EDMORE, MICHIGAN: A NEW IIIAB IRON METEORITE. C. M. Corrigan[1], T. J. McCoy[1], J. T.Wasson[2], M. Sirbescu[3] and A. M. Gilchrist[1]. [1]Smithsonian Institution, National Museum of Natural History, Washington DC, USA, [2]University of California at Los Angeles, Los Angeles, CA, USA. [3]Central Michigan University, Mt. Pleasant MI, USA. (corriganc@si.edu).

Introduction: In 1939, a meteorite reportedly fell on a farm near the town of Edmore in the state of Michigan in the United States. The owner of this farm reportedly recovered the meteorite and subsequently used it as a doorstop for his barn. The subsequent owners of the farm (having been told the above story), recognizing its value to science after the Hamburg, Michigan fall in early 2018, brought the meteorite to the local university (Central Michigan University) in Mt. Pleasant, Michigan, for identification (Figure 1). Even though this new meteorite is nothing like Hamburg, which is an H4 chondrite, this event highlights the importance of increasing the visibility of meteorites to the general public so that new stones existing in personal collections (possibly even unbeknownst to the owners) can be recovered and studied for scientific purposes.

Figure 1. Photo of the ~10 kg Edmore, Michigan, IIIAB iron meteorite as submitted to Central Michigan University for identification. The specimen is ~17 cm wide in this view. Photo: M. Sirbescu, CMU.

The meteorite itself is ~10.22 kg and is, overall, roughly triangular in shape and is ~17 x 20 x 23 cm in dimension. It contains large indentations on the surface, and a light brown fusion crust covers portions of the surface. Weathering is modest to moderate, which is surprising given its history of propping open a barn door in Michigan for nearly decades!

Analytical Methods: Co-author Sirbescu at Central Michigan University sent a slice of the meteorite to the Smithsonian Institution for identification/classification. The slice was inserted into the Nova NanoSEM 600 scanning electron microscope under low vacuum to use energy dispersive X-ray spectroscopy (EDS) to identify Ni in its composition. The surface of the slice was then etched with 10% Nital and alcohol to expose the Widmanstätten pattern. Electron microprobe analyses are being conducted at the Smithsonian Institution National Museum of Natural History (NMNH) using the JEOL 8530Fplus Hyperprobe electron microprobe.

Petrographic Description: This meteorite is a medium octahedrite and in the slice at the NMNH, kamacite, taenite and schreibersite were identified (Figure 2). Kamacite lamellae within the Widmanstätten structure are ~0.8 mm in width. The taenite present between kamacite lamellae exhibits pronounced zoning. Schreibersite grains up to 4 mm in width show extensive fracturing. A large schreibersite vein crosses the surface of the slice (Figure 2). No fusion crust is evident on the section examined. Weathering in the slice was minor but has progressed quickly after the meteorite was prepared. A thick section of the meteorite has been prepared for electron microprobe analyses.

Figure 2. Polished and etched face of a slice of the Edmore meteorite. Specimen is ~3 x 7 cm. Widmanstätten pattern is evident, with schreibersite laths crossing the specimen on the left hand side. Photo: Smithsonian.

Classification: Analysis by neutron activation analysis at UCLA reveal that Edmore has a composition of 17 mg/g Cr, 5.41 mg/g Co, 89.1 mg/g Ni, 120 mg/g Cu, 20.9 mg/g Ga, 14.1 mg/g As, 0.34 ug/g W, <50 ng/g Re, 0.07 mg/g Ir, 4.5 mg/g Pt and 1.621 mg/g Au (Table 1). The Co concentration of the analyzed sample places this meteorite as a IIIAB. Texturally, Edmore is also consistent with being a IIIAB.

Edmore is similar in composition (with respect to most of the above elements) to other low-Ir IIIAB meteorites such as Grant, Yarovoye, Treysa, Hardesty, Sam's Valley, Teplá, Aprelsky, and NWA 11289 [3] (Table 1, Figure 1). Treysa and Yarovoye are two of the five members of the Treysa set of anomalous IIIABs discussed in [3]. However, with respect to Ir, none of these established IIIABs come within 15% of Edmore. Those within 15-25% of Edmore with respect to Ir are Hardesty, Aprelsky, and NWA 11289. Hardesty (Oklahoma) found in 1986, is the only one of these meteorites from the United States.

A New Meteorite. Based on the information presented here, including the above analyses, particularly the Ir data, this meteorite has been determined to be a new IIIAB iron meteorite. Edmore, Michigan, is the approved name.

Meteorite	Cr µg/g	Co mg/g	Ni mg/g	Cu µg/g	Ga µg/g
Grant	32	5.39	93.6	136	19.1
Yarovoye	12	5.39	97.8	183	20.0
Treysa	28	5.40	94.3	104	20.7
Hardesty	13	5.41	94.6	100	18.1
Edmore	17	5.41	89.1	120	20.9
Sam's Valley	72	5.44	95.3	157	18.7
Teplá	13	5.44	95.5	159	21.2
Aprelsky	13	5.44	97.5	112	19.3
NWA 11289	15	5.45	93.5	122	19.9

Table 1A. Compositional data for Edmore and other IIIAB irons. Data from [2,3, some unpublished from coauthor Wasson].

Meteorite	As µg/g	W µg/g	Re ng/g	Ir µg/g	Pt µg/g	Au µg/g
Grant	15.5	0.26	<20	0.042	3.2	1.801
Yarovoye	15.40	0.70	63	0.92	6.2	1.736
Treysa	16.40	0.87	94	1.110	9.5	1.732
Hardesty	15.8	0.35	<30	0.088	4.6	1.805
Edmore	14.1	0.34	<50	0.070	4.5	1.621
Sam's Valley	17.3	0.31	<40	0.014	2.8	1.955
Teplá	15.2	0.29	<30	0.016		1.762
Aprelsky	17.3	0.26	<40	0.058	3.0	2.022
NWA 11289	13.40	0.35	<18	0.081	3.9	1.64

Table 1B. Compositional data for Edmore and other IIIAB irons. Data from [2,3, some unpublished from coauthor Wasson].

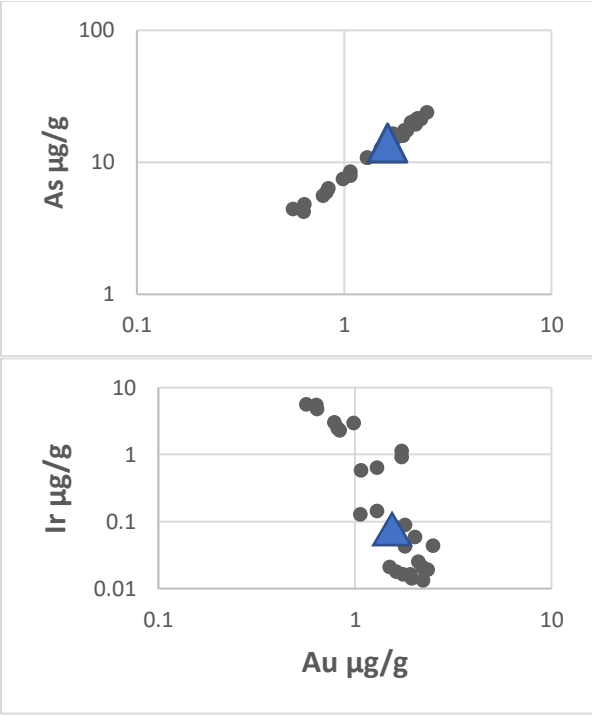

Figure 1. Log-log plots of As vs. Au (both in µg/g) and Ir vs. Au (both in µg/g) for IIIAB iron meteorites. Edmore, Michigan, the new IIIAB meteorite, is plotted as the blue triangle. Data from [2,3, some unpublished data from coauthor Wasson].

References: [1] Greer J. et al. (2019) LPSC # 1638. [2] Wasson J. (1999) *GCA*, *18*, 2875-2889. [3] Wasson J. (2016) *MAPS* 51, 773.