49th ESLAB SYMPOSIUM: EXPLORING THE UNIVERSE WITH JWST

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ESLAB

- The European Space Research Laboratory (ESLAB) was part of ESRO (the European Space Research Organisation). It was located nearby in a former hotel in Noordwijkerhout.
- ESLAB became the Space Science Department and eventually today's Scientific Support Office.
- The 1st ESLAB symposium was in 1967 on "Satellite and rocket measurements of corpuscular radiation from outer space".
- Since then topics have covered specific missions as well as broader issues such as the formation and evolution of moons, star formation and comparative planetology.
- Welcome to the 49th symposium: Exploring the Universe with JWST

ESA'S SCIENCE PROGRAMME

- ESA's role is "To provide for, and promote, for exclusively peaceful purposes, cooperation among European states in **space research** and **technology** and their **space applications** (Article 2 of the ESA Convention)

- The Science Programme is part of the mandatory programme of ESA and covers astronomy, space science and elements of fundamental physics. Exploration is an optional programme (sort of "a la carte") which includes ExoMars – Hence the Directorate of Science and Robotic Exploration (D/SRE)

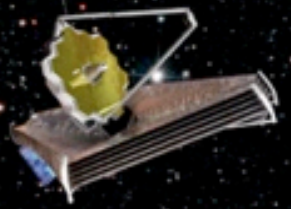
- The Programme is science driven. Both long-term science planning and mission calls are bottom-up processes, relying on broad community input and peer review

→ ESA'S FLEET ACROSS THE SPECTRUM

esa

Thanks to cutting edge technology, astronomy is unveiling a new world around us. With ESA's fleet of spacecraft, we can explore the full spectrum of light and probe the fundamental physics that underlies our entire Universe. From cool and dusty star formation revealed only at infrared wavelengths, to hot and violent high-energy phenomena, ESA missions are charting our cosmos and even looking back to the dawn of time to discover more about our place in space.

jwst
Observing the first light



gaia
Surveying a billion stars

herschel
Unveiling the cool and dusty Universe

planck
Looking back at the dawn of time

cheops
Sizing and first characterisation of exoplanets

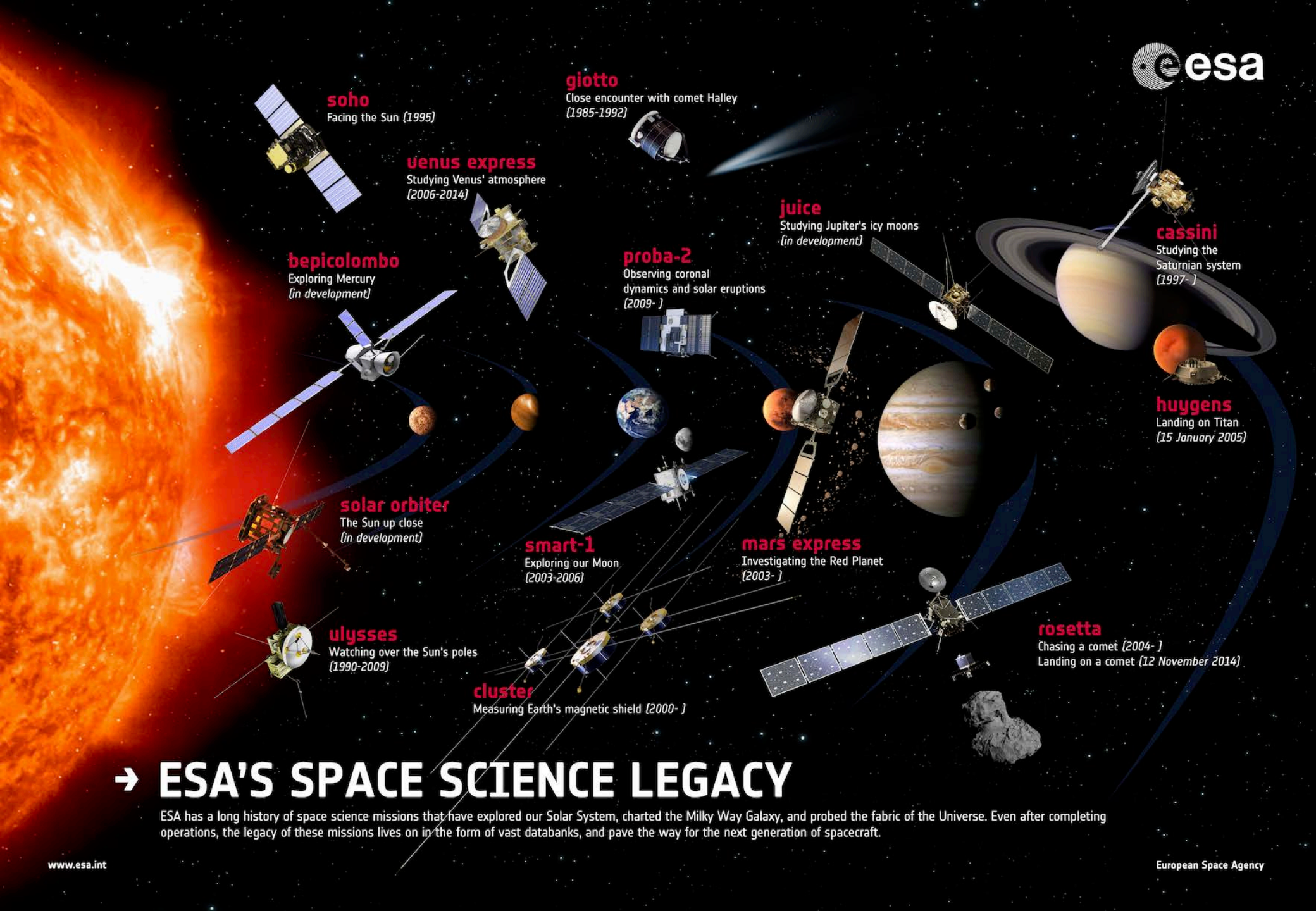
euclid
Exploring the dark Universe

hst
Expanding the frontiers of the visible Universe

xmm-newton
Seeing deeply into the hot and violent Universe

lisa pathfinder
Testing the technology for gravitational wave detection

integral
Seeking out the extremes of the Universe

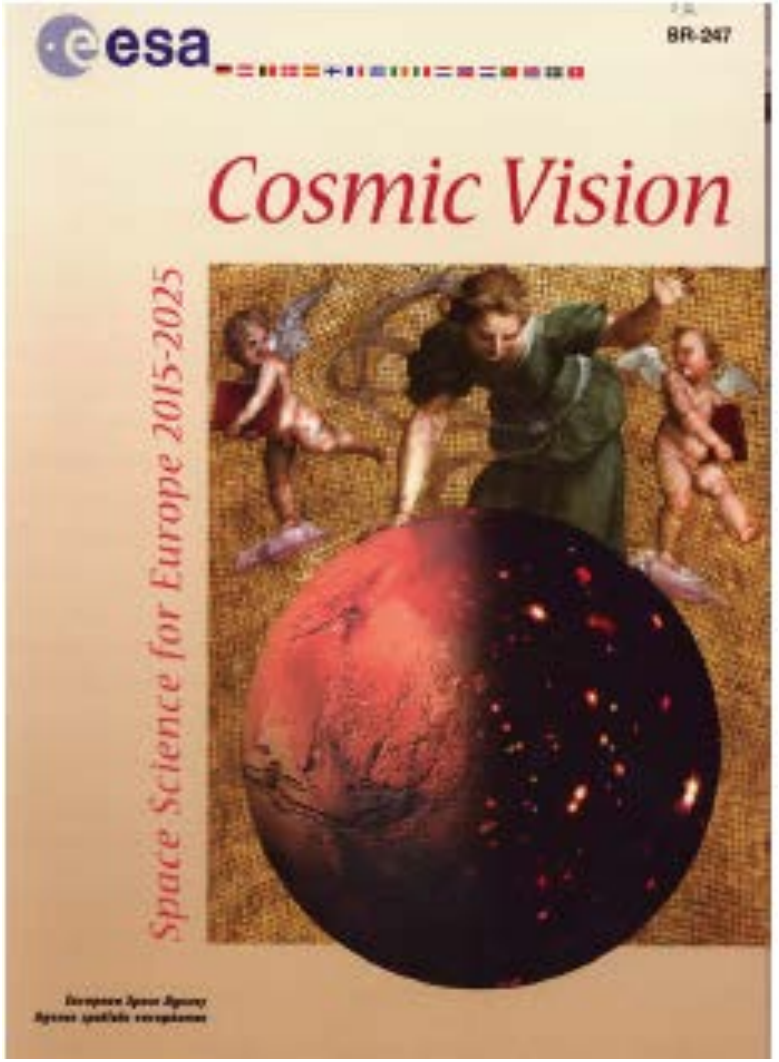


→ ESA'S SPACE SCIENCE LEGACY

ESA has a long history of space science missions that have explored our Solar System, charted the Milky Way Galaxy, and probed the fabric of the Universe. Even after completing operations, the legacy of these missions lives on in the form of vast databanks, and pave the way for the next generation of spacecraft.

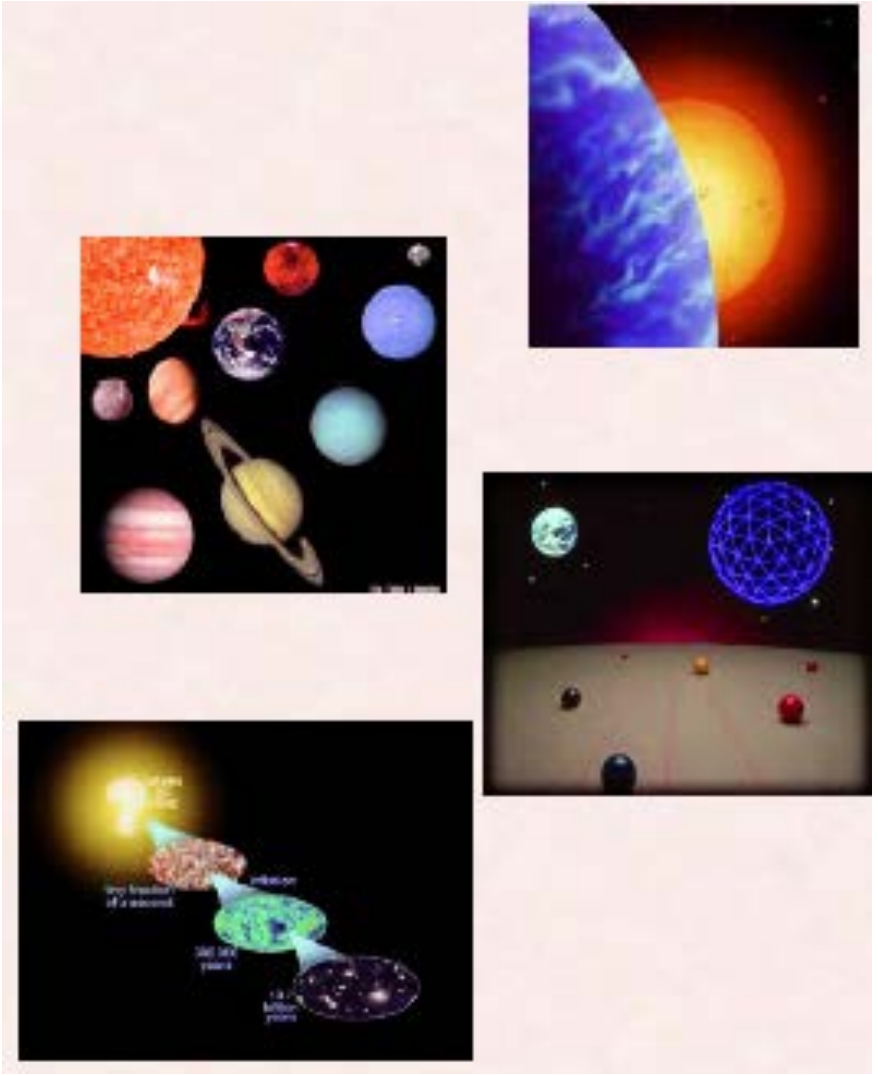
COSMIC VISION PROGRAMME

- This is the long term planning process in the Science and Robotic Exploration Directorate of ESA
- Previous plans: **Horizon 2000** (20 years, 1985-2005) and **Horizon 2000+** (10 years, 2005-2015) have been very successful.
- In 2005, a new programme was introduced for one more decade with the name **Cosmic Vision** (2015-2025).



COSMIC VISION "GRAND THEMES"

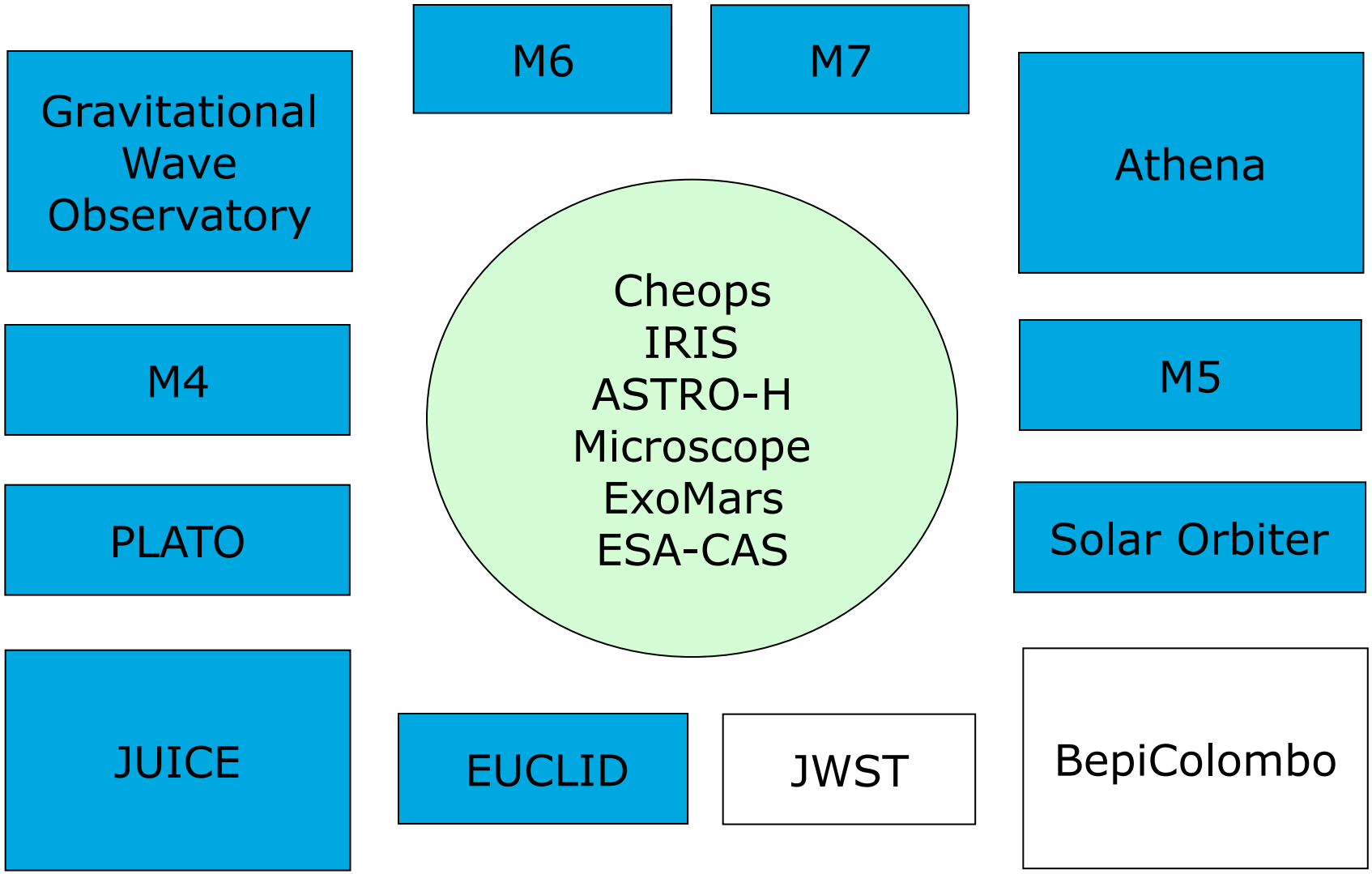
1. What are the conditions for planetary formation and the emergence of life ?
2. How does the Solar System work?
3. What are the physical fundamental laws of the Universe?
4. How did the Universe originate and what is it made of?



ESA'S NEXT LAUNCH

- L-missions
  - European led flagships with international contributions
  - May need technology development
  - Cost to ESA of around 2 annual budgets (1.0 B€)
- M-missions
  - ESA led or contribution to international collaboration.
  - No technology development
  - Cost to ESA of up to one annual budget (550 M€)
- S-missions
  - National agencies play a leading role
  - No technology development
  - Cost to ESA of 0.1 annual budgets (50 M€)
- O-missions
  - Missions of opportunity, led by other agencies, small contributions.

COSMIC VISION (2015-2035)



COSMIC VISION LONG TERM PLANNING

Tentative planning for mission calls:

a. M1, M2, L1	done, done, done
b. M3, M4, L2	done, done, done
c. M5, M6, L3	2016, 2018, 2017
d. M7	2022

Tentative planning for launches:

a. M1, M2, L1	2018, 2020, 2022
b. M3, M4, L2	2024, 2026, 2028
c. M5, M6, L3	2030, 2032, 2034
d. M7	2035

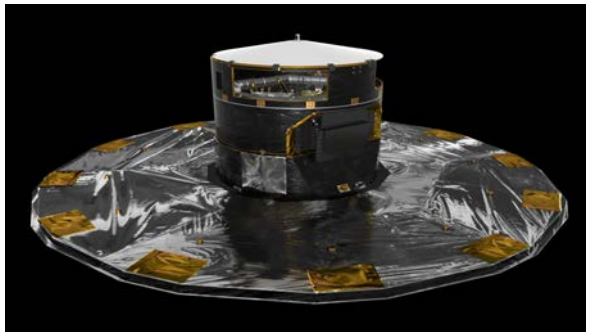
SCIENCE PROGRAMME LATEST

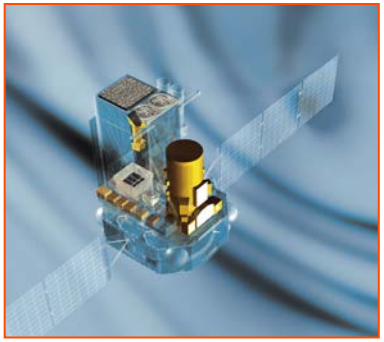
- M4 studies have started for three candidates ARIEL, THOR and XIPE.

- The overall schedule is:
  - Phase A kick-offs – March 2016
  - Selection of one (from three) M4 mission – June 2017
  - Adoption ("final approval" of the selected M4 mission – November 2018
  - Launch 2026

THE NEXT OPPORTUNITY….

- Is the M5 Cosmic Vision mission call, for a planned launch in 2030
- Around 30 non-binding Statement of Interests letters received. These will be used to engage any potential partner agencies in a dialog over the feasibility of the proposed scheme.
- Call expected to be released at the beginning of 2016 and is up to a "full" M mission (550 M€ cost cap). May be ESA led, or a contribution to a mission from another agency.
- Proposals due April 2016 to be evaluated between May-June 2016





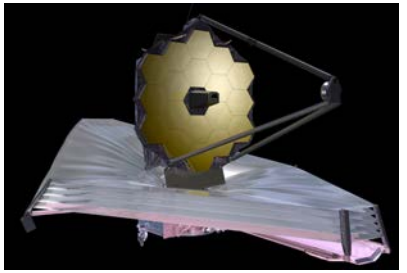

SCIENCE PROGRAMME LATEST!

- LISA Pathfinder is now at Kourou preparing for launch on 2 December 2015 on ESA's Vega rocket

8 October 2015

JAMES WEBB SPACE TELESCOPE

- JWST will be one of the "great observatories" of the next decade.
  - Often presented as the next step after the Hubble Space Telescope (HST)
- Joint mission between NASA, ESA and CSA
  - Prime example how three agencies working together can achieve something that would have been very difficult, or impossible, alone
- Setup similar to the HST one
  - Over the duration of the mission, >15% of the total JWST observing time goes to ESA Member States applicants.
  - European observers have been very successful in obtaining HST observing time – 29% of the accepted observing time in Cycle 23 (18% of observing time over mission life)



JWST - COLLABORATION

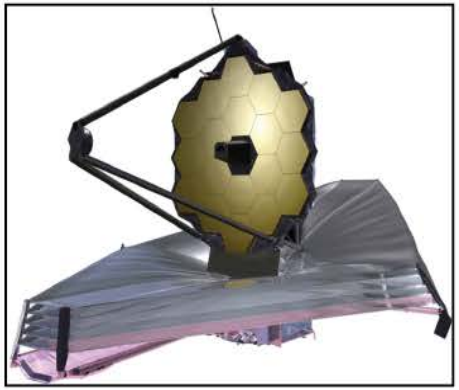
Launch segment

Payload adapter

Launcher (Ariane 5)

Launch site services

Observatory segment

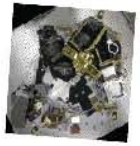


Spacecraft (bus, sunshield...)

Telescope

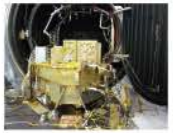
Payload module (ISIM) and instruments

NIRCam



NIRSpec

FGS / NIRISS



MIRI

Ground segment

Science and operation center (STScI)

15 ESA staff members

Common systems (deep space network)

Provided by NASA

Provided by ESA and Europe

Provided by CSA

HAVE A SUCCESSFUL AND REWARDING SYMPOSIUM AS WE LOOK FORWARD TO…