

THE KINDBERG L6 ORDINARY CHONDRITE FALL AND RECOVERY IN AUSTRIA – A CASE STUDY OF CITIZEN SCIENCE.

L. Ferrière¹, J. Roszjar¹, and P. Povinec², ¹Natural History Museum Vienna, Burgring 7, 1010, Vienna, Austria (ludovic.ferriere@nhm.at), ²Department of Nuclear Physics and Biophysics, Faculty of Mathematics, Physics and Informatics, Comenius University, 84248 Bratislava, Slovakia.

Introduction: Meteoritics in Austria started very early on with the Natural History Museum Vienna (NHMV) hosting the oldest and one of the most important meteorite collections in the world. However, before the recently recovered Kindberg meteorite (observed fall from November 19th, 2020) described here, only seven meteorites (4 observed falls and 3 finds), all ordinary chondrites, have been recovered in Austria over the last 250 years.

We report here on the different steps and activities that finally resulted in the recovery of the Kindberg meteorite, a case study of Citizen Science, as well as on preliminary scientific investigations conducted on the sample.

Results and Discussion:

Observation of the fireball: At 4:46 a.m. CET on November 19th, 2020, a bright fireball was observed over Austria by a large number of eyewitnesses in Austria, Germany, Italy, and Czech Republic. Some of the witnesses also reported on sounds of loud explosions and rumbling as well as the observation of a dust trail (see here: https://fireball.amsmeteors.org/members/imo_view/event/2020/6819). The fireball was captured by a number of cameras, from the AllSky7 fireball network, the Fireball Recovery and InterPlanetary Observation Network (FRIPON), and the European Fireball Network. Using recordings of the European Fireball Network, it was estimated that some fragments, up to a few kilograms, should have landed within a mountainous area about 50 km long and up to 3 km wide, located between the municipalities of Lunz am See (Lower Austria) and Kindberg (Styria), about 100 km SW of the capital city of Vienna (Austria).

Search campaign: In the next days and weeks after the fall, one of us (L.F.) organized search campaigns involving friends and colleagues of the NHMV, and informed the local residents via distribution of pamphlets and an intense media campaign. No meteorite fragments were to be found, but several dozens of citizen scientists contacted the NHMV to report on their findings of possible meteorites, all of which were pseudometeorites, i.e., a diversity of slags and “strange looking” terrestrial rocks. The strong interest of the local residents and Austrian public in general (i.e., having seen or read in the media about the possible fall event of a meteorite in Austria, numerous persons reported to the NHMV on possible meteorites they have found years earlier as well as on a variety of rocks they have at home, some of which for decades) decreased within weeks after the observation of the bright fireball until one stone was found and recognized as a meteorite. On July 4th, 2021, more than 8 months after the fall, a local resident of Kindberg found, on the side of his private forest trail, a broken stone of 233.08 g (8.1 × 5.2 × 3.2 cm), partially covered with a dark brownish fusion crust. Interestingly, L.F. met with the finder back in November 2020 during one of the first search campaigns and not only gave him a pamphlet (with information on the fall event, how to recognize a meteorite, contact information, etc.) but also showed him what to look for (i.e., during the search campaigns a typical ordinary chondrite was shown to the local residents). Obviously, without the intense search efforts and this meeting in particular, the Kindberg meteorite would likely never have been recovered.

Classification of the meteorite: The Kindberg meteorite is classified as an L6 ordinary chondrite (S3, W1) [1]. It is weakly shocked, showing a network of thin dark shock veins cross-cutting the light greyish interior. Orange-brownish oxide rims formed around metal grains indicate a low weathering stage. A detailed sample description and mineral chemical composition by electron microprobe can be found in [1]. Gamma-spectrometry carried out in July-August 2021 showed the presence of the following radionuclides: ⁵⁷Co, ⁵⁴Mn, ²²Na, and ²⁶Al. Recalculated to November 19th, 2020, ²²Na was 99±7 and ²⁶Al was 60±6 (both in dpm/kg). The activity ratio of 1.65±0.20 is consistent with a fall on that date. Thus, there is no doubt on the relation of the recovered meteorite fragment and the eyewitnessed and detected bright fireball of November 19th, 2020.

Conclusions: In the last centuries, most of the meteorites were found in Europe by farmers or local residents after they witnessed the fall, a practice known these days as “Citizen Science”. The Citizen Science approach was used very early on (i.e., on the first day after the fall) in the search of the Kindberg meteorite to increase the chance to find meteorite fragments due to the very large strewn field and the difficult field conditions, a success story at the end. The main mass (194 g) of the meteorite is now in the collection of the NHMV as a permanent loan and will be added to the display in the Meteorite Hall. The type specimen and two polished sections are at the NHMV.

Acknowledgements: The media, the local residents of Kindberg, the friends and colleagues which took part to the search campaigns are thanked for their support. Family Zangl is acknowledged for the finding and report of the Kindberg meteorite to NHMV researchers. W. Wegner is thanked for support with the microprobe investigations.

References: [1] The Meteoritical Bulletin, No. 110, In preparation.