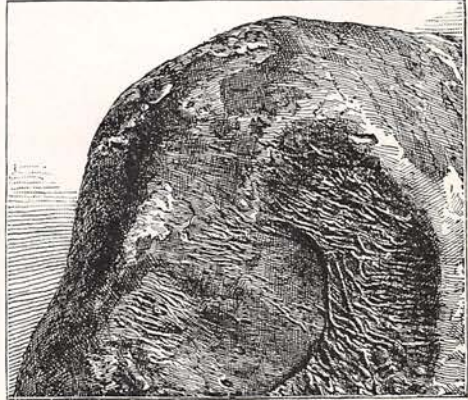


FIGURE 3. CRUST ON METEORITE. (MAGNIFIED TWO DIAMETERS.)

gravitation alone. Had the mass simply fallen a few hundred feet, it could have hardly received less damage.

I have thus treated of the fall, crust, internal structure, and composition of this new meteorite, and will now ask the reader to look to the probable origin of its parental comet. Allowing it to be a fragment of a comet does not help us very far on the track of its ancestry, yet to show where comets most probably have their birthplace would be an endeavor to state the full pedigree of this meteorite.

Some astronomers hold that comets are the "scavengers of space" and have accreted their mass and motion by the simple laws of gravitation and of chemical affinity; but that they had their origin within some sun seems equally as probable, especially, when we study their débris in the form of meteorites.

We have the evidence from Daubr e and others that "meteorites are absolutely identical in structure with terrestrial products, such as are found only deep beneath the surface. They were formed, it is certain, under such conditions of high temperature and tremendous pressure as only can exist deep within the mass of a planet or a sun." Graham and others have shown that iron meteorites contain such quantities of gases, as indicate an origin in a region occupied by hydrogen in a state of great chemical activity, convincing us that such meteorites have brought to us across the stellar

IS IT A PIECE OF A COMET?

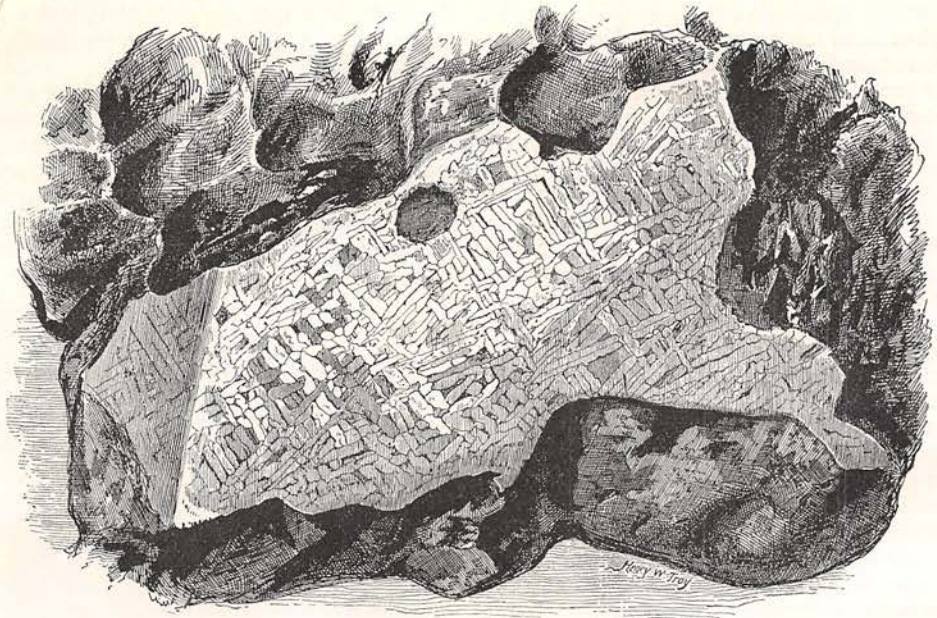


FIGURE 4. WIDMANSTÄTTEN FIGURES OF THE MAZAPIL METEORITE.

depths the material matter of some fixed star or sun.

Therefore, as Mr. Proctor has conjectured,* there remains no other reasonable explanation save that meteor flights are products of some sort of planetary ejection or rejection, which was effected while a planet was in a sun-like stage. He writes:

“Our sun is the only case of a sun-like body we can inquire into; we are forced to the question, ‘Can he eject solid bodies?’ Those who imagine the eruption prominences of the sun to be what they seem to be—jets of glowing gas—may be disposed to answer in the negative. But may they not indicate the tracks of denser bodies not themselves visible because the spectroscope will not show bodies near the sun which shine with the spectral colors? It may doubtless be the case that of ejected meteoric bodies for the greater number return to the sun-like orb which expelled them, but if only one flight, or part of an outburst, escapes from the sun in a year, of how many thousands of such flights has he been the parent in the

* Letter to Editor N. Y. “Tribune.” Sept. 20th, 1886.

An iron-nickel meteorite, weighing one hundred and seven pounds, was announced, in the American Journal of Science of last June, as having been seen to fall on March 27th, 1886, in Johnson county, Arkansas; thus making the tenth mass of meteoric iron whose date of fall is a matter of record.

It is also necessary to state that “it appears questionable whether the 4th, 5th, and 6th in the list of iron meteorites *seen to fall* should be included, since no record of their fall has been published.” The list

past countless ages? Each flight would have been a comet and each component body a meteor, and thus we would have an explanation of such phenomena.”

But before accepting this plausible idea of Mr. Proctor’s as final, we must bring ourselves to believe that a celestial body has the power within itself to expel a part of itself beyond the sphere of its own attraction.

If, in conclusion, the fall of this meteorite shall be confirmed in all its interesting details at a recurrence of the Bielids, and the fact be established that it is in truth a piece of Biela’s Comet, then its scientific importance could not be overestimated. Its close identity with the metallic meteorites of known fall, and of accidental discovery, would place them all in the same category of similar origin, and thus we could think of this class of meteorites as having come from some particular sun-system of stellar space; while for the stony meteorites, in their several varieties,—consistently with this thought—we would seek an origin in other regions of that infinite deep from which dust, starborn, comes to us as comets.

William Earl Hidden.

if thus corrected would be as follows: 1st, Hraschina, Croatia, May 26th, 1751; 2d, Charlotte, Dickson County, Tennessee, Aug. 1st, 1835; 3d, Braunau, Bohemia, July 14th, 1847; 4th, Nedagolla, India, Jan. 23d, 1870; 5th, Rowton, England, April 20th, 1876; 6th, Mazapil, Mexico, Nov. 27th, 1885; 7th, Johnson County, Arkansas, March 27th, 1886. The doubtful ones being those of Tabarz, Saxony; Victoria-West, Africa; and Nejed, Arabia.—W. E. H.