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► To cite this version:

Philipp Heck, Christopher Herd, Jeffrey Grossman, Dmitry Badjukov, Audrey Bouvier, et al.. Best practices for the use of meteorite names in publications. *Meteoritics and Planetary Science*, 2019, 54 (7), pp.1397-1400. 10.1111/maps.13291 . hal-02106317

HAL Id: hal-02106317

<https://hal.science/hal-02106317v1>

Submitted on 11 Dec 2024

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Best practices for the use of meteorite names in publications

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(Received 23 January 2019; revision accepted 13 March 2019)

Abstract—This document contains suggestions for best practices by authors who refer to meteorites in publications. It can also be taken as a guide for publishers in establishing guidelines for authors. The following best practices are recommended in addition to acknowledging the loaning institution or loaning individual (unless required otherwise). The main motivations are to: help ensure that research on meteorites is reproducible, prevent confusion in the literature, and enhance tracking of specimens and related data.

INTRODUCTION

The Meteoritical Society (MetSoc) is the world's authority on meteorite names (e.g., Marvin 1993; Leonard 2018). In order for a meteorite (as defined in Rubin and Grossman 2010) to receive an official name from MetSoc, every meteorite must be documented as to its physical properties and provenance, receive an initial classification by a qualified researcher, and have a type specimen deposited in an institutional collection with a long-term commitment to meteorite curation and which loans specimens to qualified scientists for research. The Society's Nomenclature Committee (NomCom) has developed Guidelines for Meteorite Nomenclature (Guidelines 2018), and is charged with implementing these guidelines for all newly discovered meteorites.

The following set of recommendations has been prepared and endorsed by the 2016 NomCom and the independent Meteorite Curators Working Group (MCWG); the latter group also includes curators of other astromaterials (e.g., cosmic dust and material returned by sample-return missions). These recommendations are meant to complement the Guidelines for Meteorite Nomenclature (Guidelines 2018), in order to specifically provide guidance regarding the use of names of meteorites in publications.

The principles behind the Guidelines for Meteorite Nomenclature and the recommendations presented here are as follows. (1) *Preventing confusion*. All publications on meteorites should be easily traceable to publicly available data that contain the details of a specific meteorite fall or find. Moreover, publications should be searchable, such that all publications on a specific meteorite can be found by searching for a single name. (2) *Reproducibility*. In order for meteorite research to be reproducible, it is critical that future generations be able to accurately identify the meteorite that was studied and obtain additional specimens. (3) *Traceability*. Many meteorites are dispersed among public and private collections. Within these collections, there may be multiple stones ("stones" is used here to include metal-rich meteorites) associated with a given meteorite, and many subsamples may exist of individual stones. Because

most meteorites are heterogeneous, and because pairing between individual stones may be uncertain, publications need to record the details of which collection, which stone, and which subsample was used for the research.

The following studies represent examples of publications in which sample numbers were provided. The Sutter's Mill meteorite is a regolith breccia dominated by a CM-type lithology that fell on April 22, 2012 (Jenniskens et al. 2012). Some of the specimens were collected a few days after the fall, while the majority were collected after it had rained. The latter specimens show effects of terrestrial alteration, including loss of the water-soluble sulfide oldhamite, whereas those collected before the rain retained oldhamite and showed less alteration (Walker et al. 2018). In this way, the effects of terrestrial modification of an important fall are documented. Another example is the comparative study of the mid-IR spectroscopy of the Tagish Lake C2-ungrouped chondrite with that of the Martian moon Phobos, providing insights into Phobos's origin (Glotch et al. 2018). There is lithological variation among Tagish Lake stones (e.g., Blinova et al. 2014); the sample chosen for this study was selected to be representative of less-altered lithologies (Glotch et al. 2018). In both of these examples, the specimens that were used are clearly indicated in the articles, and the sample processing scheme was documented. The samples (or aliquots thereof) are back in their respective collections and available for future researchers to do similar or complementary studies. The provision of these specimen numbers will allow workers to refer to, or request these specific specimens for future work. The increased use of computed tomography (CT) to investigate meteorites in three dimensions in multiple subsections of CT volumes (e.g., Ebel et al. 2008) will increase the need for precise subsample information to ensure the success of future investigation of the same samples. Focused ion-beam extraction from meteorites for transmission electron microscopy provides similar challenges for specimen source identification.

There are many more examples in the literature that could be cited in this context where meteorite specimens

are provided following the recommendations given below (e.g., Bouvier et al. 2015; Santos et al. 2015; Jilly-Rehak et al. 2017; Marrocchi et al. 2019).

RECOMMENDATIONS FOR METEORITE NOMENCLATURE IN PUBLICATIONS

1. *Approved meteorites.* Authors can only use official meteorite names, i.e., names that have been approved by the Nomenclature Committee, in publications, such as papers, monographs, abstracts, and popular articles. All such names are listed in the *Meteoritical Bulletin Database* within 1 week of their approval. Care should be taken to be sure that the spelling, punctuation, and diacritical marks in official names are properly maintained, even if the approved name seems misspelled or otherwise incorrect to the author. This is the *Prime Directive* of meteorite nomenclature.
2. *Provisional names.* Provisional names cannot be used in publications (including abstracts and popular articles). Many meteorites in dense collection areas (i.e., those with names in numbered sequences) have been assigned provisional names. Such names are clearly labeled as provisional in the *Meteoritical Bulletin Database* and highlighted in a different color. Provisional names are given for the purpose of tracking specimens through the classification and approval process and are not official.
3. *Abbreviations.*
 - a. *Official abbreviations.* Many meteorites in dense collection areas have been given official abbreviations, which are published in the *Meteoritical Bulletin Database*. When these exist, authors should use them rather than defining their own abbreviations, whenever possible and practical. A complete list of dense collection areas and their approved abbreviations, demonstrating proper usage, is maintained by the Editors of the *Meteoritical Bulletin*.
 - b. *Author-defined abbreviations.* Authors frequently find it convenient to abbreviate meteorite names in text, tables, and figures. In doing so, care should be taken that the abbreviation does not duplicate any existing names, abbreviations, or synonyms for other meteorites, which could lead to confusion in the literature.
 - c. *Usage.* Authors should avoid the use of abbreviated meteorite names in titles and abstracts of publications, and should introduce them in text as they would do with any other abbreviation. This practice should be followed both for official and author-defined abbreviations.
4. *Synonyms.* Synonyms for official meteorite names should NOT be used in publications, except when needed to provide historical context, identify specimens (see §5), or prevent confusion by readers. Synonyms are listed in the *Meteoritical Bulletin Database* for the sole purpose of identifying meteorites that may have appeared in previous publications or in popular usage under different names. Such names should not be propagated by authors.
5. *Named masses.* Many large meteorites, in particular large irons, have popular names that have been assigned to significant masses (e.g., the “Ahnighito” mass of *Cape York*). In many cases, these names are listed as synonyms in the *Meteoritical Bulletin Database*, which may also include a tabulation of known masses. Authors are encouraged to identify the source masses of specimens under discussion. The text should always make clear what the official meteorite name is for each mass and only use mass names when it is important to distinguish the named mass from other masses of the same meteorite.
6. *Catalog numbers.* The sources of meteorite specimens used in publications should always be identified. This includes citing the name of the source institution or other entity from which specimens have been obtained, along with all relevant catalog and specimen numbers, including subsample information. This enables scientific replication and verification and allows loaning institutions to document the use of their collections as well as the methods applied to each specimen.
7. *Pairing groups.* When numbered meteorites from dense collection areas are known or suspected to be paired (part of the same fall event), they may be referenced collectively in publications by the lowest number, the most widely studied number, or the number with the largest mass (e.g., the *EET 87711* pairing group). Whatever the author chooses to do, all meteorites considered part of the pairing group that are relevant to the discussion should be named and identified as part of the group.
8. *Suspected meteorites.* Occasionally, an author will want to discuss a specimen suspected of being a new meteorite but has not received an official name. Best practice in these situations is always for the author to submit such meteorites to NomCom for approval prior to publication. However, in cases where the authenticity of the meteorite is in doubt, authors should state the nature of the controversy, introduce the specimen with a label that does not conflict with existing meteorite names, abbreviations, and synonyms and which is clearly identified as an “unofficial name.”

Editorial Handling—Dr. A. J. Timothy Jull

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