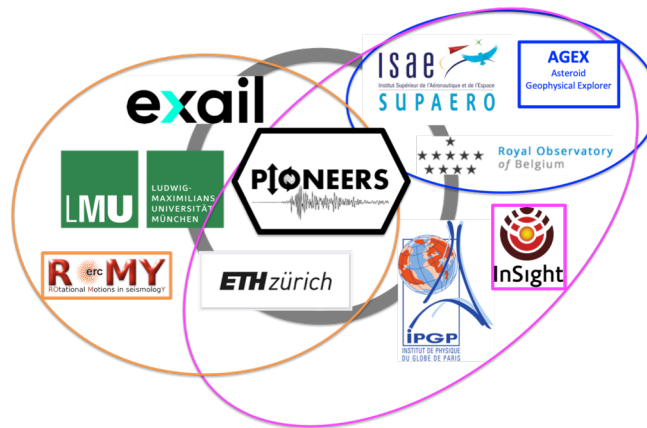


What do terrestrial planets and asteroids look like inside?

## PIONEERS consortium

<b>ISAE SUPAERO</b>	France (project lead)
<b>exail</b>	France
<b>ETH</b>	Switzerland
<b>LMU</b>	Germany
<b>iPGP</b>	France
<b>ROB</b>	Belgium

Partners from 4 European countries gather their expertise from a variety of disciplines in research and industry, having participated in space missions at the frontier of planetary science.



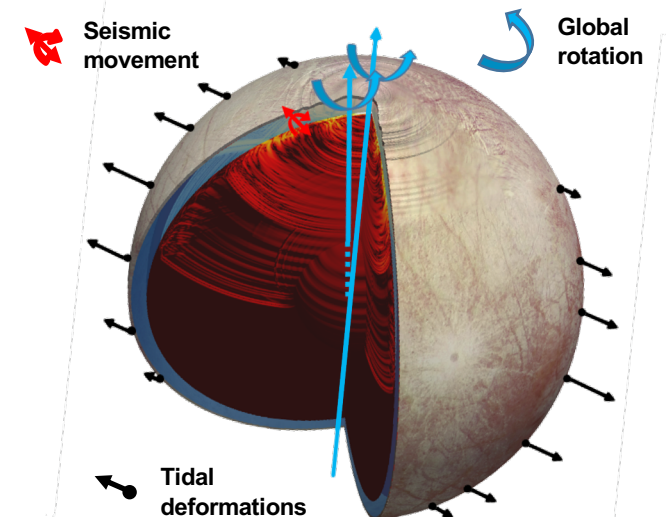
[www.H2020-pioneers.eu](http://www.H2020-pioneers.eu)

*This project has received funding from the European Union's H2020 Research and Innovation programme under the grand agreement N°821881*



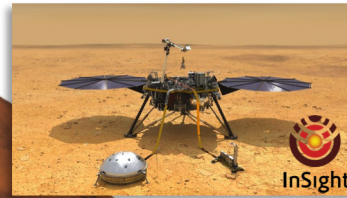
Planetary Instruments based on Optical technologies for an iNnovative European Exploration using Rotational Seismology

## Probing the interior of Solar System bodies

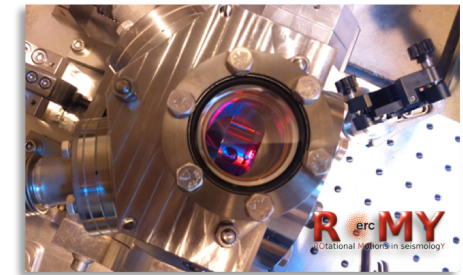


# PIONEERS

The **interior structure** of asteroids and planets gives insight into their **formation and evolution**. This is especially crucial for asteroids that could become a **threat to life on Earth**. Interior composition and mechanical properties must be known to develop effective countermeasures, and safely perform **proximity operations** on asteroids with spacecraft.

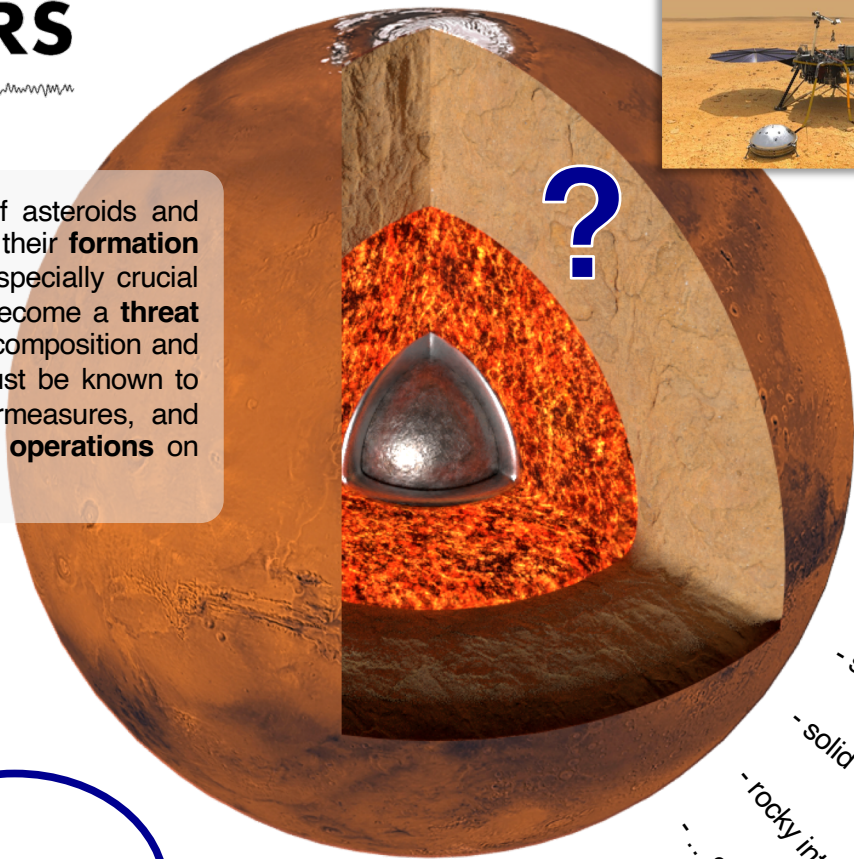


The **PIONEERS** next generation planetary ground motion instrumentation uses **optical fiber sensors** to deliver performance 100x better than existing space seismometers.

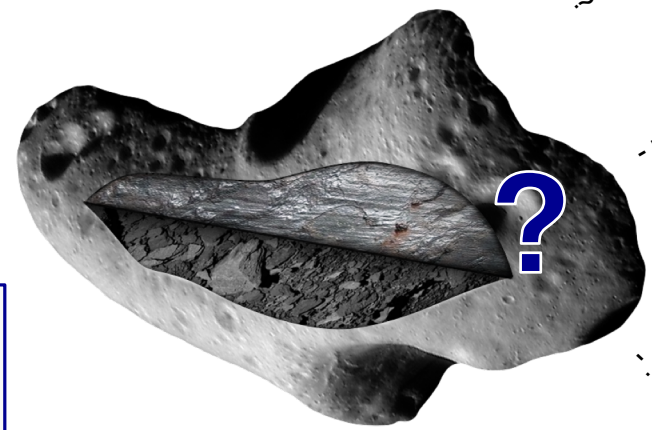


Advancing technology from the **InSight** mission on Mars and from the **ROMY** project on Earth

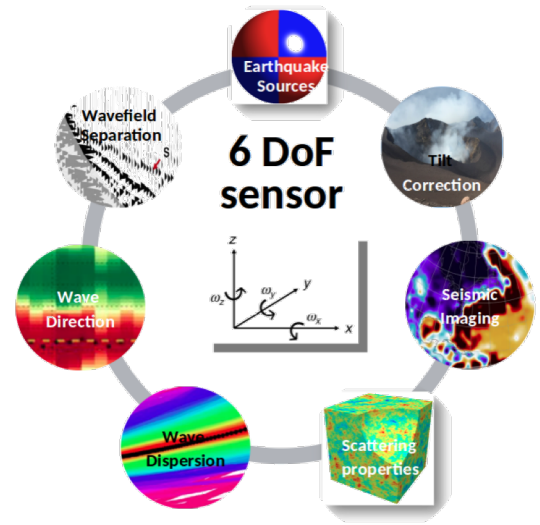
The new instrumentation measures all **six degrees of freedom (6-DOF)**: x, y, z translations and  $\omega_x$ ,  $\omega_y$ ,  $\omega_z$  rotations. This returns information **equivalent to small seismic arrays**.



- liquid core?
- subsurface ocean?
- solid core?
- rocky interior?
- ...?



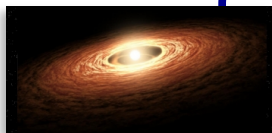
- macro porosity?
- rubble pile?
- micro porosity?
- ...?



planetary defense



interior structure



formation of the Solar System



proximity spacecraft

The **PIONEERS** innovative 6-DOF sensors are first of their kind and will demonstrate technology in space that does not exist yet for Earth.

Learn more on [www.H2020-pioneers.eu](http://www.H2020-pioneers.eu)