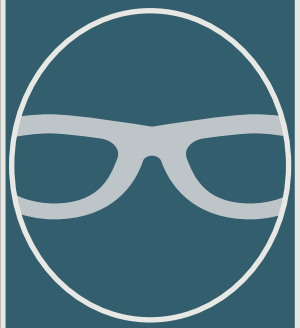
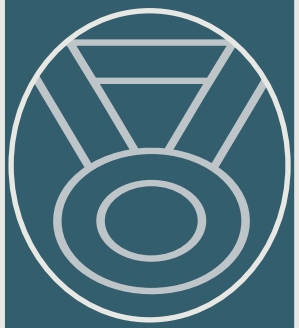
European leadership in science & technology through ESA's Science Programme

Science Programme strategic goals

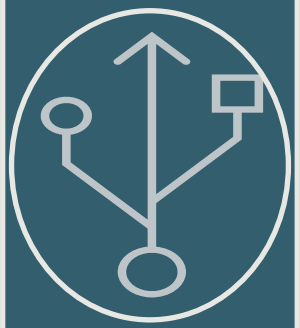
Enable European global leadership in frontier breakthrough science and technology



Implement a strategic vision for European excellence and leadership in space science, that drives European competitiveness and skills in industry and academia for the benefit of Member States



Develop sustained capability to deliver iconic, unique world-leading science missions responding to the ambitions of Europe's science community

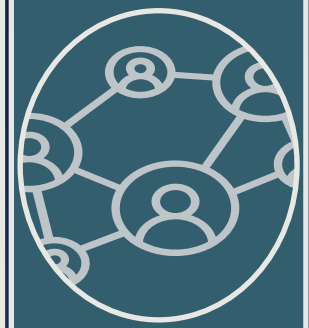


Grow the Science Programme to maintain the core strength of ESA and European scientific and technological sovereign capability

Build sustainable, world-competitive European industrial capability in advanced space technology

Scale up European excellence by leveraging critical-path contributions to international flagship missions

Retain and grow European talent in science and technology for next decades



Reinforce public engagement in the wonders of space and trust in science

Science Missions

SCIENCE MISSION STUDY/DEVELOPMENT

ESTEC (Noordwijk, Netherlands)

Largest ESA site and the technical heart where most ESA projects are born and developed, no matter whether in the domain of Science, Human and Robotic Exploration, Earth Observation, Telecommunications or Navigation.

SCIENCE OPERATIONS

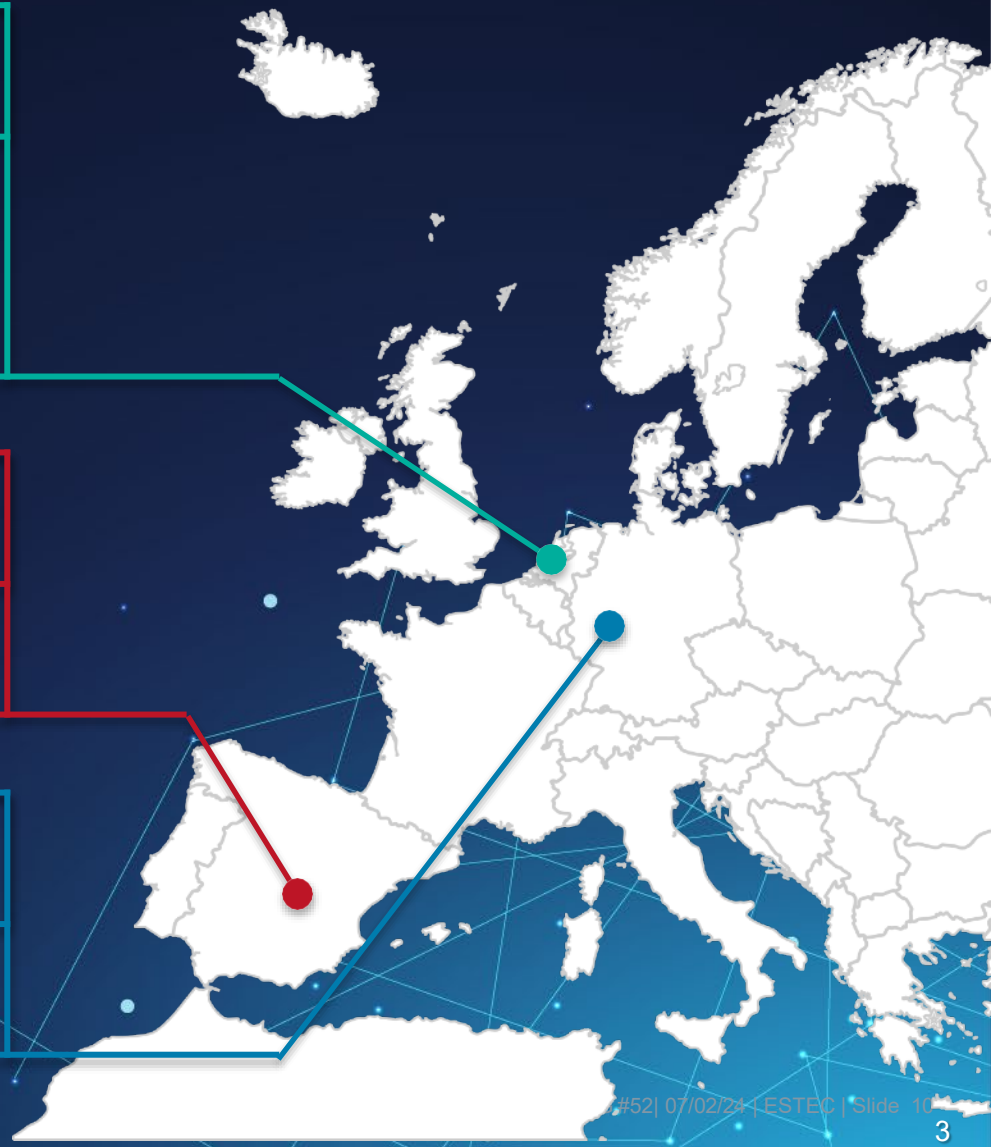
ESAC (Madrid, Spain)

ESAC hosts ESA's Science Operations Centres (SOCs) for ESA Astronomy and Solar System missions.

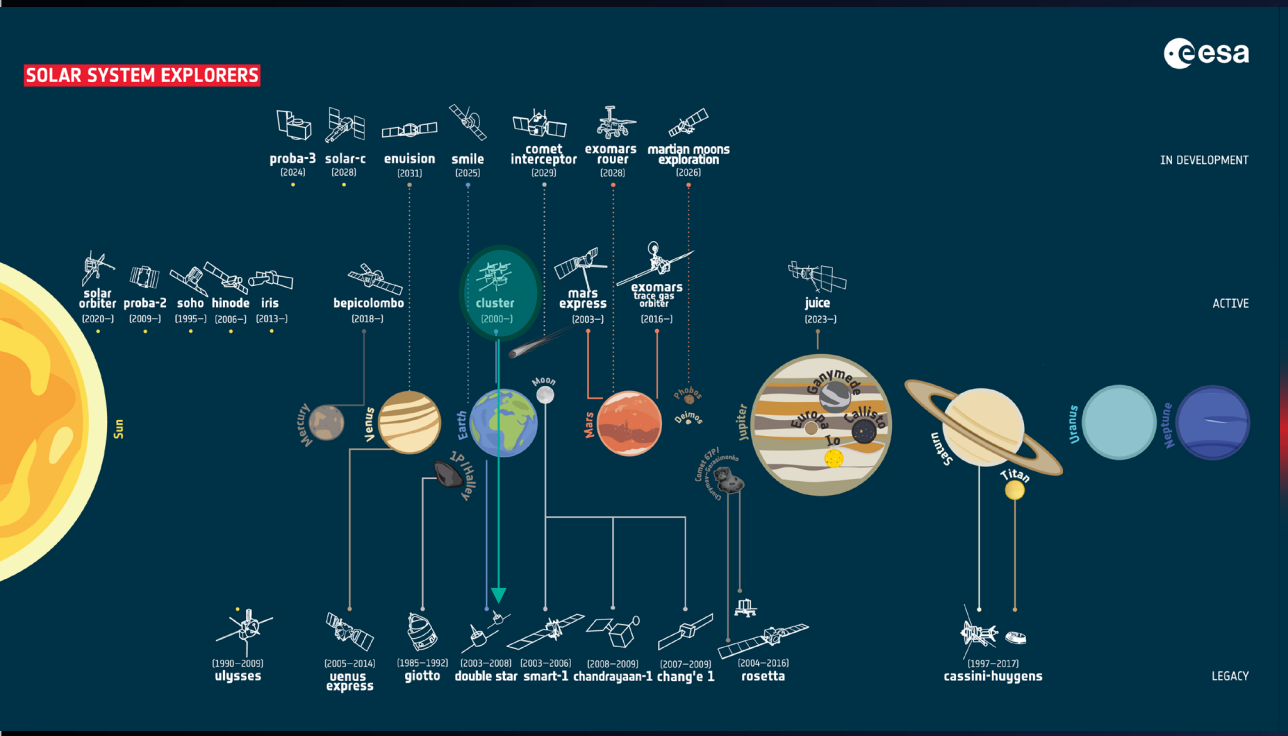
MISSION OPERATIONS

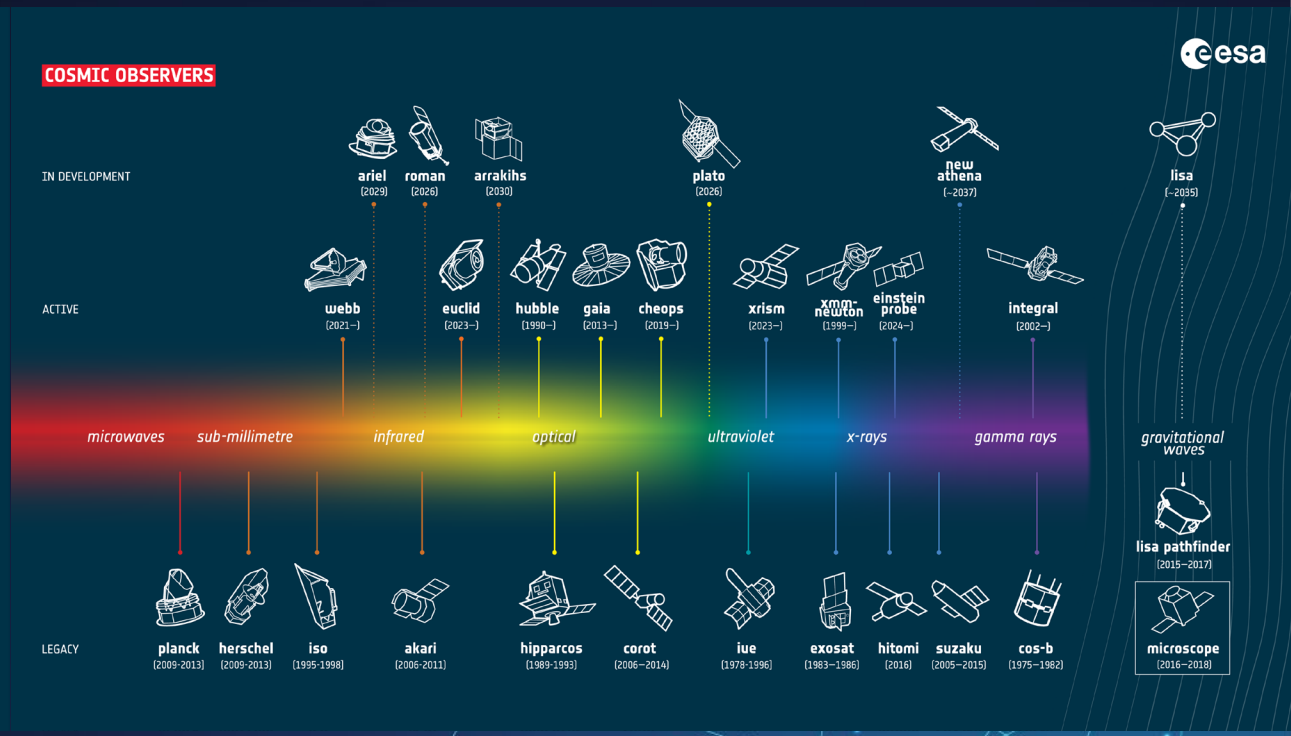
ESOC (Darmstadt, Germany)

ESOC is ESA's centre for mission operations and ground systems engineering



ESA Scientific Programme Fleet:
… standing on the shoulders of giants! …





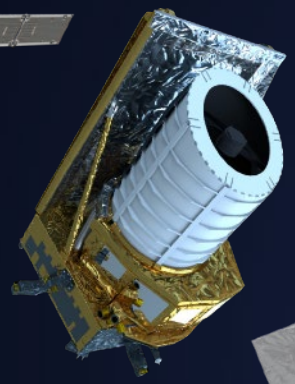
18 missions in operation; 13 missions in preparation; 23 in legacy phase

Several missions done in international cooperation, many under ESA leadership

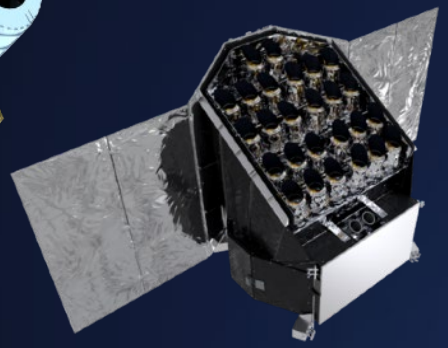
Current Programme: Cosmic Vision

Medium-class Missions

M1: Solar Orbiter
[2020]



M2: Euclid
[2023]



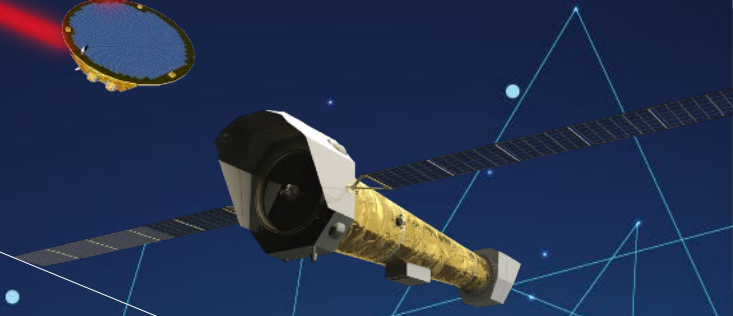
M3: PLATO
[2026]

Large-class Missions

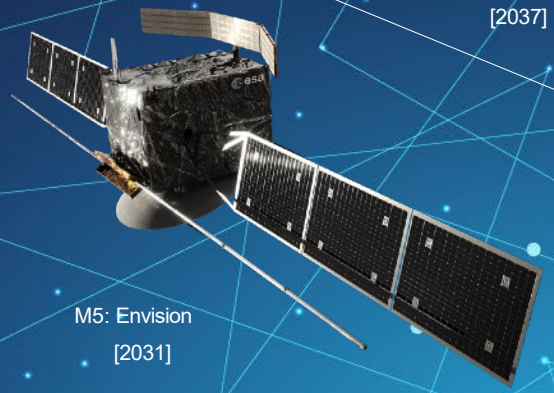
JUICE
[2023]

LISA
[2035]

M4: Ariel
[2029]

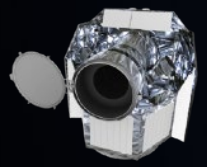


NewAthena
[2037]



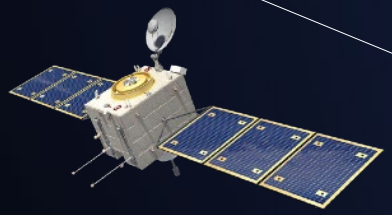
M5: Envision
[2031]

Small and Fast Missions



S1: CHEOPS
[2019]

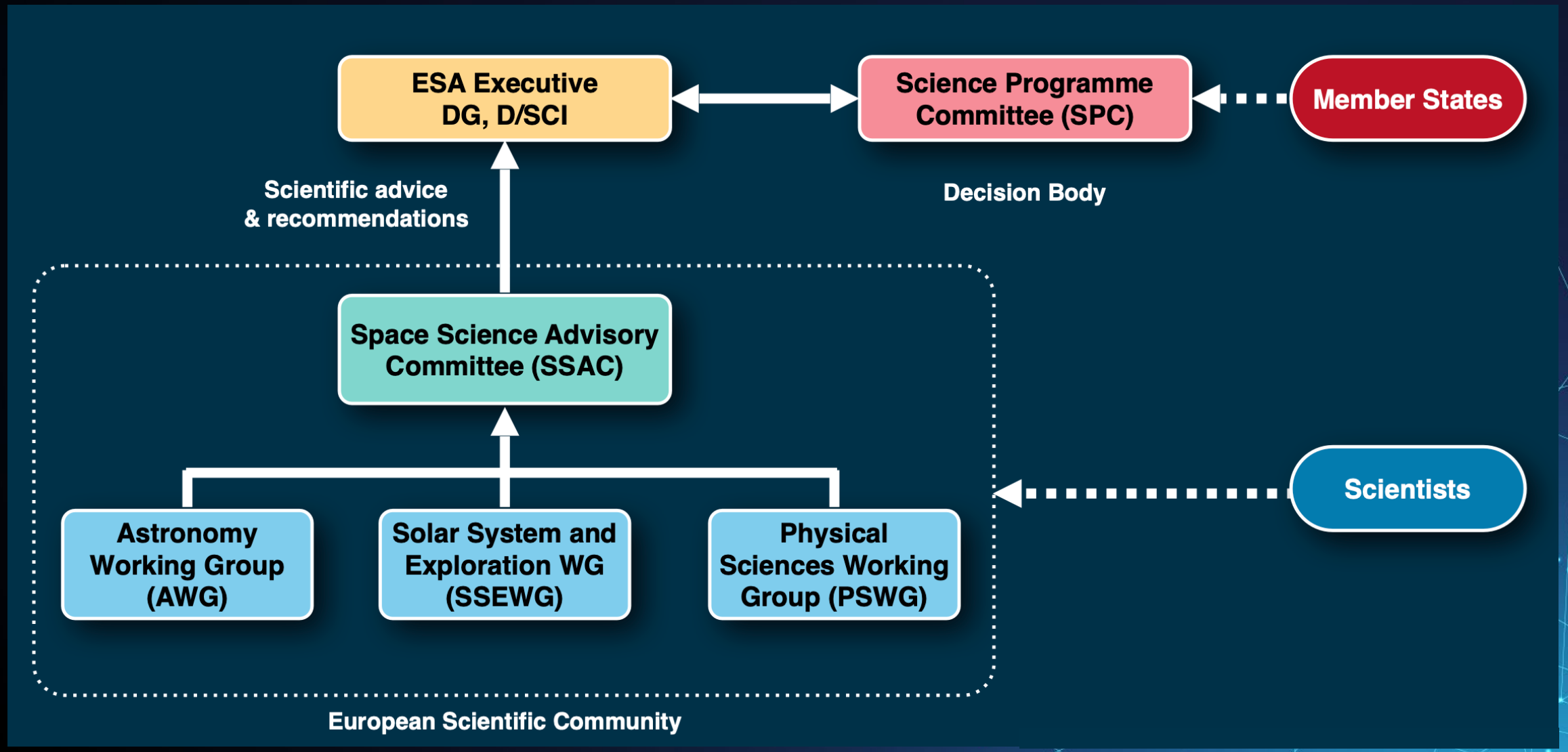
SMILE
[2025]



F1: Comet
Interceptor
[2029]

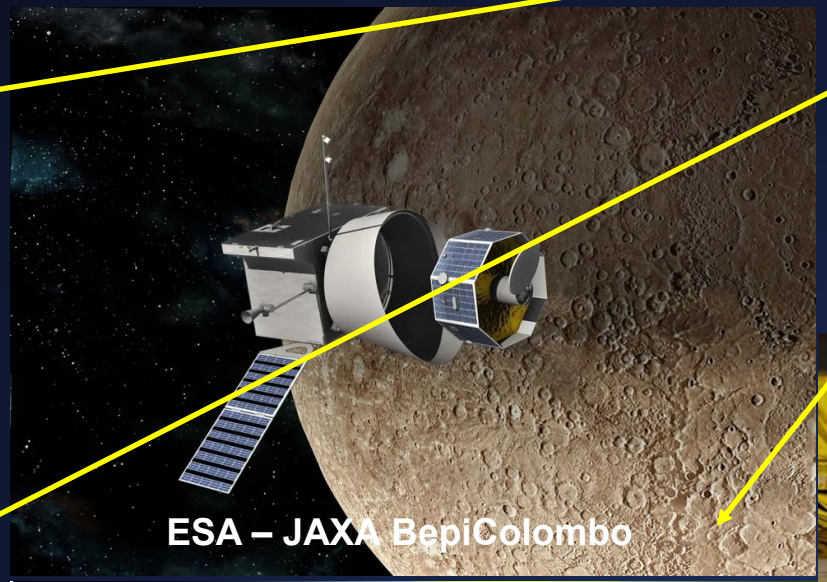
F2: ARRAKHIS
[2030]

All mission selections are based on bottom-up selection processes



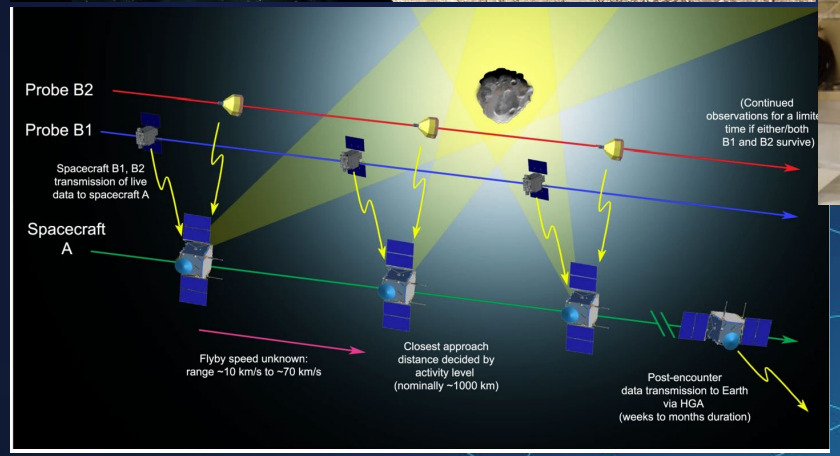
A gateway for international partnerships

Opportunities to work in a multi-cultural and competitive environment, sharing common objectives



ESA – Solar Orbiter

Coordination



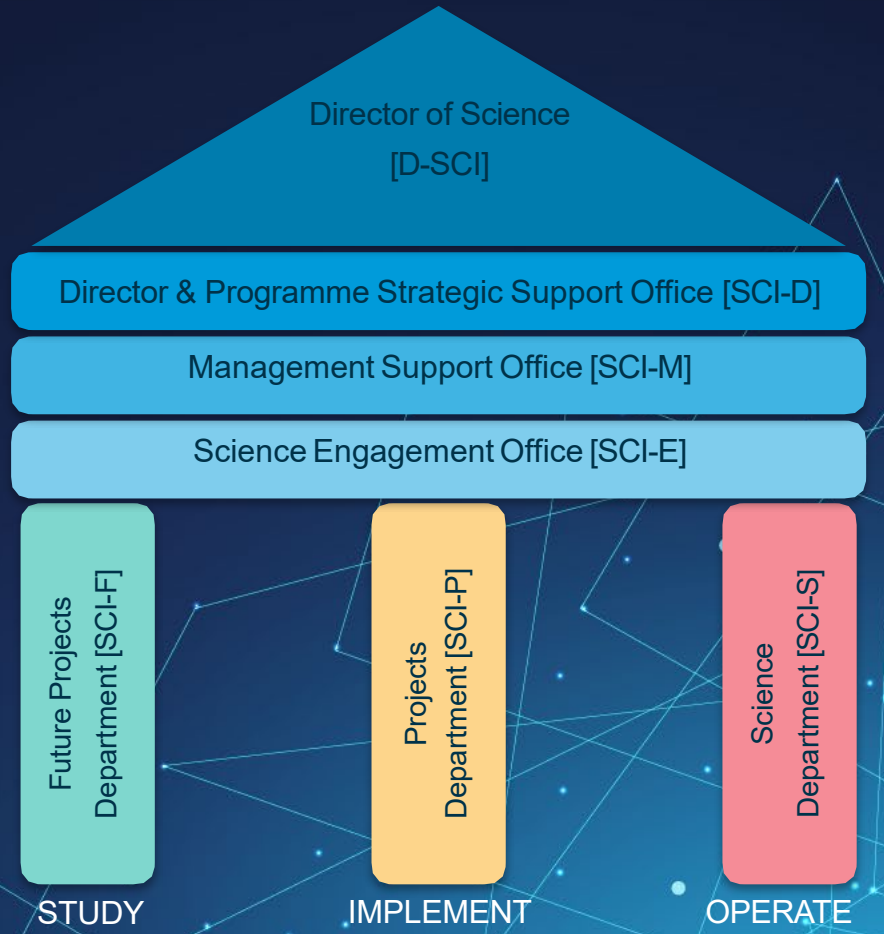
ESA – JAXA Comet Interceptor

The Scientific Programme implementation logic

- General Model: ESA funding is used for the spacecraft, launcher and ground segment, while the Member States fund the payloads and parts of the science ground segment

  ESA funds some technology development activities associated with both the spacecraft and payload

- We “study” multiple mission concepts until one is selected for development. We “implement” (build) that mission and then “operate” the mission in order to harvest the science.



The Science Programme Elements

Science is part of the **Mandatory** Activities of ESA

Science Programme yearly budget **~632 M€ in 2024**

Science Programme missions are proposed by the European **scientific community** and selected in a **competitive** process

Four types of missions (building blocks):

- Large missions (~1.5 B€, European-led flagships, ~every 7-8y)
- Medium missions (~0.75 B€, ~every 3-4y)
- Smaller missions (F + miniF missions, ~0.2 and ~0.05 B€)
- Missions of Opportunity (contributions to non-ESA missions)

The Science Technology Development Plan (TDP)

Developing technology maturity for Science missions for mission implementation

Technical excellence required: European industry developing technology with significant commercial impact

Technology Development Plan elaborated regularly following established procedures, employing the TECNET process

D/SCI is combining in its TECNETs (mostly April/September)

the decision on **CTP** (~20M€/y) **and TDE** (~6M€/y) funded TDAs.

A single Technology Plan (updated once or twice per year) is produced, which covers all activities (CTP&TDE) relevant for **SCI future mission preparations**.

Science Technology Work Plans, once approved by IPC, are made public (Google: "ESA Science Technology Plan")

Engagement of Scientists in the Programme (1)

ESA Science Announcements of Opportunity

cosmos.esa.int/web/science-announcement-of-opportunities

Coming soon (Q1 2025):

- Call for new M-, F- and miniF missions

Recent calls:

- Expression of interest for Members of Astronomy Working Group, Solar System and Exploration Working Group, Space Science Advisory Committee
- Interdisciplinary Scientists for EnVision Science Team
- Science Planners for NASA-led IRIS mission
- NewAthena Science Study Team & LISA Science Team
- XRISM & CHEOPS Guest Observer Calls

Engagement of Scientists in the Programme (2)

Early Career Programmes

Open to nationals of ESA Member States & Cooperating States

Master students

- Penultimate/final year: Internships (3-6 months)
- Final year: ESA Graduate Trainees (1-2 years)

esa.int/About_Us/Careers_at_ESA/Graduates_Young_Graduate_Trainees
esa.int/About_Us/Careers_at_ESA/Graduates_National_Trainees

Research Fellows

- Recent PhDs with potential to develop independent research plan
- 2+1 years, 100% research (up to 20% “functional” opportunities)

cosmos.esa.int/fellowship

Engagement of Scientists in the Programme (3)

Boost your research via ESA

Press Releases

- ESA science contact person (Project Scientist)
- > 4 weeks before publication date
- editorial board

ESA Grants

- research ideas can be submitted to the Open Discovery Ideas Channel (ideas.esa.int)
- emphasis on i*nnovation/novelty*
- co-sponsored research provides from ~20-90k€, matching funds for a duration 6-36 months

Science Visitor Programmes

- Archival Research Visitors: reviewed 2x year for 1-3 month stays
- Faculty Visitor Programme: shorter stays throughout the year
  see: cosmos.esa.int/web/space-science-faculty/opportunities/visiting

ESA SCIENCE NEWSLETTER

Subscribe:
cosmos.esa.int/web/scinews

ESA SCIENCE NEWSLETTER

ISSUE #01/2024 - 14 MAY 2024

ESA's First Director of Science Town Hall

It is our pleasure to invite all interested members of the scientific community to ESA's first Director of Science Town Hall, to be held virtually on 28 May, from 9:30 to 12:30 CEST.

The Town Hall will provide an opportunity for direct exchange between the Directorate's Executive and the broader scientific community, including current and future users of ESA's missions. It will allow us to introduce the long-term vision of ESA's Science Programme and provide a channel to listen to the views, ambitions, and requests from the scientific community.

Read more

Research Fellows in Space Science 2024

ESA has selected 12 new Fellows to pursue their own independent research in space science in 2024.

Among the 2024 Research Fellows in Space Science are Alice Borghese, Louise Breuval, Sam Fayolle, Jack M. Jenkins, Eva Laplace, David O'Ryan, Erwan Quintin, Matilde Signorini, Lorenzo Speri, Domenico Trotta, and Bert Vander Meulen. Their research spans a broad range of exciting topics in the fields of heliophysics, planetary science, astrophysics, and fundamental physics. For example, they model colliding black holes, investigate the orbit and interior of Jupiter's innermost Galilean Moon, Io, measure the expansion rate of the Universe, and work towards understanding solar prominences.

The next call for the ESA Research Fellowship in Space Science is expected to open in August 2024.

Read more

IRIS Call for Science Planners AO#10

NASA's Interface Region Imaging Spectrograph (IRIS) is a Small Explorer (SMEX) mission that allows scientists to trace the flow of solar

Upcoming ESA conferences:

MERCURY2024
4-7 June 2024, Kyoto, Japan

During this meeting all topics relevant to the exploration of Mercury - magnetosphere, exosphere, surface and interior and evolution - will be discussed. Topical tutorials and overview talks summarising recent studies in the field will be held each day.

European Astronomical Society Annual Meeting 2024 - Lunch Sessions LS3 and LS4: ESA Archives and ESA Science Programme
3 July 2024 and 4 July 2024, Padua, Italy

During two dedicated lunch sessions, ESA's Science Directorate will present an overview over its programme aimed at early career researchers and update the European space science community on the services, tools, and assets offered by the ESA Space Science Archives.

European Astronomical Society Annual Meeting 2024 - Special Session SS21: The PLATO mission: Towards new horizons in Exoplanet and Stellar Science
4 July 2024, Padua, Italy

PLATO will focus on the study of exoplanets orbiting up to the habitable zone of Sun-like stars. In this Special Session, the community will be informed about the status of the mission, the core science, the science preparatory activities, the data products, and the possibilities for community involvement. The second goal is to provide a forum for the community to present current research relevant for the preparation and exploitation of the PLATO mission.

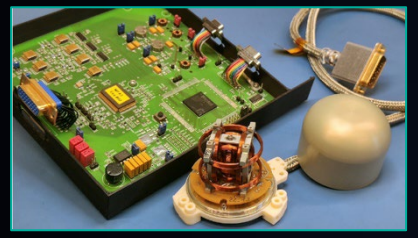
Mercury Laboratory Workshop
16-18 September 2024, Berlin, Germany

The aim of the workshop is to bring together the Mercury community from different institutions and laboratories to: present laboratories, facilities and ongoing work on Mercury analogues, discuss Mercury surface composition studies (from MESSENGER to BepiColombo), design a plan of experiments on common samples, and prepare for the BepiColombo observations.

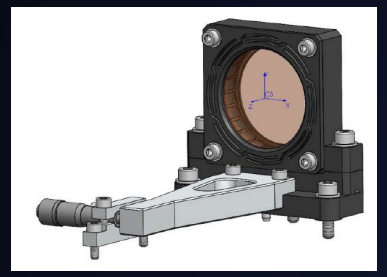
22 years of INTEGRAL: catching results and discoveries
21-25 October 2024, ESA/ESAC, Madrid, Spain

INTEGRAL has been crucial in our understanding of astrophysical phenomena over a wide energy and temporal range. This conference is the occasion to discuss novelties in high-energy astrophysics, new instrumental facilities, and innovative data-analysis methods. Anticipated lively interactions among participants will be harnessed to refine the plan for maximizing data exploitation now and in the decades to come.

The (optional) **PRODEX** programme - A powerful tool for Member State engagement (e.g. development of instruments for Science missions)

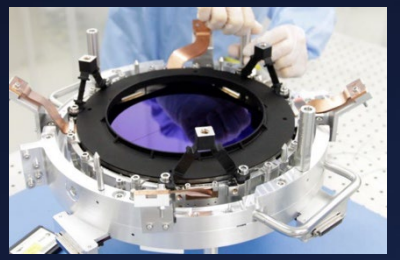


AT: Comet Interceptor DFP Fluxgate magnetometer (EM)

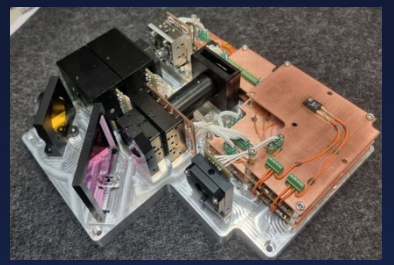


CZ: ARIEL common optics

EE: OPIC instrument EFM, Comet Interceptor

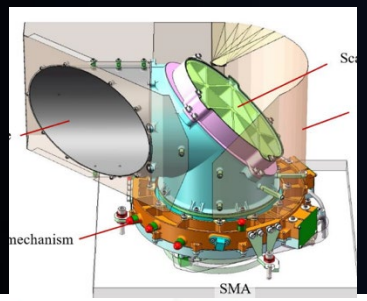


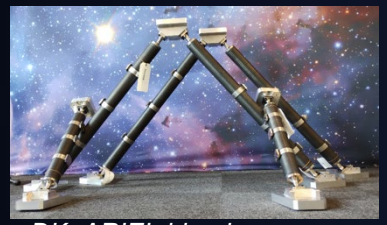
ES: PLATO cameras – Focal Plane Assembly Structure



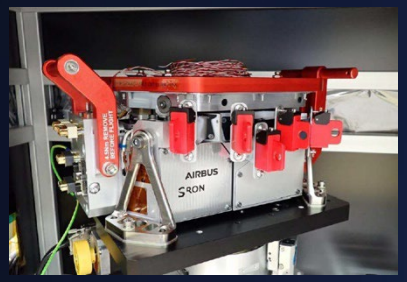
FI: Comet Interceptor MIRMIS NIR-MIR channels (STM)

PT: PLATO OGSE & MLI



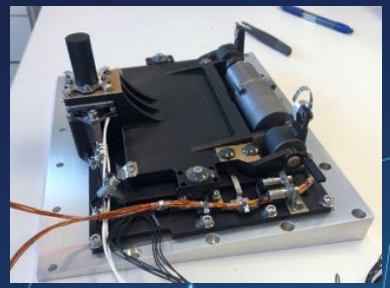


DK: ARIEL bipods

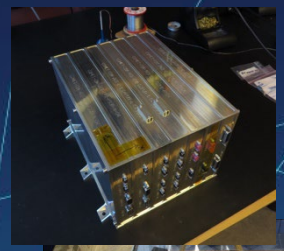


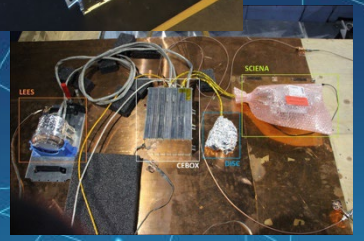
NL: SPEX-one Earth atmosphere Polarimeter

HU: ARIEL MGSE, instrument radiator

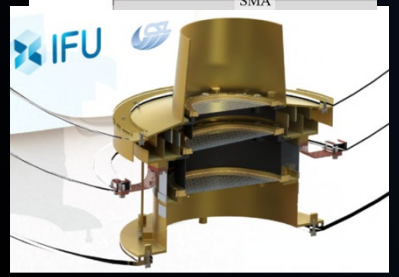


NO: SMILE radiation shutter

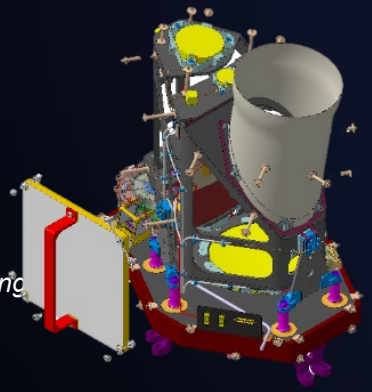




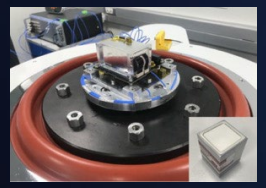
PL: Comet Interceptor DFP : EM EMC test and CEBOX



BE: Comet Interceptor CoCa pointing mirror (top)
ATHENA X-IFU Aperture Cylinder (bottom)



CH: Comet Interceptor CoCa instrument



IE: EIRSAT-1
3 experiments

RO – LISA
Low-latency pipelines.