

Catalogs and Inventories

The meteorite collection of the National Museum of Natural Sciences, Madrid, Spain: An updated catalog

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Abstract—A catalog of the meteorite collection hosted by the National Museum of Natural Sciences of Madrid is presented. It includes 88 stony meteorites, 56 iron meteorites, and 13 stony-iron meteorites, as well as 14 tektites.

The National Museum of Natural Sciences of Madrid (MNCN) holds the most important meteorite collection in Spain. This collection was first organized by the Marquis of Socorro, during the second half of the nineteenth century (1866–1882), based on several specimens stored in the museum, and several later exchanges and acquisitions. In 1886, according to Fernández Navarro (1923), the collection included 68 specimens corresponding to 64 meteorites (falls or finds). When the geologist Salvador Calderón became the head of the mineralogy section of the museum (1901–1910), meteorites began to receive special attention and there was a significant increase in the number of specimens thanks to exchanges with private collectors and other museums. In 1916, 99 specimens from 94 meteorites were listed, and by 1923 the collection contained 168 specimens. This total increased in the following decades thanks to private donations.

Only a few studies have been performed by Spanish researchers. These comprise historical reviews of the impacts (Alcalá and Martín Escorza, 1996, 2000; Ordaz *et al.*, 1999); petrological and geochemical studies (Martínez-Frías *et al.*, 1989a; Llorca Piqué, 1997); and isotopic dating (Sanz and Wasserburg, 1969; Sanz *et al.*, 1970). A Spanish–North American committee studied and reclassified some specimens (Keil *et al.*, 1986; Casanova *et al.*, 1990; McCoy *et al.*, 1990). The last Spanish meteorite registered in the Meteoritical Bulletin (Grossman, 1998)—the only one in the last 50 years—was Valencia H5 (Muñoz Sanz, 1997; Muñoz Sanz *et al.*, 1998). The research was carried out both in the museum and at the Complutense University of Madrid. This meteorite is not held in the collection, but by the University of Valencia.

A listing of the collection published by King *et al.* (1986) numbered 217 specimens from more than 155 different

meteorites. Three years later a specific overview focusing on Spanish meteorites was carried out by Martínez-Frías *et al.* (1989b).

Some acquisitions have been made since then, with one case deserving special attention. In 1994 a supposed meteorite fell in the town of Getafe (South Madrid). The studies carried out so far indicate that although the circumstances surrounding the fall are well documented, the petrologic and geochemical characteristics of the material (a larnite-rich ultrarefractory rock) do not match any of the previously classified meteorites or clearly terrestrial rocks (Martínez-Frías, 1999; Martínez-Frías *et al.*, 1999). It has therefore been included in the catalog as a pseudometeorite.

A general revision of the information available on the collection reflects differences in the weight of some specimens due to recent scientific exchanges and studies, which make the update of the catalog necessary. The inventory we present lists the meteorites by the names used in the British Museum Catalogue (Grady, 2000), and classifies the specimens according to their petrologic class, including data on their place and date of fall or find, total weight, and number of fragments (Table 1).

Additional questions about the collection, including request for samples, should be addressed to B. Sánchez.

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TABLE 1. Catalog of the meteorite collection at the National Museum of Natural Sciences of Madrid.

Name	State and country	Class and type	Date of fall or find	Total weight (g)	Number of fragments
Ordinary chondrites H					
Abbott	New Mexico (USA)	H6	found 1951	86.3	1
Agen	Lot-et-Garonne (France)	H5	1814 September 5	14.5	1
Allegan	Michigan (USA)	H5	1899 July 10	13.8	5
Anthony	Kansas (USA)	H5	found 1919	131.8	1
Bath	South Dakota (USA)	H4	1892 August 29	60.6	1
Bonita Springs	Florida (USA)	H5	found 1938 September	459.4	1
Bur-Gheluai	Bur-Hagaba (Somalia)	H5	1919 October 16	358.5	2
Cangas de Onis*	Asturias (Spain)	H5	1866 December 6	10500	1
Cañellas	Barcelona (Spain)	H4	1861 May 14	454.6	5
Collescipoli	Umbria (Italy)	H5	1890 February 3	17.9	1
Djati-Pengilon	Java (Indonesia)	H6	1884 March 19	55.8	1
Estacado	Texas (USA)	H6	found 1883	204.7	1
Forest City	Iowa (USA)	H5	1890 May 2	486	1
Gerona	Gerona (Spain)	H5	found 1899	52.6	1
Gilgoin	New South Wales (Australia)	H5	found 1889	117.5	2
Guareña	Badajoz (Spain)	H6	1892 July 20	32905.9	4
Hessle	Uppsala (Sweden)	H5	1869 January 1	92.4	5
Kernouve	Morbihan (France)	H6	1869 May 22	63.7	2
Kesen	Iwate Honshu (Japan)	H4	1850 June 13	28.2	1
Lançon	Provence (France)	H6	1897 June 20	152.7	1
Lixna	Daugavpils (Latvia)	H4	1820 July 12	7.5	1
Molina*†	Murcia (Spain)	H5	1858 December 24	112500	1

TABLE 1. *Continued.*

Name	State and country	Class and type	Date of fall or find	Total weight (g)	Number of fragments
Ordinary chondrites H (<i>continued</i>)					
Monroe	North Carolina (USA)	H4	1849 October 31	1.7	2
Nulles	Tarragona (Spain)	H6	1851 November 5	4372.2	9
Ochansk	Perm (Russia)	H4	1887 August 30	4.5	2
Ogi	Kyushu (Japan)	H6	1741 June 8	22.2	1
Olmedilla de Alarcón	Cuenca (Spain)	H5	1929 February 26	36320.8	5
Oviedo	Asturias (Spain)	H5	1856 August 5	10.3	2
Plainview (1917)	Texas (USA)	H5	found 1917	859.3	1
Pultusk	Warsaw (Poland)	H5	1868 January 30	554.4	4
Raco	Tucumán (Argentina)	H5	1957 November 17	1	1
Richardton	North Dakota (USA)	H5	1918 June 30	246.3	1
Searsmont	Maine (USA)	H5	1871 May 21	9.2	2
Selma	Alabama (USA)	H4	found 1906	651.8	1
Sena	Huesca (Spain)	H4	1773 November	1688.6	3
Stålldalen	Örebro (Sweden)	H5	1876 June 28	15.1	1
Trenzano	Brescia (Italy)	H6	1856 November 12	14.3	1
Ordinary chondrites L					
Alfianello	Lombardy (Italy)	L6	1883 February 16	121.2	3
Aumale	Alger (Algeria)	L6	1865 August 25	26.9	1
Aumieres	Lozere (France)	L6	1842 June 3	2.7	1
Ausson	Hautte Garonne (France)	L5	1858 December 9	8	1
Bjurböle	Nyland (Finland)	L/LL4	1899 March 12	429.9	2
Bluff (a)	Texas (USA)	L5	found 1875	210.4	2
Cabezo de Mayo	Murcia (Spain)	L6	1870 August 18	132.7	1
Château-Renard	Loiret (France)	L6	1841 June 12	3	1
De Nova	Colorado (USA)	L6	found 1940	199	1
Dhurmsala	Himachal Pradesh (India)	LL6	1860 July 14	507.4	1
Ergheo	Brava (Somalia)	L5	1889 July	135.3	1
Farmington	Kansas (USA)	L5	1890 June 25	7.6	1
Fisher	Minnesota (USA)	L6	1894 April 9	137.8	1
Garraf	Barcelona (Spain)	L6	found 1905 June	7.8	1
Girgenti	Sicily (Italy)	L6	1853 February 10	112.3	1
Homestead	Iowa (USA)	L5	1875 February 12	87.5	1
Honolulu	Hawaii (USA)	L5	1825 September 27	6.2	1
Knyahinya	Ungvár (Ukraine)	L5	1866 June 9	26	2
L'Aigle	Orne (France)	L6	1803 April 26	120.1	2
Lissa	Bohemia (Czech Republic)	L6	1808 September 3	5.2	2
Los Martinez*	Murcia (Spain)	L6	1894 May	20	1
Madrid	Madrid (Spain)	L6	1896 February 10	18.5	1
Marion (Iowa)	Iowa (USA)	L6	1847 February 25	58.8	1
Mauerkirchen	Ober-Österreich (Austria)	L6	1768 November 20	1.1	1
McKinney	Texas (USA)	L4	found 1870	492.1	2
Mező-Madaras	Harghita (Romania)	L3.7	1852 September 4	33.2	1
Mocs	Transylvania (Romania)	L6	1882 February 3	383.7	3
Modoc (1905)	Kansas (USA)	L6	1905 September 2	674.9	1
Ness County (1894)	Kansas (USA)	L6	found 1894	146.7	1
New Concord	Ohio (USA)	L6	1860 May 1	79.5	1
Ojuelos Altos	Cordoba (Spain)	L6	1926 December 10	4606.7	2
Pavlograd	Ekaterinoslav (Ukraine)	L6	1826 May 19	25.7	1
Rakovka	Orlovsk Province (Russia)	L6	1878 November 20	45.7	1
Reliegos†	Leon (Spain)	L5	1947 December 28	10109	3
Vera	Santa Fe (Argentina)	L4	found 1941	2.6	1
Vouillé	Vienne (France)	L6	1831 May 13	15.4	1

TABLE 1. *Continued.*

Name	State and country	Class and type	Date of fall or find	Total weight (g)	Number of fragments
Ordinary chondrites L (<i>continued</i>)					
Zavid	Zvornik (Bosnia)	L6	1897 August 1	151.3	2
Ordinary chondrites LL					
Olivenza†	Badajoz (Spain)	LL5	1924 June 19	50076	5
Parnallee	Tamil Kadu (India)	LL3.6	1857 February 28	84.1	1
Sevilla	Sevilla (Spain)	LL4–6	1862 November 1	61	2
Soko Banja	Aleksinac (Serbia)	LL4	1877 October 13	117.7	1
Carbonaceous chondrites					
Allende†	Chihuahua (Mexico)	CV3.2	1969 February 8	1446.3	2
Lance	Loir-et-Cher (France)	CO3.4	1872 July 23	82.2	1
Orgueil	Tarn-et-Garonne (France)	CI1	1864 May 14	9.6	1
Vigarano	Emilia-Romagna (Italy)	CV3.3	1910 January 22	92.1	1
Achondrites					
Béréba	Burkina Faso	Eucrite	1924 June 27	4.5	1
Bishopville	South Carolina (USA)	Aubrite	1843 March 25	5	1
Cumberland Falls†	Kentucky (USA)	Aubrite	1919 April 9	259	1
Juvinas	Ardeche (France)	Eucrite	1821 June 15	65.5	1
Pavlovka	Sharatov Province (Russia)	Howardite	1882 August 2	27	1
Petersburg	Tennessee (USA)	Howardite	1855 August 5	46.6	4
Iron meteorites: Octaedites					
Arispe	Sonora (Mexico)	IC	found 1896	416.2	1
Augustinovka	Dnipropetrovsk Province (Ukraine)	IIIAB	found 1890	102.4	1
Ballinoo	Western Australia (Australia)	IIC	found 1892	98.6	1
Bishop Canyon	Colorado (USA)	IVA	found 1912	277.1	1
Campo del Cielo	Gran Chaco Gualamba (Argentina)	IAB	found 1576	14.9	1
Canyon Diablo	Arizona (USA)	IAB	found 1891	1214.5	3
Carlton	Texas (USA)	IIICD	found 1887	129.8	1
Charcas	San Luis De Potosí (Mexico)	IAB	found 1804	22.1	2
Colomera†	Granada (Spain)	IIE	found 1912 November 5	120342.3	4
Costilla Peak	New Mexico (USA)	IIIAB	found 1881	493	1
Cuba	Oriental (Cuba)	IAB	found 1871	1200.6	2
Edmonton (Kentucky)	Kentucky (USA)	IIICD	found 1942	244.6	1
Gibeon	Namaqualand (Namibia)	IVA	found 1836	404.1	1
Grand Rapids	Michigan (USA)	Ungrouped	found 1883	6.7	1
Iquique	Tarapaca (Chile)	IIIAB	found 1903	37.2	1
Kenton County	Kentucky (USA)	IIIAB	found 1889	15.1	1
La Grange	Kentucky (USA)	IVA	found 1860	75	1
Linwood	Nebraska (USA)	IAB	found 1940 or 1941	348.7	1
Merceditas	Atacama (Chile)	IIIAB	found 1884	26	1
Misteca	Oaxaca (Mexico)	IAB	found 1804	585.7	1
Mount Joy	Pennsylvania (USA)	IAB	found 1887	976.1	12
Netschäevo	Kaluzhsk Province (Russia)	IIE	found 1846	2	1
New Westville	Ohio (USA)	IVA	found 1941	341.2	1
Oroville	California (USA)	IIIAB	found 1893	228.2	1
Perryville	Missouri (USA)	IIC	found 1906	143.3	1
Plymouth	Indiana (USA)	IIIAB	found 1893	31	1
Puerta de Arauco	La Rioja (Argentina)	IVA	found 1904	44.3	1
Putman County	Georgia (USA)	IVA	found 1839	47.3	1
Quesa	Valencia (Spain)	Ungrouped	1898 August 1	8.5	1
Ruff's Mountain	South Carolina (USA)	IIIAB	found 1844	235.8	1

TABLE 1. *Continued.*

Name	State and country	Class and type	Date of fall or find	Total weight (g)	Number of fragments
Iron meteorites: Octaedites (<i>continued</i>)					
Sacramento Mountains	New Mexico (USA)	IIIAB	found ca. 1890	154.3	2
San Angelo	Texas (USA)	IIIAB	found 1897	161.9	1
Santa Luzia	Goiás (Brasil)	IIAB	found 1921	231.6	1
Sao Juliao de Moreira	Minho (Portugal)	IIAB	found 1883	175	4
Sardis	Georgia (USA)	IAB	found 1940	918	1
Schwetz	Kwidzyn (Poland)	IIIAB	found 1850	152.1	1
Seeläsgen	Schwiebus (Poland)	IIICD	found 1847	26.8	1
St. Genevieve County	Missouri (USA)	IIIF	found 1888	172.3	1
Steinbach	Saxony (Germany)	IVA	found 1724	6.5	1
Tazewell	Tennessee (USA)	IIICD	found 1853	107.5	1
Toluca	Mexico State (Mexico)	IAB	found 1776	1472.7	4
Trenton	Wisconsin (USA)	IIIAB	found 1858	105.1	1
Verkhne Udinsk	Buryatia (Russia)	IIIAB	found 1854	94.7	1
Wabar	Rub' al Khali (Saudi Arabia)	IIIAB	found 1863	26.3	1
Wichita County	Texas (USA)	IIICD	found 1836	28.9	1
Youndegin	Western Australia (Australia)	IAB	found 1884	27.4	1
Iron meteorites: Hexahedrites					
Chesterville	South Carolina (USA)	IIAB	found 1849	75.2	1
Coahuila	Coahuila (Mexico)	IIAB	found 1837	222.3	2
Mayodan†	North Carolina (USA)	IIAB	found 1920	265	1
Mejillones	Atacama (Chile)	IIAB	found 1875	235	1
Murphy	North Carolina (USA)	IIAB	found 1899	19.4	1
Iron meteorites: Ataxites					
Santa Catharina†	Morro Do Rocio (Brasil)	Ungrouped	found 1875	1066.7	3
Santa Rosa	Boyaca (Colombia)	IC	found 1810	400	1
South Byron	New York (USA)	Ungrouped	found 1915	362.1	1
Tucson	Arizona (USA)	Ungrouped	found 1850	91	1
Iron meteorites: Anomalous					
Zacatecas (1792)	Zacatecas (Mexico)	Ungrouped	found 1792	17.8	1
Stony-iron meteorites: Mesosiderites					
Barea†	Logroño (Spain)	Mesosiderite	1842 July 4	988.1	3
Crab Orchard	Tennessee (USA)	Mesosiderite	found 1887	41.2	1
Dalgaranga	Western Australia (Australia)	Mesosiderite	found 1923	27	3
Estherville	Iowa (USA)	Mesosiderite	1879 May 10	78.7	1
Mincy	Missouri (USA)	Mesosiderite	found 1857	223.4	4
Morristown	Tennessee (USA)	Mesosiderite	found 1887	75.5	1
Vaca Muerta	Atacama (Chile)	Mesosiderite	found 1861	66.3	3
Stony-iron meteorites: Pallasites					
Admire	Kansas (USA)	Pallasite	found 1881	16.2	8
Brenham	Texas (USA)	Pallasite	found 1882	1.5	1
Finmarken	Finnmark (Norway)	Pallasite	found 1902 September	51.2	14
Glorieta Mountain	New Mexico (USA)	Pallasite	found 1884	30.3	1
Imilac	Atacama (Chile)	Pallasite	found 1822	100.6	1
Krasnoyarsk†	Krasnoyarsk Territory (Russia)	Pallasite	found 1749	258.6	2
Pseudometeorites					
Getafe	Madrid (Spain)	Pseudometeorite	1994 June 20	1478.8	25
Igast	Esthonia	Pseudometeorite	1855 May 17	11.7	1

*The correct spelling of "Cangas de Onis" and "Los Martinez" is "Cangas de Onís" and "Los Martínez", respectively. The meteorite "Molina" is known as "Molina de Segura" in Spain, after the complete name of the location where it fell.

†Largest meteorite in each group.

The collection includes 14 tektites from Moldavia (10.8 g), Indonesia (19.2 g) and Thailand (260.3 g), as well as metallic spheroids from Canyon Diablo (Arizona, USA) (50.3 g).
