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Promoting the Interest in Meteorites in the Framework of the Dawn Mission

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Abstract

The Dawn spacecraft was launched on September 29, 2007 with the aim to analyze two objects in the main asteroid belt: Vesta and Ceres. But a few months earlier, on May 10, 2007, an extraordinary event took place in Spain: a fragment of Vesta crossed the Earth's orbit, fragmented in the atmosphere and impacted in the surroundings of the village of Puerto Lápice. Several fragments of the Puerto Lápice eucrite were recovered and analyzed by researchers belonging to the SPanish Meteor Network (SPMN). These analyses provided important information related to the nature of asteroid Vesta, but also had an important side effect, as the fall of the Puerto Lápice meteorite also increased the public's interest and fascination for these extra-terrestrial rocks in this country. Thus, since 2007 several outreach activities related to meteorites have been organized in Spain. And the interest for these materials was recently renewed with the arrival of Dawn to Vesta in July 2011. This gave rise to the development of an outreach project at Casa de la Ciencia de Sevilla (CSIC). The main features of this initiative are exposed here.

1. Introduction

Dawn's main objective is to characterize two of the largest bodies in the main asteroid belt: asteroid Vesta and dwarf planet Ceres. This will provide important information about the conditions and processes of the solar system's earliest epoch, as these protoplanets remaining practically intact since they were formed.

Despite Ceres is only slightly farther from the Sun than Vesta, these objects have followed a very different evolutionary path as a consequence of the diversity of processes that operated during the first stages of solar system evolution. Thus, although no meteorites have been linked to this dwarf planet, the detection of a possible signature of hydrated minerals reveals that water seems to have played an important role in the evolution of Ceres. However, Vesta appears to be a dry, differentiated body, with evidence of lava flows. Telescopic observations reveal also the existence of an impact crater with a diameter of about 460 km near its south pole. The event that generated this crater may have excavated about 1% of Vesta. In fact, this catastrophic event is believed to be responsible for the existence on Earth of fragments of Vesta. Thus, although no samples of Ceres are currently available, meteorites coming from Vesta are known to exist. These achondrites are magmatic rocks known as HEDs for their principal constituents: howardites, eucrites and diogenites.

The arrival of Dawn to Vesta on July 2011 offers an excellent opportunity for education and outreach. Thus, an exhibition was organized with the aim to promote the public's interest for the Dawn mission and the role that meteorites play for our knowledge of Vesta and other bodies of the Solar System. This outreach activity was entitled *"Vesta and Ceres: the Origins of the Solar System"* (Fig. 1). It took place during 2011 and 2012.

2. Contents and structure

Different contents related to the Dawn Mission were placed in a dedicated exhibition room located at Casa de la Ciencia (CSIC), in Sevilla (Spain). Among them, over 100 specimens belonging to the Madiedo Meteorite Collection were exhibited. About 30 of these were meteorites from Vesta, including two specimens from the Puerto Lápice eucrite.

Meteorites and related materials were placed inside properly conditioned glass cabinets. Informative panels with text and images where also prepared in order to provide information about the exhibition contents. Some of these were placed inside the glass cabinets. Multimedia videos were also produced by

using advanced computer animation techniques. These were continuously played on different TV screens located in the exhibition room to give a better understanding of the Dawn Mission. One of them was dedicated to describe the fall and recovery of the Puerto Lápice eucrite.

The structure of the exhibition covered different aspects related to Dawn and the role of meteorites for our knowledge of the origin and evolution of Vesta and other bodies in the Solar System:

a) Description of the Dawn Mission. Objectives and timeline. The Dawn spacecraft. b) Basic types of meteorites. How to recognize a meteorite. What can we learn from them? c) Where do meteorites come from? Meteorites from Mars, the Moon and Vesta. Meteorites with unknown origin. d) Meteorites from Vesta: howardites, eucrites and diogenites. Their likely origin: the event that produced the large crater on Vesta's south pole. Latest images from Dawn that confirm this event. e) The role of impacts in the evolution of the Solar System: the origin of the Moon. The role of impacts on life on Earth. f) The Puerto Lápice meteorite: a rock from Vesta.

The activity was designed for a wide audience, including students, educators and even other researchers. Guided visits to small groups were organized. During the there months that this exhibition was open, it received about 20.000 visitors and provided useful feedback for the development of similar activities in future.

3. The meteorite collection behind the exhibition

The meteorites exhibited during the development of this outreach activity belong to the private meteorite collection owned by Prof. Jose Maria Madiedo. The Madiedo Meteorite Collection consists of over 800 specimens which are available for research purposes, but also for education and outreach. In fact, some of these meteorites are being regularly exhibited since 2007 in several places in this country together with multimedia materials and additional stuff that complete this collection. Among these, there are numerous impactites and "meteorwrongs".

4. Summary and Conclusions

We have designed and developed an exhibition related to the Dawn Mission in the framework of *Casa de la Ciencia de Sevilla* (CSIC). This was also focused on the role that meteorites coming from Vesta play for our knowledge of this asteroid. The project has provided useful feedback for the preparation of similar outreach activities in future.

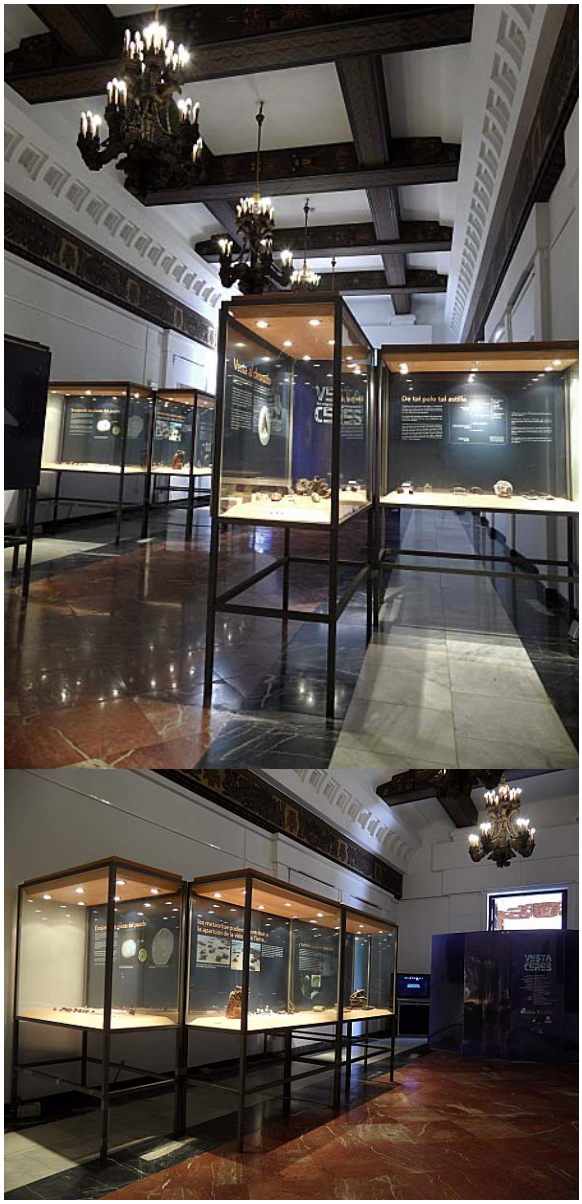

Figure 1: Images of the exhibition *Vesta and Ceres: the Origins of the Solar System* (Casa de la Ciencia del CSIC, Sevilla, 2011-2012).