

**PLANETARY NOMENCLATURE: OVERVIEW AND UPDATE FOR 2022.** T. A. Gaither<sup>1</sup>, A. L. Gullikson<sup>1</sup>, K. Aksnes<sup>2</sup>, G. A. Burba<sup>3</sup>, G. J. Consolmagno<sup>4</sup>, R. M. C. Lopes<sup>5</sup>, P. Masson<sup>6</sup>, R. Schulz<sup>7</sup>, W. Sheehan<sup>8</sup>, G. V. Williams<sup>9</sup>, and C. Wood<sup>10</sup>, <sup>1</sup>USGS Astrogeology Science Center, Arizona, USA, [tgaither@usgs.gov](mailto:tgaither@usgs.gov), <sup>2</sup>Institute for Theoretical Astrophysics, Oslo, Norway, <sup>3</sup>Vernadsky Institute, Moscow, Russia, <sup>4</sup>Specola Vaticana, Vatican City State, <sup>5</sup>Jet Propulsion Laboratory, California Institute of Technology, California, USA, <sup>6</sup>Universite de Paris-Sud, Orsay, France, <sup>7</sup>ESA Science Directorate, ESTEC, Noordwijk, The Netherlands, <sup>8</sup>Lowell Observatory, Arizona, USA, <sup>9</sup>Minor Planet Center (formerly), Massachusetts, USA, <sup>10</sup>Planetary Science Institute, Arizona, USA.

**Introduction:** Planetary nomenclature is a tool that helps to uniquely identify topographical, morphological, or albedo features on the surfaces of planets and satellites, so that they can be reliably located, described, and accurately discussed and compared by the scientific community.

The task of naming planetary surface features, rings, and natural satellites is managed by the International Astronomical Union's (IAU) Working Group for Planetary System Nomenclature (WGPSN). The volunteer members of the WGPSN and its six Task Groups have worked since the early 1970s to provide a clear, unambiguous system of planetary nomenclature that represents cultures and countries from all regions of Earth. The WGPSN is chaired by Dr. Rita Schulz and includes eight other members from countries around the globe. The six Task Groups, each chaired by a WGPSN member, advise the WGPSN.

Since the 1980s, the USGS Astrogeology Science Center has managed (for the IAU and with the financial support of NASA) the ever-growing database of planetary names, the online Gazetteer of Planetary Nomenclature [1], and the IAU name proposal process, for the planetary science community. This abstract provides an overview of the program.

**Overview:** There are currently 15,769 IAU-approved names in use for surface features located on all planets, satellites, and small bodies. There are 127 name approvals per year on average. Requests for one or two feature names at a time are the most common. However, name requests for dozens of features often occur in years in which there are active missions to new bodies, or new higher resolution data become available for previously imaged bodies.

**Purpose and Rules:** The purpose of official IAU planetary nomenclature is to facilitate the scientific community's identification and discussion of features in the papers, presentations, and maps. The IAU WGPSN requires that proposed names must adhere to specific rules and conventions (see <http://planetarynames.wr.usgs.gov/Page/Rules> for the complete list), including:

- Names should be simple, clear, and unambiguous.
- Names should only be approved for features that are scientifically significant and useful to the scientific and cartographic communities at large.

- Duplication of names of 2+ bodies is discouraged.
- Solar system nomenclature should be international in its choice of names.
- Names with political, military, or modern religious significance are not allowed.

**Descriptor Terms and Naming Themes:** The Gazetteer lists 56 descriptor terms, or feature types that are used to describe named planetary features based on their morphology and/or topography (<https://planetarynames.wr.usgs.gov/DescriptorTerms>).

A distinction is made between *topographical*, *morphological*, or *albedo* features and *geological* features or units to avoid assigning names based on scientific interpretations, which may change over time. In short, names are intentionally non-genetic. Many descriptor terms are common to several planetary bodies (such as crater or mons), and some are applied only on single bodies. For example, a flumen (plural flumina) is a channel on Titan that may carry liquid. Determining the most appropriate descriptor is one of the critical initial steps in the naming process, and is usually, but not always, straightforward. For example, the descriptors vallis (*valley, canyon-like, often sinuous trough*) and fossa (*long, narrow depression; ditch; narrow, linear trench*) may seem distinct and most morphological features fit one description or the other very neatly. However, some features may have demonstrable characteristics of both descriptors. In such cases, Task Group and WGPSN members apply the descriptor most consistent with already-named features with the most similar morphology.

Once the feature has been assigned a descriptor, either suggested by the proposer or by the body Task Group, a name is chosen that fits the naming theme assigned to that descriptor. Naming themes allow for many potential names to be in reserve for future name requests. For example, small (<50 km) craters on Mars are named for small towns and villages of the world. As such, a list of these small towns and villages is held in reserve for assignment and to ensure equal representation; no commemoration of specific modern towns or villages is intended.

**Guidelines for Authors and Geologic Mappers:** Standardized planetary nomenclature is particularly useful in peer-review journal publications and planetary geologic maps. Official names provide reliable points of

reference for authors and mappers to describe specific planetary features, geologic units, and geologic histories. As such, journal authors and planetary mappers are some of the heaviest users of planetary names. To facilitate the correct use of these names, authors should verify the official IAU nomenclature for planetary features early in the manuscript preparation process. Geologic mappers should review the official nomenclature in their map area early in the mapping process, as all names in the map area should be shown on published maps (provided the map scale allows). Early review of existing IAU nomenclature also allows plenty of time for new official names to be requested and approved, if needed. To facilitate correct application of the nomenclature in GIS mapping, point shapefiles are available for download on each planetary body's page in the Gazetteer of Planetary Nomenclature. Online PDF maps of all current nomenclature for each body are available in the Gazetteer as well. Authors of geologic maps submitted for technical review are encouraged to use these resources for identifying and placing nomenclature.

Geologic mappers should assess any implications of the nomenclature for the mapping. For example, if there is an approved crater name in the map area, but no crater unit has been mapped, the mapper should consider whether a crater unit should be mapped. Likewise, feature types should be checked with the geologic units (e.g., if there is an official dorsum name for a feature mapped as a fossa, the terminology should be corrected).

**Guidelines for Requesters:** An official name may be requested for any unnamed morphological or topographic feature that will be a primary focus of a publication, map, and/or map text. New name requests should come as early as possible in the manuscript or map preparation phase, so that name proposals do not delay publication.

A proposer may request a specific name that adheres to the naming themes as described above. However, proposed names are subject to IAU review and there is no guarantee any specific name will be approved. Requests to name a crater specifically to honor an individual with no justifying scientific need are not accepted.

Before submitting a name request, a proposer should consult the online database and maps showing named features to confirm that the feature is not already named. If a specific name is included in the request, the database should also be checked to ensure the proposed name has not already been approved for a different feature.

**Submitting a Name Request:** The Gazetteer includes an online Name Request Form that can be used by members of the professional science community.

Name requests and general inquiries can also be made by emailing Tenielle Gaither at [tgaither@usgs.gov](mailto:tgaither@usgs.gov). Required information for each request includes the bounding coordinates of the feature (in the correct coordinate system), feature size, one annotated image and one unannotated image of the feature, and origin and reference information for any suggested name. Proposals must also include a scientific justification statement, describing the morphology of the feature, the requestor's research investigation involving the feature, and a timeline for publication in a peer-reviewed journal.

**Name Approval Process:** Name requests are first reviewed by one of the six Task Groups (Mercury, Venus, Moon, Mars, Outer Solar System, and Small Bodies). After a Task Group has reviewed a proposal, it is submitted, along with the Task Group's recommendation, to the WGPSN for final approval. For simple name requests (i.e., one or two crater names), the process typically takes four to six weeks. More time may be necessary if the proposal is complicated, includes multiple feature names, and/or if significant questions are raised during the review process. Name requests should be submitted well in advance of publication deadlines. Upon WGPSN approval, names are considered formally approved and it is then appropriate to use them in publications. Approved names are immediately entered into the database and a feature page is viewable on the Gazetteer of Planetary Nomenclature. Approved names are listed in the Transactions of the IAU [2] and on the Gazetteer of Planetary Nomenclature website.

**Summary:** The USGS Planetary Nomenclature project, in collaboration with the IAU and NASA, supports ongoing planetary research and geologic mapping through the solicitation, review, and approval of feature names on bodies across the solar system. Participation in the process by community scientists is vital to its success. Questions about the nomenclature database and the naming process can be sent to Tenielle Gaither, USGS Astrogeology Science Center, 2255 N. Gemini Dr., Flagstaff, AZ 86001, or by email to [tgaither@usgs.gov](mailto:tgaither@usgs.gov).

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**References:** [1] Working Group for Planetary System Nomenclature. Gazetteer of Planetary Nomenclature. International Astronomical Union. January 4, 2022. <http://planetarynames.wr.usgs.gov/>. [2] Transactions of the IAU, Vol. XXIXB, January 2019. [http://www.iau.org/science/publications/iau/transaction\\_s\\_b/](http://www.iau.org/science/publications/iau/transaction_s_b/).