European Space Sciences Committee (ESSC-ESF)

Briefing to CSSP

Space Science Week

Washington, DC, 31 March 2015

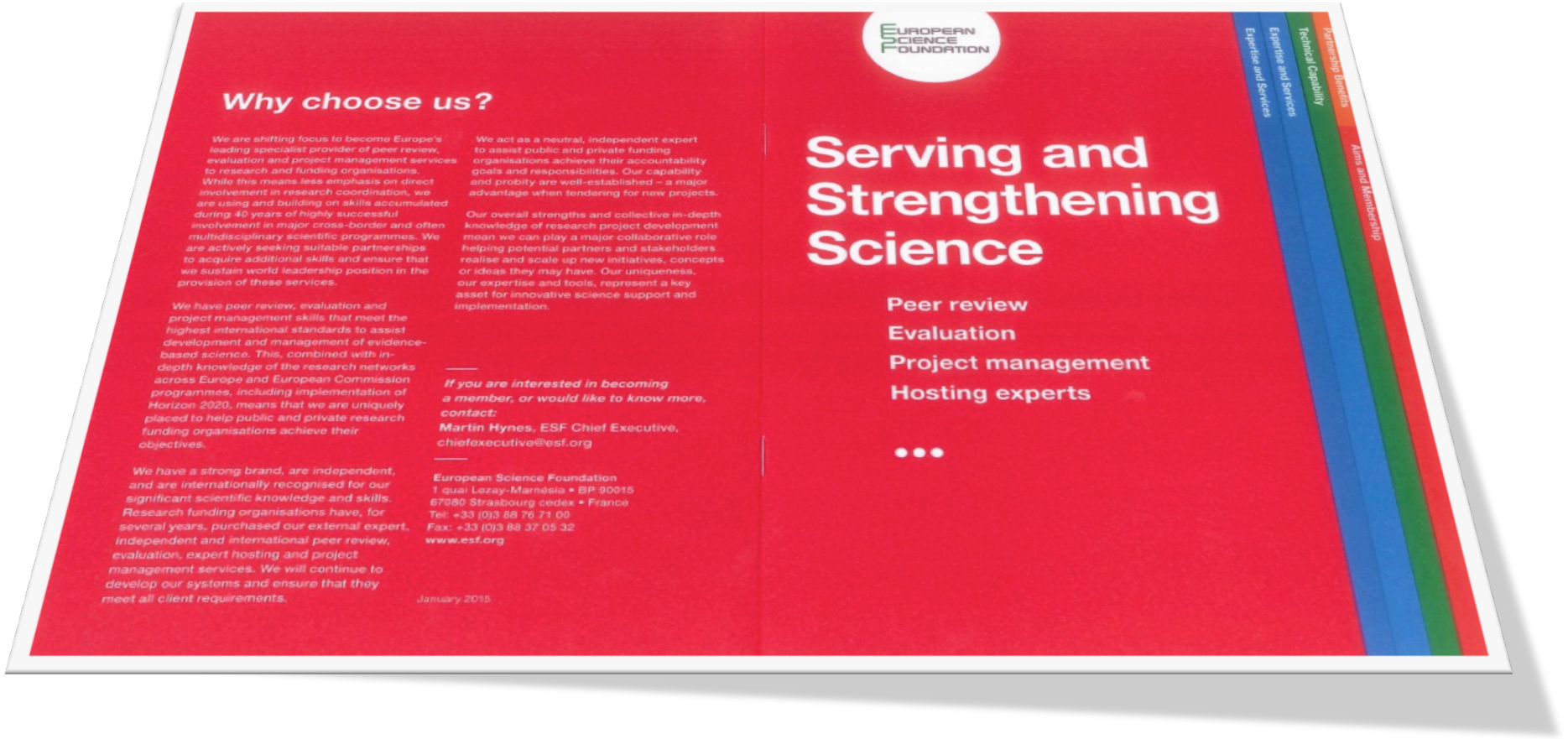
ESF Member Organisations

ESF is an independent association of 66 Member Organisations

- research funding organisations
- research performing organisations
- academies and learned societies

in 29 countries

ESF Successor Organisation



Why choose us?

We are shifting focus to become Europe's leading specialist provider of peer review, evaluation and project management services to research and funding organisations. While this means less emphasis on direct involvement in research coordination, we are using and building on skills accumulated during 40 years of highly successful involvement in major cross-border and often multidisciplinary scientific programmes. We are actively seeking suitable partnerships to acquire additional skills and ensure that we sustain world leadership position in the provision of these services.

We have peer review, evaluation and project management skills that meet the highest international standards to assist development and management of evidence-based science. This, combined with in-depth knowledge of the research networks across Europe and European Commission programmes, including implementation of Horizon 2020, means that we are uniquely placed to help public and private research funding organisations achieve their objectives.

We have a strong brand, are independent, and are internationally recognised for our significant scientific knowledge and skills. Research funding organisations have, for several years, purchased our external expert, independent and international peer review, evaluation, expert hosting and project management services. We will continue to develop our systems and ensure that they meet all client requirements.

We act as a neutral, independent expert to assist public and private funding organisations achieve their accountability goals and responsibilities. Our capability and probity are well-established – a major advantage when tendering for new projects.

Our overall strengths and collective in-depth knowledge of research project development mean we can play a major collaborative role helping potential partners and stakeholders realise and scale up new initiatives, concepts or ideas they may have. Our uniqueness, our expertise and tools, represent a key asset for innovative science support and implementation.

If you are interested in becoming a member, or would like to know more, contact:

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January 2015

EUROPEAN SCIENCE FOUNDATION

Serving and Strengthening Science

- Peer review
- Evaluation
- Project management
- Hosting experts

•••

Expertise and Services
Expertise and Services
Technical Capability
Partnering Benefits
Aims and Membership

Expert Boards and Committees
Voices for European science

Committee on Radio Astronomy Frequencies	CRAF
European Marine Board	MARINE BOARD
European Space Sciences Committee	ESSC
Materials Science and Engineering Expert Committee	MatSEEC
Nuclear Physics European Collaboration Committee	NuPECC

ESSC Mission Statement

*" The mission of the ESSC is to provide an **independent** European voice on European space research and policy. It is the ESF's expert body on space research "*

European Space Sciences Committee

- **ESSC is funded by 18 organisations (space agencies, research councils) from 14 European Countries, plus ESA**
- **ESSC is supported by a secretariat of four staff**
- **ESSC is composed by 30 experts across four panels**
  - ***Nominated ad-personam***
  - ***Large turn-over at next meeting***
- **Two plenary meetings/year**

Interdisciplinarity

- **The four ESSC panels allow cutting across all/most domains of space sciences**
- **Members' interests declared**
- **Consensual positions and recommendations from ESSC are endorsed by representatives from various disciplines**

  → ***No bias***

  → ***Stronger positioning***

ESSC Chair: Athena Coustenis

Solar System and Exploration

•**Hermann Opgenoorth,** Earth sciences and space physics (**Panel Chair**)

•**Athena Coustenis**, outer planets
•***Franck Montmessin**, terrestrial planets*
•***Mahesh Anand**, Moon*
•***Gerhard Paar**, robotics*
•**Kari Muinonen ,** small bodies
•**Ester Antonucci**, solar physics
•**Petra Rettberg**: astro/exobiology, biology

Research in Weightlessness

•**Dominique Langevin,** fluid physics and foams (**Panel Chair**)

•***NN**, neurology **INVITED***
•***Alexander Chouker**, integrated physiology*
•***Berndt Feuerbacher**, solid state physics*
•***Hubertus Thomas**, complex plasmas*
•***NN**, ices & physical sciences **INVITED***
•**NN**, biology ***TO IDENTIFY***
•***Peter Preu**, materials*
•***Roberto Piazza**, colloids*

Astronomy and Fundamental physics

•**Stéphane Udry,** exoplanets, **(Panel Chair)**

•***Conny Aerts**, asteroseismology*
•**NN**, high-energy physics ***TO IDENTIFY***
•**Pierre Binetruy**, fundamental physics
•**Paolo de Bernardis,** Ir/sub-mm astronomy
•**Jordi Torra**, galactic astronomy & astrometry

Earth Sciences

•**Ian Brown,** glaciology (**Panel Chair**)

•**Heiko Balzter,** land-atmosphere interface
•**Andreas Kääb,** EO and satellite based glaciology
•***NN**, space law **INVITED***
•***NN**, climate **INVITED***
•***Pepijn Veefkind**, Sentinel algorithms and climate*
•***Maarten Krol**, atmos. Phys. & chemistry, climate*
•***Laurence Eymard**, ocean/atmosphere*

ESSC Representation

International Environment

European Union

- FP7 Space Advisory Group (individuals)
- FP7/H2020 stakeholder consultations
- Direct interactions with programme executives

National Space Agencies

- Annual meeting with ESSC Funding Organisations
- UKSA's SPAC
- Swedish national committee

ESA

- Council at Ministerial level
- High-level Science Policy Advisory Committee (ex-Officio)
- Scientific advisory committees at programme level (ex-Officio)
- Meetings with programme executives

- COSPAR Science Advisory Committee (ex-officio)
- UN Office of Outer Space Affairs (exchange of observers and NEO Action Team 14)

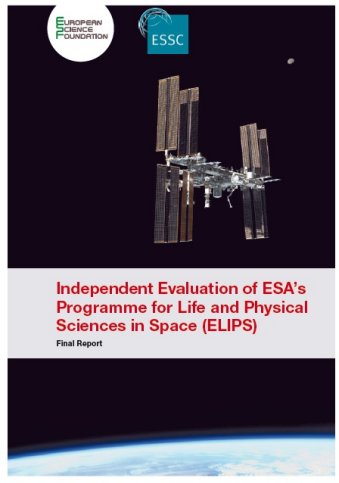
- US National Academies Space Studies Board (ex-officio)

Overarching Science Policy Advice

- **High level pol**
  recommendat
  council at mi
- **High level pol**
  recommendat
  space scienc
- ***Pro-Active* sp**
  communicati
  recommendat
  institutions

Specific Scientific Advice

- **When specialist targeted independent advice is required**
- **Setting up of *ad-hoc* committees and panels**
- **Commissioned Studies**
  - ***Evaluation of ESA Microgravity Programme***
  - ***Strategic advice on planetary protection***
- **Pro-Active disciplinary foresight - Roadmaps**
  - ***Astrobiology and life in extreme environments***
  - ***Human space exploration***
  - ***Nuclear propulsion***
  - ***Technology development***



ESSC

ESF FORWARD LOOK

Technological Breakthroughs for Scientific Progress

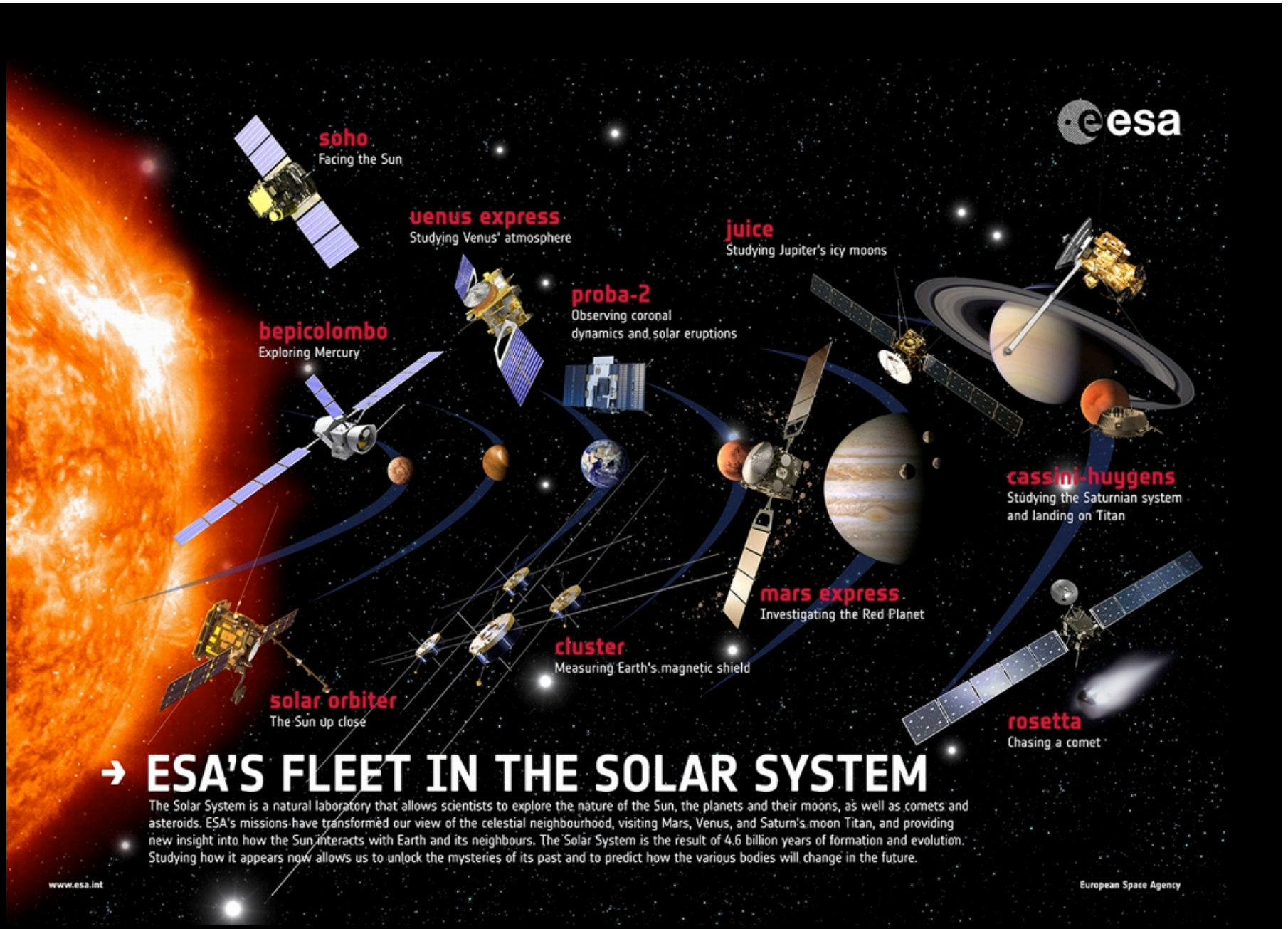
TECHBREAK

The TECHBREAK report was published and distributed last summer.

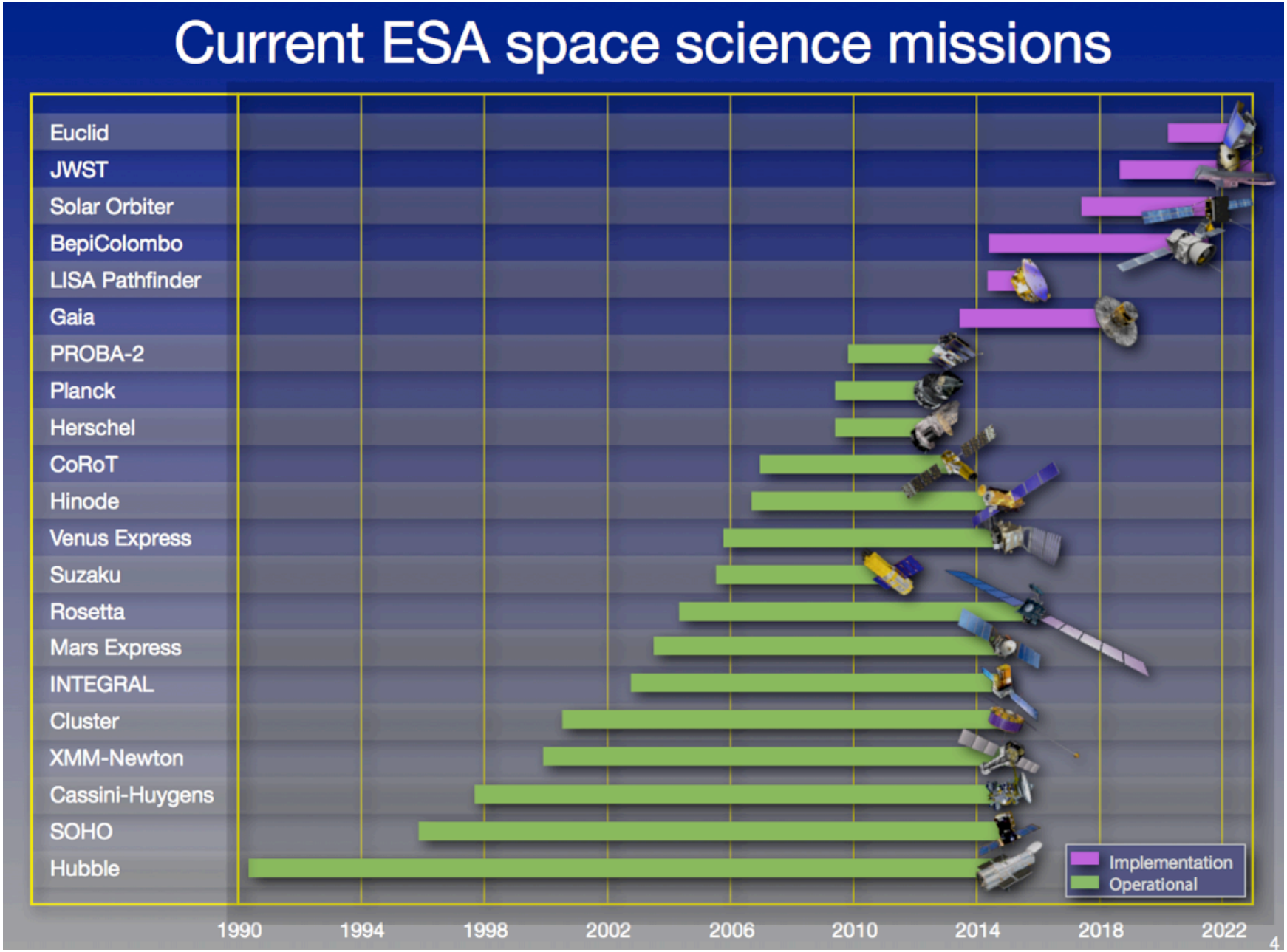
Cooperation and collaboration in space discussed between SSB & ESF since 1976 and more recently on matters of planetary protection

9 joint reports over 32 years

www.esf.org/space


esa
soho
Facing the Sun
venus express
Studying Venus' atmosphere
proba-2
Observing coronal
dynamics and solar eruptions
juice
Studying Jupiter's icy moons
bepicolombo
Exploring Mercury
cassini-huygens
Studying the Saturnian system
and landing on Titan
mars express
Investigating the Red Planet
cluster
Measuring Earth's magnetic shield
solar orbiter
The Sun up close
rosetta
Chasing a comet
ESA'S FLEET IN THE SOLAR SYSTEM
The Solar System is a natural laboratory that allows scientists to explore the nature of the Sun, the planets and their moons, as well as comets and asteroids. ESA's missions have transformed our view of the celestial neighbourhood, visiting Mars, Venus, and Saturn's moon Titan, and providing new insight into how the Sun interacts with Earth and its neighbours. The Solar System is the result of 4.6 billion years of formation and evolution. Studying how it appears now allows us to unlock the mysteries of its past and to predict how the various bodies will change in the future.
www.esa.int
European Space Agency

Current ESA space science missions



Current and future ESA-related Heliophysics Missions

ESA Magnetospheric Missions in Operation

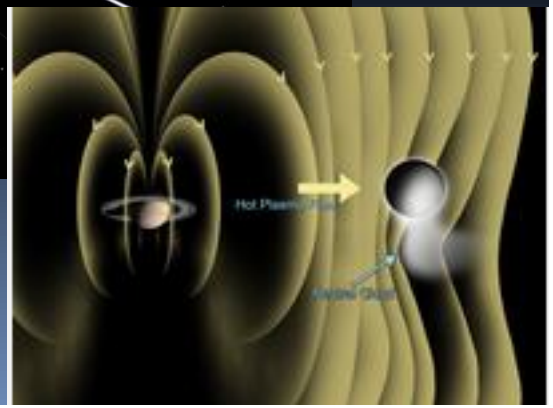
Cluster and SOHO

2000 -

4 identical spacecraft flying in formation to study plasma processes and the interaction between the solar wind and Earth's magnetic environment. Together with the ESA-NASA Solar Heliospheric Observatory (SOHO), Cluster is investigating the entire chain of events from the solar wind's generation at the Sun to its collision with Earth's magnetosphere, and the processes inside the magnetosphere which lead to transport and conversion of solar wind energy. This energy is finally deposited into the upper atmosphere via energised aurroal particles and currents.

Cassini

And of course Europeans participate in the Cassini mission which continues to make imporant discoveries on the magnetospheric environment around Saturn and its interaction with the Sun.



Cassini at Enceladus

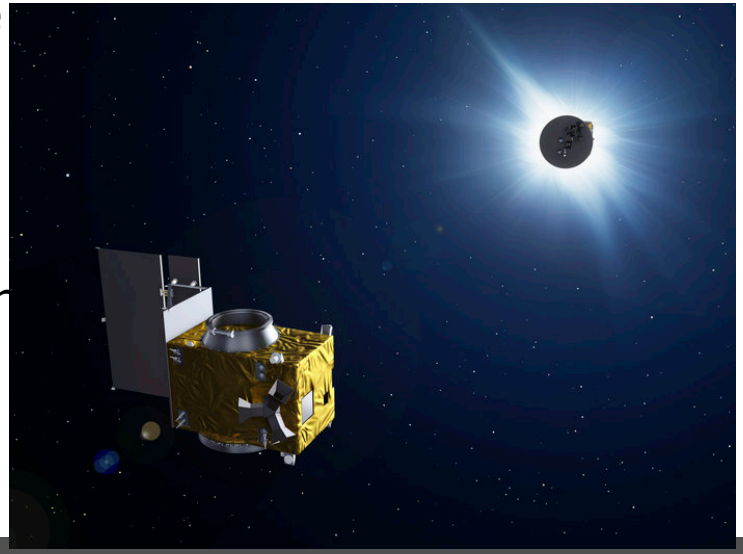
Current European missions related to solar and space physics

Proba 2 (technology demonstrator)

2009-

ESA's Sun-watching mission with an EUV coronal imager, a radiometer and a segmented Langmuir probe. Recent Highlight:

During a partial solar eclipse in Europe, on 20 March 2015, Proba-2 caught two eclipses over the course of the morning. Orbiting Earth once every 100 minutes, Proba-2 used its SWAP imager to capture the Moon passing in front of the Sun. SWAP views the solar disc at extreme ultraviolet wavelengths to capture the turbulent surface of the Sun and its swirling corona.



TO BE FOLLOWED BY:

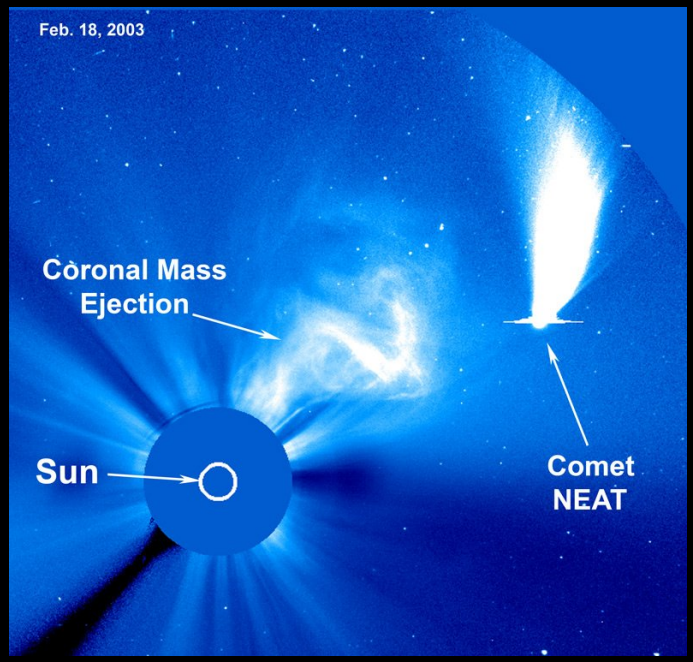
Proba 3 (formation flyer)

Proba 3 will be a first formation flying demonstrator mission with a coraanl imager and an occulter, observing the entire solar corona closer to the sun than any other coronagraph before and for extended periods of time.

Future European missions related to solar and space physics

Cosmic Vision M1 : **Solar Orbiter**

Future ESA Heliophysics Missions



***Solar Orbiter* @ L1**
1st cornerstone Horizon 2000
1995-

Imagers

- Lasco C2-C3 Coronagraphs (2-30 solar radii)
- EIT the extreme ultraviolet solar disk imager

provide scientific & *space weather* data

SOLAR ORBITER

1st Mission ESA Cosmic Vision Program

Mission Goal

- Investigate the link between the Sun and the interplanetary medium

Mission profile

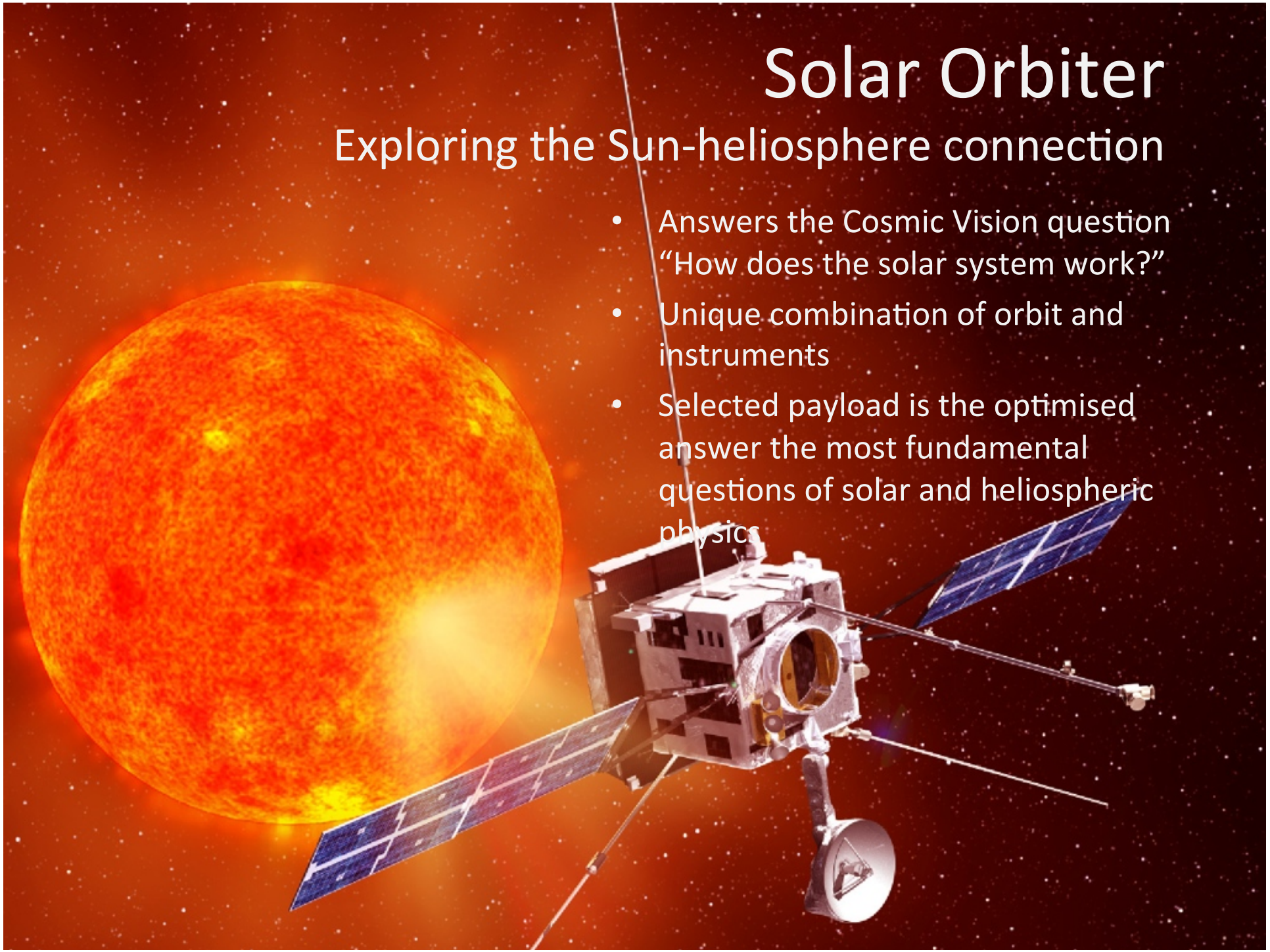
- Close to the Sun (0.28 AU)
- Out of ecliptic (≥34°): first polar view of the Sun
- Quasi-corotation with the Sun

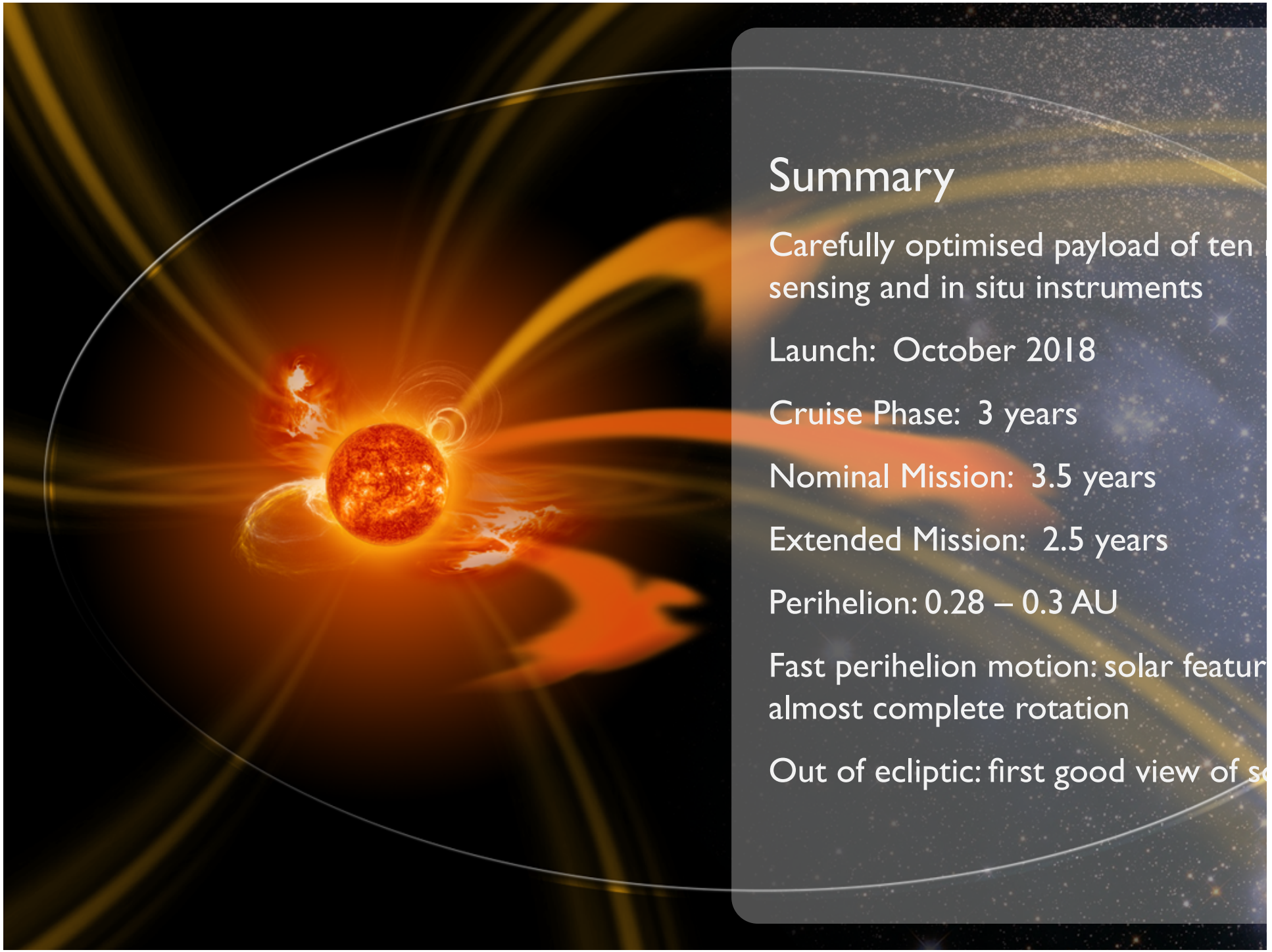
Launch 2018

Solar Orbiter

Exploring the Sun-heliosphere connection

- Answers the Cosmic Vision question "How does the solar system work?"
- Unique combination of orbit and instruments
- Selected payload is the optimised answer the most fundamental questions of solar and heliospheric physics





Summary

Carefully optimised payload of ten
sensing and in situ instruments

Launch: October 2018

Cruise Phase: 3 years

Nominal Mission: 3.5 years

Extended Mission: 2.5 years

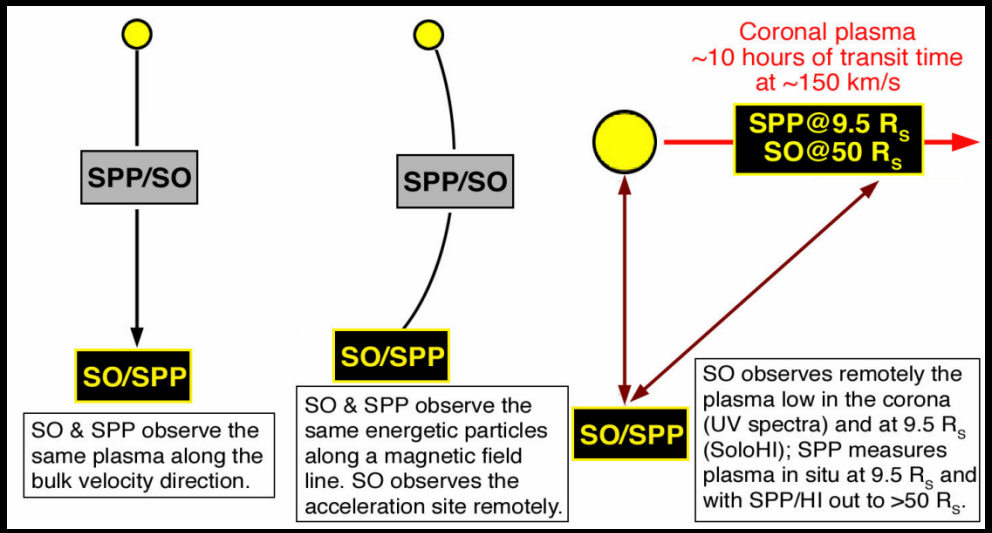
Perihelion: 0.28 – 0.3 AU

Fast perihelion motion: solar featur
almost complete rotation

Out of ecliptic: first good view of s

Links to Solar Probe Plus

- Many conjunctions will occur between Solar Orbiter and Solar Probe Plus very close to the Sun
  - Extends science return from both missions
  - Multiple vantage points will increase our understanding of inner heliospheric processes



Future European missions related to solar and space physics

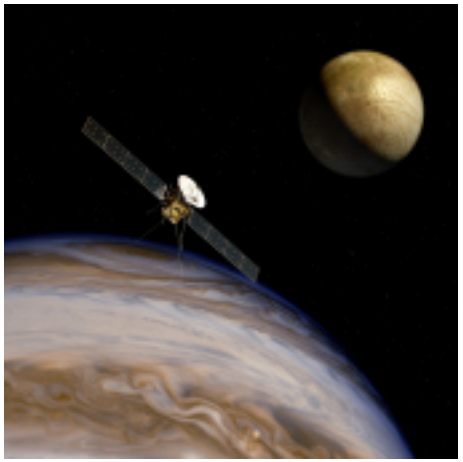
BEPICOLOMBO

To study and understand the composition, geophysics, atmosphere, magnetosphere and history of Mercury to be launched in 2017

BepiColombo

JUICE

ESA's L1 will study the Jupiter system. To launch in 2022, among other objectives it will study the emergence of habitable worlds around giant planets with focus on Ganymede. It will also explore the Jovian magnetosphere and the three-dimensional properties of the magnetodisc and perform in-depth study of the coupling processes within the magnetosphere, ionosphere and thermosphere. Aurora and radio emissions and their response to the solar wind will be elucidated.

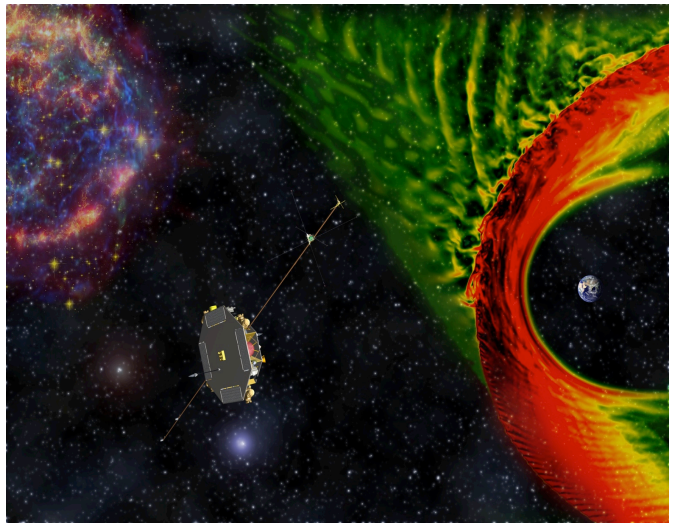


JUICE

Future European missions related to solar and space physics : CV/M4 for study selection:

- **Alfven** : a dual spacecraft mission to investigate the fundamental plasma physics processes involved in the auroral acceleration region of Earth's magnetosphere.
- **Raven** : Using 2 excentric Molnya Orbits to provide continuous auroral imagery from the northern hemisphere covering the development of magnetic storms and providing stereoscopic imaging of the ring current
- **THOR :** Plasma turbulence mission to address questions like : How is plasma heated and particles accelerated?
How is the dissipated energy partitioned?
How does dissipation operate in different regimes of turbulence?

S2 and M5 to follow



THOR