



ACCOUNT OF CIRCUMSTANCES SURROUNDING THE FALL OF A METEORITE IN SOŁTMANY VILLAGE

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REPORT FROM THE PLACE OF THE EVENT

Site

A tourist farm owned by Mrs. Alfreda Lewandowska in the village of Sołtmany. Sołtmany belongs to the administrative district of Krukłanki, within Giżycko County. The exact GPS coordinates of the fall site are 54°00'31,5"N, 22°00'17,86"E (taken from a GPS unit and validated against maps available at geoportal.gov.pl).

Time

The event took place on April 30th, 2011 at approximately 06:03 am local time.

Meteorite

The meteorite turned out to be an ordinary chondrite, a type of stone meteorite. The stone penetrated

a wooden roof and came to rest on a concrete step. Upon impact, it broke into several pieces, the largest of which, a so called "main mass", weighed ~813 grams. The total known weight of the meteorite is at ~1066 grams.

The probable trajectory of the object was determined from the two terrestrial points of contact. It was flying almost vertically (at an angle of 2–3 degrees) from the North-East.

Photographic records

Photographs of the specimen and the impact site were taken on May 2nd and 3rd, 2011. They are enclosed at the end of this article.

SOŁTMANY – ACCOUNT OF OUR VISIT

On Sunday, May 1st, 2011, Andrzej Pilski, astronomer and meteorite collector of the Frombork Astronomical Observatory, notified the authors of a reported meteorite fall near Giżycko.

The event took place on Saturday, April 30th, at approximately 6:06 am. Andrzej asked if we could drive to the scene of the meteorite impact. By that evening, he confirmed the stone's whereabouts and provided the first photographs of the alleged meteorite. There was no doubt as to the origin of the stone. On May 2nd, we drove to Frombork to settle the facts. Our objective was to gather as much information as possible

including witness statements and photographic evidence of both the scene and fragments of the meteorite. We aimed to acquire samples in order to have the stone analyzed and classified. We were also to inquire as to whether the main mass could be potentially purchased by the Frombork Museum. Our contact in Giżycko was Roman Rzepka, a fellow meteorite enthusiast. He was the same person who informed Andrzej Pilski about the fall.

On May 1st, Mr. Rzepka and his wife were the first to reach the scene of event. They introduced us as they were already acquainted with the landlady. Mr.

Rzepka also accompanied us on the way to Sołtmany, around 30 kilometers from Giżycko.

Upon arrival, we noticed a hole in the roof. Chunks of asbestos from the roof and wood chips from planks were scattered around the place. We examined the stone and the fragments which had broken apart when the stone had hit the concrete stair. Then we wrote down the account of the fall and acquired samples for study. Unfortunately, it was already too late to take additional photographs of the stone.

We also had a conversation on the desired future of the meteorite with its owner, Mrs. Alfreda Lewandowska. It seemed appropriate for the stone to be placed into a museum collection. We purchased around 190 grams of the meteorite, the entire material that was available for sale. Mrs. Lewandowska kept some of the small fragments as “good luck charms,” as she put it. She also advised that she had made a commitment to Andrzej Pilski that he would be offered the largest remaining piece (“main mass”). On the following day, we came back to Sołtmany to secure photographic evidence. We took photographs of the stone and the scene of the event. Accompanied by the landowners, we also searched the surroundings of the shed. Unfortunately, we did not find any further fragments of the meteorite.

Alfreda Lewandowska’s account of the fall:

April, 30th 2011

I always get up at 6 am without an alarm clock. [On that day] I was smoking and making coffee. I opened the window so that the smoke would not hover inside the kitchen. Then all of a sudden I heard something. At first, I did not know what it was. It sounded like a whiz-bang and was followed by a big boom. Actually, it was more like a long thud kind of noise. My son, Marcin, was in the bathroom. He heard it too even though the door was closed. We both ran out of the house. Marcin was literally wearing only one sock. We thought the house would collapse, but it was still standing. The buildings were intact apart from a hole in the shed roof, right over the door. We

found loose asbestos lying near the shed and a big chunk of it hanging on a nail. Marcin thought that it must have been a bird which dropped something. I could not help noticing “what a bird would that have to be”. We gazed into the sky looking out for planes as they often fly above our heads. But there was no sign of them. Although the sky was cloudless, the sun was not yet shining strongly.

5 meters away from the hole, by a pile of planks, I found a black stone. I picked it up. Was it warm? It definitely did not seem as cold as any other stone. It was just different, maybe a bit warmish. I held it in my hands for a while and then put it back on the ground. I was about to throw it, but in the end I put it back gently where I took it from.

We came back to the house. I looked at my watch. It was 6:06 am. We spent no more than 3 minutes outside. Later on I went to Giżycko to visit my daughter, Anita. “Mom, it is a meteorite,” she pointed out immediately. Then I recalled having watched a documentary about meteorites on Discovery channel. It was hosted by a guy with long hair [it was likely Robert Haag].

Me and my daughter arrived back at home. Fragments of the stone were scattered over an area of 4-5 meters. Small pieces were laying near the concrete step. We picked them up. Additional fragments were later recovered by my daughter and son in law. We took the stone home and started pondering.

Mrs Alfreda, who is a direct and clear-headed person, also shared a peculiar observation with us.

My father used to stop by every day at 6 am to drink coffee with my husband. I was not getting up so early. My father passed away in June and my husband was gone one year later. I thought that this meteorite must be some kind of a sign. Maybe they were drinking coffee in heaven and dropped something?

Mrs. Alfreda, her daughter, and future son in law, searched the surroundings of the shed to no avail. The area is sparsely populated. According to Mrs. Alfreda (and other people living in the house), there were no other witnesses. None of the people living in the vicinity saw the fall or heard any sounds accompanying it.

OUR CONCLUDING REMARKS

1. The description of sounds accompanying the event (whistle and rumble, no explosions) indicates that only one stone was involved. There was no noise which would suggest a possible fragmentation. The rumble reported by the witness was likely caused by a sound wave.

2. The specimen displays the characteristics of orientation. The fragments fit together to form what appears to be a complete stone. It is quite oval in shape

and fully covered with fusion crust. If any fragmentation occurred during atmospheric flight, it must have taken place at a high altitude.

3. The hole in the roof (through asbestos roofing and thick planks) and the markings in concrete left by the stone made it possible to estimate the direction and angle of the stone’s flight. It came from the North-East and its trajectory was 2-3 degrees from vertical. The meteorite punched a perfect hole through a thick

plank without breaking it which indicates that the stone fell with a very high velocity. As the meteorite lost its initial cosmic velocity in the atmosphere, the trajectory of the fall was undoubtedly altered. Thus, the aforementioned angle should not be perceived as the angle at which the meteoroid entered the Earth's atmosphere. If we are to correctly calculate the trajectory of the last stage of flight, we must take into account that the impact into roof planks also could have altered both its angle and direction. Therefore, the estimated direction of the fall should be regarded as probable. We must also consider the influence of wind on the trajectory of the meteorite. If we assume free fall in the atmosphere as well as a simple model according to which a meteorite is a sphere of density of 3.35 g/cm^3 (average density of a chondrite), the weight of 1 kg and a friction coefficient of 0.45, falling down in a gravitational field, then the velocity of the fall must have been of at least 82 m/s (approx. 295 km/h).

4. The main mass of the meteorite is at approx. 813 grams with a total known weight of approx. 1066 grams. Respective weights of smaller fragments were provided by their owner. Thus, a number of specimens were not weighed by us. Some of them, treasured "as souvenirs," "for her daughter," etc. were wrapped in handkerchiefs. Small fragments may be yet to be found below the planks piled alongside the shed. We determined the weights of the main mass

and some fragments using an electronic kitchen scale with an accuracy of 1 gram. We were not equipped with a laboratory scale. **By combining the available data, we estimated the total known weight to approx. 1066 grams.**

5. The fall took place at 6:06 am as per Andrzej Pilski's preliminary report. According to the witness statement of Mrs. Alfreda Lewandowska, she always gets up at 6:00 am sharp. When she was challenged on how she could be so sure it had been exactly 6:00 am, she replied that she always got up at 6 am without an alarm clock. It was 6:06 am when she came back in and she claimed that she and her son had been outside for around 3 minutes. **Thus, we should accept 6:03 am as the moment of the fall.**

6. The stone has the characteristics of an ordinary chondrite. It has a well-defined chondrite-like fusion crust and a very light interior exhibiting specks of iron and troilite. There are hardly any chondrules visible on fractured surfaces.

7. In our opinion, the fall was likely comprised of only one stone. The farm is located on a headland of the Wydmiańskie Lake. An area of wet, soggy ground spreads behind the shed which does not lend itself to meteorite hunting. As the roof was under repair, the yard was cluttered with fragments of asbestos, pieces of planks, etc. The conditions hindered our search for small pieces of the meteorite.

DOCUMENTATION AND SAMPLES TRANSFER

On Tuesday, May 3rd, already at home, we took photographs of the specimens we had acquired and immediately transcribed this account. In the evening of that day, the first information was published online at <http://wiki.meteoritica.pl>.

We packed the first batch of samples and dispatched them to Prof. Tadeusz Przylibski in Wrocław by a courier service. From thence, they were delivered to Marcin Cimala where they were cut and prepared for analysis. At the same time, Prof. Przylibski was looking for a research laboratory in Europe that would perform an analysis of short-lived isotopes in the meteorite. By establishing the CRE age (cosmic-ray exposure age), the scientists could determine for how long the meteoroid was exposed to cosmic rays in outer space as well as its initial mass upon entry into the Earth's atmosphere. Prof. Przylibski reached

an agreement with the Laboratori Nazionali del Gran Sasso in Italy and the analysis was to be performed by Dr. Matthias Laubenstein. There was one condition: the specimen had to be delivered by Wednesday, May 11th. For results to be meaningful, CRE age analysis should be conducted within two weeks of a meteorite's having fallen. The package arrived in Italy that Wednesday at 4 pm. On Monday, we gave a sample of the meteorite to Prof. Marek Lewandowski. He took it with him to Krakow where Prof. Pierre Rochette (of CEREGE, Aix-an-Provence, France) was taking part in a seminar. The professor measured the magnetic susceptibility of the meteorite.

We thereby accomplished our objective of making the meteorite available to scientists. This marked the beginning of the next, terrestrial, period in its long history.

ACKNOWLEDGEMENTS

We express our gratitude to the individuals and institutions whose contribution made this work possible.

We express special appreciation to Mr. Roman Rzepka and his wife, Anna.



Fot. 1. The meteorite 76 hours after the fall. The interior of the stone does not show any signs of weathering. Visible damage to the surface of the stone is the result of striking many targets: roofing material, a concrete step, and, finally, the ground. The finders kept this meteorite in a handkerchief. More photographs on web page <http://wiki.meteoritica.pl>



Fot. 2. Main mass of the Soltmany chondrite on the concrete step before the shed. The stone is photographed at the place where it impacted and partly fragmented. It subsequently ricocheted approx. 4 – 5 meters before coming to rest. A small bright patch is visible on the step above the meteorite; this is the point where the meteorite struck the step



Fot. 3. The hole in the roof of the shed – the first place of contact between the Soltmany meteorite and solid Earth



Fot. 4. Determining the final fall trajectory of the meteorite. The farm buildings stand along a SE-NW line



Fot. 5. The hole in the roof and the place where the meteorite was found (marked by arrows)



Fot. 6. Four of the meteorite fragments transferred for research (photo Tomasz Jakubowski)