http://europlanet-ri.eu

Europlanet RI

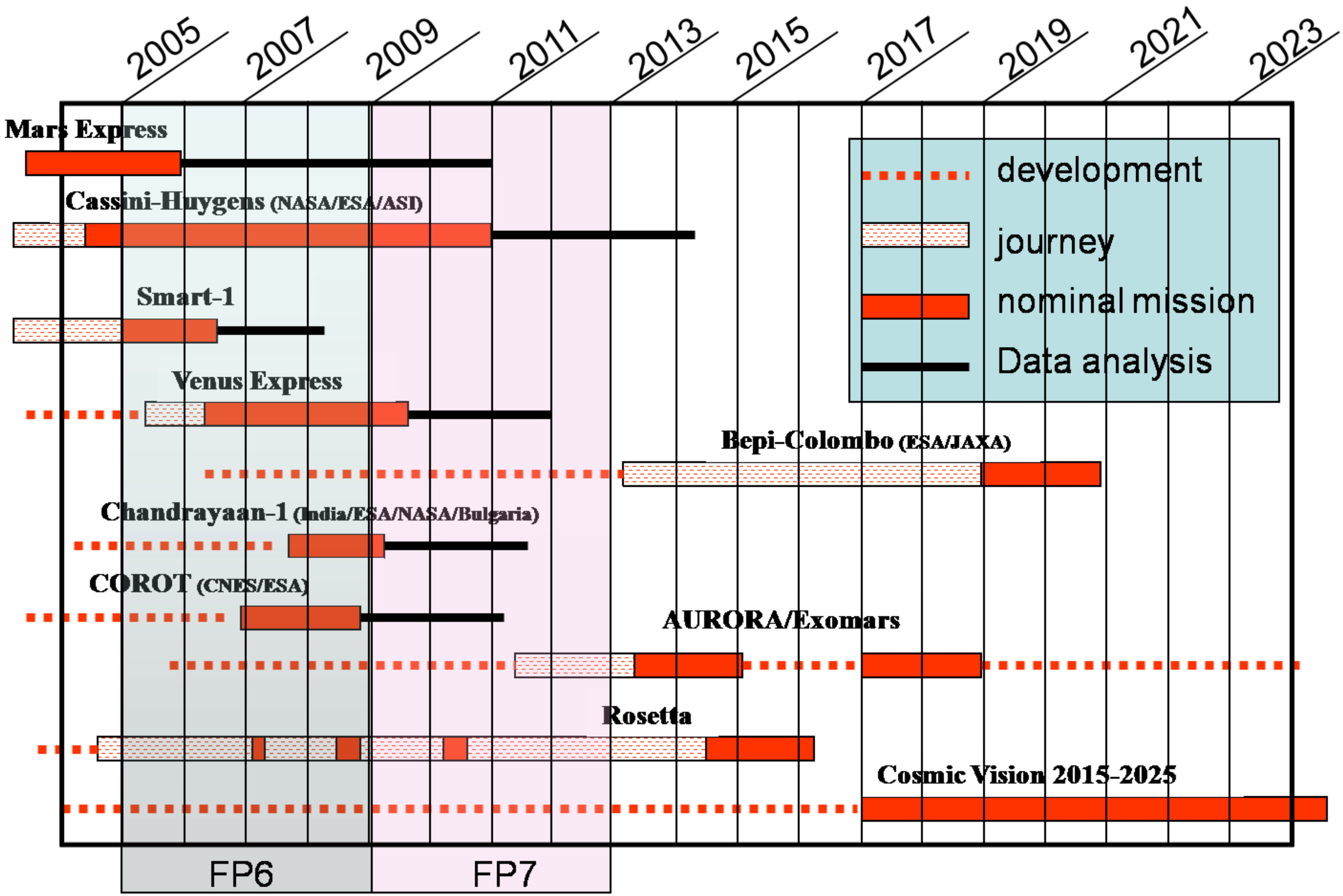
A network for all planetary scientists

A service to the community

Manuel Grande
Scientific Dissemination Coordinator

EC grant agreement no 228319

A unique opportunity!



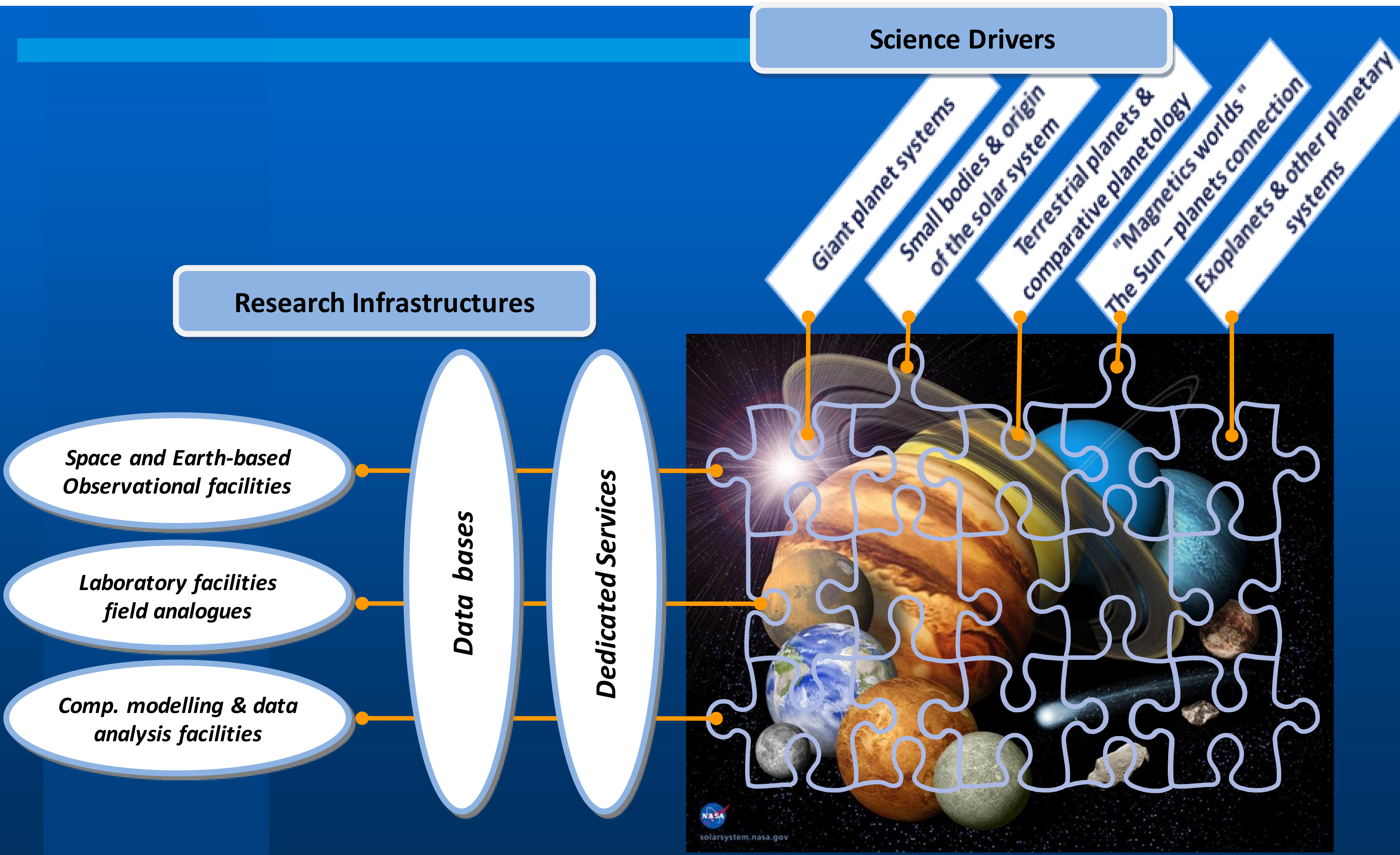
Our responsibility and our goal:

- Provide support to the optimal use of data from past and present space missions by the broadest possible science community

- Provide support to the preparation of future planetary missions :
  - Earth-based preparatory observations,
  - laboratory studies,
  - R and D on advanced instrumentation and exploration technologies,
  - theory and modelling, …

- **Bridge the gap between past/present space missions and those for the next generation**

SCIENTIFIC STRUCTURE



Europlanet Research Infrastructure

EPSC European Planetary Science Congress

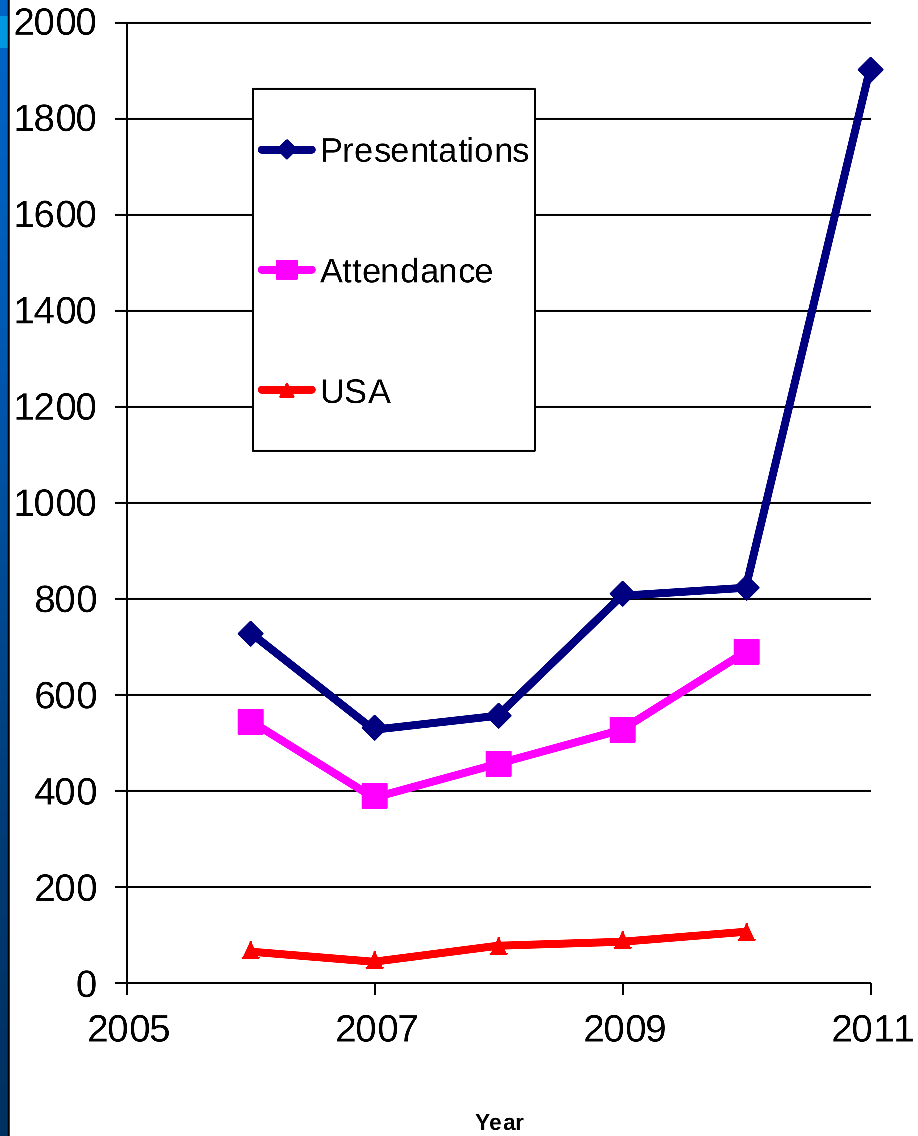
EPSC is the platform of the Europlanet Research infrastructure

It's a self standing meeting organised by Copernicus, where Europlanet does its business

80 sessions (70 2011)

1900 Abstracts

? attendees



- **Technology Foresight – Planetary Detectors Tue PM**
- **Press office (Anita Heward, anitaheward@btinternet.com**

TECHNOLOGY FORESIGHT WORKSHOPS

- The European planetary community lacks a clear path for identifying the technology needed for future planetary exploration. where European instrument capabilities can be married to planetary exploration science requirements.
- We organise a series of workshops aimed at identifying roadmaps for key technologies

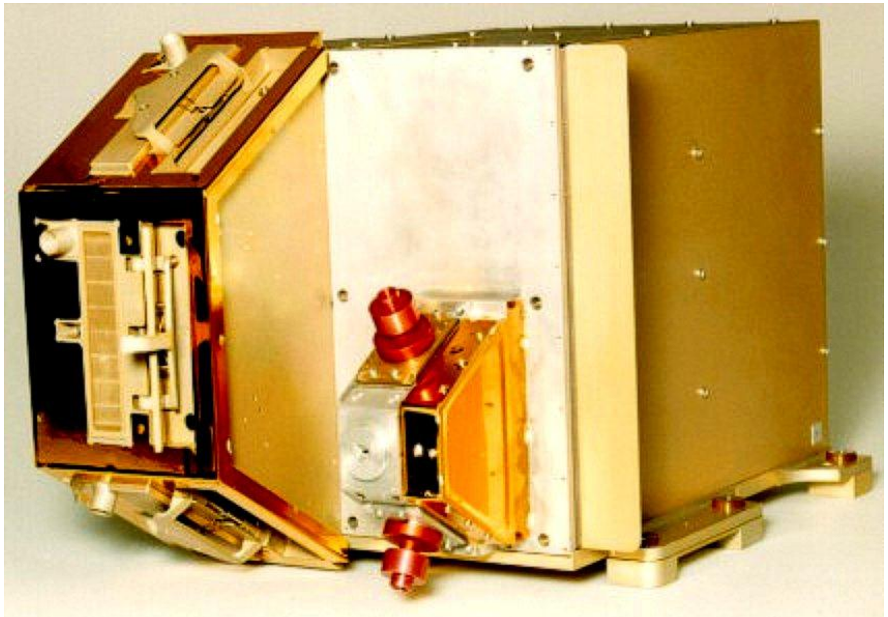
TECHNOLOGY FORESIGHT WORKSHOPS

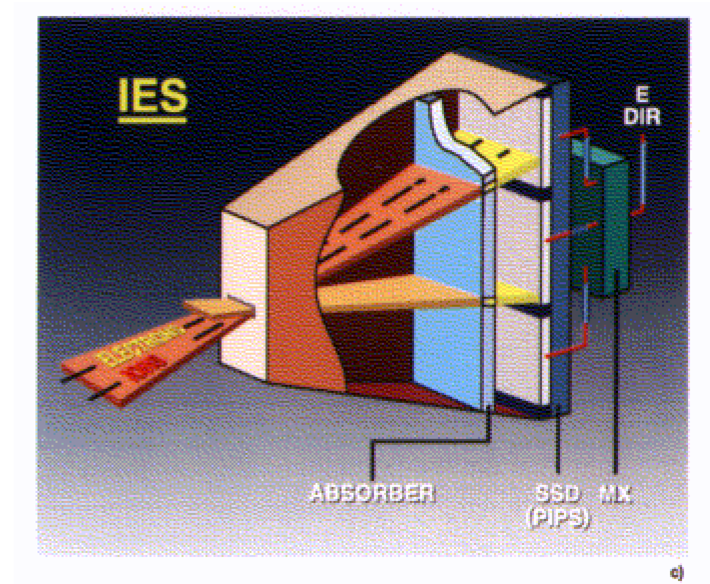
Previous:

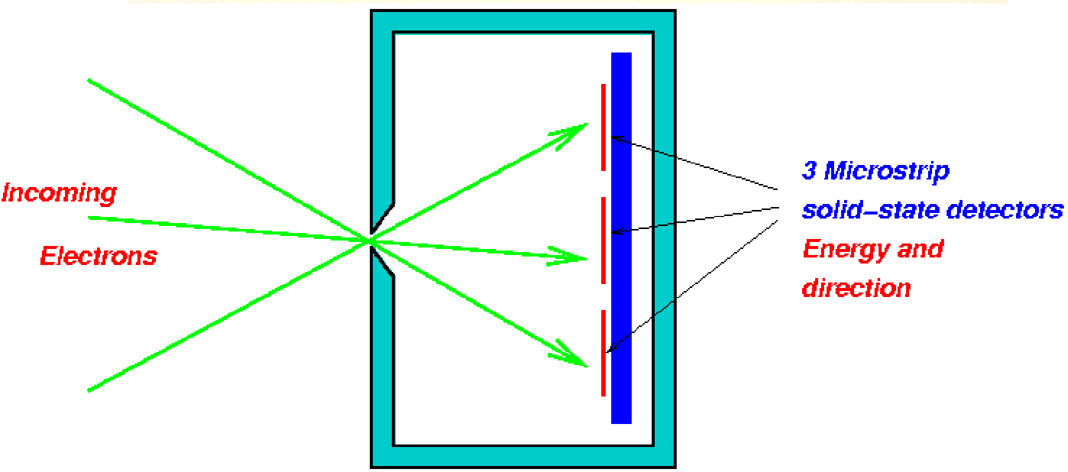
- Planetary Robotics
- Planetary Cartography
- Detectors for Planetary Science

Europlanet Research Infrastructure

MX and Cluster RAPID







One of 3 IES (Electrons) Sensors

X-RAY SPECTROMETER ON SMART-1 AND CHANDRAYAAN -1

1 The Sun shines on the Moon (in X rays)

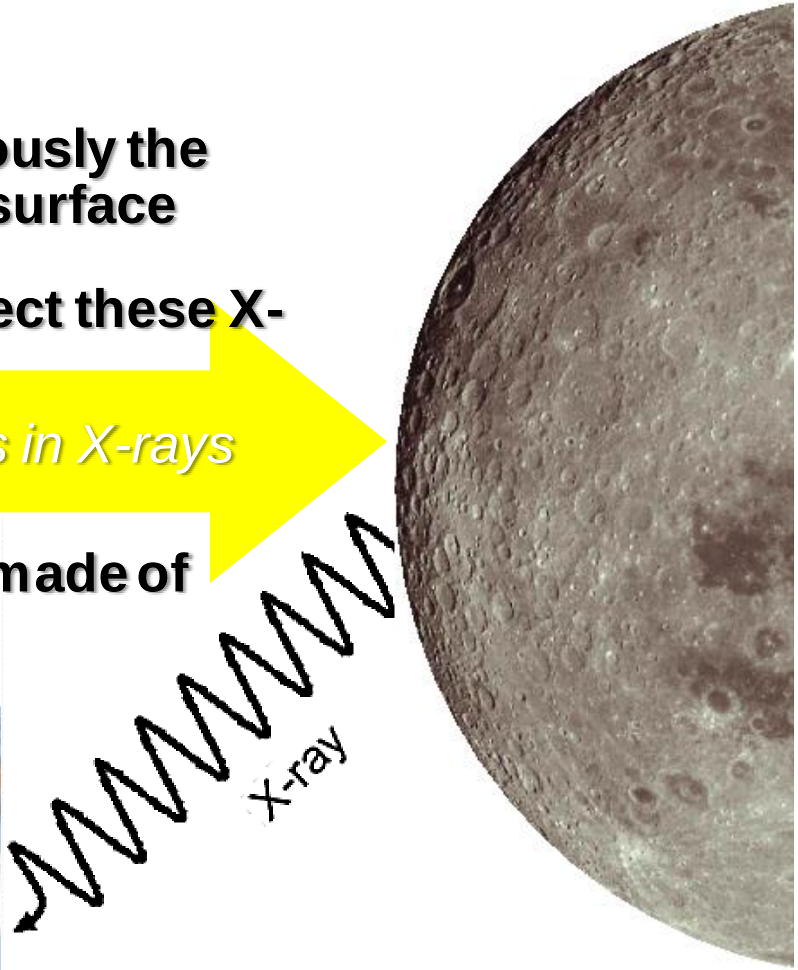
2 The Moon fluoresces

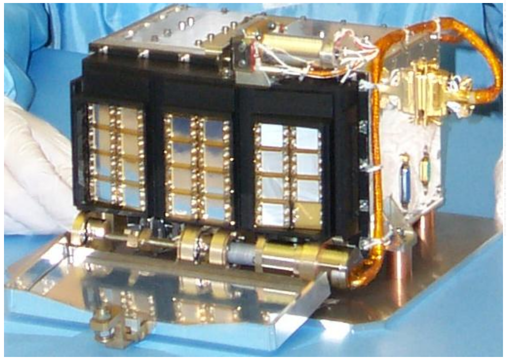
3 Each X-ray energy indicates unambiguously the abundance of a particular element in the surface

4 CIXS used two new technologies to detect these X-rays

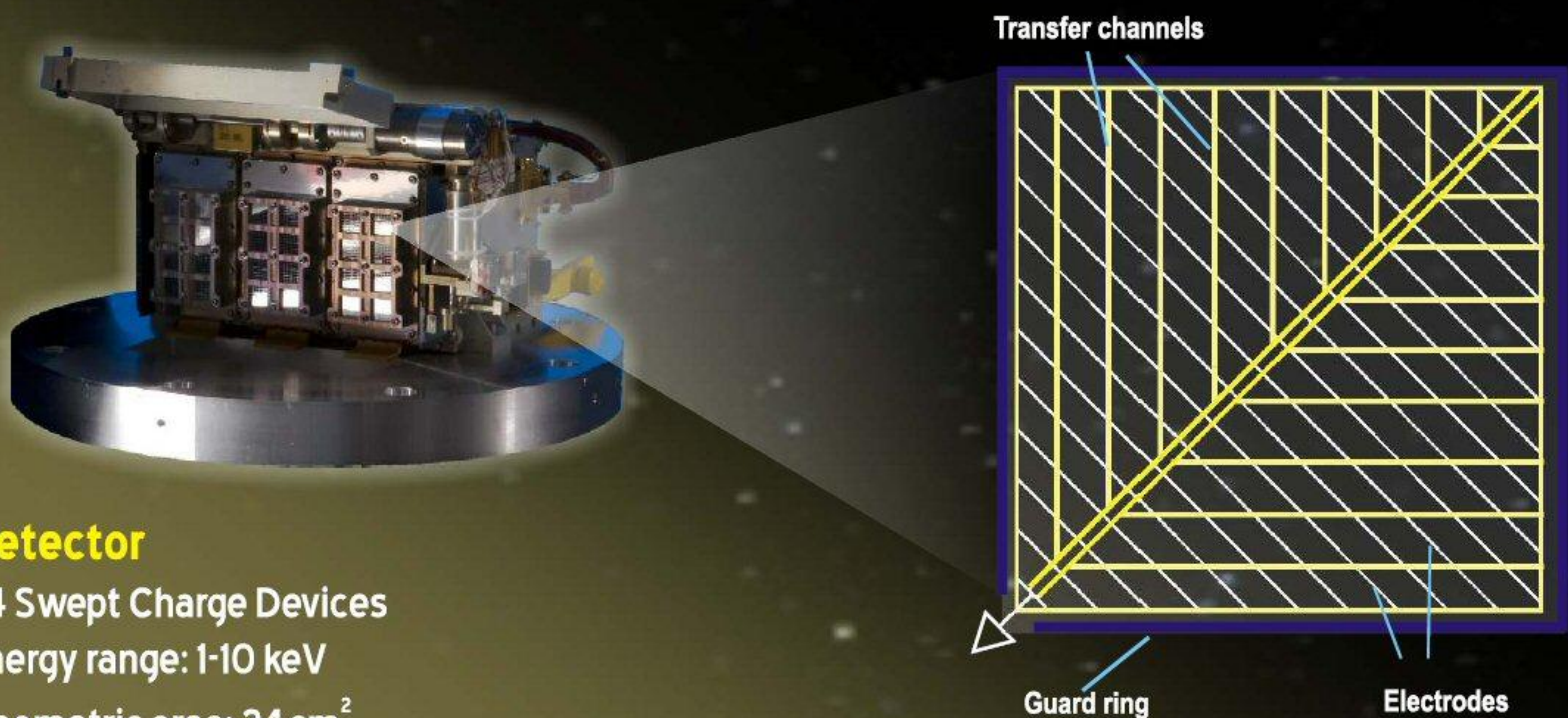
Sun Shines in X-rays

So we could measure what the Moon is made of





C1XS



Detector

24 Swept Charge Devices

Energy range: 1-10 keV

Geometric area: 24 cm^2

Ground resolution: 25 km

Energy resolution : ~100 eV at 1.48 keV (-20°C)

Swept Charge Device

X-ray photon generates a charge cloud which is transferred to the diagonal and then to the amplifier at the left hand corner for further processing.

Need to match up science requirements with available technologies - Galileo:

- But mustn’t forget that the science is primary

QUESTIONS

- What are the major science drivers for the next 20 years? (i.e. from now to 2030)
- How will science instrumentation change over the next 20 years?
- What methods will we need to address these science challenges (Resolution, radiation Hardness, readout speed etc.)?
- What are the priority robotic technologies that we must invest in now to meet these future science challenges?
- What are the priority constituent technologies that we must invest in now to meet these future science challenges? (e.g. materials technology, computing, etc.)
- Are there nearer term technologies that we can significantly improve, and how?
- What will the planetary detector technology road-map look like from now to 2030?

OUTPUTS

Technology Road-Map Overview:

	2010	2015	2020	2025	2030
Science Drivers	How do planets work? Minor bodies research. ROSETTA.	Outer Solar System. Mars orbiter mission (2016).	Post ExoMars (2018). ESA Cosmic Vision.	Lunar exploration. Mars network mission.	Mars Sample Return (MSR). Lunar Tritium Return (LTR).
Future Instrumentation	Smarter science instrumentation.	High impact - tough sensors.	High resolution multi-spectral, multi-dimensional imaging devices.	Rovers carry greater numbers of advanced instrumentation.	Aerobot, Cryobot, Hydrobot instrumentation.
Robotic Exploration Methods	-	Robot Penetrators.	Generic rover exploration architectures.	Legged robotic devices.	Aerobot technology. Cryobot technology. Hydrobot technology.
Priority Future Robotic Technologies	Improved sample acquisition technologies.	Greater robot autonomy. Autonomous science robots.	Dexterous planetary robots. Faster/further robot locomotion.	Cooperating robots – robot/robot and robot/human. 'Health' self-aware robots	Cryobots for Europa, Mars Polar region. Dark Lunar craters.
Priority Future Constituent Technologies	-	New materials and on-board computing for robot fabrication.	"Smaller, lighter, smarter" robotic technology.	Dedicated in-orbit planetary robot assets communications technology.	New power technologies for planetary aerial/surface/sub-surface robots.
Nearer Term Robotic Technology Improvements	Improved international standards (e.g. calibration).	Improved ground-based processing for robot data processing and commanding.	Improved radiation hard technologies for planetary robotics.	-	-

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Version: 24.11.2009

Some Roadmap Implications - 1

- There are a host of background issues (mass, volume, power, computing) that must be taken onboard and cannot be ignored. Engineering constraints improvements are essential.
- We need alternative locomotion methods for future planetary & lunar robotic exploration. We need robots that can move further and faster. Faster on-board vision processing required.
- Greater travel distances (traverse or airborne) will require autonomous localisation. Greater improvements required for on-board processing for rover localisation pipe-line.
- All future missions will require greater autonomy and the ability to conduct autonomous (opportunistic) science. Increased on-board image processing demands. New science target identification vision based algorithms.