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NOTABLE METEORITES FROM THE REGIONAL MUSEUM OF NATURAL SCIENCES IN TURIN, ITALY

OVIDIU GABRIEL IANCU[1], ALBERTO VITALE BROVARONE[2], GABRIELA IANCU[3]

[1] „Al. I. Cuza” University of Iaşi, Department of Geology, 20A Carol I Blv., 700505 Iaşi, Romania
[2] Università degli Studi di Torino, Dipartimento di Scienze Mineralogiche e Petrologiche, Via Valperga Caluso, no. 35-37, 10125,Torino, Italy
[3] ”Gh. I. Brătianu” School, Ciornei str., no 18-20, 700350, Iaşi, Romania

Abstract

The purpose of the paper is to present the most important meteorites from the collection of the Regional Museum of Natural Sciences in Turin. The collection is part of the Mineralogy-Geology-Petrography section and it includes 30 stony meteorites, 19 iron meteorites and 4 stony-iron meteorites, as well as 3 tektites. Notable pieces kept in Turin include one fragment of Orgueil (fallen in 1864 in France), one of eight known meteorites belonging to the CI chondrite group, remarkable for having a composition that is essentially identical to that of the Sun, excluding gaseous elements like hydrogen and helium, one fragment of the Cañon Diablo meteorite (found in 1891 in USA), which impacted at Barringer Crater, USA, one fragment of Sikhote-Alin (fallen in 1947 in Russia), an iron meteorite whose fall is among the largest meteorite showers in recent history and, last but not least, one fragment of Mezö-Mădăraş (fallen in 1852 in Transylvania), one of the most important L3 meteorites, intensely studied because they afford a unique opportunity for exploring preplanetary processes.

Keywords: stony meteorites, iron meteorites, stony-iron meteorites, collection, Turin, Orgueil, Cañon Diablo, Sikhote-Alin, Mezö-Mădăraş.

[1] e-mail: ogiancu@uaic.ro

Introduction

The main purpose of this paper is to present for the first time all the meteorites which are kept in the collection of the Regional Museum of Natural Sciences in Turin, Italy.

Founded in 1978, the Regional Museum of Natural Sciences is housed in the seventeenth-century building of the former San Giovanni Battista Hospital in the city centre. Its collections include zoology, entomology, botany, mineralogy, geology and palaeontology exhibits, some from the University museums, others new acquisitions. It houses numerous temporary exhibits and a library.

In 1978, the Piedmont Region instituted the Regional Museum of Natural Science through a law that stipulated the usage of a part of the building of the San Giovanni Battista Hospital, thus establishing the prestigious location.

In 1980, a convention, still valid nowadays, was drawn up between the Piedmont Region and the University of Studies of Turin, for the delivery for usage to the Regional Museum of Natural Science of the natural collections of the University Museums. Therefore, the museum began the placing and the cataloguing of the collections of the university, with the purpose of preserving and exhibiting them.

The museum is nowadays divided, as far as the scientific part is concerned, into the sections of Botany, Entomology, Mineralogy-Geology-Petrography, Palaeontology and Zoology; it has got about 1,000 square metres of exhibition area and it also has a specialized library with 12,000 volumes and 1,250 periodicals.

Description of the collection

The collection of meteorites is part of the Mineralogy-Geology-Petrography section and it includes 30 stony meteorites, 19 iron meteorites and 4 stony-iron meteorites, as well as 3 tektites (tab. 1). Sorted by country of origin, the 53 meteorites are distributed as follows: 1 - Chile, 1 - Croatia, 3 - Czech Republic, 3 - France, 2 – Germany, 1 – India, 10 – Italy, 2 - Mexico, 1 – Namibia, 2 – Poland, 2 – Romania, 5 – Russia, 1 – Serbia, 2 – Slovakia, 1 – Spain, 2 – Sweden, 1 – Ukraine, 13 – USA (fig. 1).

Notable meteorites kept in the museum

Orgueil is one of eight known meteorites belonging to the CI chondrite group, this being the largest (14 kg). This group is remarkable for having a composition that is essentially identical to that of the Sun, excluding gaseous elements like hydrogen and helium.

Because of its extraordinarily primitive composition and relatively large mass, Orgueil is one of the most-studied meteorites. One notable discovery in Orgueil was a high concentration of isotopically anomalous xenon called "xenon-HL". The carrier of this gas is extremely fine-grained diamond dust that is older than the solar system itself, known as presolar grains.

Table 1. Meteorite collection hosted by the Regional Museum of Natural Sciences in Turin, Italy

Name	Country	Class and Type	Date of fall or find	Total weight (g)	Number of fragments
Ordinary chondrites H					
Motta di Conti	Italy	H4	1868, February 29	6309	1
Vjatka	Russia	H4-5	Found 1994	379	1
L'Aigle	France	H5	1803, April 26	17.9	1
Alessandria	Italy	H5	1860, February 2	256	2
Assisi	Italy	H5	1886, May 24	227	1
Cereseto	Italy	H5	1840, July 17	1330.39	1
Collescipoli	Italy	H5	1890, February 3	90	1
Orvinio	Italy	H5	1872, August 31	79	1
Pultusk	Poland	H5	1868, January 30	282	3
Cangas de Onis	Spain	H5	1866, December 6	28	3
Hessle	Sweden	H5	1869, January 1	161	1
Ställdalen	Sweden	H5	1876, June 28	28	1
Forest City	USA	H5	1890, May 2	140.9	2
Trenzano	Italy	H6	1856, November 12	155	1
Ordinary chondrites L					
Mezö-Mădăraș	Romania	L3	1852, September 4	134	1
Saratov	Russia	L4	1918, September 6	599	1
McKinney	USA	L4	Found 1870	134.2	2
Ausson	France	L5	1858, December 9	185	1
Knyahinya	Ukraine	L5	1866, June 9	265.9	3
Mocs	Romania	L5-6	1882, February 3	269	2
Milena	Croatia	L6	1842, April 26	21	1
Pavlograd	Russia	L6	1826, May 19	100	1
New Concord	USA	L6	1860, May 1	100	1
Alfianello	Italy	L6	1883, February 16	734	2
Ordinary chondrites L					
Soko-Banja	Serbia	LL4	1877, October 13	72	1
Siena	Italy	LL5	1794, June 16	63.5	1
Dhurmsala	India	LL6	1860, July 14	3818	2
Carbonaceous chondrites					
Orgueil	France	CI1	1864, May 14	93	1
Vigarano	Italy	CV3	1910, January 22	38.6	1
Achondrites					
Stannern	Czech Republic	Eucrite	1808, May 22	32	1

Iron meteorites: Octahedrites					
Bohumilitz	Czech Republic	IAB	Found 1829	44	1
Toluca	Mexico	IAB	Found 1776	238	1
Xiquipilco	Mexico	IAB	Found 1949	2363	4
Magura	Slovakia	IAB	Found 1840	399	1
Cañon Diablo	USA	IAB	Found 1891	150	1
Sikhote-Alin	Russia	IIB	1947, February 12	4280	1
Lenarto	Slovakia	IIIAB	Found 1814	30	2
Ivanpah	USA	IIIAB	Found 1880	47	1
Seeläsgen	Poland	IIICD	Found 1847	910	2
Wichita County	USA	IIICD	Found 1836	49	1
Staunton	USA	IIIE	Found 1869	398	1
Nelson County	USA	IIIF	Found 1856	31	1
Gibeon	Namibia	IVA	Found 1836	490.7	2
Grand Rapids	USA	IRANOM	Found 1883	243.5	1
Cambria	USA	IRANOM	Found 1818	27	1
Iron meteorites: Hexaedrites					
Braunau	Czech Republic	IIAB	1847, July 14	9.9	1
Iron meteorites: Ataxites					
Chinga	Russia	IVB	Found 1913	1033	1
Iron meteorites: Anomalous					
Bitburg	Germany	IAB	Found 1805	144	2
Steinbach	Germany	IVA	Found 1724	144	2
Stony-iron meteorites: Mesosiderites					
Estherville	USA	Mesosiderite	1879, May 10	26	1
Stony-iron meteorites: Pallasites					
Brenham	USA	Pallasite	Found 1882	180	1
Eagle Station	USA	Pallasite	Found 1880	219.6	1
Imilac	Chile	Pallasite	Found 1822	147	1

In 1962, Nagy et al. announced the discovery of 'organised elements' embedded in the Orgueil meteorite that were purportedly biological structures of extraterrestrial origin. These elements were subsequently shown to be either pollen (including that of ragwort) and fungal spores (Fitch and Anders, 1963) that had contaminated the sample, or crystals of the mineral olivine.

The **Cañon Diablo** meteorite (fig. 1) impacted at Barringer Crater (Meteor Crater), Arizona, and is known from fragments collected around the crater and nearby Cañon Diablo which lies about 3 to 4 miles west of the crater. The meteorite has been known and collected since the mid 1800s and was known and used by pre-historic Native Americans. From the late 19th to the mid-20th century, the Barringer Crater was the centre of a long dispute over

the origin of craters that showed little evidence of volcanism. That debate was settled in the 1950's thanks to Eugene Shoemaker's study of the crater.

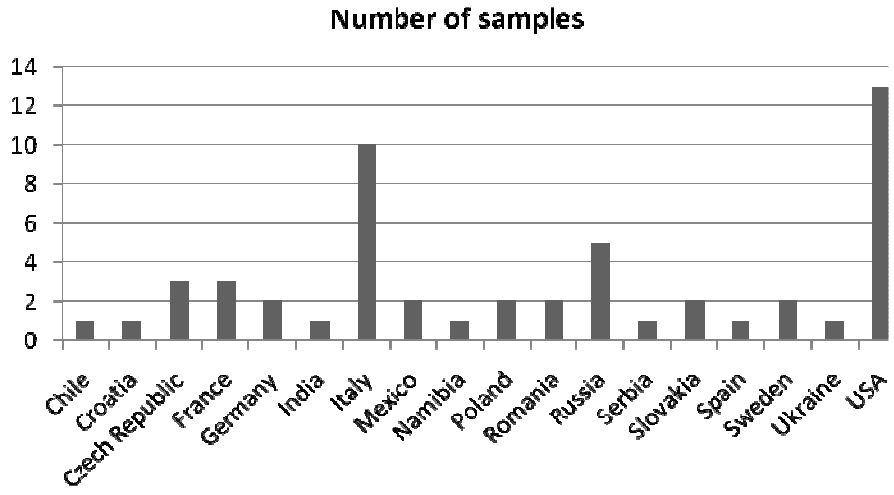

Fig. 1 The meteorites kept in the Regional Museum of Natural Sciences in Turin, sorted by country of origin

Clair Cameron Patterson, in 1953, used samples of the meteorite to estimate the age of the Earth at 4.550 billion years (± 70 million years).

The diamond is one of the minerals reported in this meteorite (Ksanda and Henderson, 1939).

Sikhote-Alin is an iron meteorite that fell in 1947 on the Sikhote-Alin Mountains in Russia. This fall is among the largest meteorite showers in recent history.

According to Graham et al. (1985), a shower of fireballs fell onto the thick forest in the Sikhote-Alin Mts., 25 miles from Novopoltavka, Maritime Province, producing 106 impact holes, and many fragments summing over 23000 kg in weight. The largest specimen of this iron meteorite recovered so far (1745 kg from over 23000 kg found) is kept in the Academy of Sciences in Moscow, Russia.

The bright flash and the deafening sound of the fall were observed for three hundred kilometres around the point of impact – not far from Luchegorsk and approximately 440 km northeast of Vladivostok. A smoke trail, estimated to have been 32 km long, remained in the sky for several hours.

As the meteorite — travelling at a speed of about 14 km/s — entered the atmosphere, it began to break apart, and the fragments fell together. At an altitude of about 5.6 km, the largest mass apparently broke up in a violent explosion.

Fig. 2 The fragment of the Cañon Diablo (syn Canyon Diablo) iron meteorite kept in Turin

On November 20th, 1957, the Soviet Union issued a stamp for the 10th anniversary of the Sikhote-Alin meteorite shower. It reproduces a painting by P. J. Medvedev, a Russian artist who witnessed the fall: he was sitting near his window starting a sketch when the fireball appeared, so he immediately began drawing what he saw.

The **Mezö-Mădăraş** meteorite fell on September 4th, 1852, at 16.30, in Transylvania (Mureş District). It was classified as L3.7 chondrite. According to Sears et al. (1991), the ordinary chondrites referred to as type 3 or UOC (unequilibrated ordinary chondrite) are the least-metamorphosed members of the three ordinary chondrite groups. They afford a unique opportunity for exploring preplanetary processes and for distinguishing the effects of processes that occurred prior to aggregation. Dodd et al. (1965) discovered a new mineral in this meteorite, named *Merrihueit* after Craig M. Merrihue, eminent student at the Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, SUA, who died of cancer in 1965.

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