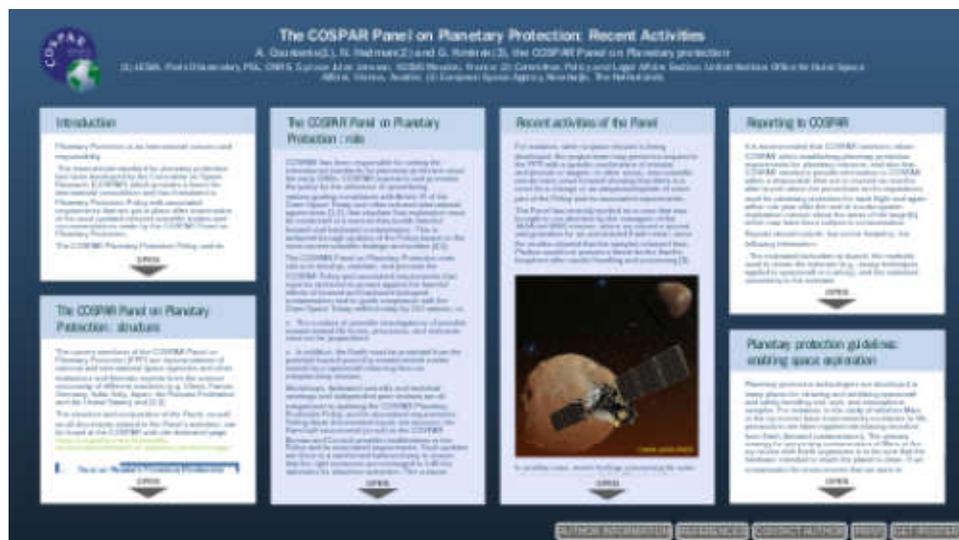


# The COSPAR Panel on Planetary Protection: Recent Activities



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PRESENTED AT:



## INTRODUCTION

Planetary Protection is an international concern and responsibility.

The international standard for planetary protection has been developed by the Committee on Space Research (COSPAR) which provides a forum for international consultation and has formulated a Planetary Protection Policy with associated requirements that are put in place after examination of the most updated relevant scientific studies and recommendations made by the COSPAR Panel on Planetary Protection.

The COSPAR Planetary Protection Policy, and its associated requirements, is not legally binding under international law but it is the only internationally agreed planetary protection standard with implementation guidelines for reference in compliance with Article IX of the United Nations Outer Space Treaty of 1967. States Parties to the Outer Space Treaty are responsible for national space activities under Article VI, including the activities of governmental and non-governmental entities. It is the State that ultimately will be held responsible for wrongful acts committed by its jurisdictional subjects.

## THE COSPAR PANEL ON PLANETARY PROTECTION : STRUCTURE

The current members of the COSPAR Panel on Planetary Protection (PPP) are representatives of national and international space agencies and other institutions and thematic experts from the science community of different countries (e.g. China, France, Germany, India, Italy, Japan, the Russian Federation and the United States) and [1,2].

The structure and composition of the Panel, as well as all documents related to the Panel's activities, can be found at the COSPAR web site dedicated page.

<https://cosparhq.cnes.fr/scientific-structure/panels/panel-on-planetary-protection-ppp/> (<https://cosparhq.cnes.fr/scientific-structure/panels/panel-on-planetary-protection-ppp/>)



### Panel on Planetary Protection Membership

Chair: Athena **Coustenis** (planetology)

Vice-Chairs: **Niklas Hedman** (UNOOSA, space law) & **Gerhard Kminek** (ESA, Earth sciences)

China/CNSA	Jing <b>Peng</b> (engineering)
France/CNES	Michel <b>Viso</b> (astrobiology)
Germany/DLR	Petra <b>Rettberg</b> (microbiology, astrobiology)
India/ISRO	Praveen <b>Kumar K</b> (engineering scientist)
Italy/ASI	Eleonora <b>Ammannito</b> (planetologist)
Japan/JAXA-ISAS	Masaki <b>Fujimoto</b> (space plasma physics)
Russia/IKI	Vyacheslav K. <b>Ilyin</b> (microbiology, medicine)
UKSA	Karen <b>Olsson-Francis</b> (astrobiology, microbiology)
USA/NASA	James <b>Green</b> (plasma physics, astrobiology)

- **Nine members appointed by space agencies:**
- **Nine scientists representing the COSPAR Scientific Commissions**

Olivier <b>Grasset</b> (FR, geodynamics, planetology)	Alex <b>Hayes</b> (USA, planetology)
Peter <b>Doran</b> (USA, Hydrogeology, Extreme Environments)	Akiko <b>Nakamura</b> (JP, experimental physics)
Olga <b>Prieto-Ballesteros</b> (ES, geology, astrobiology)	François <b>Raulin</b> (FR, chemistry, planetology)
Kanyan <b>Xu</b> (CN, microbiology, biochemistry)	Maxim <b>Zaitsev</b> (RU, astrochemistry, organic chemistry)
Maria-Paz <b>Zorzano</b> (SE/ES, astrobiology, biophysics)	

• Ex-officio member: Colleen **Hartman**, NASEM SSB & ASEB Board Director



## THE COSPAR PANEL ON PLANETARY PROTECTION : ROLE

COSPAR has been responsible for setting the international standards for planetary protection since the early 1960s. COSPAR maintains and promotes the policy for the reference of spacefaring nations guiding compliance with Article IX of the Outer Space Treaty and other relevant international agreements [1,2], that stipulate that exploration must be conducted in a manner that avoids harmful forward and backward contamination. This is achieved through updates of the Policy based on the most current scientific findings and studies [4,5].

The COSPAR Panel on Planetary Protection main role is to develop, maintain, and promote the COSPAR Policy and associated requirements that must be achieved to protect against the harmful effects of forward and backward biological contamination and to guide compliance with the Outer Space Treaty ratified today by 110 nations, i.e.

- o The conduct of scientific investigations of possible extraterrestrial life forms, precursors, and remnants must not be jeopardized.
- o In addition, the Earth must be protected from the potential hazard posed by extraterrestrial matter carried by a spacecraft returning from an interplanetary mission.

Workshops, dedicated scientific and technical meetings and independent peer reviews are all integral part in updating the COSPAR Planetary Protection Policy, and its associated requirements. Taking these documented inputs into account, the Panel will recommend (or not) to the COSPAR Bureau and Council possible modifications to the Policy and its associated requirements. Such updates are done in a careful and balanced way to ensure that the right measures are envisaged to fulfil the rationales for planetary protection. The purpose obviously is to respond to the needs of space missions, while applying due diligence and expertise in the process.



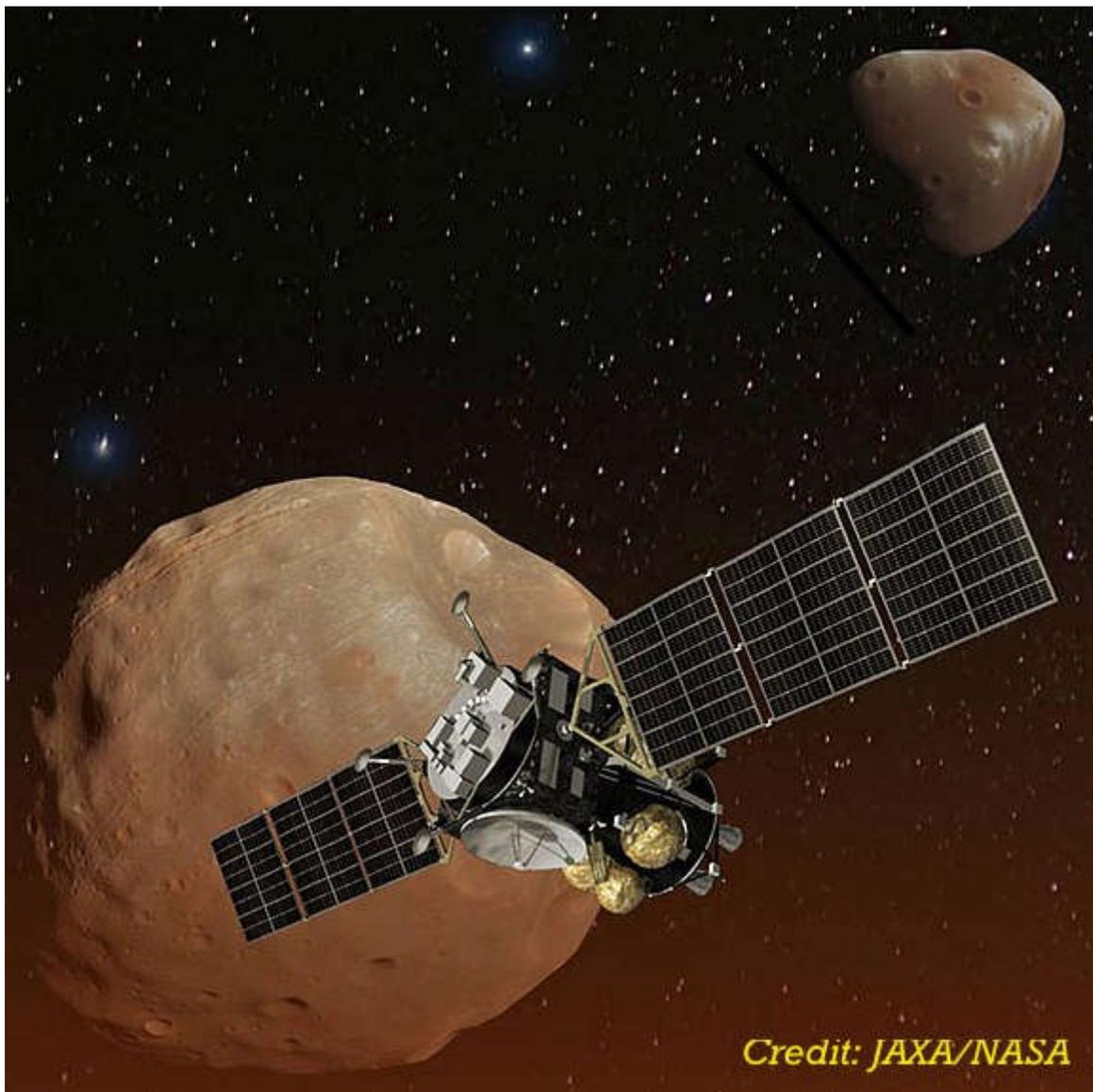
The COSPAR Panel on Planetary Protection maintains and updates the COSPAR Planetary Protection Policy, and its associated requirements, regularly in various ways. In all cases, the Panel reviews all available scientific knowledge through existing or commandeered studies performed by a group or committee of experts who review the information and make a recommendation to the Panel.

The main goal of COSPAR's PPP is to prevent any of the space missions to possible habitats from either taking biological material from the Earth and contaminating the target planet/satellite, as well as preventing any contamination from extraterrestrial material returned to Earth if the mission is designed to acquire samples for laboratory analysis [1,2,4,5,6]. Using a categorisation approach, COSPAR determines whether each mission is low risk or high risk. The five Categories of Planetary Protection outline the recommended measures that an agency should apply to each mission.

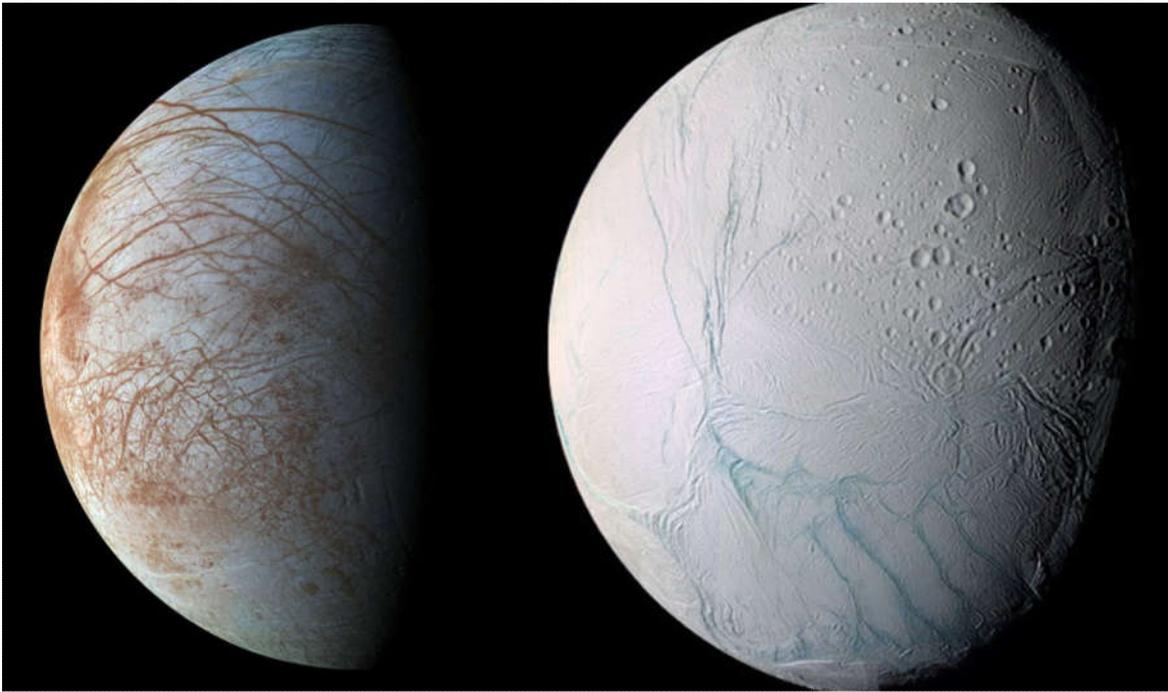
## RECENT ACTIVITIES OF THE PANEL

For instance, when a space mission is being developed, the project team may present a request to the PPP with a specific combination of mission architecture or targets. In other cases, new scientific results have come forward showing that there is a need for a change or an adaptation/update of some part of the Policy and its associated requirements.

The Panel has recently worked on a case that was brought to our attention by the managers of the JAXA-led MMX mission, where we issued a special categorization for an unrestricted Earth return, since the studies showed that the samples returned from Phobos would not present a threat for the Earth's biosphere after careful handling and processing [3].



In another case, recent findings concerning the outer solar system icy moons, led to different studies conducted by several countries and the European commission, as well as by ESA and NASEM-SSB, which recommended an update of the requirements for Europa and Enceladus (see The International Planetary Protection Handbook: Dec. 2018). These recommendations were submitted to the COSPAR PPP, which was involved throughout the whole multi-year process and in the end suggested updating of the requirements for missions to Europa and Enceladus to the COSPAR Bureau, which have been accepted and led to a revision of the COSPAR Policy published in August 2020 [4,5].



The results from these studies were published in 2019 in a special issue of *Life Sci. Space Res.* (Vol. 23) on “Planetary protection: New aspects of policy and requirements”[3].

## REPORTING TO COSPAR

It is recommended that COSPAR members inform COSPAR when establishing planetary protection requirements for planetary missions, and also that COSPAR members provide information to COSPAR within a reasonable time not to exceed six months after launch about the procedures and computations used for planetary protection for each flight and again within one year after the end of a solar-system exploration mission about the areas of the target(s) which may have been subject to contamination.

Reports should include, but not be limited to, the following information:

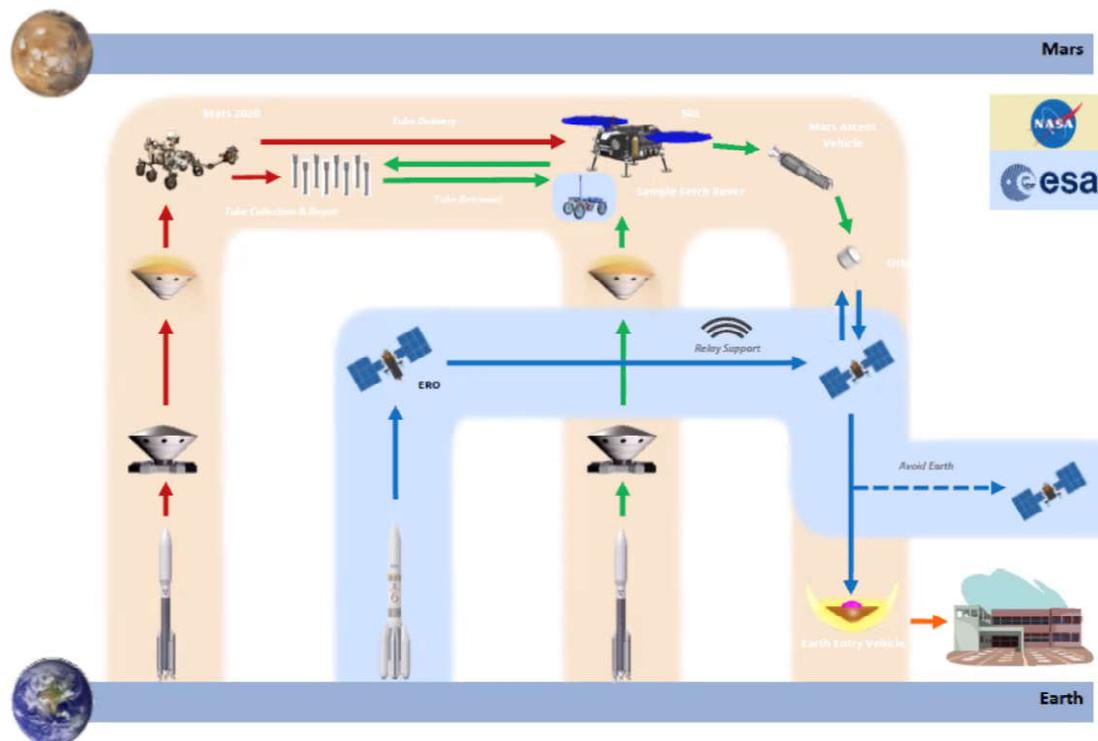
- The estimated bioburden at launch, the methods used to obtain the estimate (e.g., assay techniques applied to spacecraft or a proxy), and the statistical uncertainty in the estimate
- The probable composition (identification) of the bioburden for Category IV missions, and for Category V “restricted Earth return” missions
- Methods used to control the bioburden, decontaminate and/or sterilize the space flight hardware
- The organic inventory of all impacting or landed spacecraft or spacecraft-components, for quantities exceeding 1 kg
- Intended minimum distance from the surface of the target body for launched components, for those vehicles not intended to land on the body
- Approximate orbital parameters, expected or realized, for any vehicle which is intended to be placed in orbit around a solar system body
- For the end-of-mission, the disposition of the spacecraft and all of its major components, either in space or for landed components by position (or estimated) on a planetary surface

## PLANETARY PROTECTION GUIDELINES: ENABLING SPACE EXPLORATION

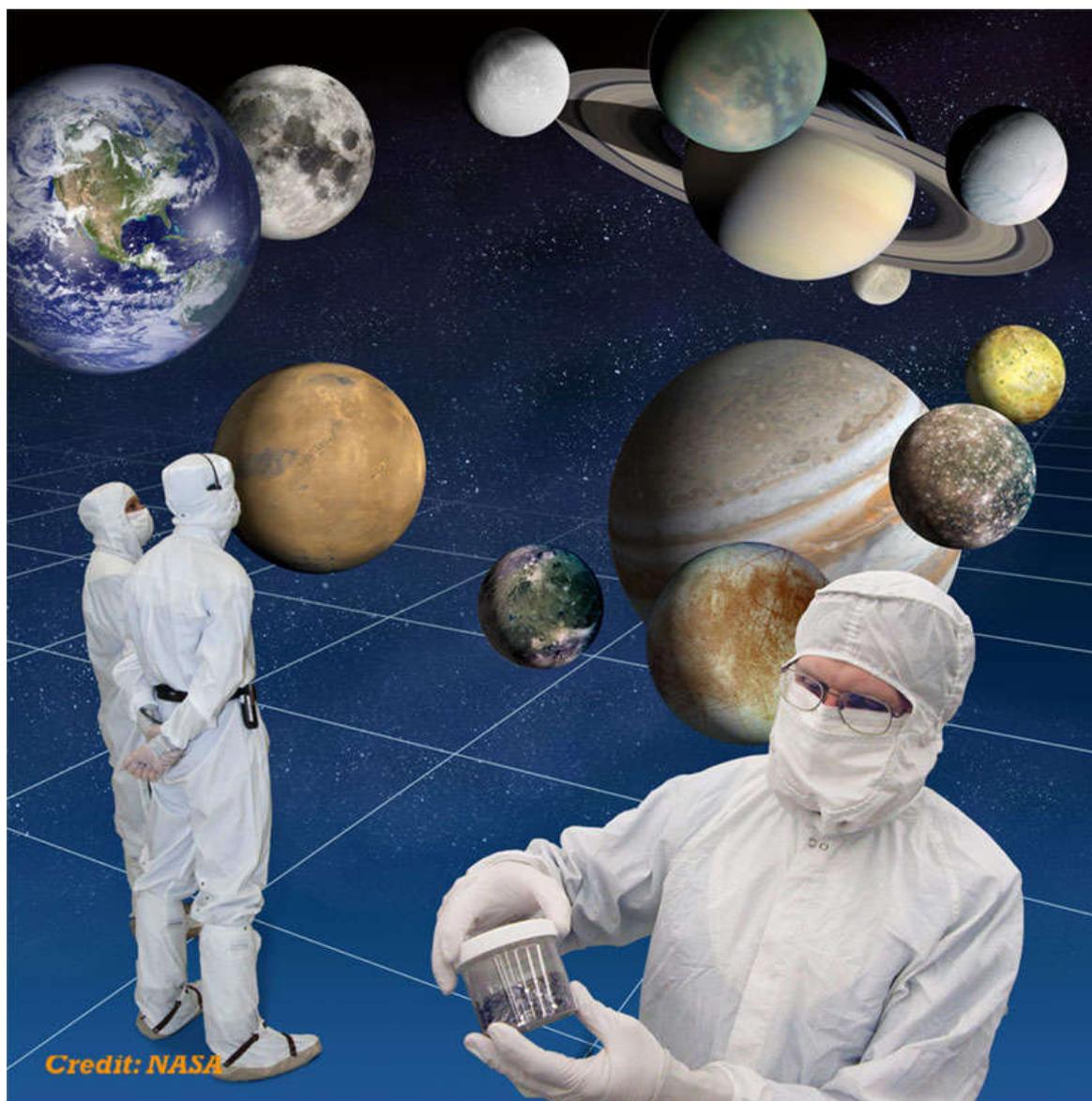
Planetary protection technologies are developed in many places for cleaning and sterilizing spacecraft and safely handling soil, rock, and atmospheric samples. For instance, in the study of whether Mars or the icy moons have environments conducive to life, precautions are taken against introducing microbes from Earth (forward contamination). The primary strategy for preventing contamination of Mars or the icy moons with Earth organisms is to be sure that the hardware intended to reach the planet is clean. If we contaminate the environments that we want to investigate with our spacecraft, we destroy any chance of properly studying such unique environments and lose information on the formation and evolution of our solar system.

At the same time, we work towards ensuring a safe preservation of our biosphere upon return of the matter to Earth (backward contamination). This is particularly important for missions with sample return as a goal, like the NASA-ESA joint Mars Sample Return (MSR) project which started with the Mars2020 Perseverance mission and will end with the return of martian samples to Earth around 2031.

### MSR Architecture Overview



Planetary protection guidelines are there to enable safe scientific space exploration for long periods of time and to ensure the protection of our planet Earth.



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## AUTHOR INFORMATION

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- [5] The COSPAR Panel on Planetary Protection, 2020. COSPAR Policy on Planetary Protection. Space Res. Today 208, August 2020, Pages 10-22.
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