THE WILLAMETTE METEORITE

1902 — 1962

By

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This booklet is published for the observance of the 60th anniversary of the discovery of the Willamette Meteorite, the iargest ever found in the United States, by the West Linn Fair Board.

This booklet has been republished from the original to commemorate the rededication of the monument on July 27, 1985 at its current site. The following organizations have participated in making this edition possible: West Linn Fair Board, Willamette Neighborhood Association, West Linn Lions, Willamette Lions, West Linn Business Group, Tri-City Chamber of Commerce, and the City of West Linn.

Cover — The plaque in the marker commemorating the 60th anniversary of the discovery of the Willamette Meteorite. The Marker, dedicated August 4, 1962, is on the lawn of the Willamette Fire Hall, West Linn, Oregon.

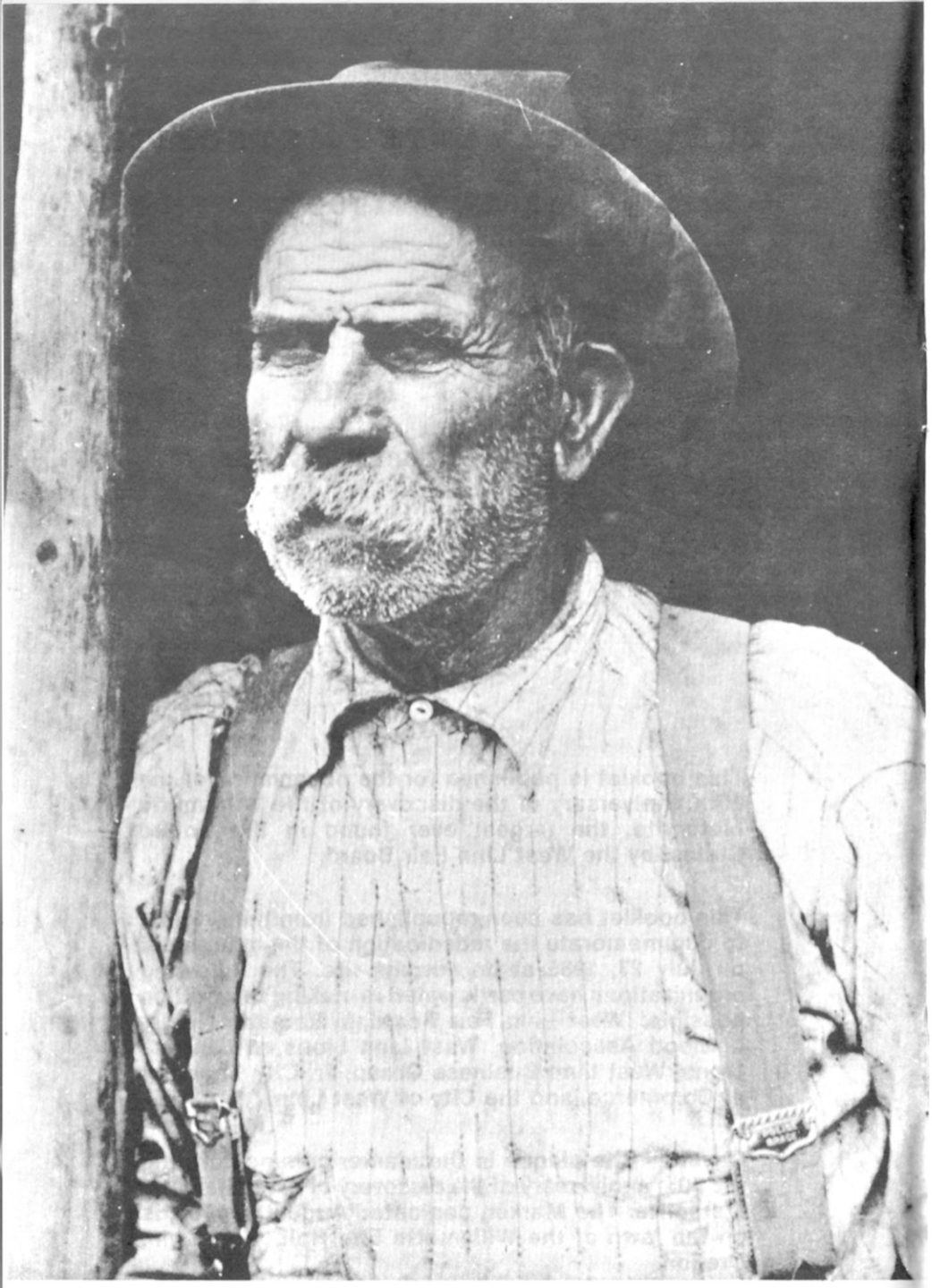


Figure 1 — Ellis Hughes, the discoverer of the Willamette Meteorite, in a photo taken in 1937, five years before his death.

The Willamette Meteorite, Its Story

> The most interesting meteorite, noble in size and wonderful in physical features, was found near the border of Clackamas County, Oregon, in the autumn of 1902. . . . This meteorite having been found two miles from this town (to the northwest) I have given it the name as above, of Willamette Meteorite.

So wrote Henry A. Ward,[9] expert in meteoritics, in 1904 after he had hurriedly journeyed across the United States to view and study the great meteorite which had been publicized in many newspapers throughout the United States.

To this day the 15-1/2 ton Willamette Meteorite remains the largest and most majestic iron meteorite to be discovered in this country. At the time of its finding, the Willamette was the third largest to be discovered on earth. Today, due to the discovery of other large meteorites, it is the world's sixth largest meteoritic discovery.

No meteorite has had a more interesting or a more unusual history. The story of the Willamette meteorite includes Indian rituals, a gigantic daylight theft, three judicial proceedings, an exhibit at a world's fair, a cross-country journey, and finally a permanent resting place amid a great meteorite collection in one of the world's major museums.

This great mass from space was quietly discovered in the fall months of 1902 by Ellis Hughes (figure 1), once a Welsh miner, who had purchased a small farm about two miles west of Willamette, Oregon. Willamette since 1913 has been incorporated as part of the city of West Linn. Mr. Hughes made his discovery on land belonging to the Oregon Iron and Steel Company. In his later years he recounted the events of the discovery destined to bring him fame both in the scientific and judicial annals in the following words:[6]

> I was coming back from work where I had been cutting wood for the Willamette school. I saw this big rock, but didn't think anything of it. I'd never seen it before. The next day when I came from work I saw half a broken saw lying near the rock. It was very rusty. Evidently some woodsman had dropped it there. I sat down on the rock. It was about 1-1/2 feet above the ground and very flat.
>
> Bill Dale came by and said, "Hughes, have you seen this rock before?"
>
> Yes, I said, I saw it yesterday. Then I picked up a large white stone and started to hammer on the rock. It rang like a bell.

Figure 2 — The Willamette Meteorite on the wagon fashioned by Ellis Hughes. Bill Dale is in the background. Note the large hole which extends through the meteorite.

Figure 3 — The Willamette Meteorite being moved through the woods to the home of Ellis Hughes. Mr. Hughes is on the left. Photo courtesy of the Oregon Historical Society.

"Hughes," Dale said to me, "I'll bet that is a meteor."
It would probably be there yet, but my wife had ideas. She was afraid somebody would go up and get it the next day.

Hughes, too, was somewhat concerned that curiosity seekers would come and carry off the large mass in small pieces. Accordingly, he set out to devise a plan whereby he could move the gigantic iron to his own property which he originally purchased from the Iron and Steel Company. During the fall of 1902 and spring of 1903 he worked in the dense woods in a very secretive manner making preparations for the moving of the meteorite, and hoping that his friends and neighbors would not become aware of his plan or of his treasure.

Months were required to cut a roadway through the forests, and as Hughes later testified in court, some 800 feet were purposely cut in the wrong direction in order to deceive the neighbors. To move the large object, Hughes found himself short on help in the form of labor saving machinery but long on ingenuity to devise the kind of apparatus needed to accomplish his purpose. Because dragging seemed an undesirable method for moving, he fashioned a crude wagon (figures 2 and 3), the bed of which was made of 10 foot poles, and the wheels of which were cut from the trunk of a tree. Next he made a capstan or "Spanish windlass" and a 100 foot cable by twisting together a number of strands of wire. Ropes and several blocks and tackle were borrowed from the nearby paper mill. By the summer of 1903 Hughes was ready to put his plan into action with a crew consisting of himself, his wife, his 15 year old boy, and one horse.

The Willamette meteorite is somewhat bell-shaped and was found with the base or flattened side upward. Hughes cleared away the brush which had grown around the meteorite, and with the aid of levers and his block and tackle was able to turn it over exactly where he wanted it, on the bed of his home-made wagon.

Next came the problem of moving the meteorite down a hillside across a canyon over rough terrain. One end of the long cable was attached to the wagon and the other to the capstan. The capstan, in turn, was anchored to trees by means of a heavy chain. Slowly the wagon was edged down hill. Then the horse was driven in an endless path around the capstan, applying a tremendous force or pull on the cable. The wagon moved slowly. Some days there was no forward progress, and the greatest distance traversed in any one day was 150 feet. Each time the cable was completely wound up, the capstan had to be moved and reanchored. Before Hughes reached his farm with his treasured cargo, the fall rains began and the wagon with its heavy load began to sink in the softened earth. This new problem was solved by having the wagon ride on a track made of heavy planks which

had to be continually moved forward. Finally after three months of sweat and toil the prized meteorite rested in the yard of Ellis Hughes.

For centuries people have marvelled at the ability of the ancient Egyptians to move large rocks to form the giant pyramids along the Nile River. The great pyramid of Gizeh was considered one of the wonders of the ancient world. Yet the stones used in building this pyramid average but two or three tons and only the very largest approach the weight of the Willamette Meteorite. In magnitude and ingenuity, the accomplishment of Hughes surpasses the work of the ancient Egyptians who performed their tasks with unlimited manpower.

Hughes next built a shed over his hard earned prize and charged curious sightseers twenty-five cents admission to look at the great visitor from space. People from surrounding communities rode to Willamette on the old electric streetcar and then walked two miles to satisfy their curiosity. Others came with their horses and buggies.

On October 24, 1903, the Portland Oregonian announced the finding of the large meteorite, and soon the discovery was known nation-wide. Experts in meteoritics rushed to view the great wonder; already some without seeing it had expressed doubt as to the authenticity of the specimen. F. W. Crosby of Washington, D. C., a collector of geological specimens for the Smithsonian Institution hurriedly came from Lodi, California, in November, 1903, and pronounced it a genuine meteorite. In February, 1904, Dr. Henry A. Ward travelled across the continent to study and photograph the celestial wonder, and in March of the same year his detailed scientific study of the Willamette Meteorite was published in the proceedings of Rochester (New York) Academy of Science. This eleven page article is the first of many to appear in the scientific literature.

Among the interested viewers came an attorney for the Oregon Iron and Steel Company, and he soon noted that the newly hewn road led to the property of his employer. A local newspaper had already noted: *

> It has been reported on the streets, and there are many who accept the rumor, that the meteor was actually discovered on land adjoining that of the parties who now have it in possession and claim sole title thereto. The report is to the effect that the specimen was clandestinely removed onto the land of those now having the meteor in possession before the discovery of the heavenly monster was announced.

* Oregon City Enterprise, November 6, 1903.

There were reports that the Iron and Steel Company offered to buy the large iron mass from Hughes. Offers of $50 and $100 were promptly refused.

On November 27, 1903, Hughes was sued by the Oregon Iron and Steel Company for possession of the meteorite in the Circuit Court in Oregon City. The company based its claim to the meteorite on the premise that it was part of the land on which it was found and had been stolen. Hughes contended it was personal property — an abandoned Indian relic. Two Indian witnesses testified that the Clackamas Indians had used and venerated the meteorite as their "tomonowos" or visitor from the moon. One Indian witness was Susap, a Klickitat, who testified that he had seen the meteorite as a "kid" and had been told by Wochimo, Chief of the Clackamas Indians, that the Indians washed their faces in the water collected in the basins of the meteorite and that they put their arrows in the water before going to battle with neighboring tribes. The other Indian, 47 year old Sol Clark, told of being born and raised at Oregon City, that his mother was a Wasco Indian, and that the stone belonged to the medicine men of the Clackamas tribe who had used it some 30 years prior. The Indian witnesses also testified that the Clackamas Indian tribe had become extinct.

The Indians had had but little effect on the jury for on April 28, 1904, the jury brought in a verdict favoring the Oregon Iron and Steel Company in the words:[11]

> We the jury duly empaneled to try the above entitled cause find a verdict for the plaintiff that it is the owner of the property described in the complaint. . . . and is entitled to the possession thereof and the return thereof and we further assess the value of said property at ($150) one-hundred and fifty dollars.

After the verdict was announced the Oregon Iron and Steel Company began to make preparations for the moving of the meteorite, and Ellis Hughes began the appeal of his case to the Oregon State Supreme Court. Before either party had made much progress an unusual turn of events took place. The attorneys who had represented Hughes in his case in the circuit court now found new clients in Rudolph Koerner and Fred Meyers, neighbors of Hughes, who now sued for possession of the meteorite. Thus Hughes was now a co-defendant with the Oregon Iron and Steel Company. The trial was heard on January 17 and 18, 1905. The plaintiffs charged that the meteorite was found on their property and had then been moved to land belonging to the Iron and Steel Company. A newspaper account of the case reported that one party contended that the meteorite fell 100 feet

on one side of the property line and the other held it fell 175 feet on the other side. A crater, viewed by the jury and rumored to have been formed by blasting, was entered as evidence by Koerner and Meyers. This case, however, was short-lived for on the next day, January 19, 1905, the jury reported:[11]

> We the jury duly empaneled and sworn find for the defendant, Oregon Iron and Steel Company, that it is the owner of the personal property described in the complaint namely an irregular shaped piece or mass of iron probably of meteoric origin and that said defendant, Oregon Iron and Steel Company, is entitled to the return thereof and we assess the value of said property at $10,000.

During the summer months of 1905, the appeal was heard before the Oregon State Supreme Court, Hughes now being represented by both of his former firms of attorneys. Then on July 17, 1905, Chief Justice Wolverton of the Supreme Court of Oregon ruled:[6]

> Meteorites, though not imbedded in the earth, are real estate, and consequently belong to the owner of the land on which they are found. . . . Seeing there is no error in the record, the judgment of the Circuit Court will be affirmed.

Playing an important part in the procedures of the courts in respect to the ownership of the Willamette Meteorite was a somewhat similar case which had been aired in the courts of Iowa. In 1890, a John Goddard leased his grass prairie land to a John Elickson. On May 2, 1890, a 60 pound aerolite (stone meteorite) fell on the leased property. The next day a Peter Hoagland in the presence of the tenant dug up the meteorite and took it to his home and a few days later he sold it for $105. The owner of the land then brought suit and the Winnebago district court found that the meteorite became part of the soil on which it fell and it rightfully belonged to the owner of the land. The act of Hoagland was considered wrongful. On October 4, 1892, the Supreme Court of Iowa upheld the Winnebago District Court.

After the Supreme Court verdict, the Oregon Iron and Steel Company moved the large meteorite to the bank of the Willamette River at the mouth of the Tualatin River. Crews of six men each with two teams of heavy draft horses worked night and day for ten days in order to move the meteorite about two and one half miles. The meteorite was floated on a barge down the river to Portland.

On August 23, 1905, the great meteorite rested in the Mines and Minerals building of the Lewis and Clark World's Fair. On that day a gala unveiling took place as several hundred people gathered to watch Dr. Charles Walcott, then director of the U. S. Geological Survey and later to become the Secretary of the Smithsonian Institution, withdraw a large American flag which was draped around the huge meteorite. This event was followed by a series of talks by visiting dignitaries including Senator Thomas R. Carter of Montana, Professor Robert H. Richards of the Massachusetts Institute of Technology and Professor O.F. Stafford of the University of Oregon. Professor Stafford related the history of the Willamette meteorite.

At the Lewis and Clark Exposition the unusual meteorite daily attracted large crowds during the few remaining weeks of the fair. Among the visitors to be impressed by the celestial wonder was Mrs. William E. Dodge II of New York who negotiated with the Iron and Steel Company for its purchase. Many Oregonians had expressed the hope that the meteorite might find a suitable permanent resting place in Oregon City or Portland. However, before any final arrangements could be made the sale to Mrs. Dodge was announced. A newspaper account reported the selling price at $26,000. Mrs. Dodge then presented the meteorite to the American Museum of Natural History in New York with the stipulation that it was to remain as a single mass and was not to be broken up. The museum has retained ownership to this day.

In 1936 the meteorite was again moved, this time to the newly-completed Hayden Planetarium, a part of the American Museum of Natural History. This great planetarium was made possible by a $150,000 gift to the museum by Charles Hayden. Here the Willamette meteorite was placed in an important position in an exhibit of 569 other meteoritic falls. The Willamette meteorite is somewhat dwarfed by the 36-1/2 ton Ahnighito, the largest of the Cape York meteorites, brought to the United States from Greenland by Commander and later Admiral Robert E. Peary.

Before the Willamette meteorite arrived in New York a number of pieces had been broken off by scientists and souvenir hunters. These specimens have become widely distributed in both private and public collections. Representative samples are to be found in the British Museum, the Chicago Museum of Natural History, the University of Michigan, and the National Museum in Washington, D.C. The catalog of meteorites in the collection of Budapest, Hungary, lists a fragment weighing slightly over a pound. A sizable piece is in the private collection of Dr. H.H. Nininger of Denver. His large meteorite collection was recently sold to the University of Arizona for research purposes. One of the few pieces remaining in the community in which the Willamette meteorite was found is a small etched specimen (figure 10) belonging to Harold Johnson of West Linn.

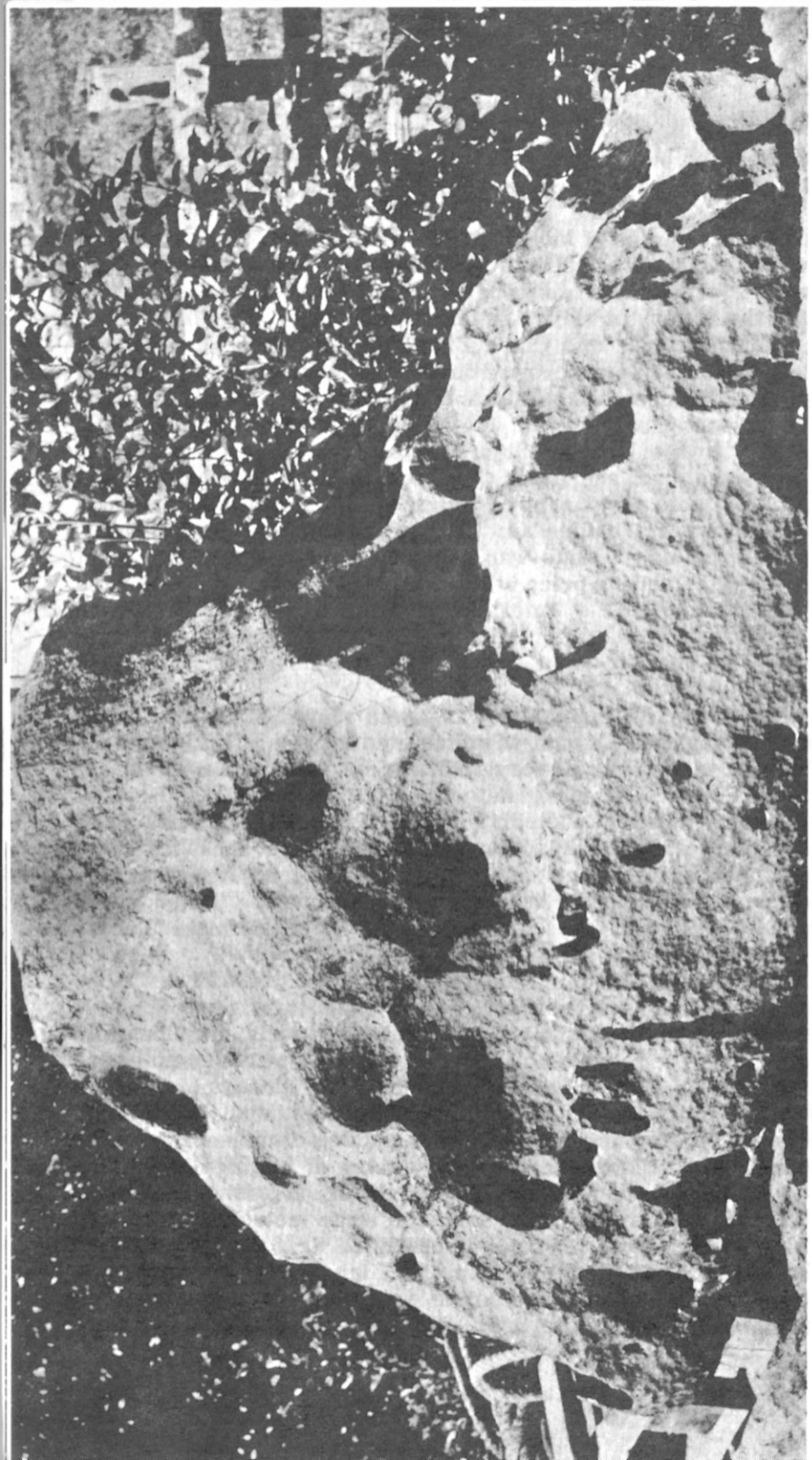


Figure 4 — The Willamette Meteorite after it had left the Hughes property. This photo shows striking examples of aerial pitting around the lower center of the meteorite.

From time to time Professor J. Hugh Pruett, astronomer at the University of Oregon, attempted to secure a piece for the meteorite collection at the University of Oregon. At first his requests to buy a piece met with failure, but finally in June, 1938, Dr. Clyde Fisher, curator-in-chief of the American Museum of Natural History wrote Pruett: *

> I have had a small piece cut from the Willamette meteorite for the University of Oregon. We have had the specimen polished and etched by Professor H.H. Nininger. The weight of the specimen is 181.1 grams.
>
> In sending the fragment of the Willamette meteorite I do not want the University of Oregon to feel any definite obligation. I felt that your University should have a piece of the largest meteorite ever found in the United States since it came from your state.

In the intervening years since the discovery of the Willamette meteorite the original site has been visited by many amateur and professional geologists and astronomers. Some of these visitors have continued to excavate the small crater from which the huge meteorite was removed. A considerable amount of oxide crust has been taken from the crater and much of it has been sold to commercial firms dealing in scientific specimens and supplies. Such samples may still be purchased. The original site, however, is today largely obscured by a thick growth of vegetation including hazel brush and poison oak.

In 1958 a group of Oregon City businessmen in making preparations for the observance of the centennial of Oregon Statehood in 1959 conceived the idea that the return of the Willamette meteorite to Oregon for the centennial year would greatly enhance the celebration. This group prevailed on the then Oregon Governor, Robert D. Holmes, to write to the American Museum of Natural History, to make such arrangements. The reply from the museum was to the effect that such a loan would gladly be extended to the people of Oregon, but unfortunately the Hayden Planetarium was built around the large meteorites and there was not a door large enough through which the meteorite might pass.

Meanwhile, Ellis Hughes continued to live a simple life as an obscure farmer on the place which brought him fame in scientific and judicial history. All of his life he harbored a bitterness over the justice administered him by the courts of Oregon. On December 3, 1942, Ellis Hughes, age 83, died suddenly. Although little remembered by his community in later years, his fame is perpetuated throughout the scientific world as the finder and loser of the largest meteorite ever discovered in the United States.

* The Oregonian, June 12, 1938

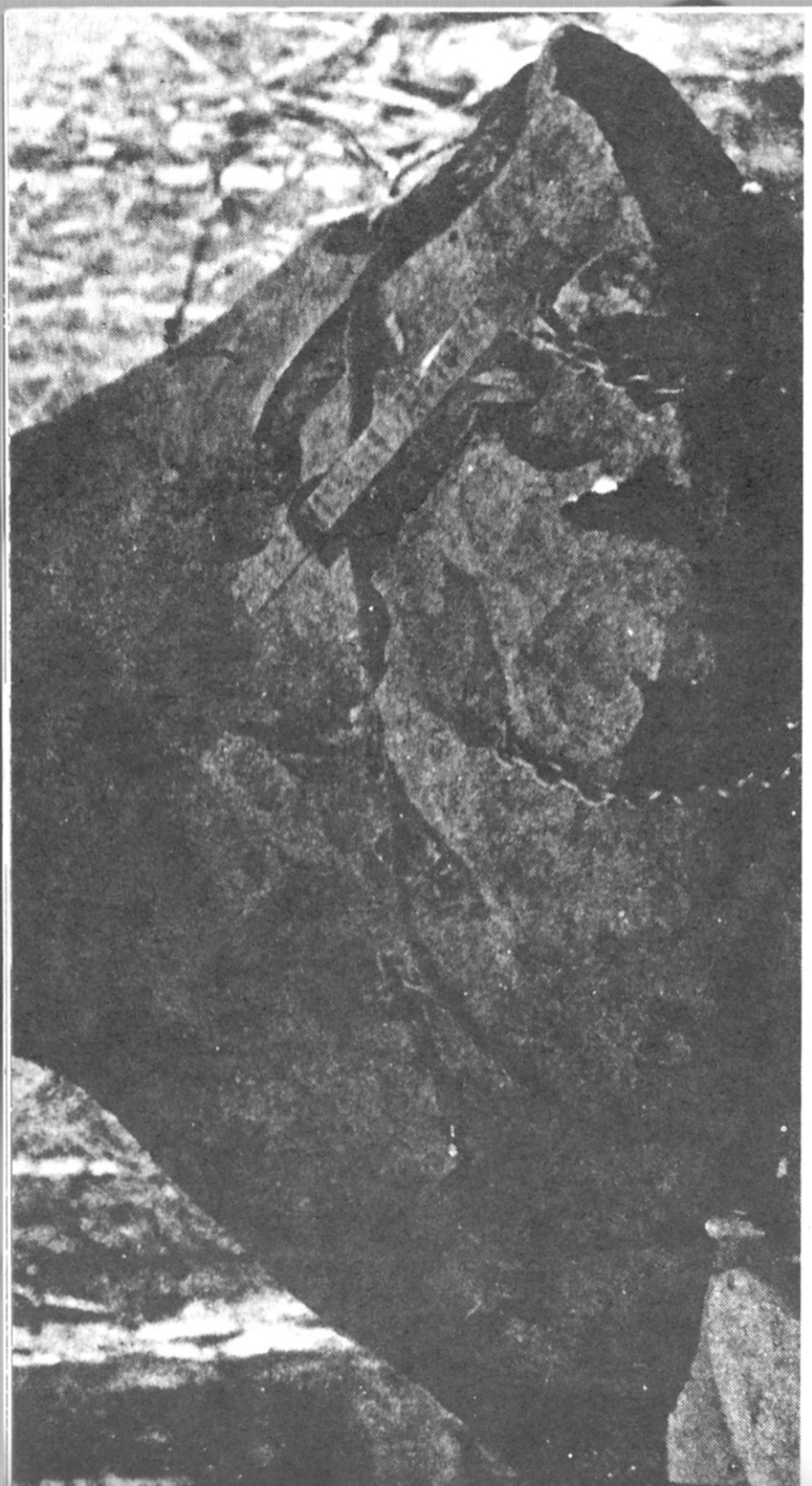


Figure 5 — A side view of the meteorite as it rested at the Ellis Hughes farm. Clearly visible are the chains passing through the holes in the base of the meteorite.

The Willamette Meteorite, Its Features

Concerning the Willamette Meteorite Dr. Ward wrote further:[9]

> This great meteorite has shown itself to be quite unique in the distinct and essentially diverse phenomena which it presents. On one side it offers us the greatest known instance of aerial erosion, helped by fusion. No such holes and furrows due to aerial attrition have been offered by any other meteorite, whether of the iron or the stone class. While on the opposite side it gives us a case of discreet decomposition of aqueous cause, far beyond anything before registered on these celestial bodies.

And the Journal of the American Museum noted:[2]

> The great hollows and deep pits which characterize the surface of the mass combine with its enormous size to make this the most remarkable and interesting meteorite known.

These quotations readily indicate that not only is the Willamette Meteorite unusual for its magnitude but also because of its surface features.

The meteorite weighed 31,107 pounds when placed on the railroad scales in Portland. The actual weight when found is not known as probably a hundred pounds or more was broken off. In dimensions the irregular mass measured ten feet in length, six and one-half feet in height, and four feet three inches in width.

The chemical analysis of the meteorite resulted in 91.5% iron and about 8% nickel. Also present were traces of the elements cobalt and phosphorous. Density determinations gave specific gravity of 7.7.

The shape of the Willamette meteorite is a conoid or more accurately an abbreviated cone (figure 4, 5, and 6) with its base in the shape of an oval (figures 7 and 8). When found the blunt apex of the cone was slightly buried in the ground and the base was uppermost and almost entirely flat. It is generally held that this was also the position or attitude of the meteorite in its flight through the earth's atmosphere. Numerous meteorites are known that have a cone-like shape, and these are generally referred to as oriented meteorites because they maintain a definite attitude in flight with the apex of the cone in front. On many meteorites distinct flow lines caused by the atmosphere shaping the hot molten materials are clearly visible, but no such striations were found on the Willamette Meteorite.

When discovered the Willamette Meteorite was covered with a heavy layer of rust which had destroyed any such markings produced by aerial friction.

From time to time various other explanations have been given for the particular position in which the meteorite was found. One idea that has been advanced is that actually the meteorite fell a great distance away and was moved to the place of discovery by an ice flow during one of the ice ages. Evidence cited for this view is the finding of white granite type rocks or erratics in the same locality. Many such seemingly out of place rocks are known in Western Oregon.

Others have suggested that the meteorite was carefully placed in position by the Indians as an object of worship long before the area became inhabited by white men. Although no such stories were told by the local Indian tribes, the belief in the space origin of meteorites was well established among the Western Indians. Meteorites were often venerated by the Indians and were held as sacred objects. The Chilcoot (Alaska) meteorite was purchased in 1881 by the California State Mining Bureau from an Indian who claimed the fall of the meteorite had been observed by the father of the oldest member of the tribe about a hundred years prior . The 135 pound Camp Verde (Arizona) and the 3-1/2 pound Livingston (Montana) meteorites were found carefully wrapped and buried in Indian graves. The large Navajo (Arizona) meteorite, long known to the Navajo Indians, had been covered over with smaller rocks when it was discovered in 1922. The Navajos felt that the covered meteorite which they held sacred would not be molested by the white men or by other Indian tribes. The place of the Willamette meteorite in Indian ritual has already been recounted, but there is no evidence that the Indians had had any part in the placing of the gigantic meteorite in the position in which it was discovered.

The most striking and interesting characteristics of the external features of the Willamette Meteorite are the variety of hollow pits, both shallow and deep, with which the outer surface is indented. Around the lower half of the cone shaped mass are numerous pittings which extend as a border around the meteorite. These are plainly seen in the photos, figures 2, 4, 5, and 9. The pits are shallow but well defined and continuous. They are generally oval in form and at times merge into each other. Such pittings, common features of meteorites, are thought to be formed by the flow of hot compressed atmospheric gases during the meteorite's flight through the air.

No description of the Willamette Meteorite is complete without calling attention to the distribution of a series of bore

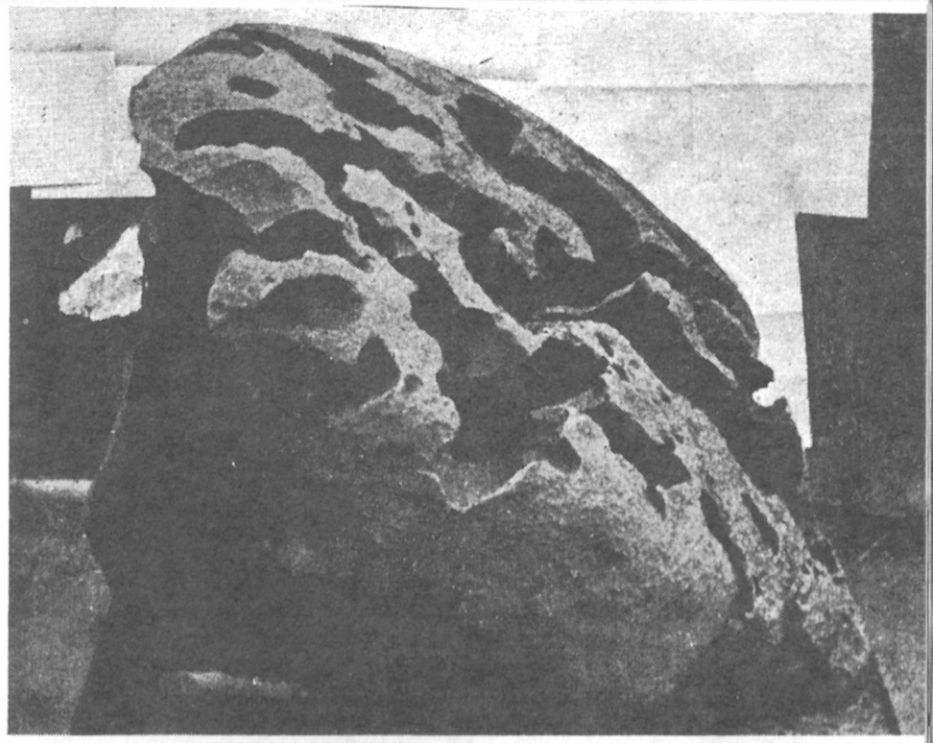


Figure 6 — Another side view of the meteorite photographed at the home of Ellis Hughes.

holes abound the lower portion of the conoid. These holes are sharp and well defined and range from about one inch in diameter to about three inches. Some thirty of these holes extend from four inches to a greater depth within the meteorite. Many of them are of greater diameter on the interior than at the opening on the surface. About ten holes penetrate through the base. Ellis Hughes found these holes useful in chaining the large meteorite securely to his crude wagon. The chains passing through the holes are visible in figure 5. There is also a large perforation passing through the entire meteorite near its base (figure 2).

Bore holes like those of the Willamette Meteorite are common to other large iron meteorites. The exact cause of the holes is not known. Some scientists believe that the holes were present before the meteorite entered the earth's atmosphere, while others believe they are formed during atmospheric flight. There is, however, general agreement that the holes contribute to the weird and awesome noises that the meteorite makes in passing through the atmosphere. The holes may be looked upon as a series of organ pipes, each giving off a particular sound depending on the velocity of the meteorite, and the diameter and depth of the hole. The absence of any impact scars, either on the meteorite itself or on the ground

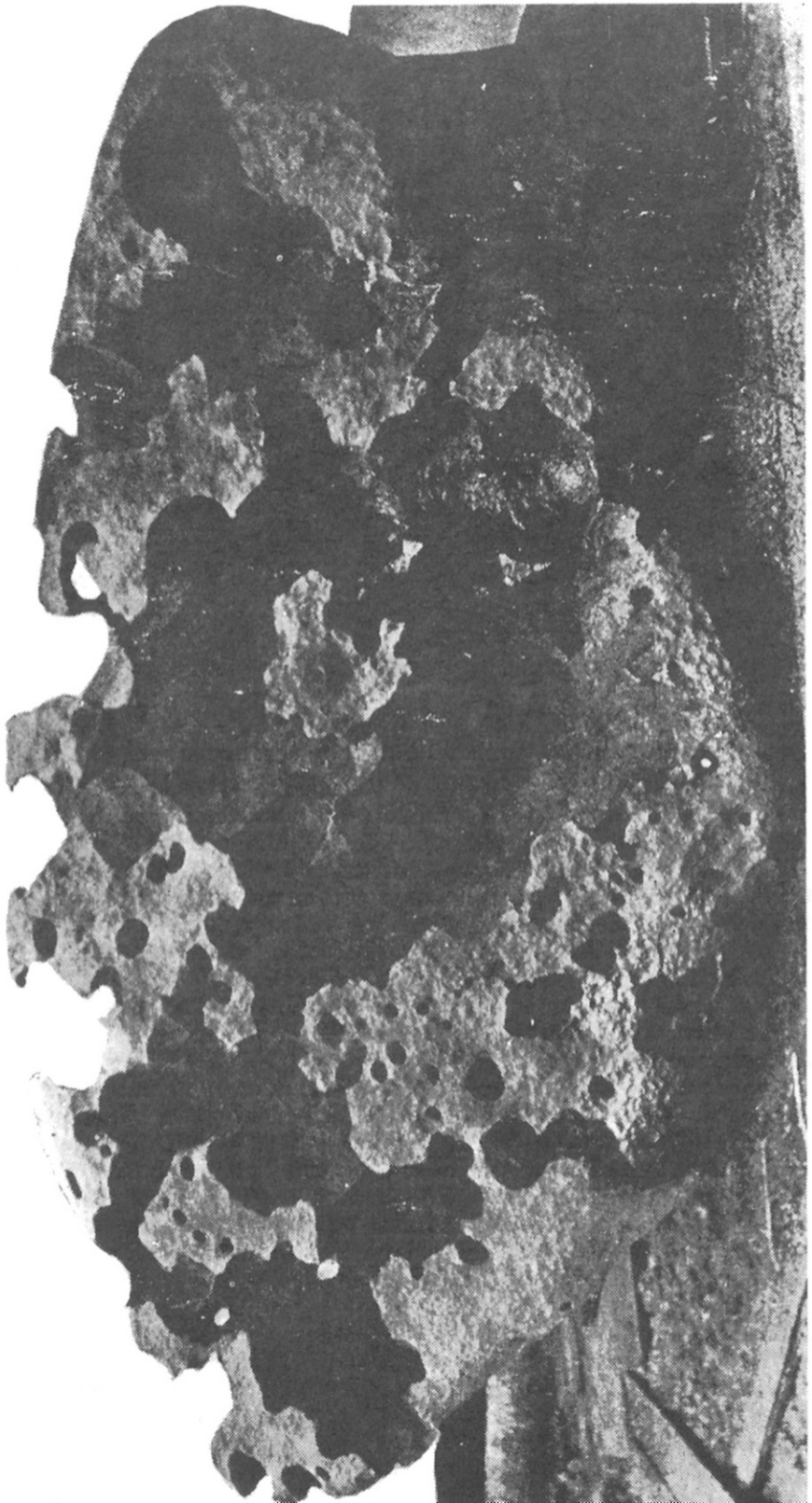


Figure 7 — This photo shows the base of the Willamette Meteorite which was uppermost when found. The large cavernous depressions were produced by moist atmospheric weathering.

where it was discovered, has led scientists to ponder the role of these holes in reducing the meteorite's terminal velocity.

The base or rear portion of the meteorite is wondefully covered with a series of caverns which Ward described in the words, "They make a confusion of kettle holes; of wash bowls; of small bath tubs!" The two largest are somewhat elliptical in shape being about 42 inches in length, 18 inches in width, and from 16 to 18 inches in depth. Figure 8 with the two small boys resting in the large caverns illustrates the immensity of the depressions which resulted from an extreme degree of moist atmospheric decomposition after the meteorite fell.

Of these depressions, so well shown in figure 7, Dr. Ward wrote:[9]

> We recognize at once that we are not treating an ordinary meteorite phenomenon. . . . These excavations in our meteorite are clearly due to the action of water. . . . Finally we remember that western Oregon is a region marked as a rainbelt ever since it has been known at all. Every condition was favorable to the decomposition of this great mass of iron, so situated that its surface was ever soaked with abundant water, and that water was heavily charged with carbonic acid, due to vegetable decomposition. Under such conditions the oxidation of the mass would go on rapidly.

In 1948 Russell A. Morley, research geologist of Salem, Oregon, found additional evidence for the long period of weathering and decomposition for the flat and uppermost side of the meteorite in its original resting place. He not only dug up some 15 pounds of oxide crust from the small crater left by the removal of the meteorite but also sampled the soil for several feet around the crater. When analyzed, the soil samples gave positive tests for nickel indicating that the slow weathering had allowed the nickel to leach into the surrounding soil. This evidence discounts the stories of many old-timers who believe they saw the fall of the Willamette Meteorite. That these people probably saw a brilliant fireball that seemed to disappear over the same hills cannot be denied, but the actual fall of the meteorite must have occured in the distant past. The fall was undoubtedly accompanied by some of the most spectacular celestial fireworks ever to brighten the skies of the Pacific Northwest. The accompanying sounds must, likewise, have been the most awe-inspiring yet heard by man.

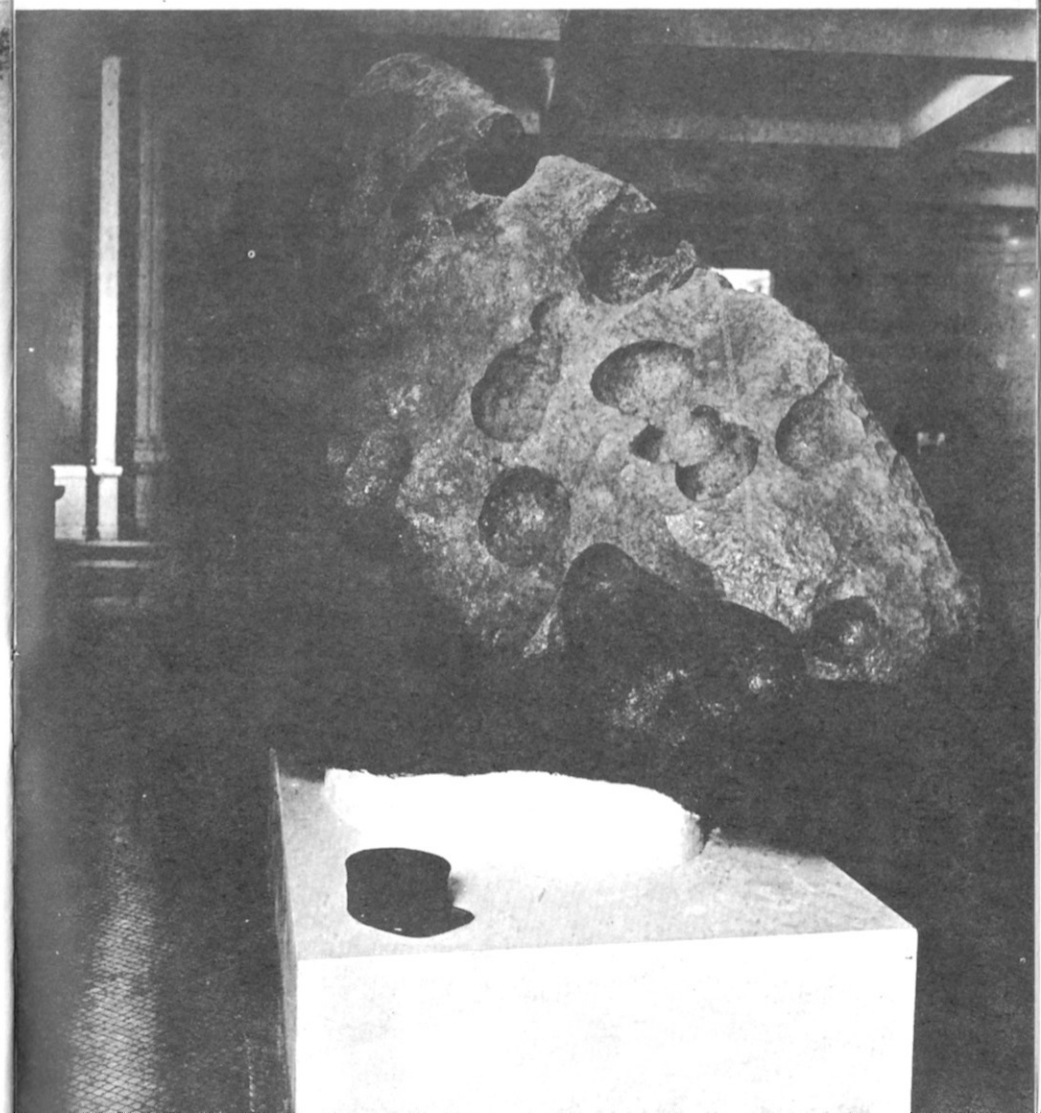
In order to ascertain whether a specimen is meteoritic, or has come to the earth from space, several tests are commonly employed. First, such materials are analyzed chemically for the presence of the element nickel which is present in all meteorites in varying amounts. Shortly after the discovery of

Figure 8 — Another view of the base of the meteorite. The two boys are nestled in the large eroded caverns.

the Willamette Meteorite, school children walking to and from school would find metallic pieces which they mistook for fragments of the meteorite. These metal pieces were slag from the iron works at Oswego and had been scattered along the country roads by the Oregon Iron and Steel Company. A chemical test for nickel would quickly distinguish such terrestrial metals from those of outer space. Another common test, developed by Dr. Alois Widmanstatten of Vienna in 1808, is the etching of a polished surface of the metal with a dilute solution of nitric acid. If the specimen is meteoritic, distinctive and characteristic patterns are produced which are known as Widmanstatten figures , (figures 10 and 11). Meteorites are formed of iron-nickel alloys of varying nickel content. The alloys of lower nickel content are selectively etched more rapidly than those of higher nickel content. The nature and the width of the lines or bands are also indicative of the nickel content of the etched specimen. The lines or bars may be fine, medium, or broad. Most iron-nickel meteorites crystallize in eight sided forms so that the meteorite is referred to as fine, medium, or broad octahedrite. In its internal structure the Willamette Meteorite is as unusual as it is in external features, in that samples from different parts of the meteorite produce one of two kinds of etching patterns. Some samples on etching give Widmanstatten figures of long medium broad bars characteristic of a medium octahedrite (figure 10) while other specimens form a crazy-quilt like pattern referred to as ataxites, a word derived from the Greek meaning out of order (figure 11).

These figures produced by etching may be thought of as an invisible writing or a language from space since earthly minerals do not produce figures when etched.

Figure 9 — A side view of the Willamette Meteorite as it is displayed in the Hayden Planetarium. Photo courtesy of the American Museum of Natural History, New York.



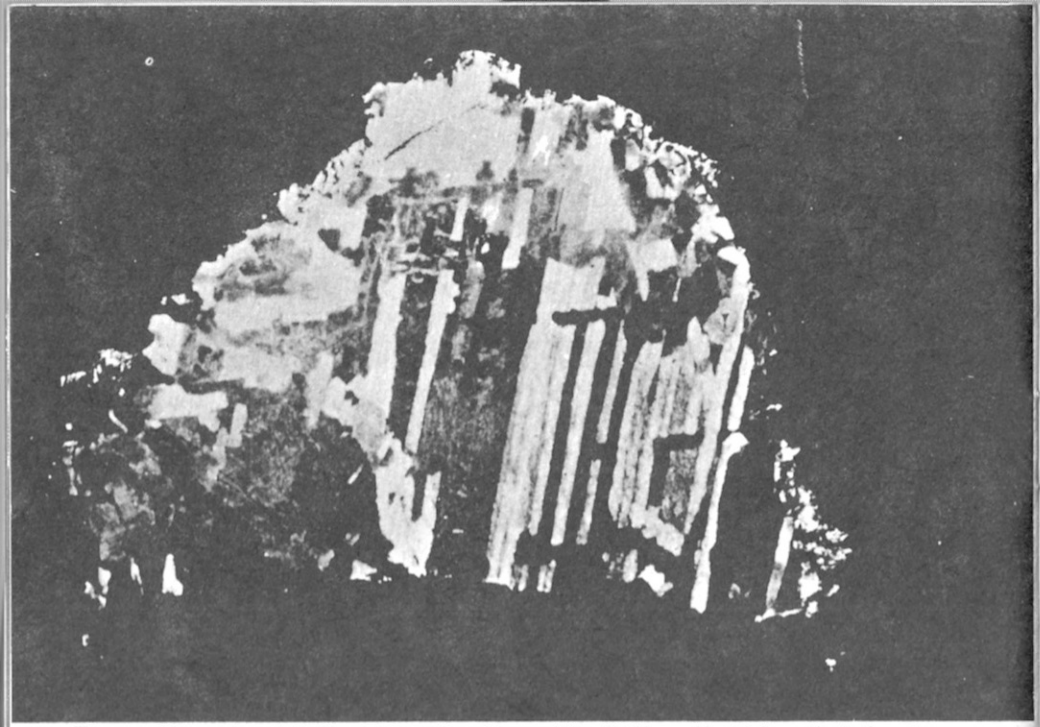
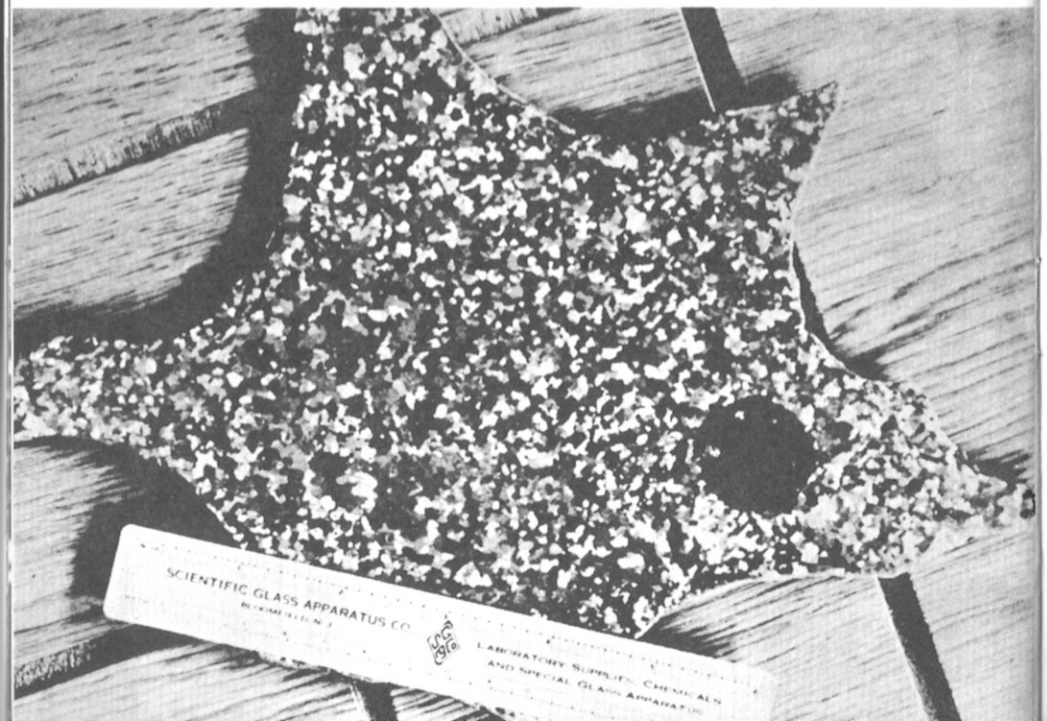


Figure 10 — An etched section of a piece of the Willamette Meteorite belonging to Harold Johnson, West Linn, Oregon. This type of etching is characteristic of a medium octahedrite.

Figure 11 — An etched section, characteristic of an ataxite, of a piece of the meteorite in the collection of the Chicago Museum of Natural History. Photo courtesy of the Chicago Museum of Natural History.



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   Sunday Oregonian, January 16, 1949.

8. Pruett, J. Hugh, The Willamette, Oregon, Meteorite in History
   Popular Astronomy, 47:148-50 (March, 1939).

9. Ward, Henry A., Willamette Meteorite
   Proceedings of the Rochester Academy of Science, 4:137-48 (March, 1904).

10. For details concerning the case of the Willamette Meteorite in the Oregon State Supreme Court see:
    Oregon Reports 47:313-22
    Pacific Reporter 81:572

11. In the Circuit Court, Clackamas County, the two cases are numbered 7587 and 7792.

"Ahnighito" Companion Of The Willamette Meteorite

Found in the collection of the American Museum of Natural History, New York, are the two heaviest and largest meteorites on display in any museum in the world. They are the 15-1/2 ton Willamette and its great companion the 36-1/2 ton "Ahnighito," (figure 12) largest of the Cape York, Greenland, meteorites. Like the Willamette, the Ahnighito, too, has had an interesting and unusual history.

Early in the 19th century, arctic explorers of Greenland found a race of native Eskimoes using iron for knife blades and harpoon points. The iron, according to the natives, supposedly came from "Saviksue" or mountain of iron. Although several specific attempts were made during the century to find the iron mountain all met with failure until May, 1894, when Commander Robert E. Peary, United States Navy, was led to the site by a native guide named Tellikotinah. Instead of finding an iron mountain he found a massive meteorite with two smaller ones in close proximity. These he found on the shores of Melville Bay about 35 miles east of Cape York, Greenland. In order to get to the site, Peary was required to make a treacherous journey of 200 miles by sledge travel.

The natives regarded the meteorites as heaven-sent and had named them as the tent, the women, and the dog. The names were partly derived from the shape and form of the objects. Legends of the natives regarded the women as the owner of the dog, and both lived in the tent. While at the site the native guide demonstrated how the iron was removed from the meteorite by pounding it with other large rocks. During most of the 19th Century the meteorite was not used as a source of iron as the metal needs of the natives were met by trading with the whalers.

In 1895, Peary returned to Melville Bay and attempted to remove the three meteorites but was only able to load the two smaller masses, the women weighing about three tons, and the dog weighing about one-half ton. He did not have the means at hand to load the largest of the three meteorites. The next year's attempt was again unsuccessful.

In 1897 Peary again returned to the site of the mammoth meteorite. This time he was equipped with a 100 ton jack, two 30 ton jacks, large timbers, and plenty of railroad irons. The venture was extremely complicated by fog, bad winds, ice, and in general, very adverse weather conditions. The meteorite had to be moved several hundred yards down a

Figure 12 — The 36-1/2 ton Cape York Meteorite which along with the Willamette Meteorite constitute the two largest meteorites in any museum. Photo courtesy of the American Museum of Natural History.

rocky slope, directly under which his ship "Hope" was moored. At that time the meteorite was christened by Peary's 4 year old daughter, Ahnighito, by breaking a bottle of wine over the massive iron. Peary's daughter had been born near Cape York, and the meteorite has ever since been popularly named in her honor.

During the loading great concern was felt by the entire crew as several days were required to load the heavy mass into the deep hold of the ship where a bed of stone ballast had been prepared. Next the meteorite had to be secured so that it would not break through the ships side or overturn the craft. All of this was accomplished under the most adverse and trying conditions, hence the anxiety.

In the fall of 1897 the great meteorite was unloaded at the Brooklyn navy yards where it remained somewhat obscure until 1904. In September of 1904 the meteorite measuring 10 feet 10 inches in length, 7 feet 2 inches in height, and 5 feet 6 inches in width, was loaded on a large wagon capable of carrying 100 tons by a huge derrick on a wrecking barge. These operations are described in the Scientific American for December,

1904. This article also pictures the meteorite on the wagon which was drawn by 24 horses. The horses and the wagon were a city block in length. A contractor moved the large Cape York meteorite from the Brooklyn yards to the American Museum for a fee of $500.00. On October 1, 1904, the Ahnighito arrived at the Museum. In 1906, it was joined in the Museum by the arrival of the Willamette Meteorite.

The Ahnighito is of historical interest as it supplied the only metal known to the smallest and most northerly aboriginal tribe of human beings on the face of the earth's globe. This tribe, living within 76^{o} north latitude had been isolated from civilization for many centuries.

The Large Western Iron Meteorites

In addition to the discovery of the Willamette Meteorite in Oregon, the next three largest meteorites found in the United States have all been found in the far west. Although found sixty years ago, no meteorite has been found in this country which even approaches the size of the Willamette Meteorite.

The second largest U. S. meteorite was discovered in 1922 in Apache County, Arizona. This meteorite, known as the Navajo, weighs 4814 pounds and is the largest meteorite in the collection of the Chicago Museum of Natural History.

In 1908 the 3190 pound Quinn Canyon Meteorite was discovered in the state of Nevada, and this meteorite has also found a permanent resting place in the Chicago Museum of Natural History.

The fourth largest meteorite found in the United States is the Goose Lake Meteorite which was found in 1938 by a group of deer hunters in lava beds of the Modoc National Forest less than a mile from the Oregon border in the state of California. This interesting meteorite, shaped like a giant molar, was placed on display at the Golden Gate International Exposition on Treasure Island in 1939 and again during the 1940 season. The Goose Lake Meteorite weighs 2573 pounds and is the heaviest meteorite in the collection of the National Museum of Natural History (Smithsonian Institution) in Washington, D. C.