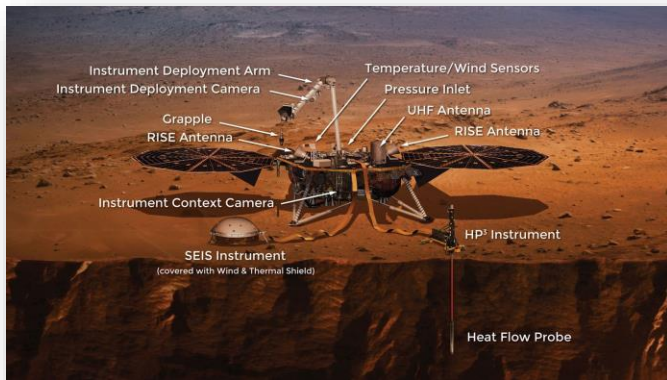




# Polish contribution to NASA InSight mission to Mars



*Credits: NASA/JPL/DLR*



**Warsaw University  
of Technology**

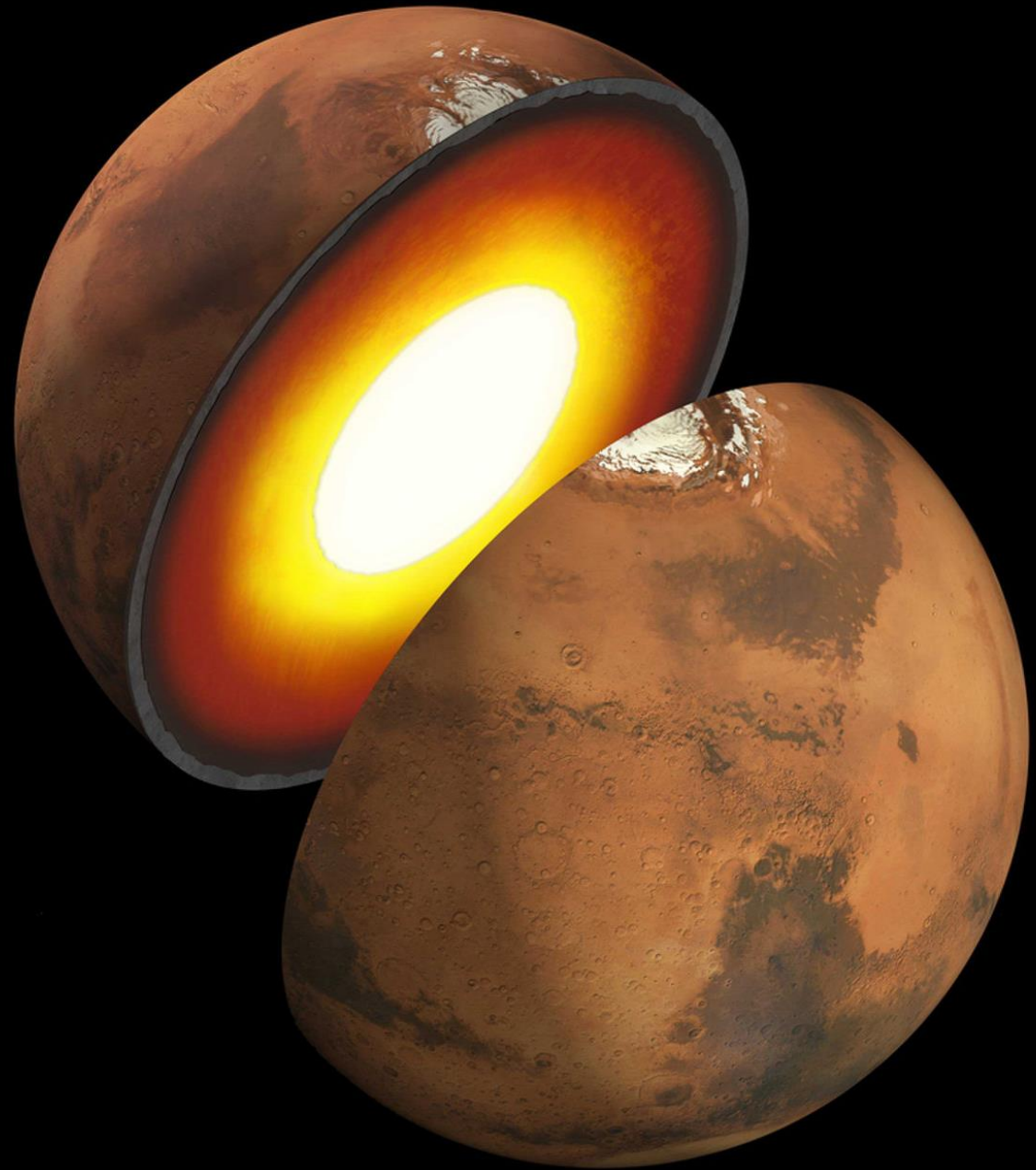


Presenter: Łukasz Wiśniewski (Astronika, Poland)

**On behalf of colleagues from:**

Astronika, Space Research Centre PAS, Warsaw University of  
Technology, Institute of Aviation, Lodz University of Technology

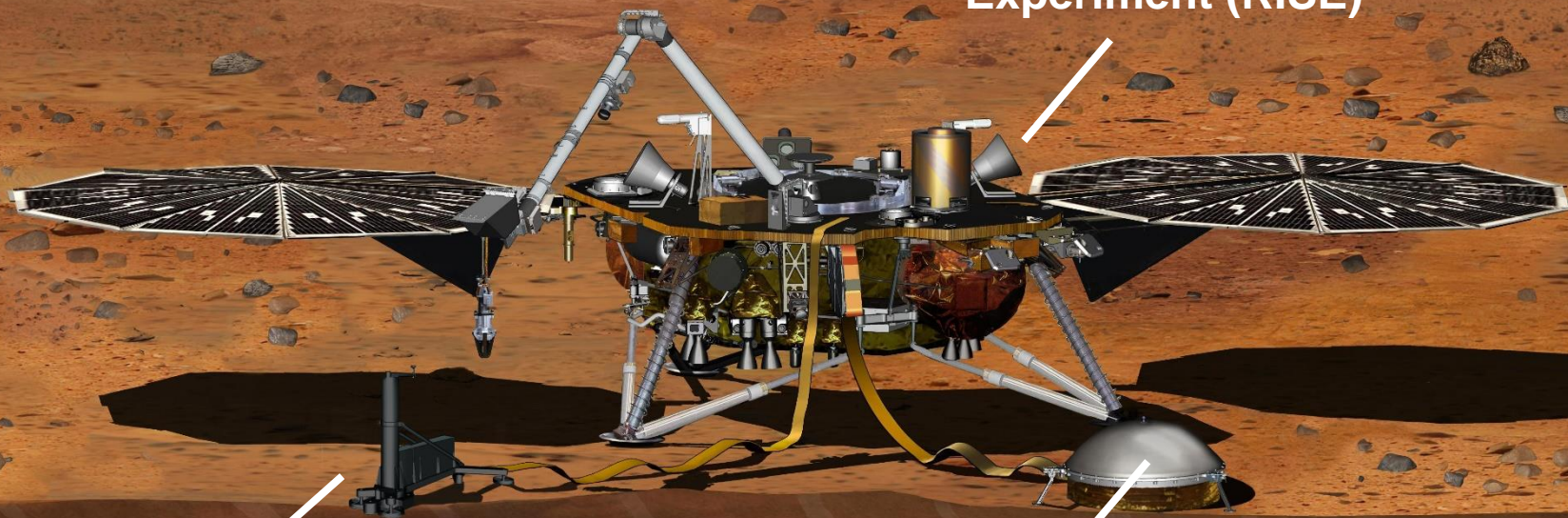
NASA InSight mission is  
the first mission to study  
interior of Mars



PI: Bruce Banerdt (JPL)



Rotation and Interior Structure Experiment (RISE)



Heat Flow and Physical Properties Package (HP3)  
PI: prof. T. Spohn

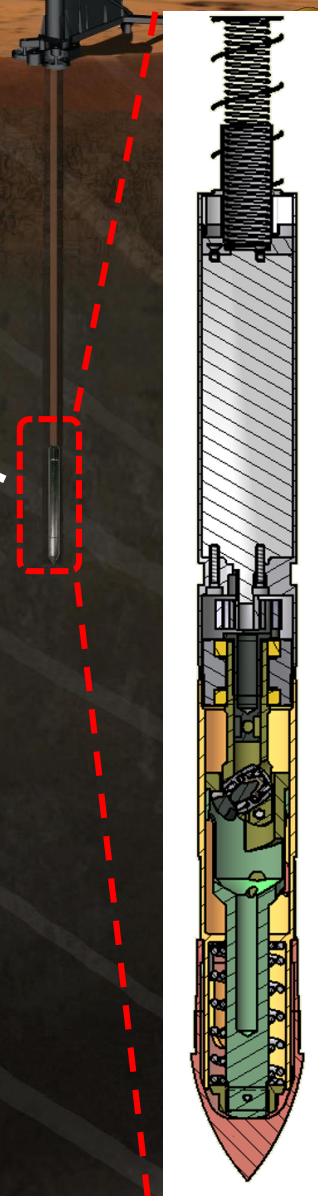
Seismic Experiment for Interior Structure (SEIS)



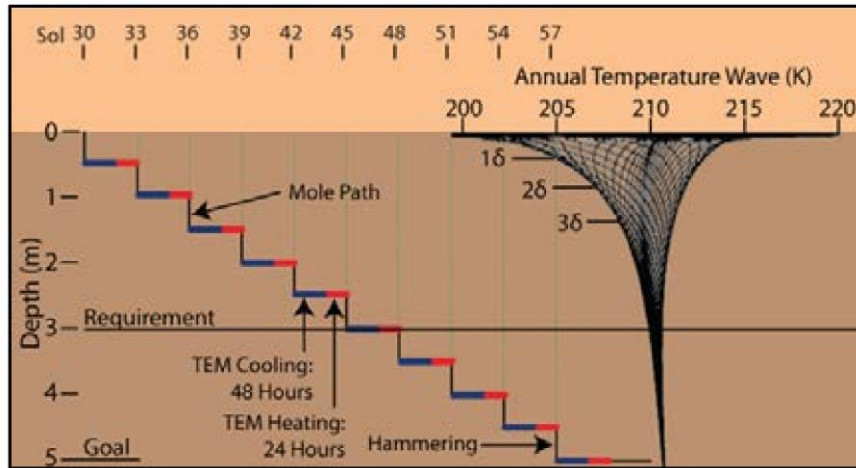
Credits: NASA/JPL/DLR



Heat Flow and  
Physical  
Properties  
Package (HP3)  
PI: prof. T. Spohn

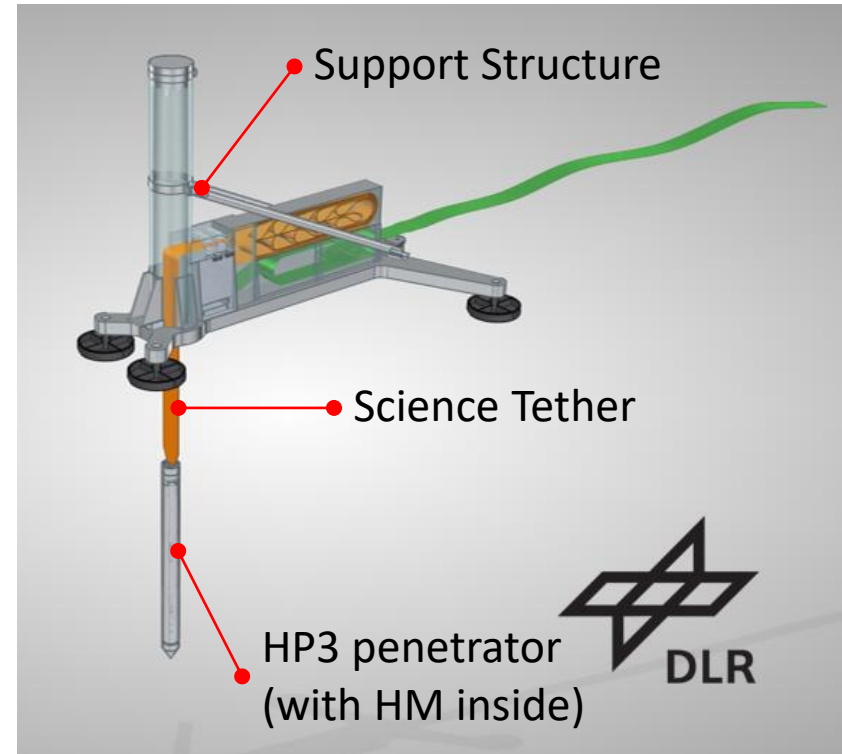


# Scientific goal of HP<sup>3</sup> experiment



Operational scenario for HP3 after deployment onto the ground by the robotic arm\*

\* Spohn T. et. al.: *InSight: Measuring the Martian heat flow using the Heat Flow and Physical Properties Package (HP3)*. In *Proceedings of International Workshop on Instrumentation for Planetary Missions*. 2012.

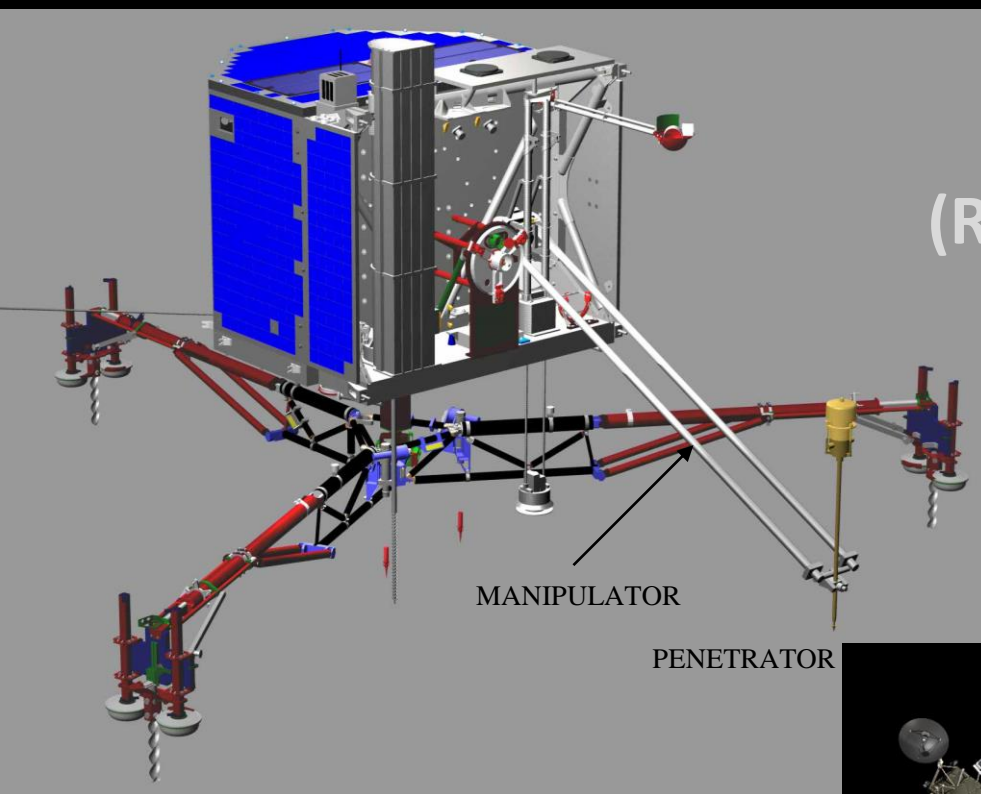


*Heat Flow probe with support structure,  
Source: dlr.de*

- Deliver heat probe below required 3m
- Determine the thermal gradient and heat flow of Martian surface
- Measurement supported with radiometer's surface temperature measurement

# Why Poland got involved?

Heritage and world recognized experience in space penetrometers development back to 90's

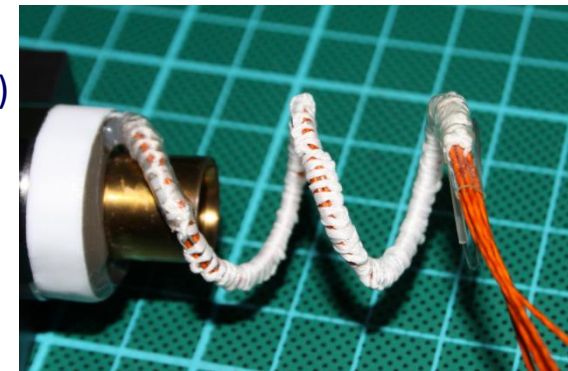
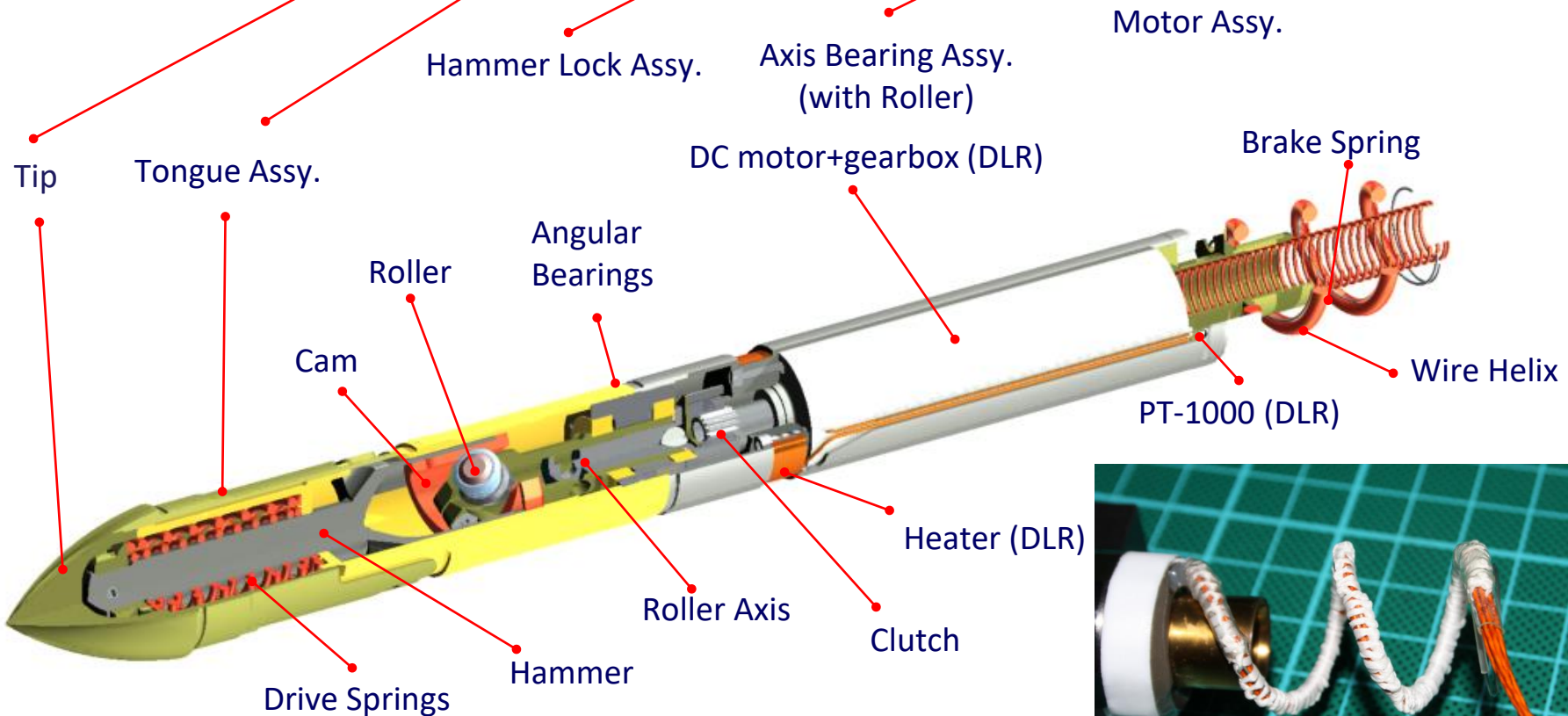
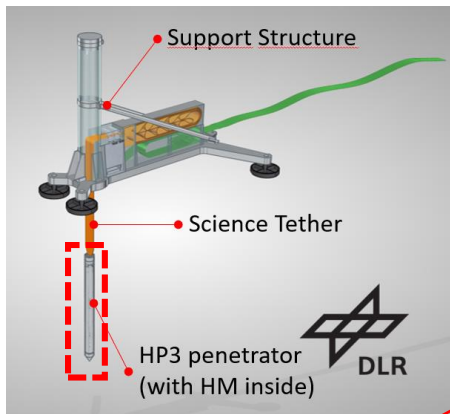


**MUPUS**  
(Rosetta mission)

MUPUS-TP on-board PHILAE lander (ESA/DLR)



# How Poland contributed to the InSight mission?



# How Poland contributed to the InSight mission?



Hammering Mechanism  
design and integration →



Parts manufacturing →

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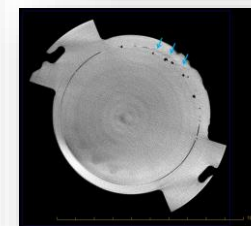
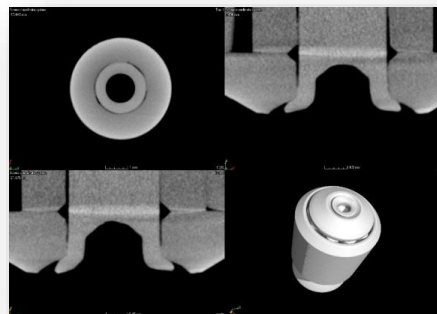
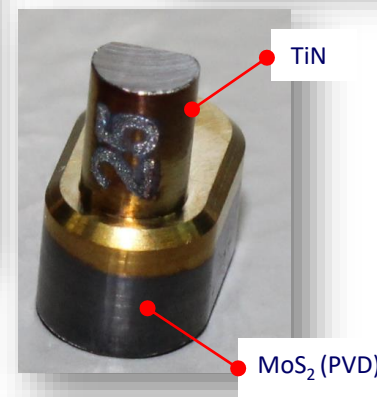
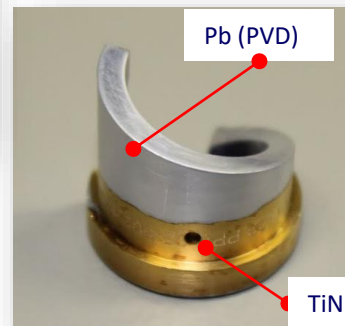
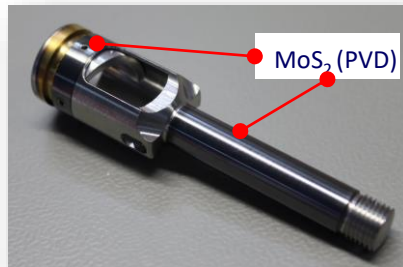
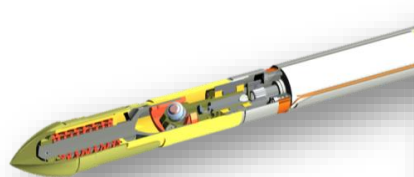
+



Coatings, tribology and surface engineering →

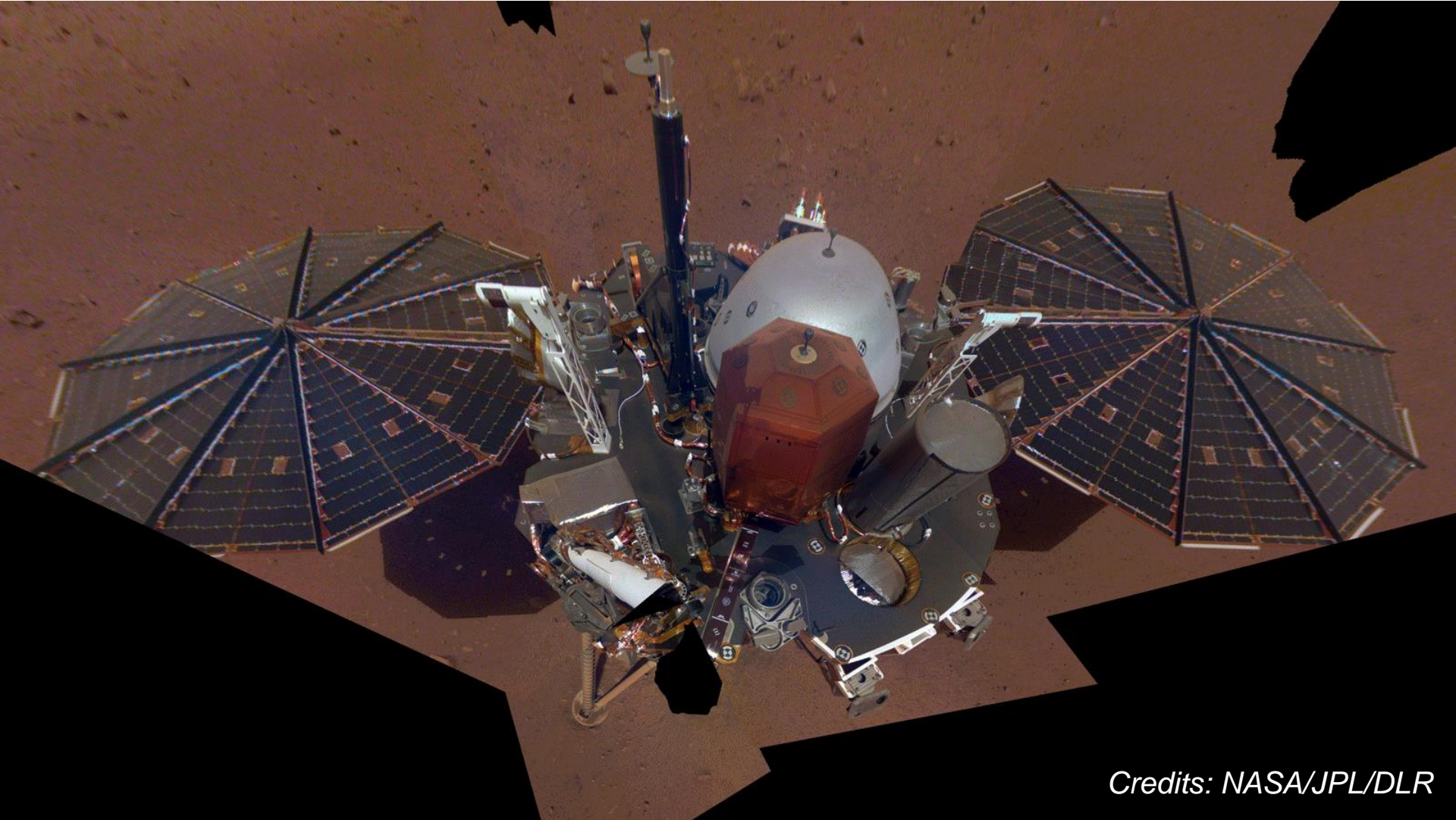


Non-destructive inspection  
(Computer Tomography) →



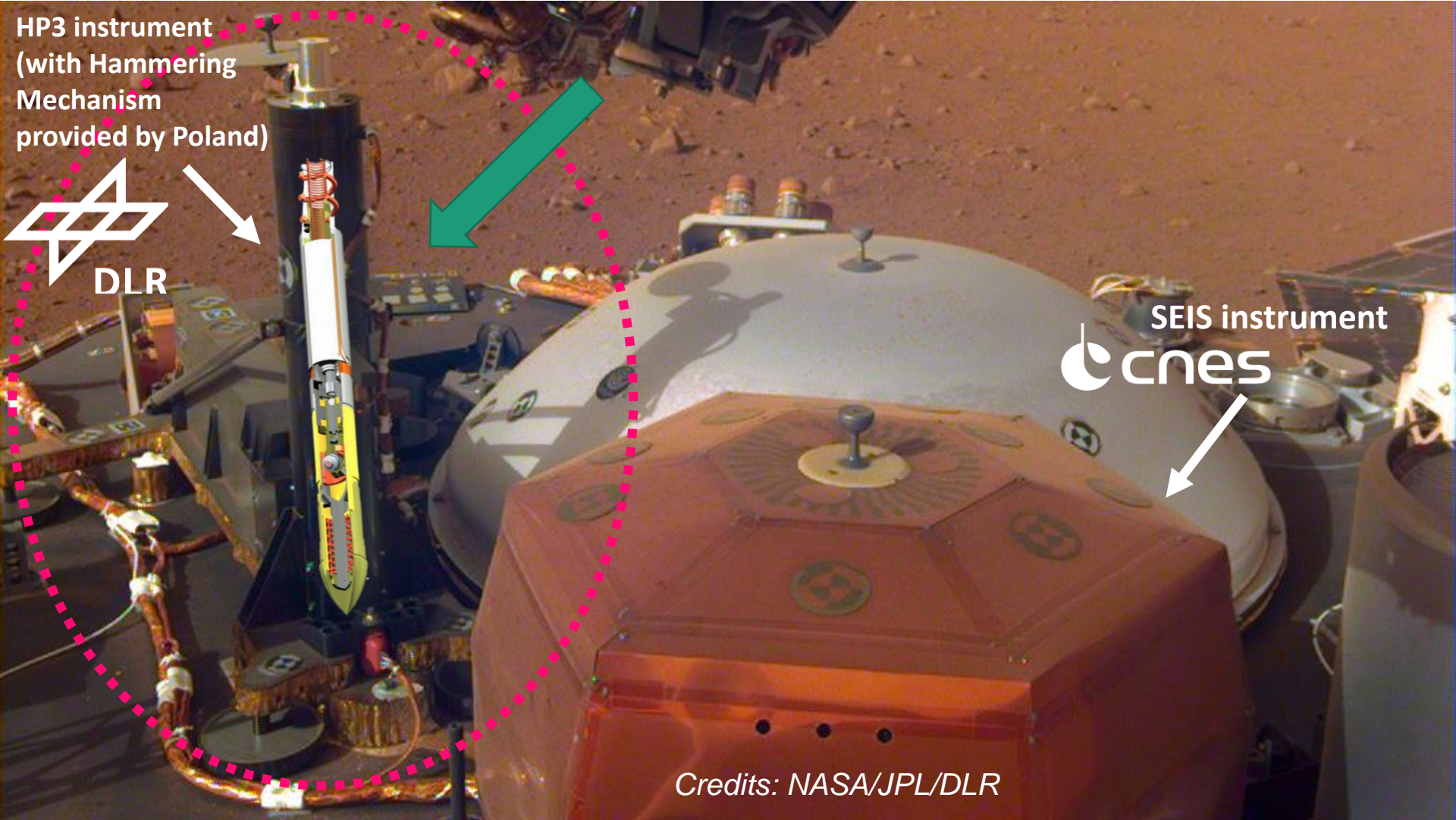


**The lander successfully landed on November 26th 2018**



*Credits: NASA/JPL/DLR*

# Instruments located on the lander's platform



Hi Jurek

See enclosed. This is the first time that a NASA Lander carries more than the American flag. Take particular note of the Polish flag

Best

Tilman (Primary Investigator of HP3 experiment, DLR)

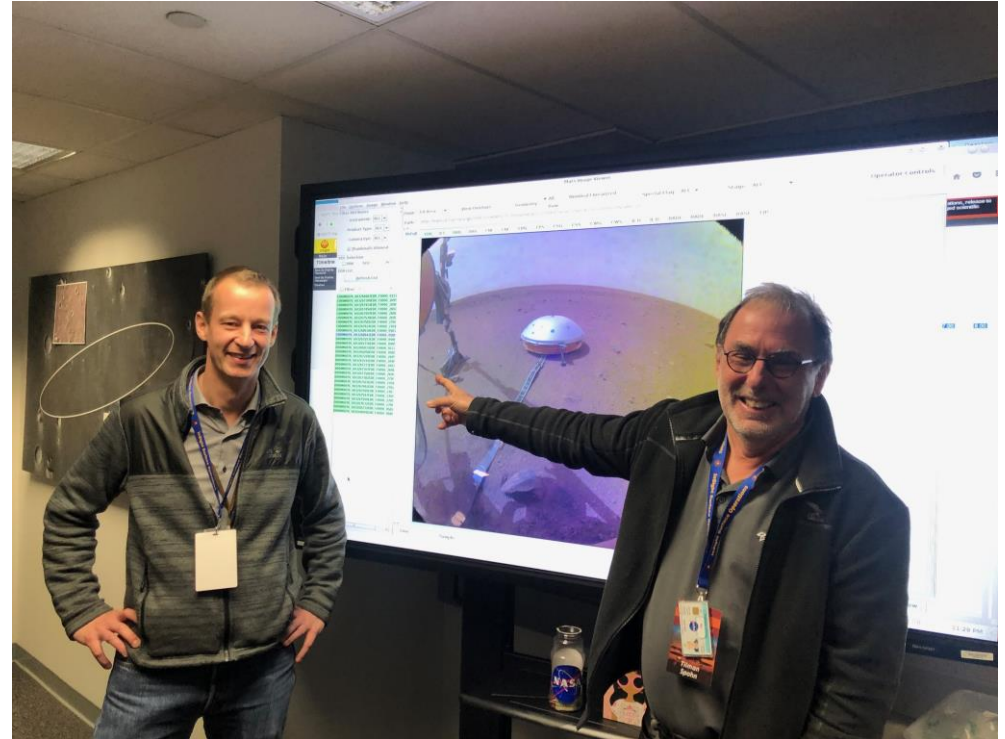


Credits: NASA/JPL/DLR

# HP3 touch down on February 12th 2019



*Credits: NASA/JPL/DLR*



*Dr M. Grott and Prof. T. Spohn (PI, DLR) showing successful deployment of HP3 instrument on the surface of Mars*

**Commending a hammering action is scheduled for tomorrow!**

# Key message

- The first NASA mission with multinational instrumentation on-board
- The first mission to study interior of Mars
- Example of continuation of good cooperation between German and Poland in space penetrators and hammering mechanisms
- InSight mission as a good example of pushing the limits of space exploration by strong international cooperation
- Importance of generation continuity in space developments. The heritage and experience is built for tens of years (here for over 20 years). Make sure there are no generation gaps.
- **Don't forget:** Commending a **hammering action** is scheduled for **tomorrow!**

Thank you for attention!  
Questions?