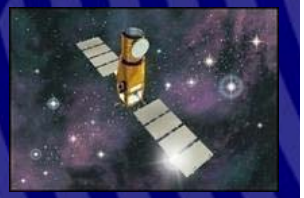
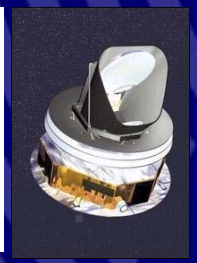
Cosmic Vision 2015 – 2025

ESA's new long term plan for space science

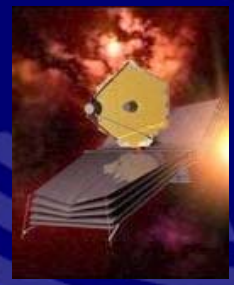
Missions in preparation



Corot
(CNES-ESA)
. 2006



Herschel-Planck
2007



JWST
(NASA-ESA)
2011

Bepi-Colombo
2012

Lisa
2014

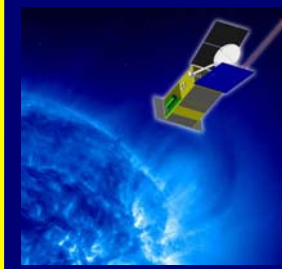
Astro-F
(Japan-ESA)
2006

Venus Express
. 2005

Lisa-Pathfinder 2009

Microscope
(CNES-ESA)
2008

Gaia
2011-12



Solar Orbiter
2015

2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

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Cosmic Vision process

- Cosmic Vision 2015 –2025 process launched on 2 April 04 with call for Science themes
- 1June 04: deadline for proposal submission
- July 04: Analysis of responses by the ESA Science advisory bodies (AWG, SSWG, FPAG, SSAC)
- 15-16 September 04: Workshop in Paris (~400 participants)
- Nov 04: progress report to SPC
- Spring 05: presentation of Cosmic Vision 2015-2025 to community
- May 05: Endorsement of Cosmic Vision by SPC

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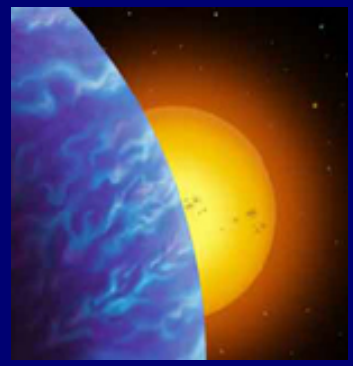
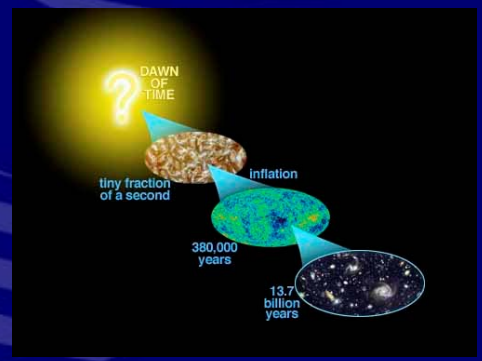
Grand themes

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





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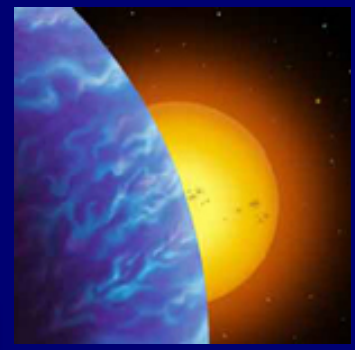
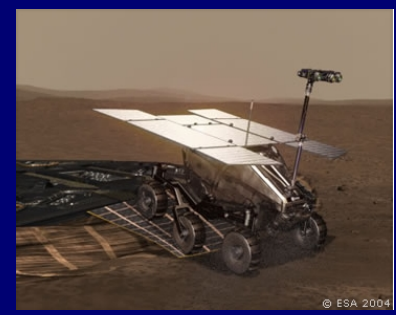
1. What are the conditions for life and planetary formation?

1.1 From gas and dust to stars and planets.



1.2 From exo-planets to bio-markers.

1.3 Life and habitability in the Solar System



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2. How does the Solar System work ?

2.1 From the Sun to the edge of the Solar System

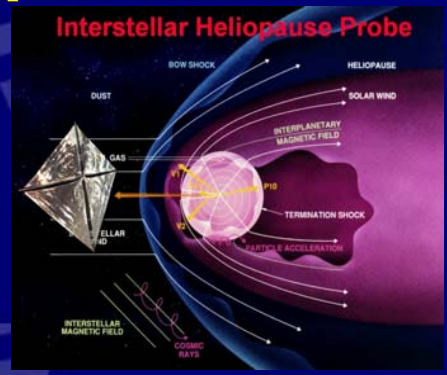
2.2 The building blocks of the Solar System, gaseous giants and their moons

Solar System Roadmap (1)

2015-2025

Look at Small Scales! Understand Space plasmas

EARTH MAGNETOSPHERIC SWARM, SOLAR POLAR ORBITER, HELIOPAUSE PROBE



2020

Go Outward! Explore the outer Solar System

JUPITER & EUROPA PROBE

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Solar System Roadmap (2)

2015-2020

Look for Life! Everywhere in Solar System

Mars rovers and sample return, Europa Probe

2020-2025

Seek Ground Truth! Land on NEOs, Moons, Planets,look below surface, return samples

Jupiter and Europa Probe, NEO Sample Return

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3. What are the fundamental laws of the Universe?

3.1 Explore the limits of contemporary physics

3.2 The gravitational wave Universe

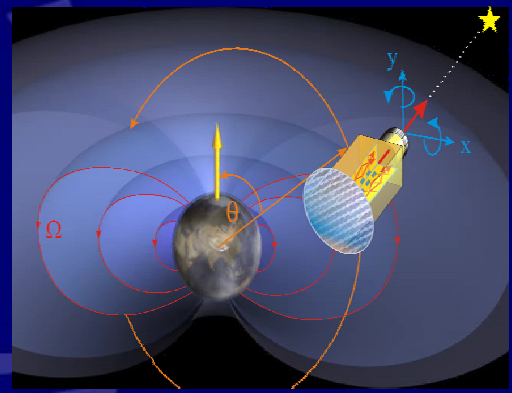
3.3 Matter under extreme conditions

Fundamental Physics Roadmap

2015-2020

Probe Grand Unified Theory and gravitation i.e. measure tiny deviations from GR and SM in ultra sensitive, high precision experiments

FUNDAMENTAL PHYSICS EXPLORER



2020-2025

Probe very early Universe (close to BB) and laws of physics at highest possible energies from detection of primordial gravitational waves

GRAVITATIONAL WAVE COSMIC EXPLORER

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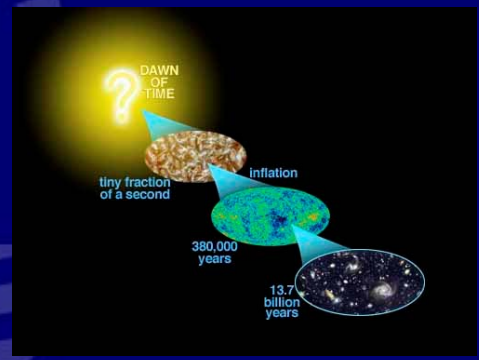
4. How did the Universe originate and what is it made of?

4.1 The early Universe



4.2 The Universe taking shape

4.3 The evolving violent Universe

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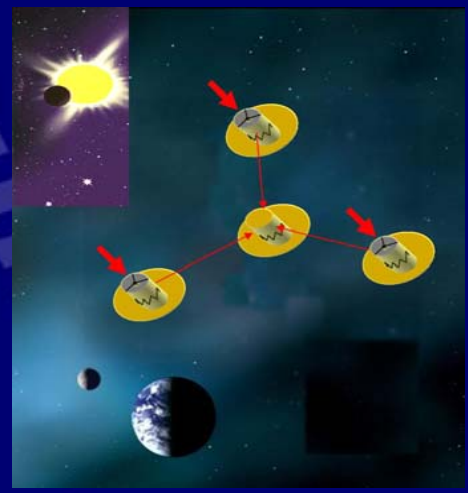
Astronomy Roadmap (1)
Observatory-type missions

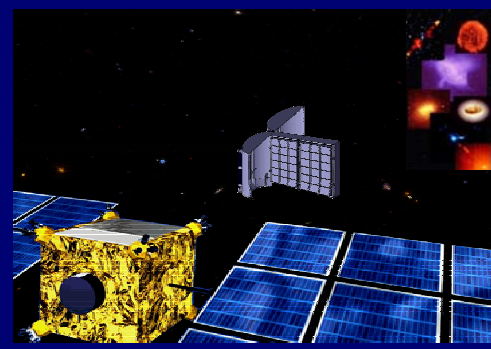
2015 - 2020



Direct detection and spectroscopy of terrestrial planets, search for biomarkers

Mid-IR NULLING INTERFEROMETER

Clusters of galaxies back to their formation epoch, warm-hot IGM, mergers of SMBH, accreting BH, Quasi-Periodic Oscillations, equation of state of neutron stars, nuclear matter vs quark matter



LARGE APERTURE X-RAY OBSEVATORY

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Astronomy Roadmap (2)
Observatory-type missions

2020-2025

Star formation, imaging and spectroscopy of protostars and protoplanetary disks, resolution of far-IR background into discrete sources, star formation regions, cool molecular clouds

Far- IR OBSERVATORY

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Astronomy Roadmap (3)
Focussed missions

2015-2025

Probe dark energy from high Z SNIa and weak lensing

OPTICAL-NIR WIDE FIELD IMAGER

Probe inflation from shape of the primordial fluctuations

ALL SKY CMB POLARIZATION MAPPER

Astronomy Roadmap (4)
Further missions

Census of terrestrial planets within 100 pc,

ULTRA HIGH PRECISION ASTROMETRY

OPTICAL-UV SPECTROSCOPY

Isotope abundances, physics of SN, origin of cosmic rays, origin of antimatter

GAMMA RAY IMAGER (MeV)

Warm/hot IGM spectroscopy, UV light-curves of SNIa as low-z templates for high-z sources

HIGH RESOLUTION UV SPECTROSCOPY

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COSMIC VISION 2015 – 2025

Potential implementation

Programme Slices

- To implement the major objectives of Cosmic Vision 2015-2025 while keeping flexibility of planning, slices of 1 to 1.5 B€ each can be identified for missions to be launched in 2015-2025.
- Flexibility within each slice will depend on size, number and order of missions and inclusion of international cooperation.
- Flexibility within each slice allows to maintain a good balance of scientific disciplines
- The first Call for Mission Proposals to cover first slice (2015 – 2018). Next slices to be implemented through subsequent Calls.

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Conclusions

let’s start soon dishing out the first slice !

a launch in 2015 requires a phase B start at the beginning of ’08

Phase A in ’07

Call for mission proposals early ‘06