

THE GEOLOGIC MAPPING SUBCOMMITTEE (GEMS)
of the
Mapping and Planetary Spatial Infrastructure Team (MAPSIT)

Operational Charter

DIRECTIVE

The Geologic Mapping Subcommittee (GEMS) is a subcommittee that functions within—and reports to—the Mapping and Planetary Spatial Infrastructure Team (MAPSIT), the analysis and assessment group for planetary spatial data infrastructure issues for NASA’s Planetary Science Division. GEMS exists when (and for a term) determined necessary by MAPSIT to identify and plan for geologic mapping-related needs within the planetary data ecosystem. The overarching goal of MAPSIT, and by extension GEMS, is to assist in accessing data for and analyzing the diverse geologic character of every solid surface body in the Solar System in pursuit of scientific knowledge and support of human and robotic exploration.

HISTORY

GEMS was first established in 1996 as a subcommittee of the Planetary Cartography and Geologic Mapping Working Group (PCGMWG) (effectively the precursor to MAPSIT) to develop recommendations and best practices to publish standardized planetary geologic maps by the USGS. GEMS members consisted of community members who had established a history of creating, reviewing, and using planetary geologic maps in the service of planetary science research. Historically, GEMS included a community-designated chairperson, a representative from the NASA funding program that primarily funded the creation of standardized planetary geologic maps (at the time, Planetary Geology and Geophysics), and the USGS coordinator for the technical review and production of planetary geologic maps (the USGS Map Coordinator). During its existence, GEMS facilitated critical communication between and among planetary scientists, NASA HQ, and the USGS in support of the continued production of standardized planetary geologic maps using the four decades of collaboration between NASA and the USGS. GEMS was dissolved in 2016 following the migration of PCGMWG into MAPSIT with the intention that community representation of the USGS-NASA Planetary Geologic Mapping Program would be accommodated by MAPSIT membership. However, re-organization of NASA Science Mission Directorate programs and resultant splitting of funding opportunities for standardized geologic maps across multiple NASA programs as well as increased proposals for creating planetary geologic maps necessitates a modern re-formulation of the Geologic Mapping Subcommittee.

RATIONALE AND INTENT

The planetary science community is entering a phase of exploration that is unprecedented in terms of the diversity of bodies being explored, the number of operating orbital and landed spacecraft, and the types and spatial resolutions of data being acquired by instruments on those spacecraft. The integrity of returned science and the safety of upcoming orbital and landed missions necessitate a modern consideration of the needs of geologic maps for both fundamental and applied scientific endeavors. The Planetary Geologic Mapping Community stands to benefit from a cohesive and independent voice to advocate for their needs, separate from the USGS Planetary Geologic Mapping Coordination Group (hereafter USGS Planetary Mapping Group) personnel, who maintain dual role as both program managers and community members. As such, the Planetary Geologic Mapping Community requests that MAPSIT reformulate GEMS, with emphasis on GEMS attending to the following tasks:

1. Serve as a dedicated communication conduit between the Planetary Geologic Mapping Community and MAPSIT for compiling community concerns, obstacles, and recommendations for discussion and potential action at both MAPSIT and NASA levels, as well as how these concerns, obstacles, and recommendations directly or indirectly impact the current and future health of the Planetary Geologic Mapping Community and, by extension, the planetary data ecosystem.
2. Ensure a dedicated venue for the collection and consolidation of perspectives from various scientific communities and disciplines regarding the process and product of body-specific geologic mapping.
3. Assess and identify actionable items for collaborating with international counterparts.
4. Participate in discussions with the USGS Planetary Mapping Group regarding adapting, improving, and (or) implementing scientific and technical standards, guidelines, conventions, and workflows for:
 - a. The creation of NASA-funded standardized geologic maps of planets and other bodies beyond Earth at global, regional, and local scales.
 - b. The creation of NASA-funded non-standardized geologic maps of planets and other bodies beyond Earth at global, regional, and local scales, regardless of publication venue.
 - c. The creation of geologic maps for planetary bodies to which geologic mapping techniques have not yet been applied, and (or) to integrate new data types into the geologic mapping and site characterization process in support of science and human and (or) robotic exploration.

The term of GEMS will be 5 years (2022 to 2027) to include a discussion with MAPSIT in 2026 to extend, as necessary.

MEMBERSHIP

GEMS will be comprised of community subject matter experts with appropriate scientific breath and technical expertise to advise MAPSIT in matters related to both standardized and non-standardized scale-based geological mapping of all solid surface bodies in the Solar System for which adequate data exists. GEMS will consist of 8 to 10 members who collectively represent the programmatic, scientific, technical diversity of the planetary science community. Members will demonstrate expertise in some (and a familiarity in all) of the following: (1) demonstrated research experience on one or more planetary bodies beyond Earth, (2) handling and analysis of diverse planetary datasets, (3) remote- and field-based geologic mapping, (4) mission operations, (5) analog activities, and (6) geographic information systems (GIS).

GEMS membership should equally represent all bodies in the Solar System for which there is (or will soon be) data that is appropriate for geologic mapping, including (at a minimum) one member for terrestrial bodies (*e.g.*, Mercury, Venus, Earth, or Mars), one member for small bodies (*e.g.*, Deimos, Vesta, Bennu), and one member for outer planet satellites, “ocean worlds”, and dwarf planets (*e.g.*, Europa, Ganymede, Triton, Pluto). In addition, GEMS will include a representative from the USGS Planetary Mapping Group and a graduate student or early career (within 5 years of receiving terminal degree) member. Idealized membership will include the following:

- Chairperson
- Terrestrial Bodies representative(s)
- Small Bodies representative(s)
- Outer Planet Satellites, Ocean Worlds, and Dwarf Planets representative(s)
- USGS Planetary Mapping Geologic Group representative
- Student/ Early Career representative

SELECTION

For initial implementation of this Charter, the MAPSIT Planetary Geologic Mapping Representative will become the GEMS Chairperson for a term of 5 years. Thereafter, the GEMS Chairperson will self-nominate from the scientific community and be considered and voted upon by the MAPSIT Steering Committee. The selected GEMS Chairperson will be or will become a member of the MAPSIT Steering Committee and will thereafter act as the Planetary Geologic Mapping Community Representative to MAPSIT. After initial implementation of this Charter, the exiting GEMS Chairperson and Planetary Geologic Mapping Community Representative to MAPSIT will have the option to become an *ex officio* GEMS member for an additional 3-year term. MAPSIT will have the discretion of retaining the exiting GEMS Chairperson as a member of the MAPSIT Steering Committee.

For initial implementation of this Charter, the MAPSIT

During and after initial implementation of this Charter, GEMS membership will be solicited through a formal announcement of opportunity to the planetary science community (through typical message boards, email listservs, and social media posts) by submitting a 2-page curriculum vitae and a 250-word statement of interest, to be submitted to the MAPSIT Chairperson. Applicants for GEMS membership will be reviewed and voted upon by the MAPSIT Steering Committee (which will, by design, include the GEMS Chairperson). The MAPSIT Steering Committee will be cognizant of and guided by diversity, equity, and inclusion of under-represented groups when making their selections for GEMS membership.

Upon selection, GEMS members will serve a 3-year term, though member re-appointment during consecutive and (or) subsequent terms may be permitted for up to a 6-year total term, as determined by the MAPSIT Steering Committee. To prevent loss of community knowledge, the reformulation of GEMS in 2022 will include staggered term dates with at least two members appointed to serve until 2024 (a 2-year term), two members appointed to serve until 2025 (a 3-year term), and two members appointed to serve until 2026 (a 4-year term). Following these initial appointments, term renewals will be for 3-year increments. Membership less than 3-year term is not ideal, though can be considered by MAPSIT as needs arise to meet the number of required members, temporarily augment, or replace scientific expertise due to mission-related time or dataset factors, or to meet demands on map production made by NASA and (or) the scientific and technical community.

ROLES AND RESPONSIBILITIES

The GEMS Chairperson will (1) act as the Geologic Mapping Community Representative to MAPSIT, (2) schedule and lead all GEMS meetings, (3) execute the directives outlined herein, including compiling, posting, and reporting community findings and recommendations to MAPSIT; and conveying responses to those findings and recommendations from MAPSIT and NASA back to the community, (4) help organize, convene, and lead the annual Planetary Geologic Mappers' meeting (with assistance from the host institution, USRA Lunar and Planetary Institute, and USGS Planetary Mapping Group personnel), and (5) coordinate technical reviews of geologic maps submitted for USGS production by USGS authors or substantive co-authors, as determined by GEMS. In such cases, the GEMS Chairperson will fulfill the responsibilities as the Map Coordinator and work with non-USGS personnel to complete technical reviews, as currently identified and described in NASA ROSES section C.1.

GEMS members will (1) attend GEMS meetings, (2) attend and act as Planetary Geologic Mapping Community representatives to Assessment and Analysis Groups (AG) and any other

relevant community meetings, conferences, and workshops, (3) act as two-way conduits for communication between GEMS and the Planetary Science Community, and (4) identify discrete ways whereby the planetary geologic mapping community can help address and resolve community findings and recommendations.

The USGS Planetary Mapping Group representative will be the current USGS Map Coordinator, the USGS-NASA Planetary Geologic Mapping Program Coordinator, or another experienced planetary scientist and geologic mapper from the USGS Planetary Geologic Mapping Group. This person will be identified by the USGS Astrogeology Science Center and will serve on GEMS at the discretion of and for a duration identified by USGS Science Center Director. The USGS Planetary Mapping Group representative will (1) attend all GEMS meetings, (2) compile and present reports to GEMS and the Planetary Geologic Mapping Community on at least an annual basis that include the number and status of all NASA-funded scale-based geologic mapping projects; average times for maps per workflow stage; updated historical statistics on the number of proposals submitted and selected per NASA program per year; and any updates on methods for map preparation and (or) technical review, (3) help organize, convene, and lead the annual Planetary Geologic Mappers' meeting (with assistance from the host institution, USRA Lunar and Planetary Institute, and the GEMS Chairperson), and (4) identify discrete ways whereby the USGS Planetary Geologic Mapping Group can help address and resolve community findings and recommendations

MEETINGS

The GEMS Chairperson will be responsible for coordinating meetings (as in person, virtual, or hybrid as needed to promote attendance), prioritizing topics, and compiling minutes for posting on the MAPSIT webpage. Additional meetings may be scheduled as necessary.

POSTING AND UPDATES

This Charter is subject to updates and refinements by MAPSIT and (or) GEMS, as deemed necessary by either, based on evolving needs of the science community. Any updates or refinements made to this document by GEMS will be conveyed to MAPSIT, and vice versa, and the updated and (or) refined Charter will be posted to the MAPSIT webpage.