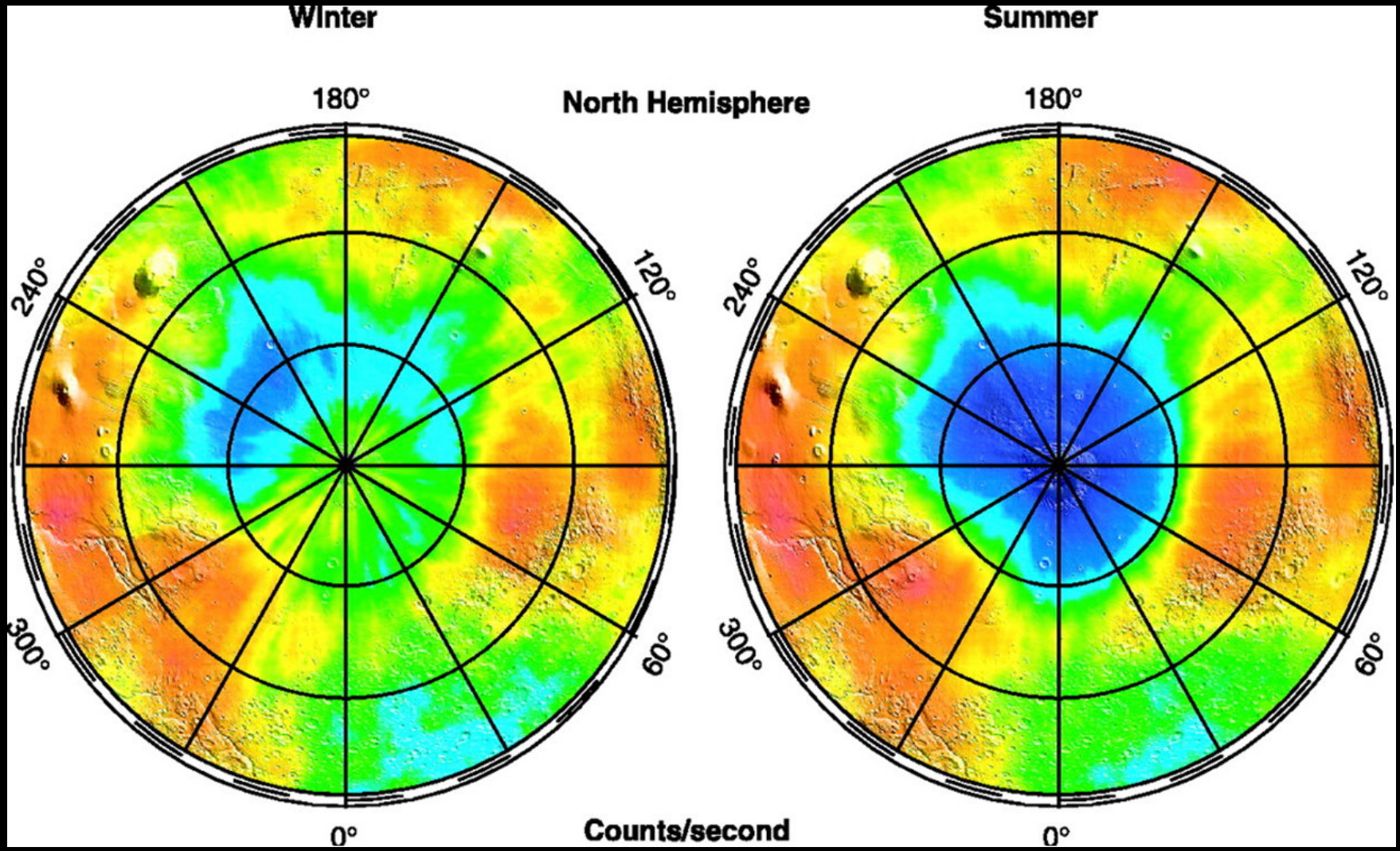

Phoenix
The First Mission To The Mars Polar Region
Barry Goldstein
Project Manager

Phoenix Was Conceived to Respond to the Discovery by Odyssey in 2003

A Large Body of Ice Water at the Poles



The Big Questions?

- What happened to the Martian water?

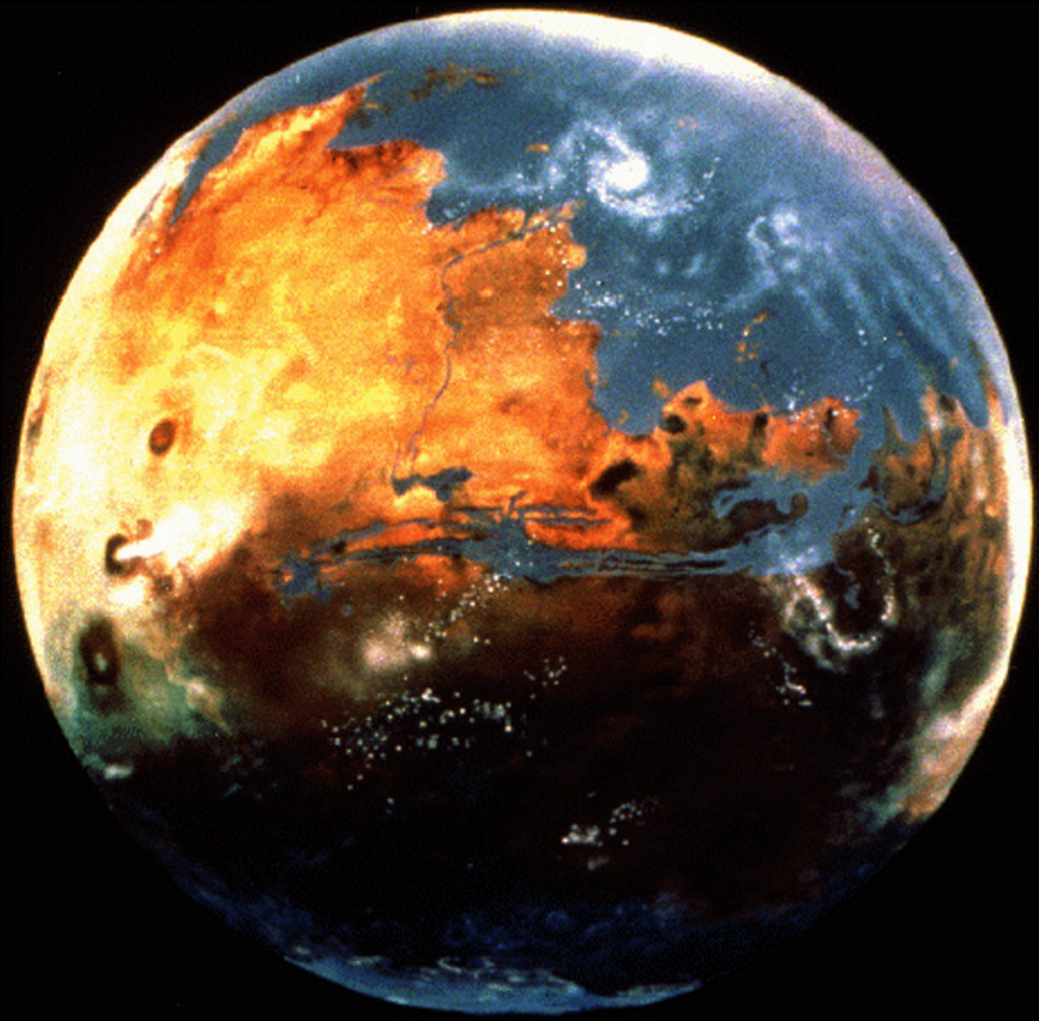
  Phoenix will be the first mission to touch and examine water on Mars

- Is there biological potential at the northern polar region of Mars?

  Three components necessary:
  Water ➔ Did the ice melt?
  Food ➔ Are there organics?
  Energy ➔ If at the surface/sun

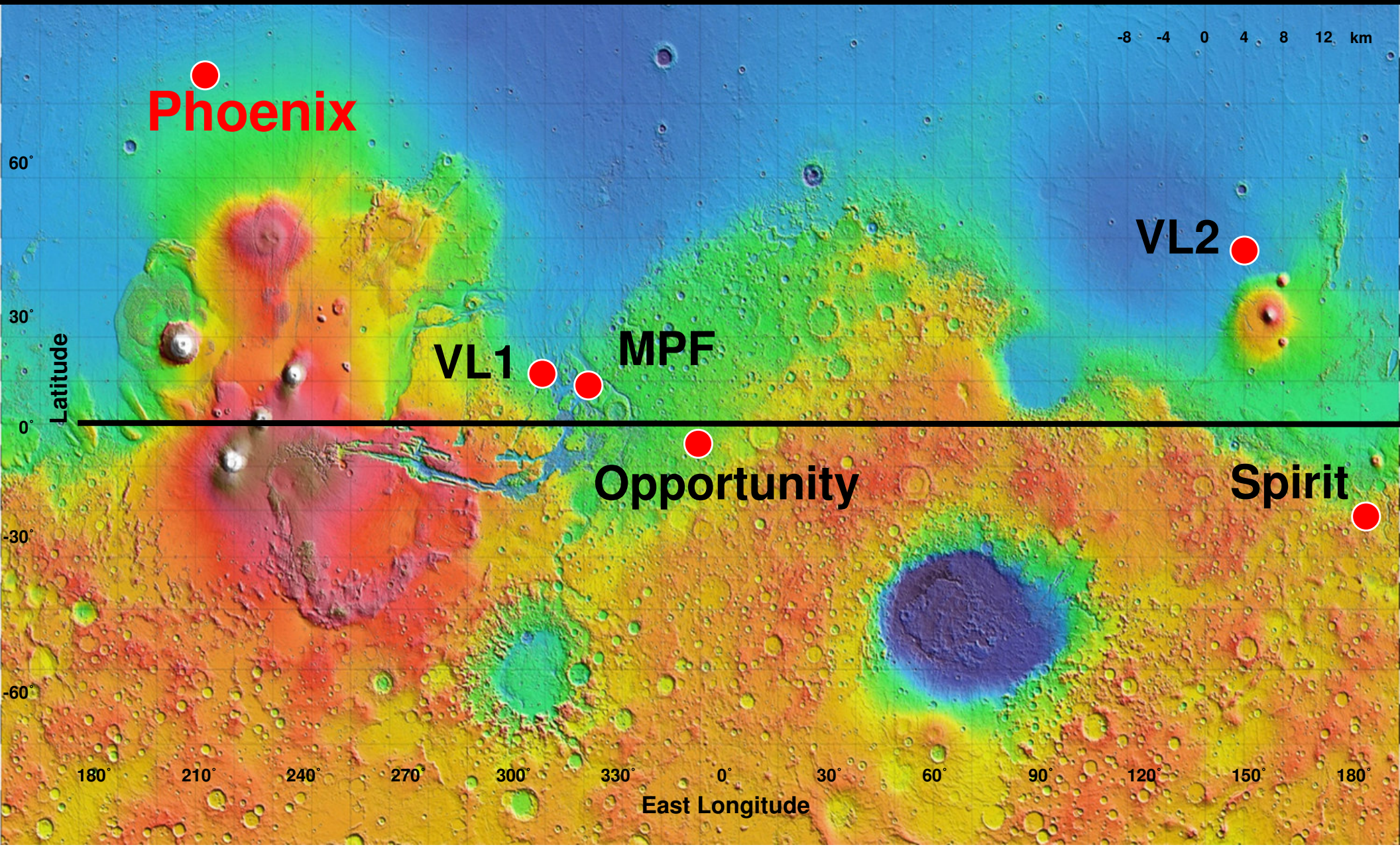
- Do the poles indicate global climate change?

  Global climate change is always dominated by polar processes

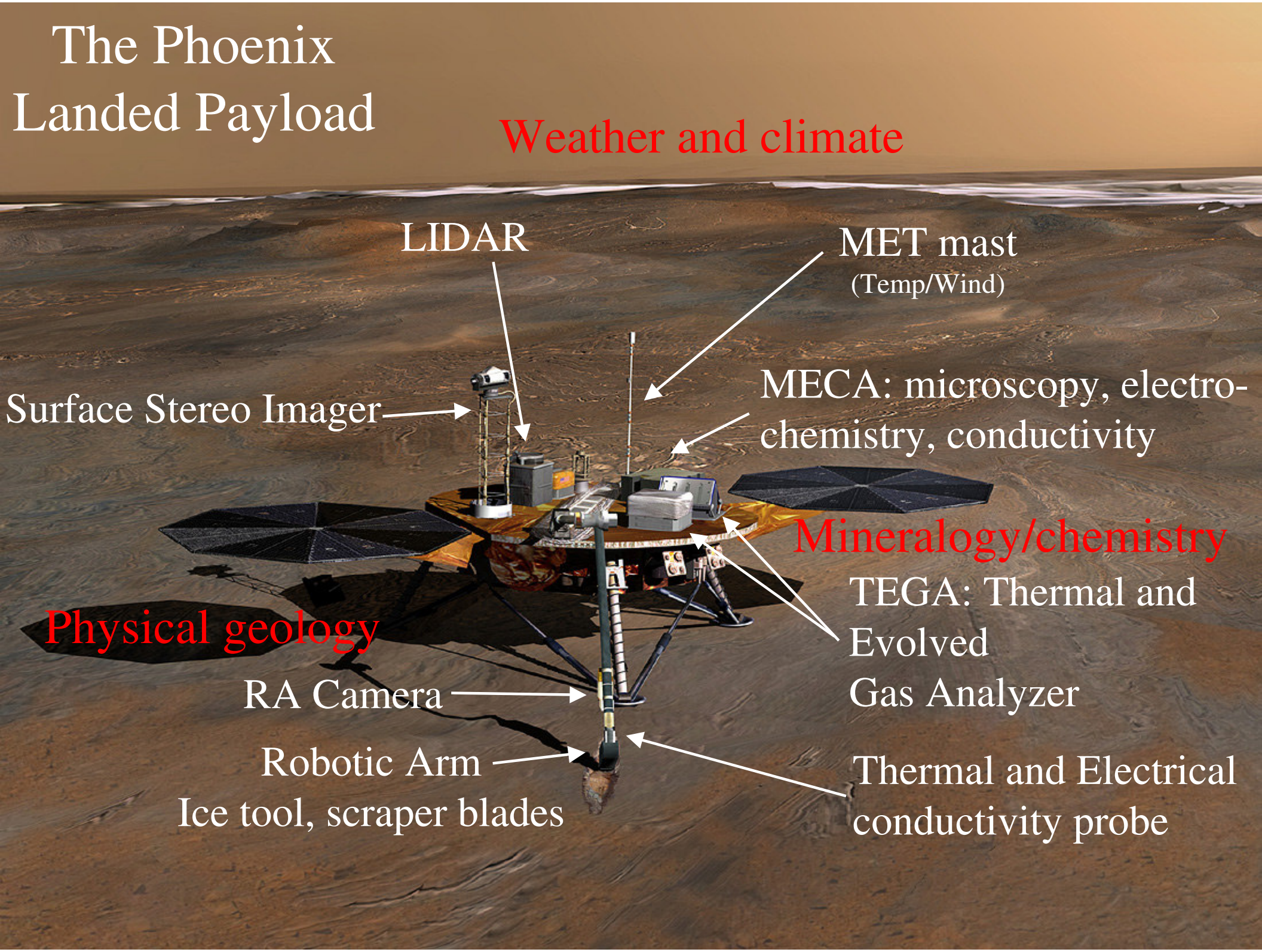


Ancient Mars?

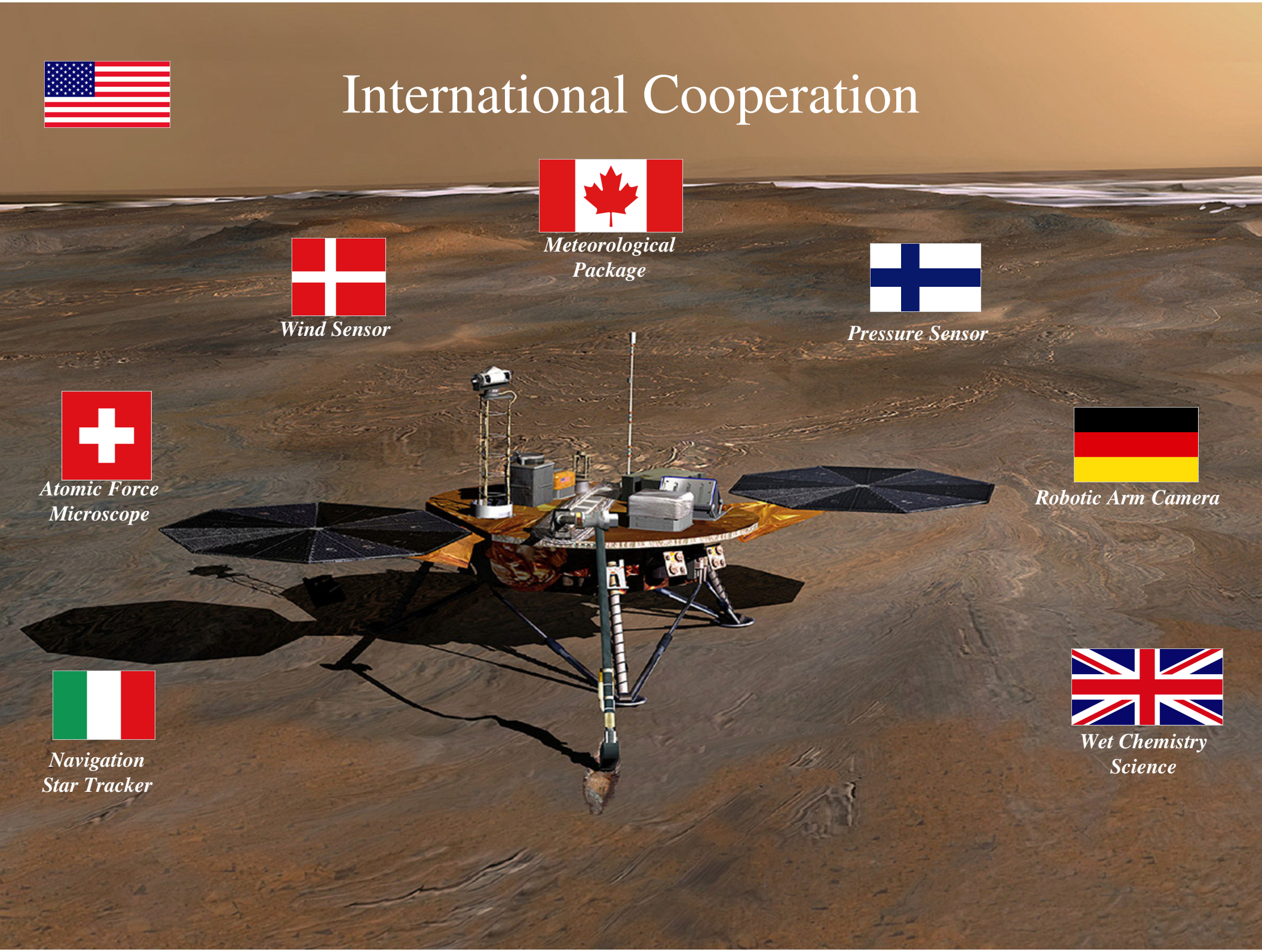
Phoenix Landing Site Is Much Farther North Relative to the Other Landers

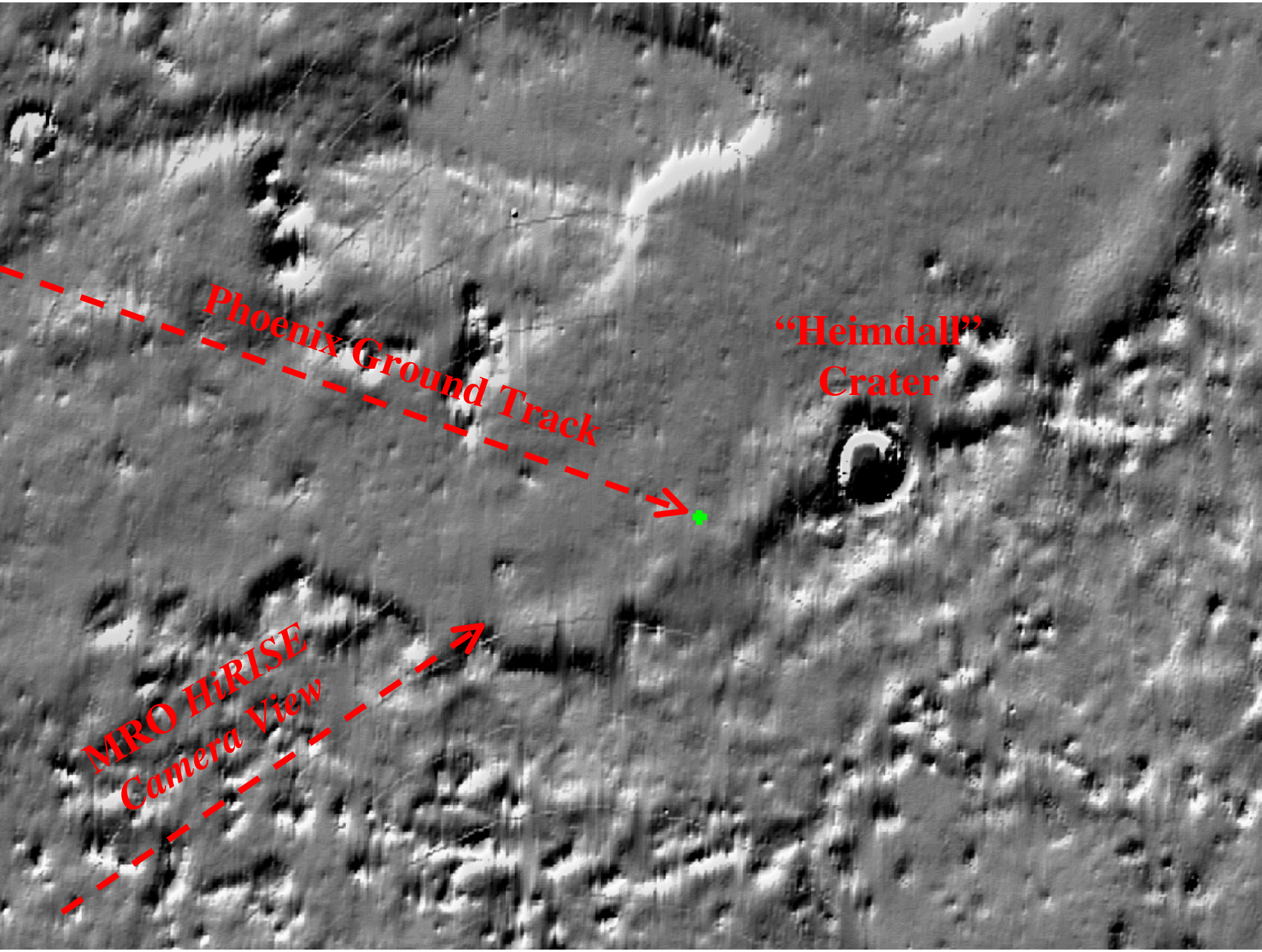


Phoenix Landing Site Latitude and Longitude If It Were on Earth


The Phoenix
Landed Payload
Weather and climate
LIDAR
MET mast
(Temp/Wind)
Surface Stereo Imager
MECA: microscopy, electro-
chemistry, conductivity
Mineralogy/chemistry
TEGA: Thermal and
Evolved
Gas Analyzer
Physical geology
RA Camera
Robotic Arm
Ice tool, scraper blades
Thermal and Electrical
conductivity probe

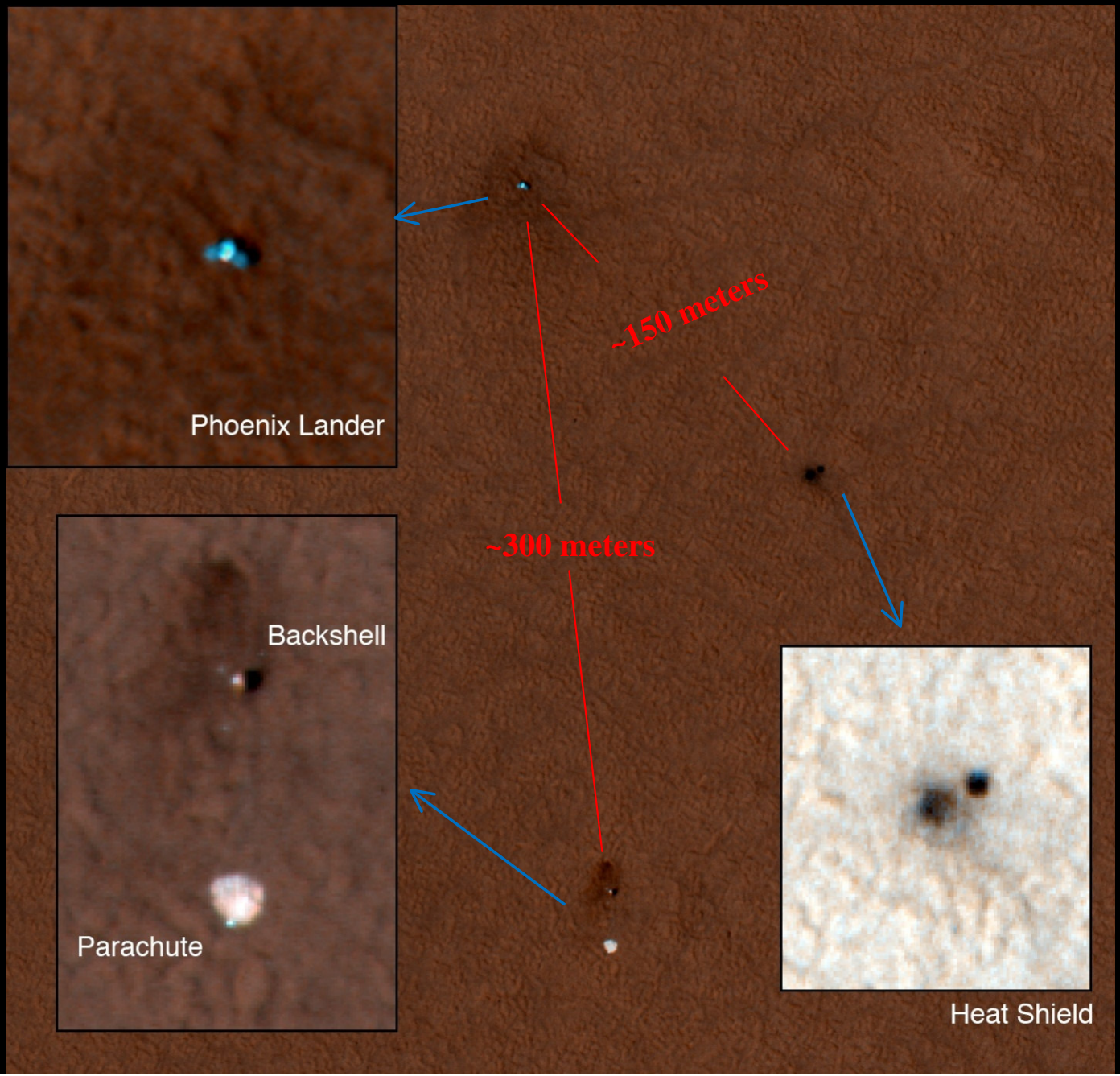
International Cooperation




Phoenix Ground Track
"Heimdall" Crater
MRO HiRISE Camera View

We landed 22 km away from the rim!

Family Portrait

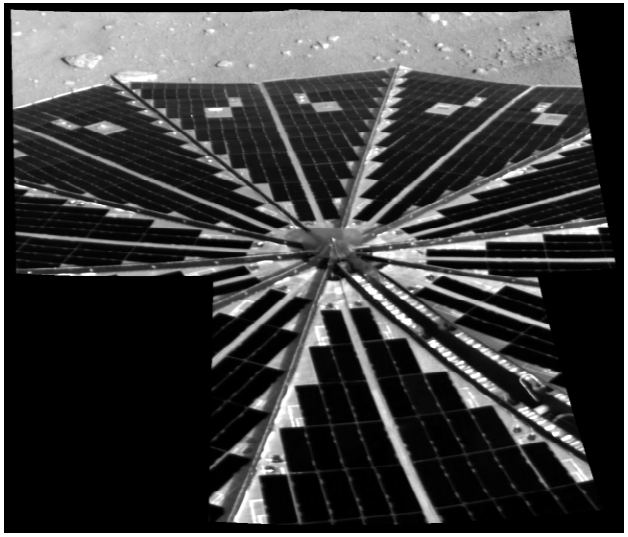


National Aeronautics and Space Administration
Jet Propulsion Laboratory
California Institute of Technology

Phoenix

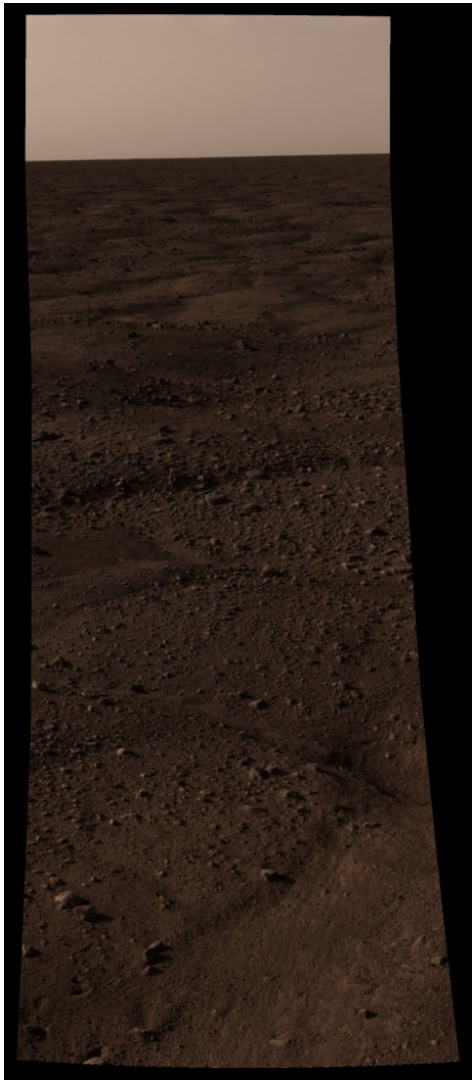
Sol-0

LOCKHEED MARTIN

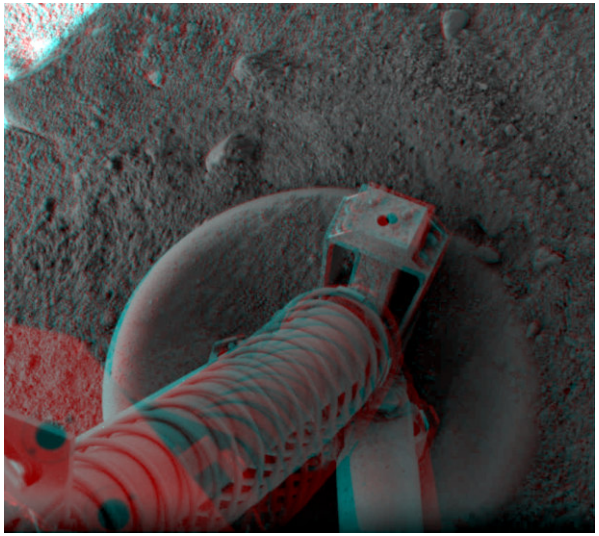


Solar Array Deployed

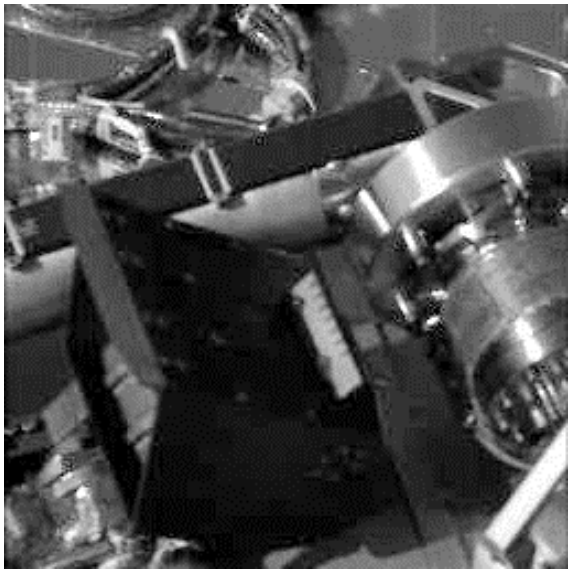
RA Bio-Barrier/MET Mast (deployed)



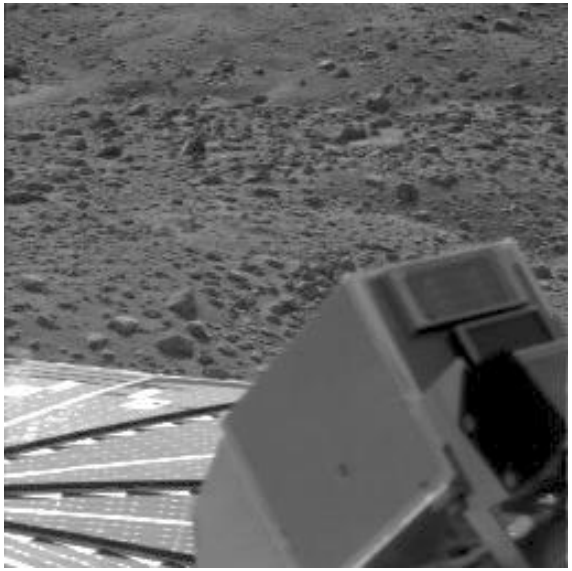
Horizon Postcard



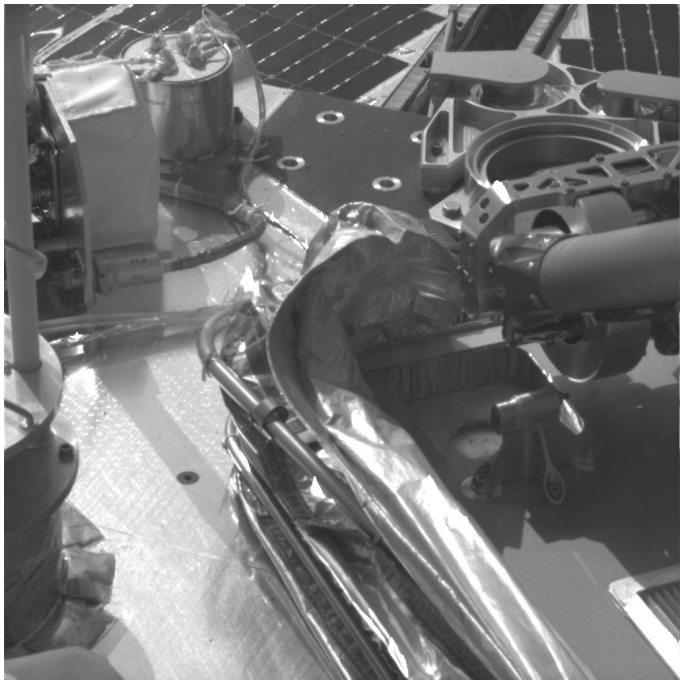
Footpad (very little soil)



Wrist Deployment



RAC High Above The Deck



Elbow Deployment

Deployment of Robotic Arm

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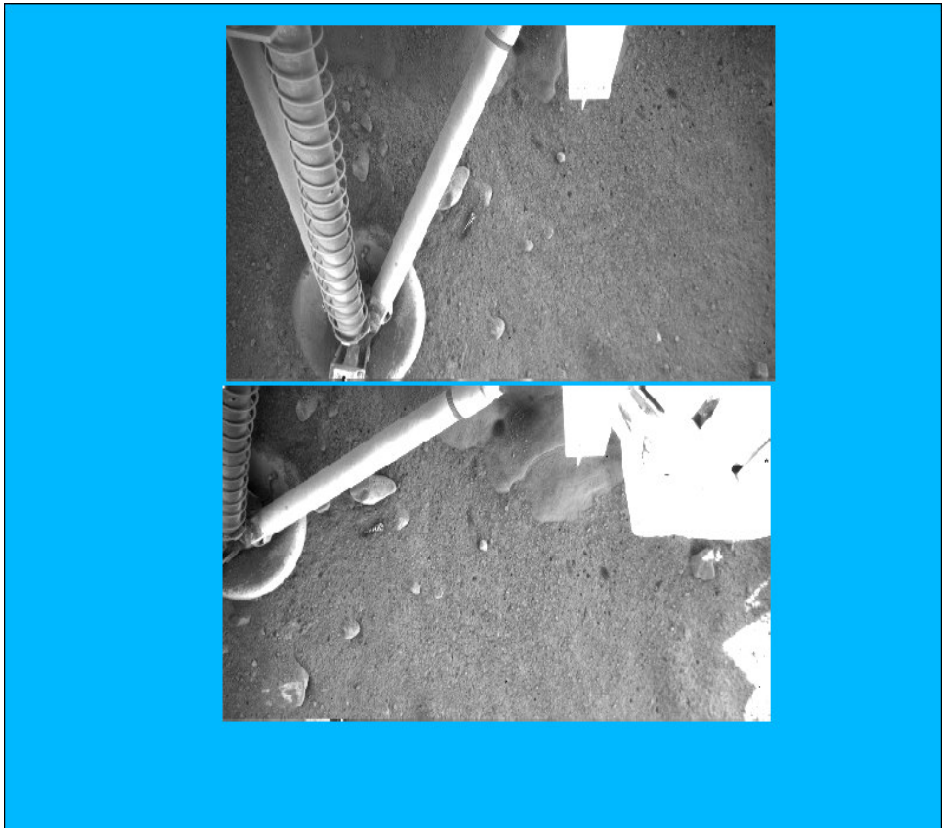
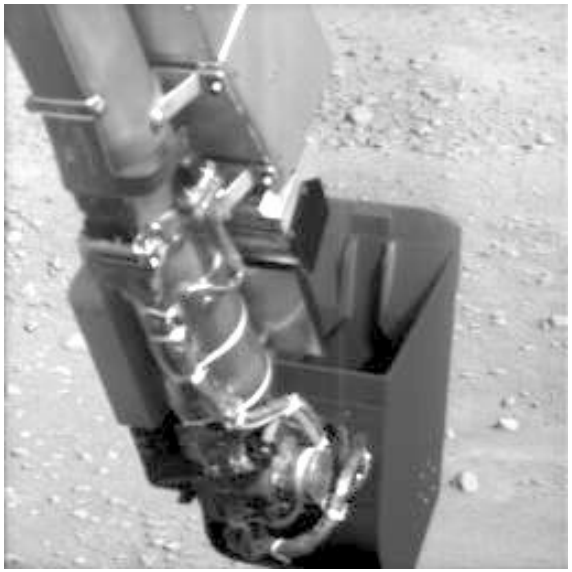
Sol-4

LOCKHEED MARTIN

LIDAR cover deployed
First Data

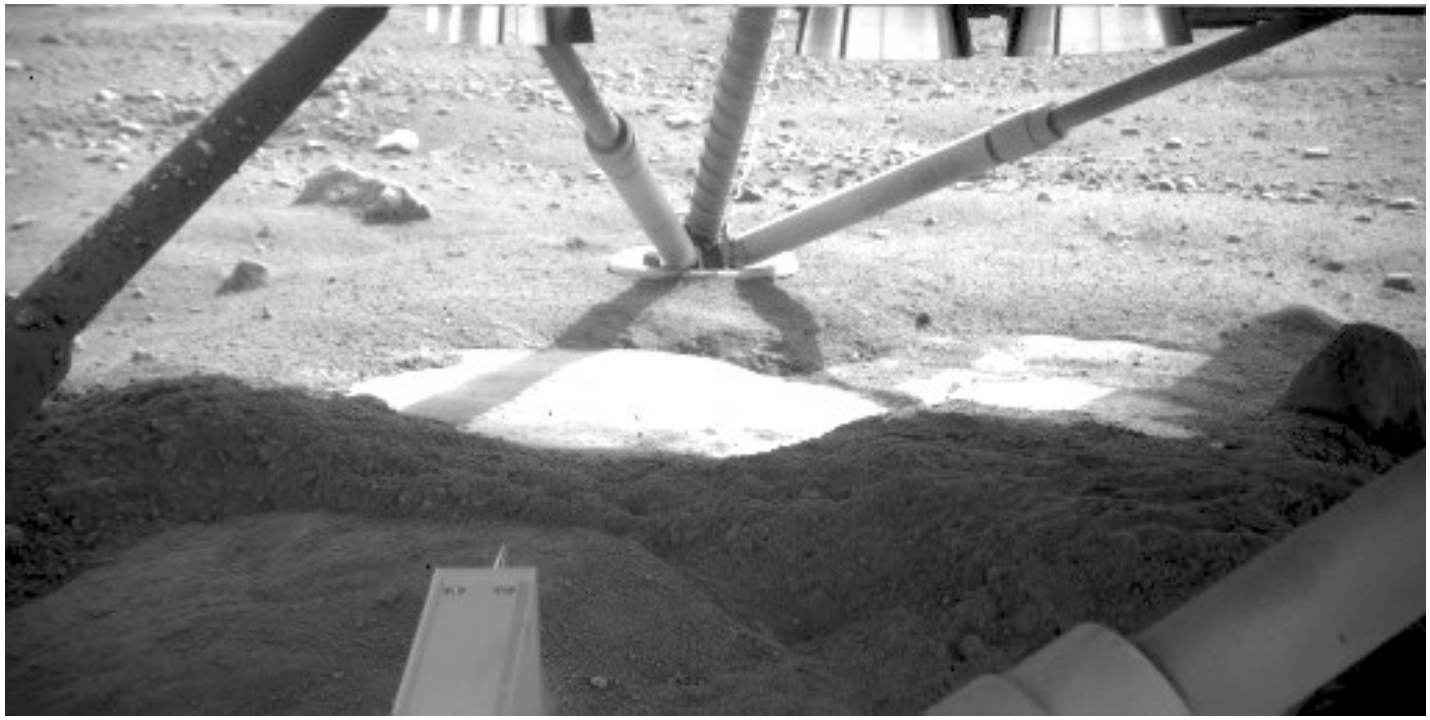


RAC Footpad Image Possible
Ice and "spring"

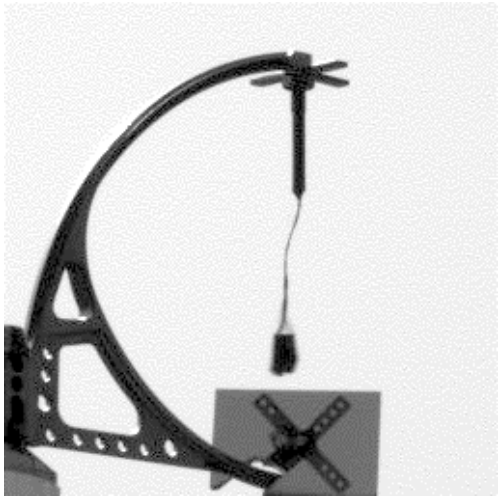


Business End Of Arm

"Holy Cow"



Tell Tale Movie



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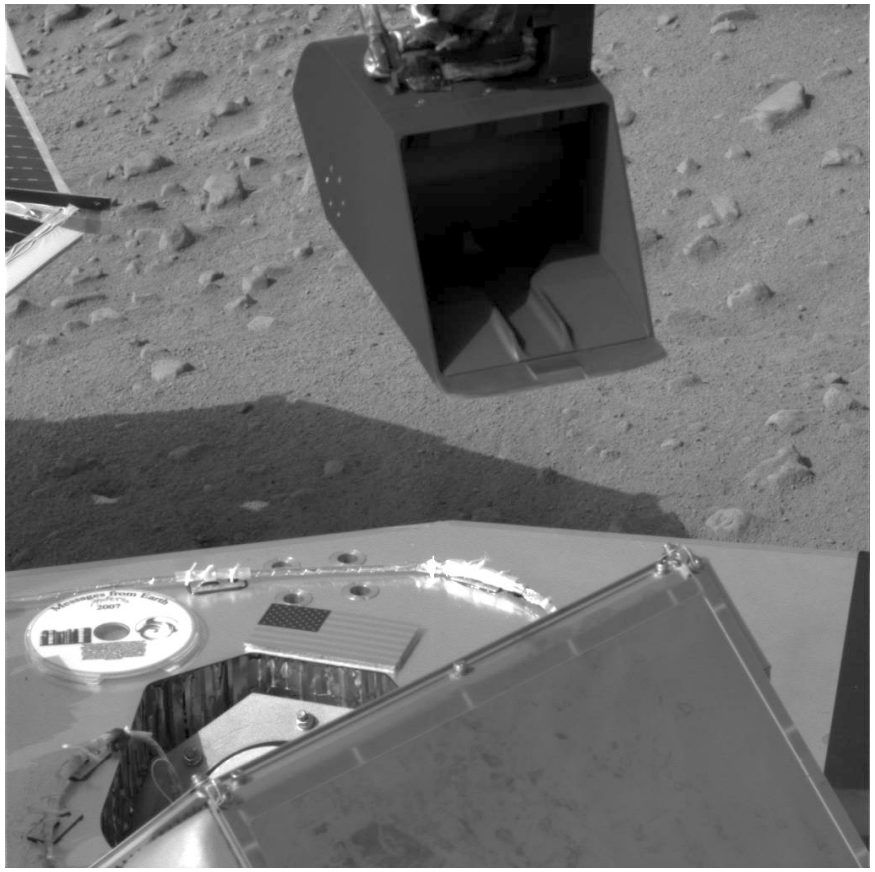
Sol-6

LOCKHEED MARTIN



Arm traversing to pay-dirt

Scoop Touches Mars
(“One Small Step”)

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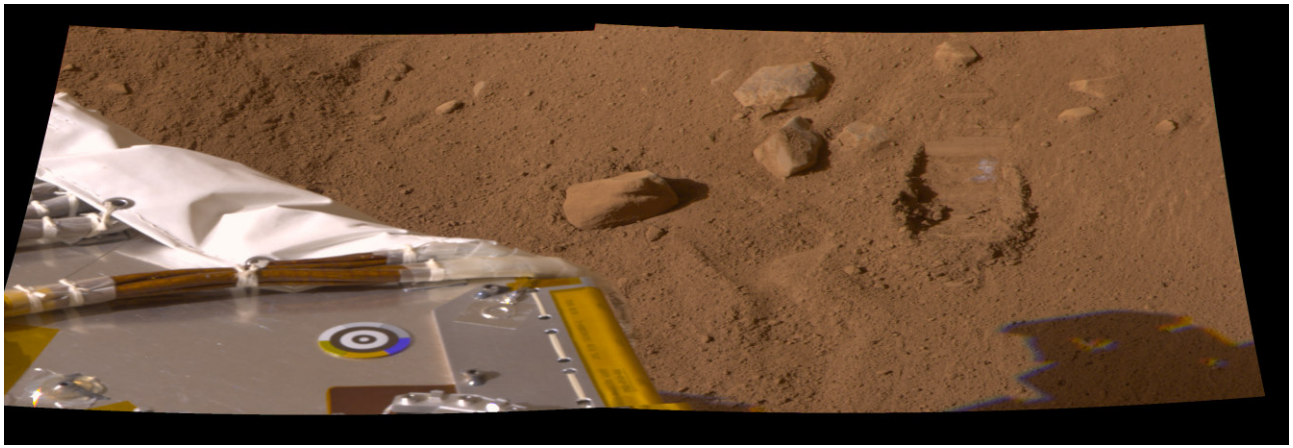
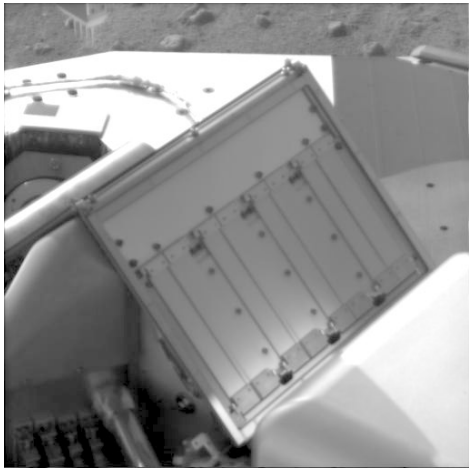
Sol-7

LOCKHEED MARTIN



First Martian Dig

Martian Soil In RA Scoop

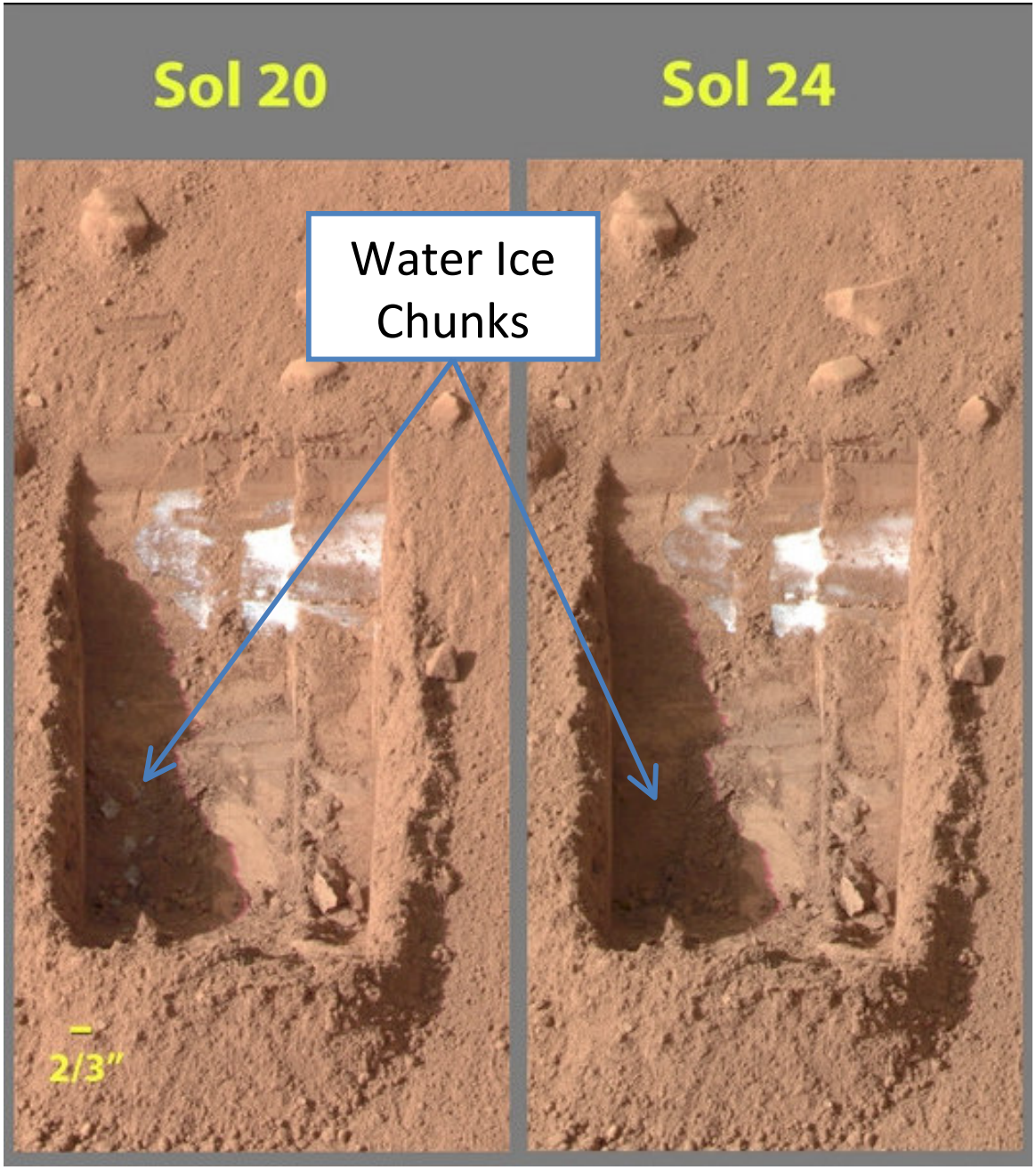


TEGA Cover Side One Deployed

TEGA Cover Side two deployed (but needs tightening)

New Delivery Technique RASP "Sprinkle"

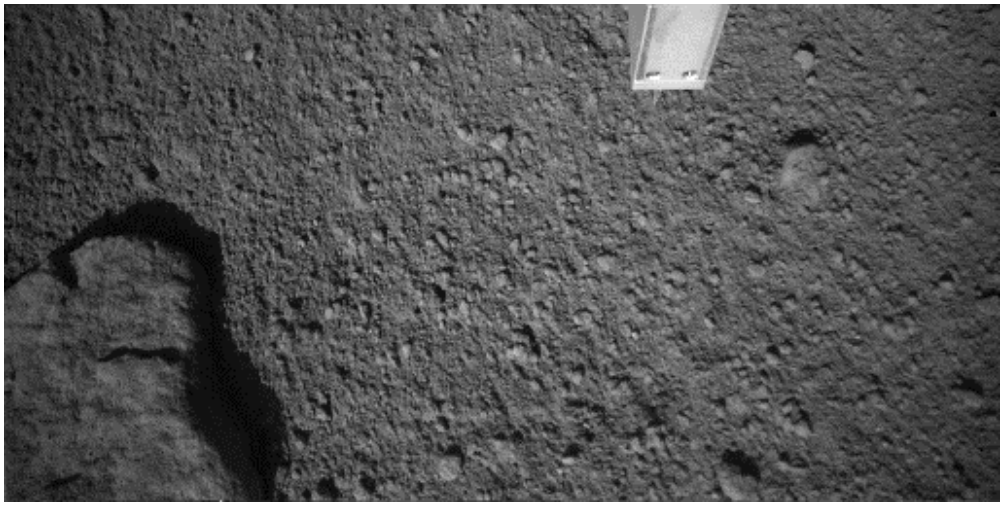
Sol-25



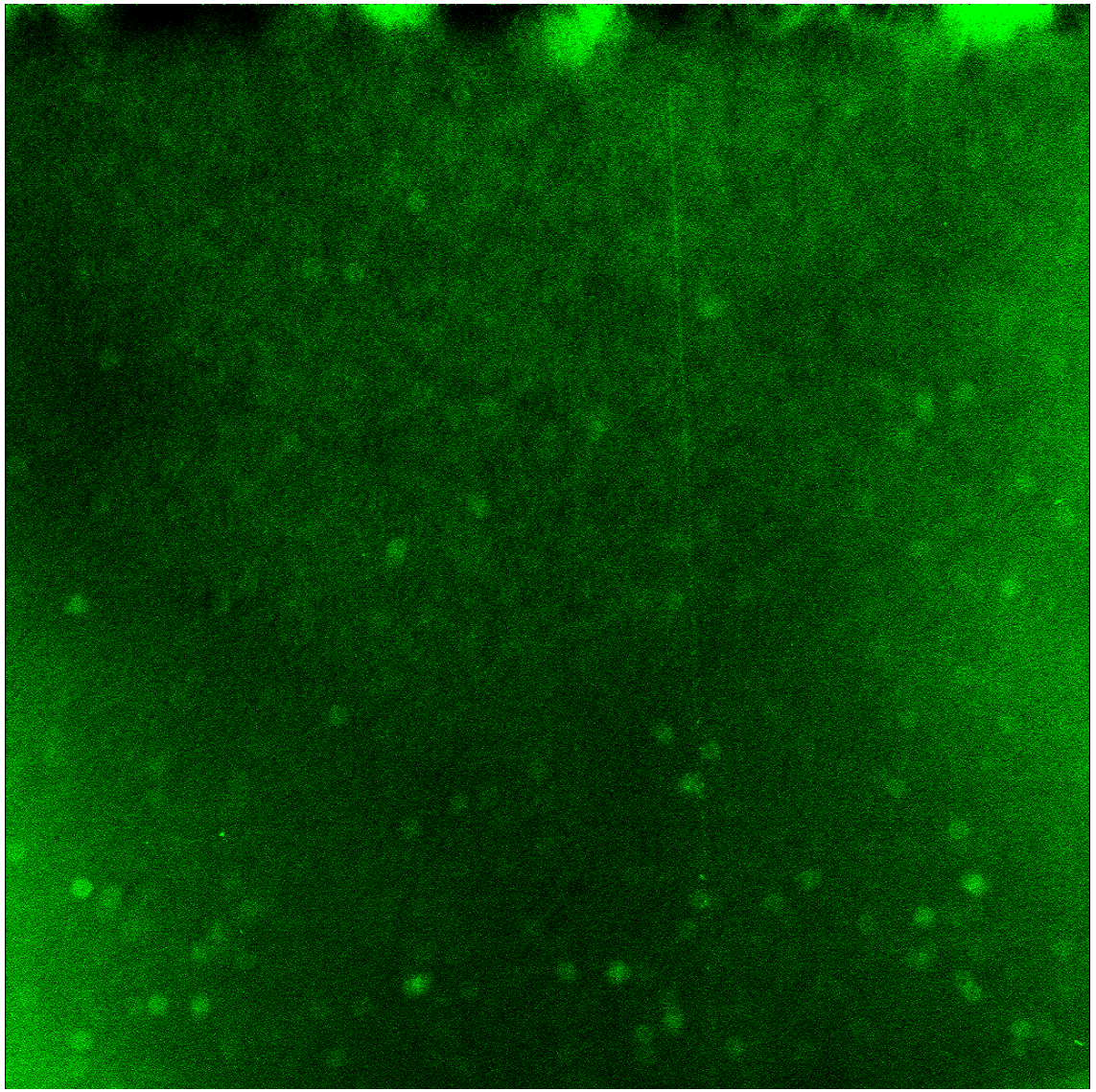
Water Ice Confirmed!!

Sublimation of ice chunks over 4 sol period consistent with water at measured temperatures and pressures

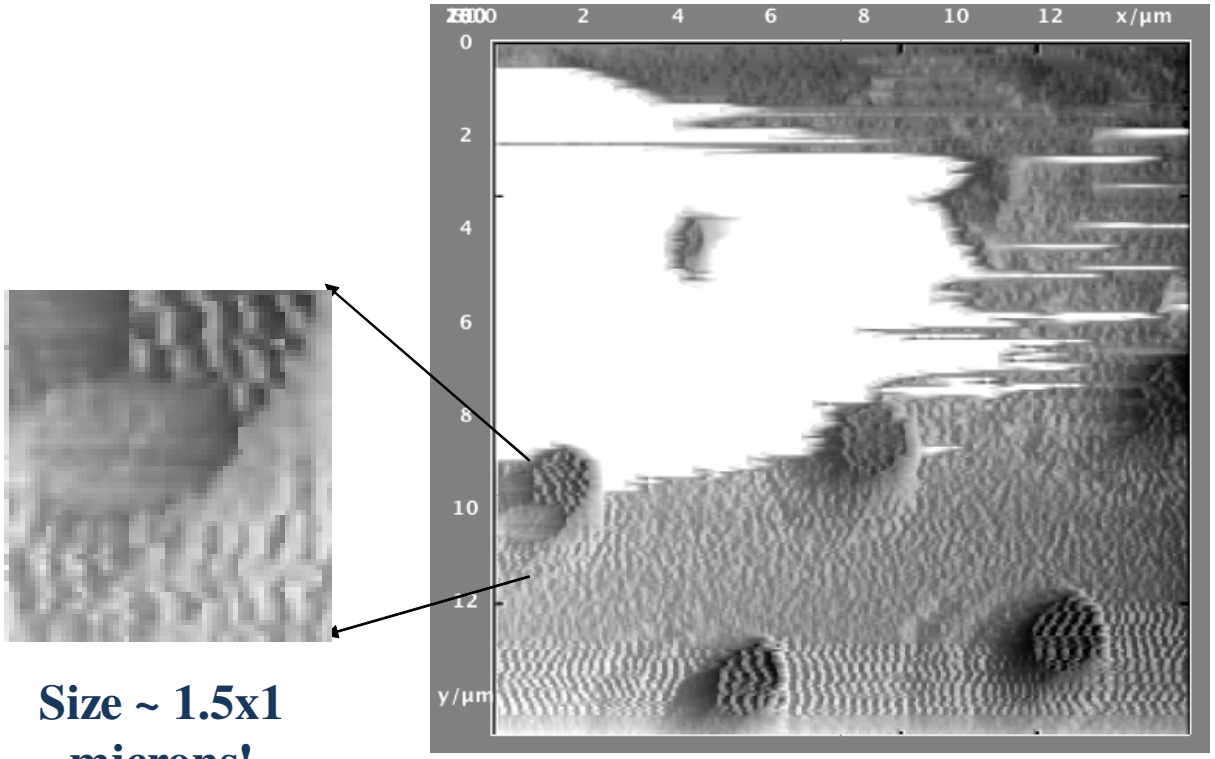
Sol-41



Second Wet Chemistry Lab Acquisition And Delivery



Laser Light Show On Mars



Size ~ 1.5x1 microns!

First Atomic Force Microscope Image of Martian Grain

Neverland & Headless

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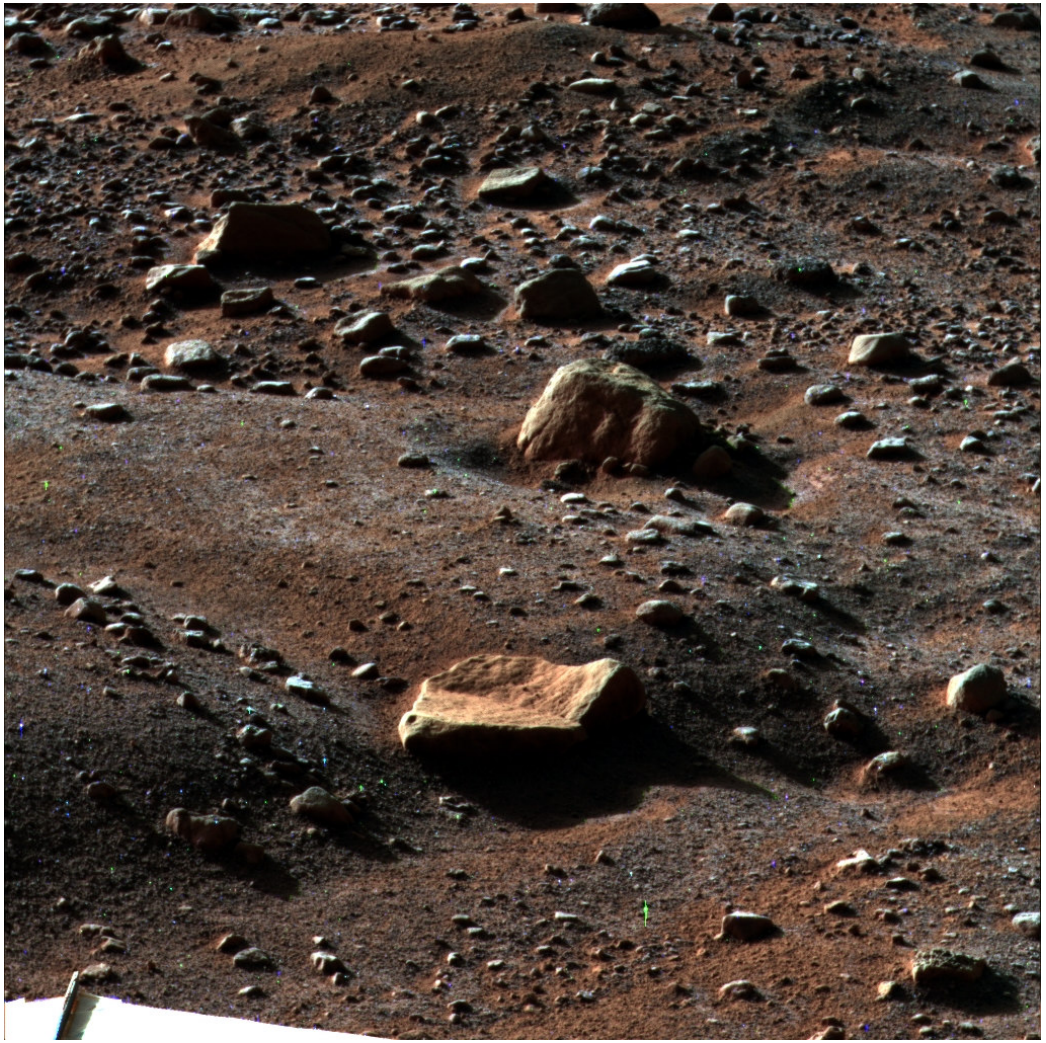
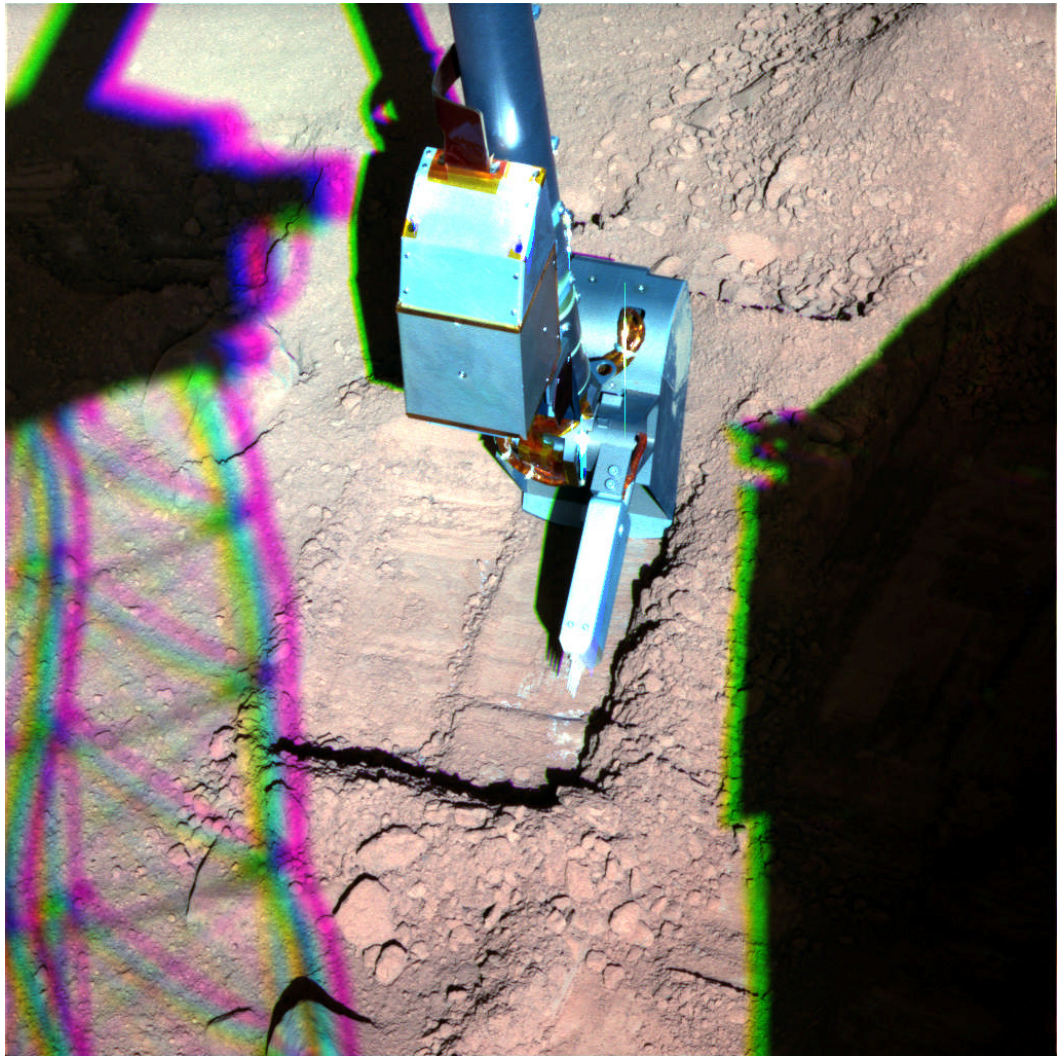
Phoenix

Sol-77

LOCKHEED MARTIN



Frost Forming



Burned Alive
Sample Acquisition

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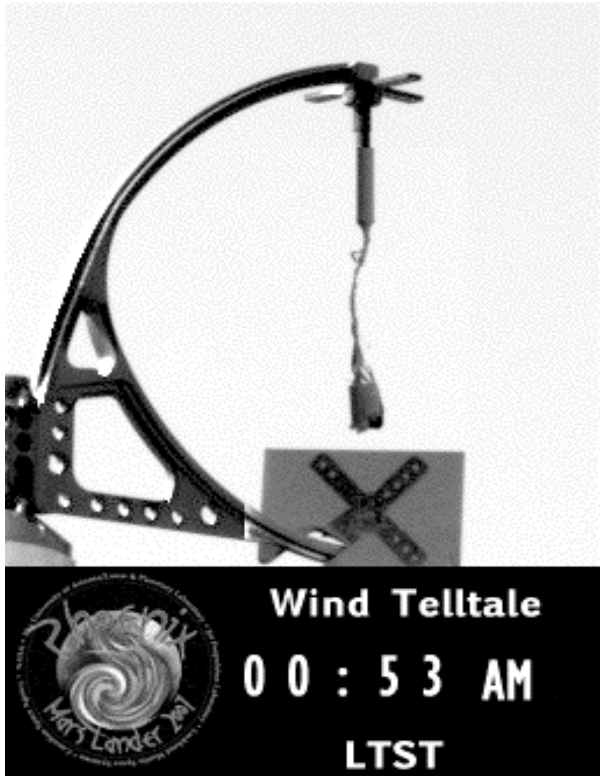
Sol-80

LOCKHEED MARTIN

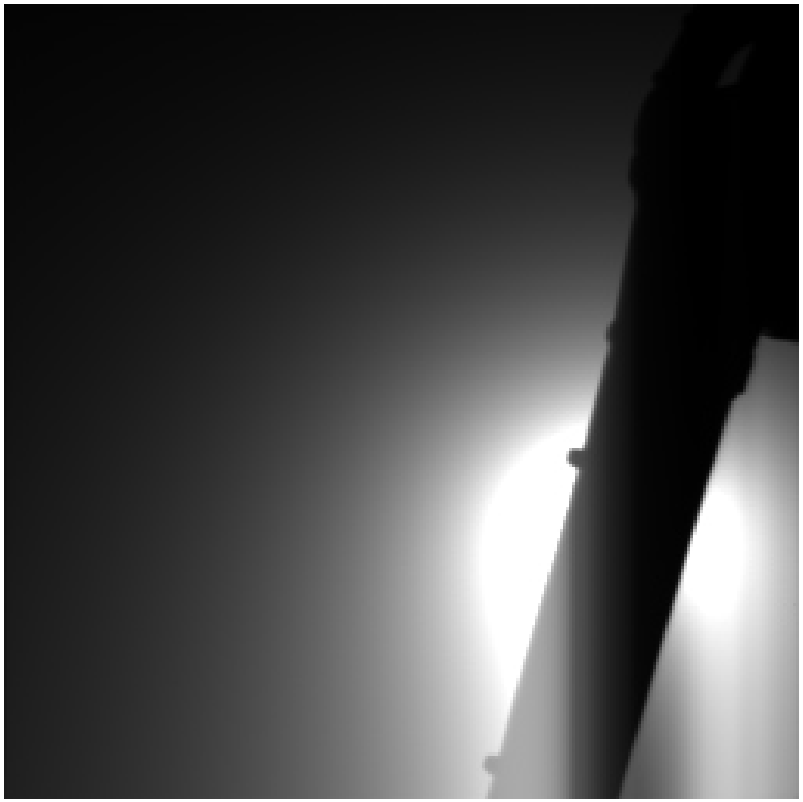


Frost On Tell-Tale Mirror

Polar Projection

Sol-91

Sunrise



“RA Eclipse”

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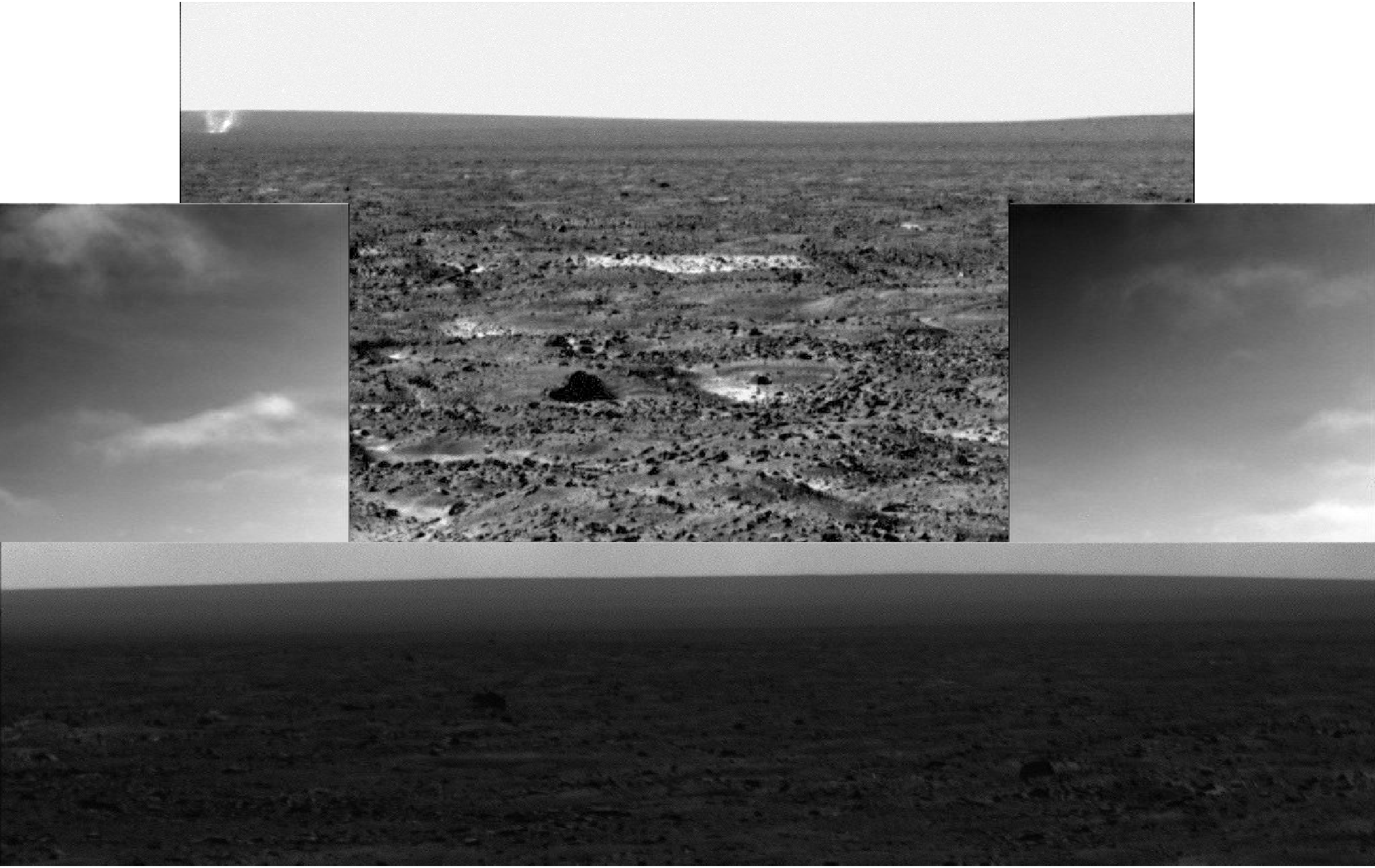
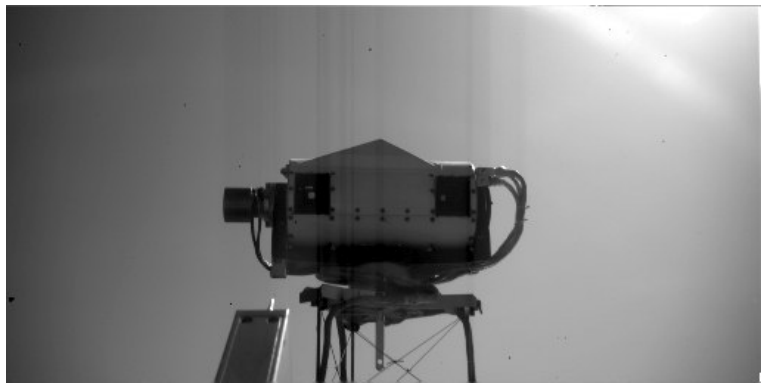
LOCKHEED MARTIN

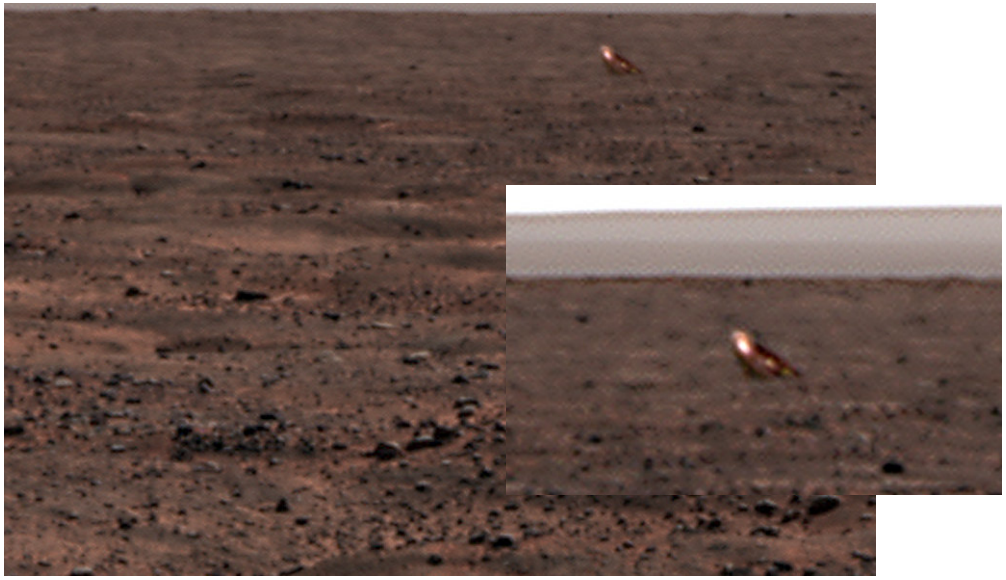
Sol-106/ Sol-109



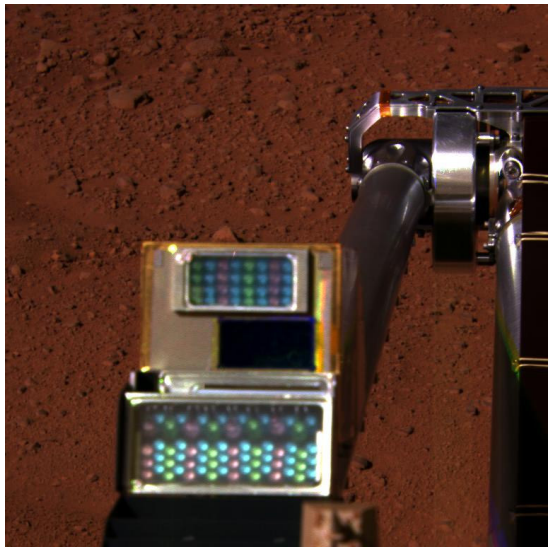
Sols 110 - 116

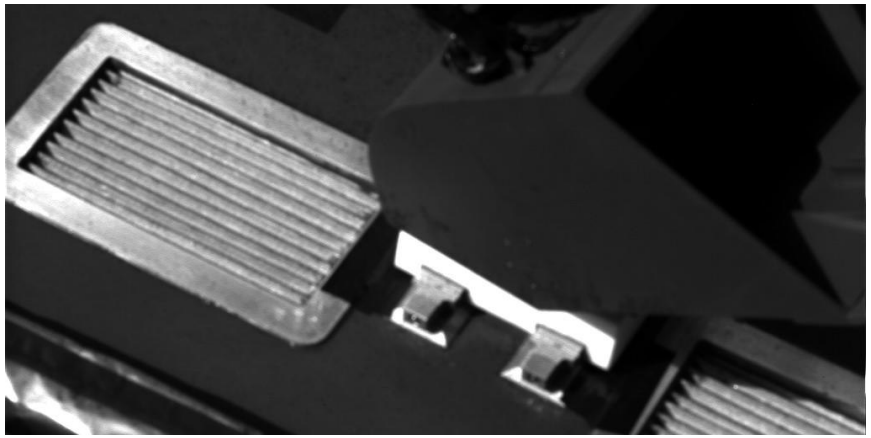


Camera's photo's of each other



Backshell





OFB Touch Test

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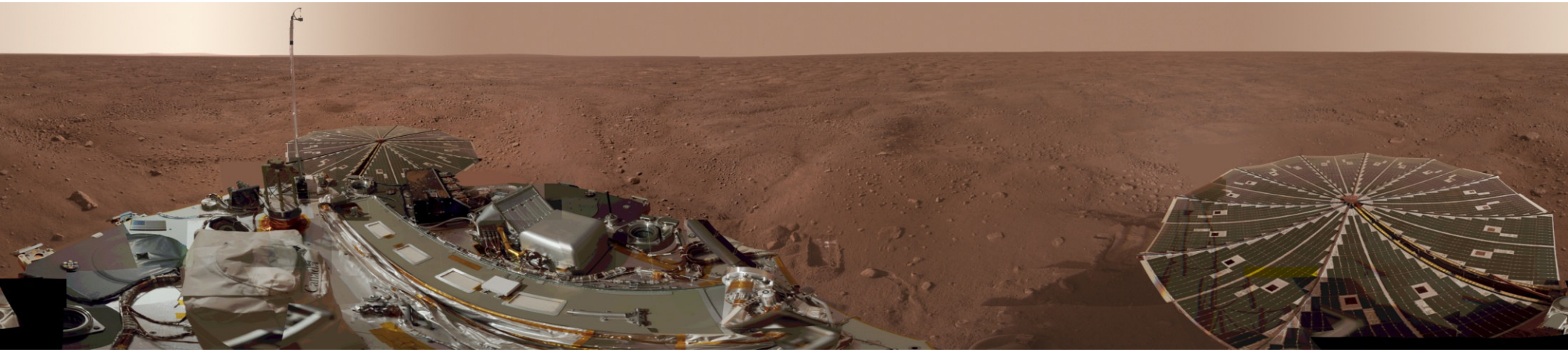
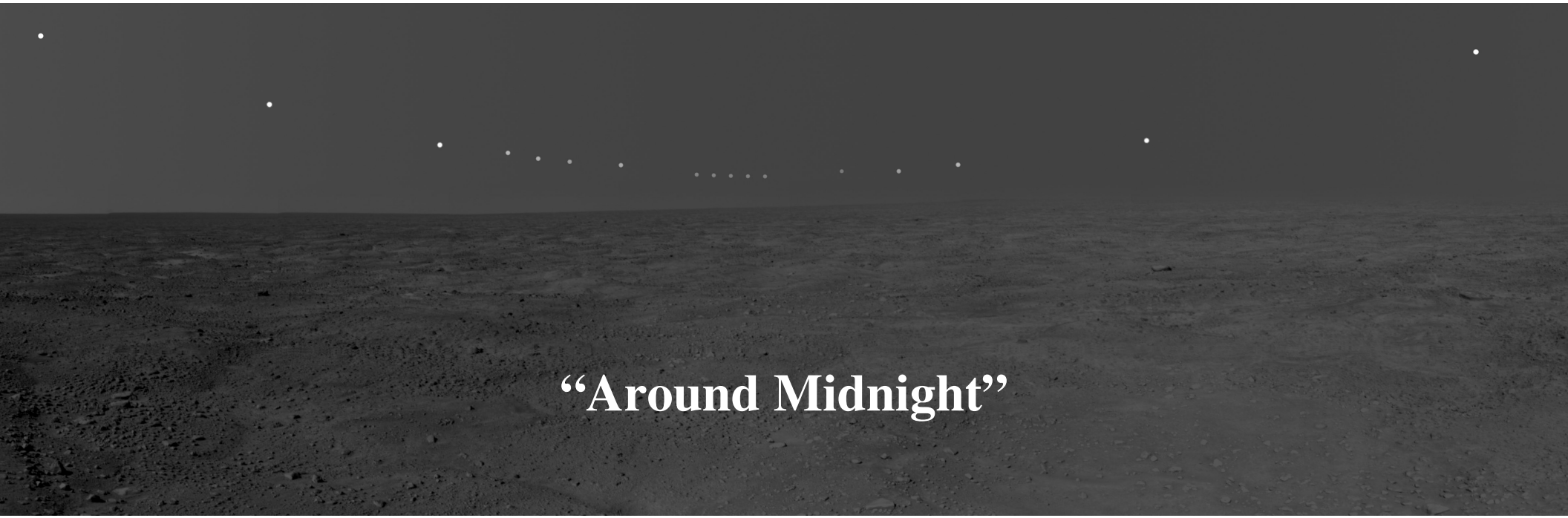
Phoenix

Panoramas

LOCKHEED MARTIN





"Around Midnight"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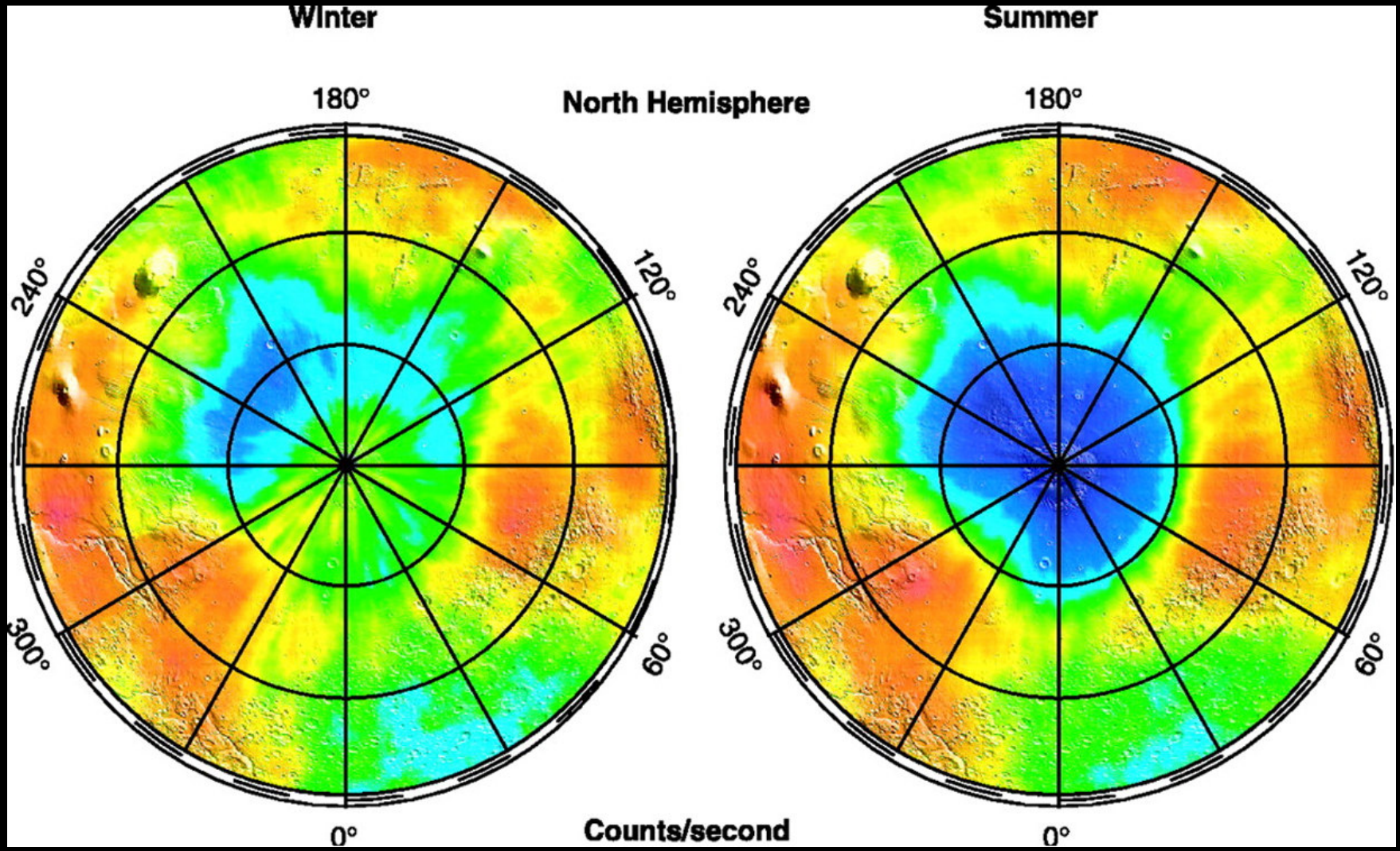

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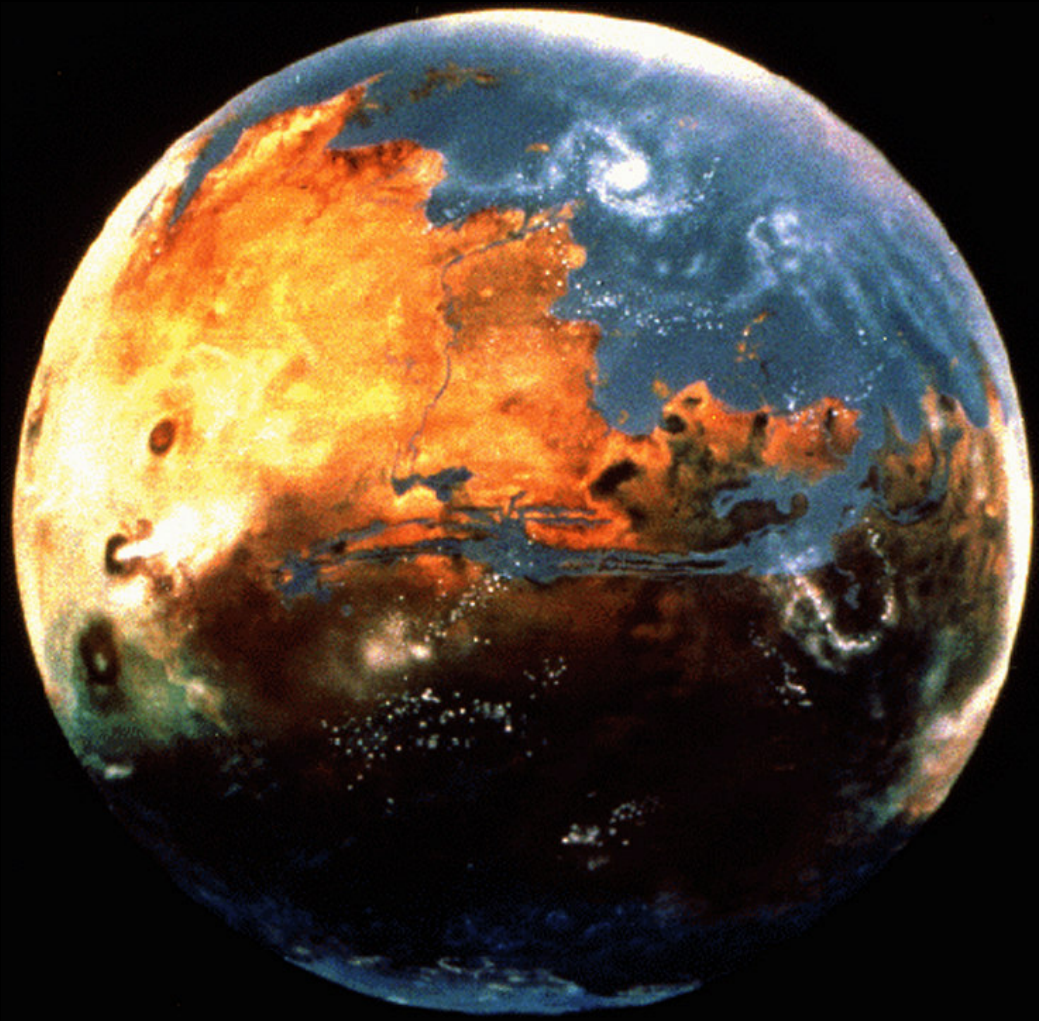

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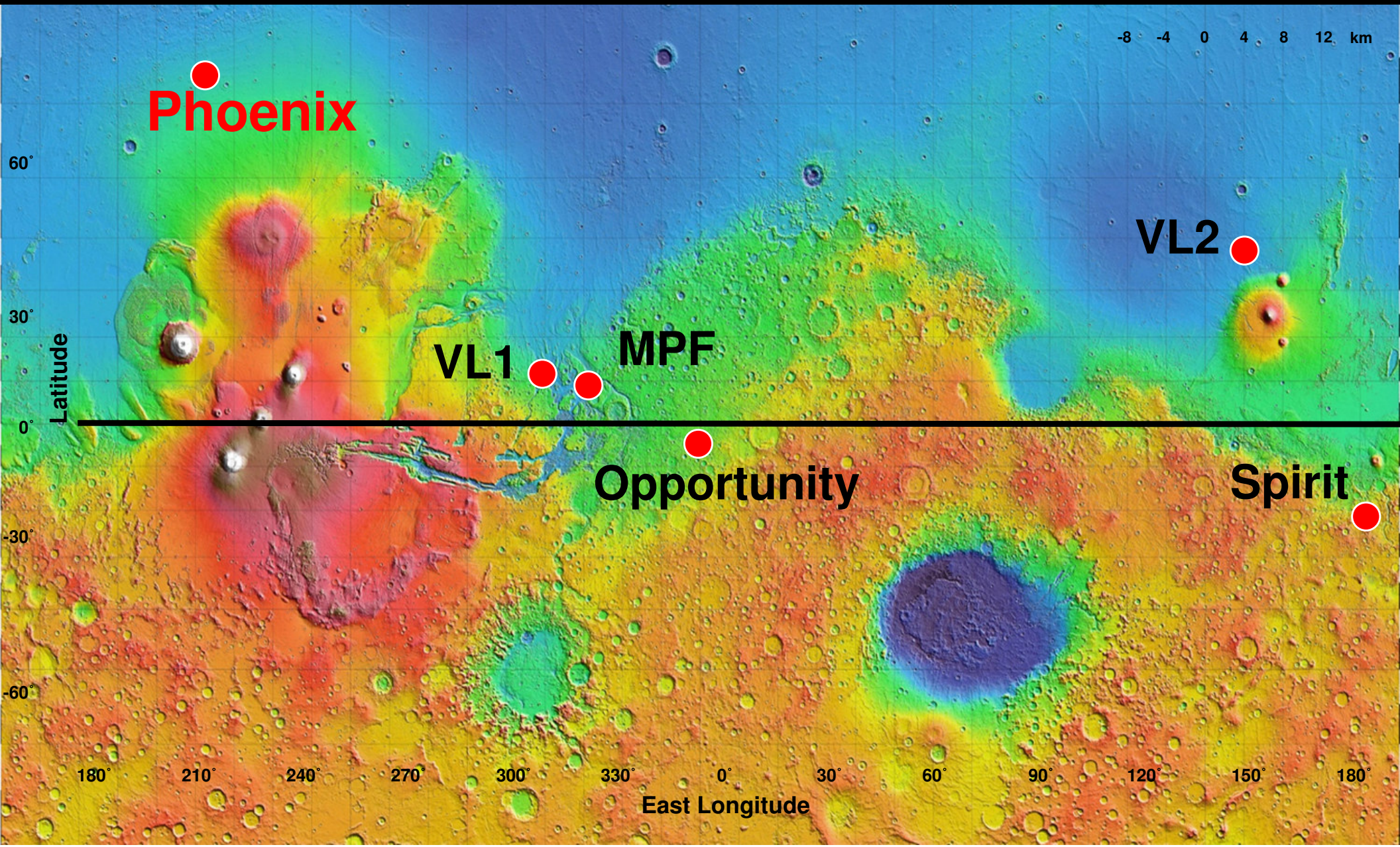

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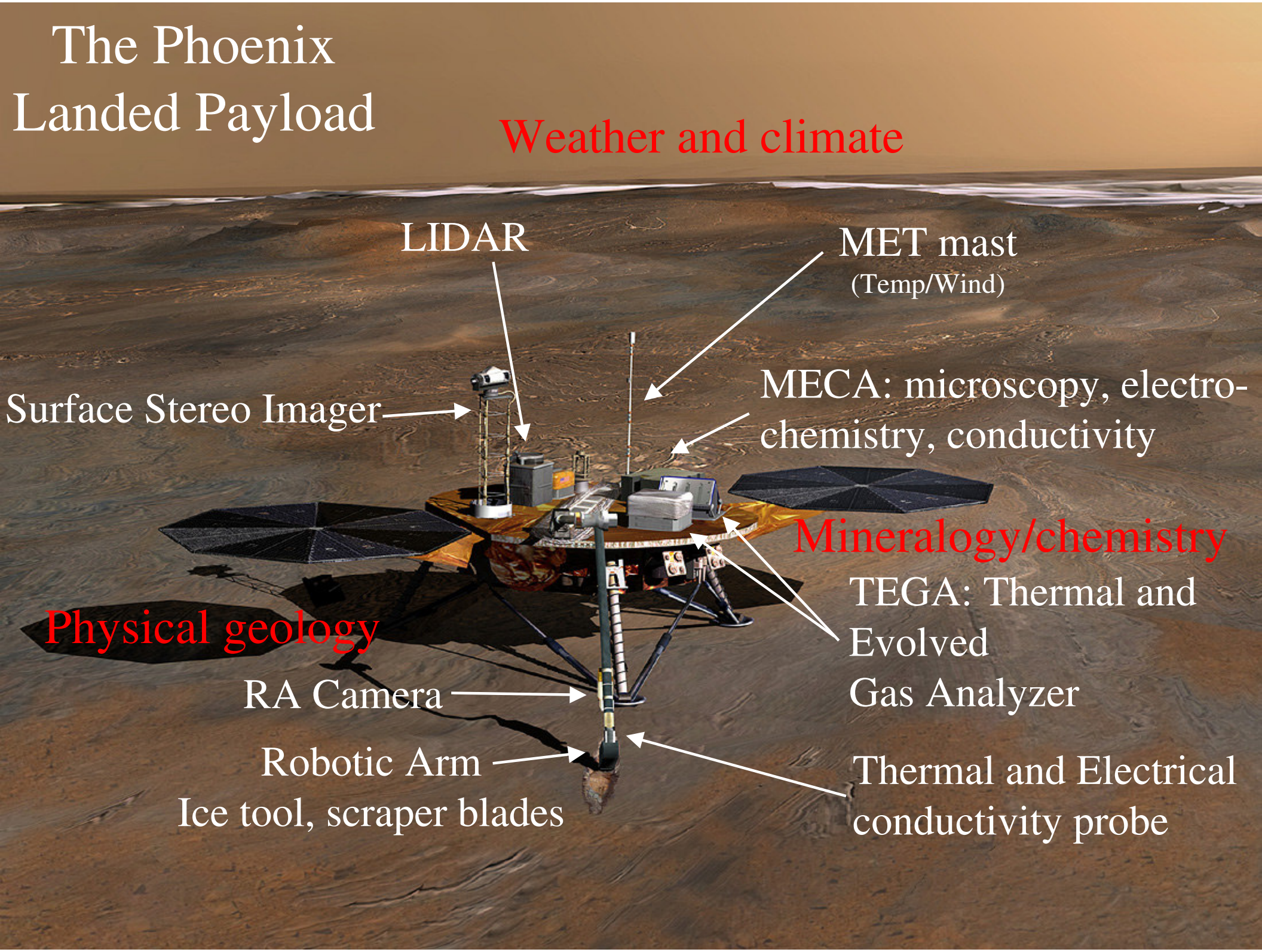
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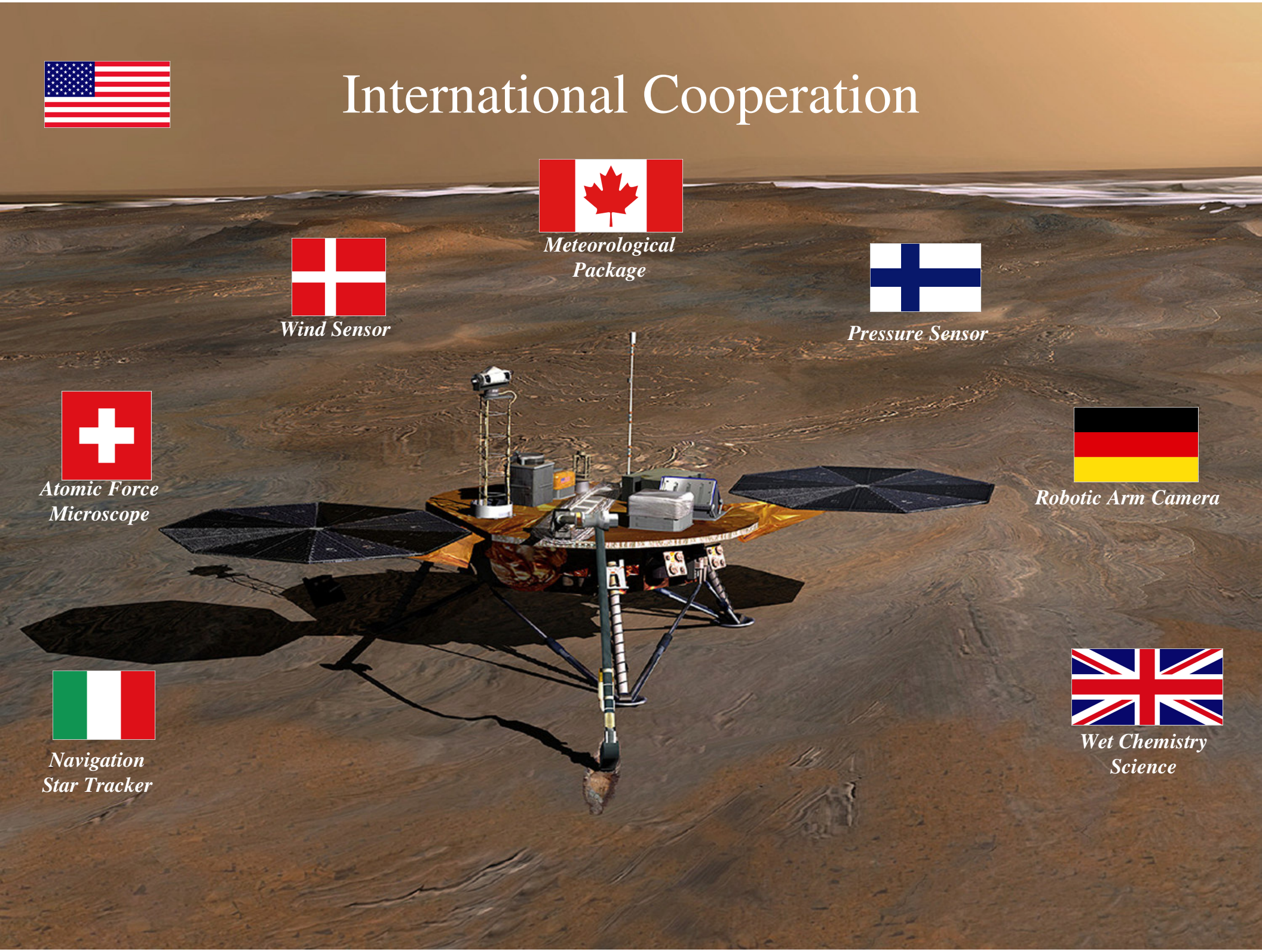

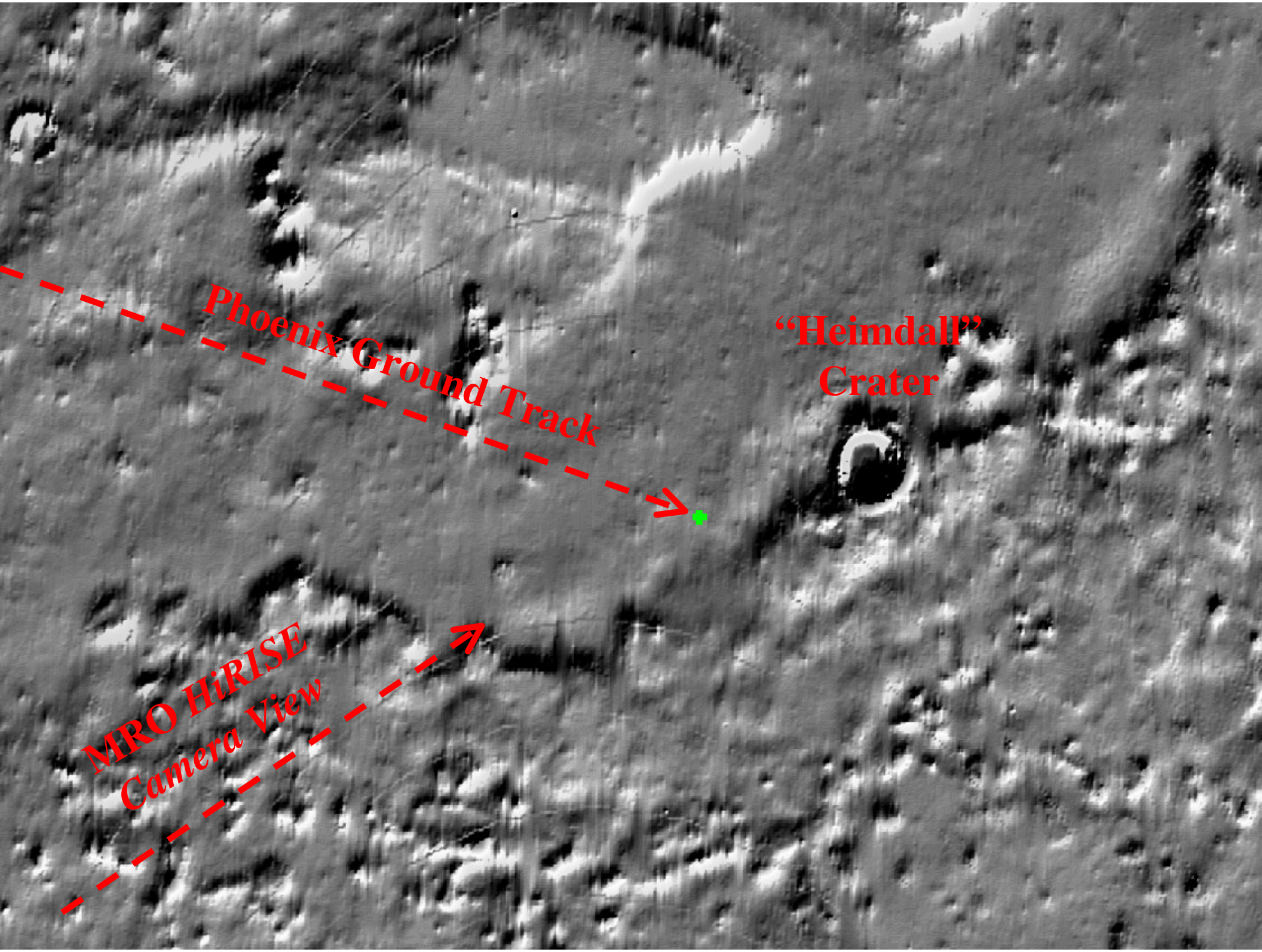
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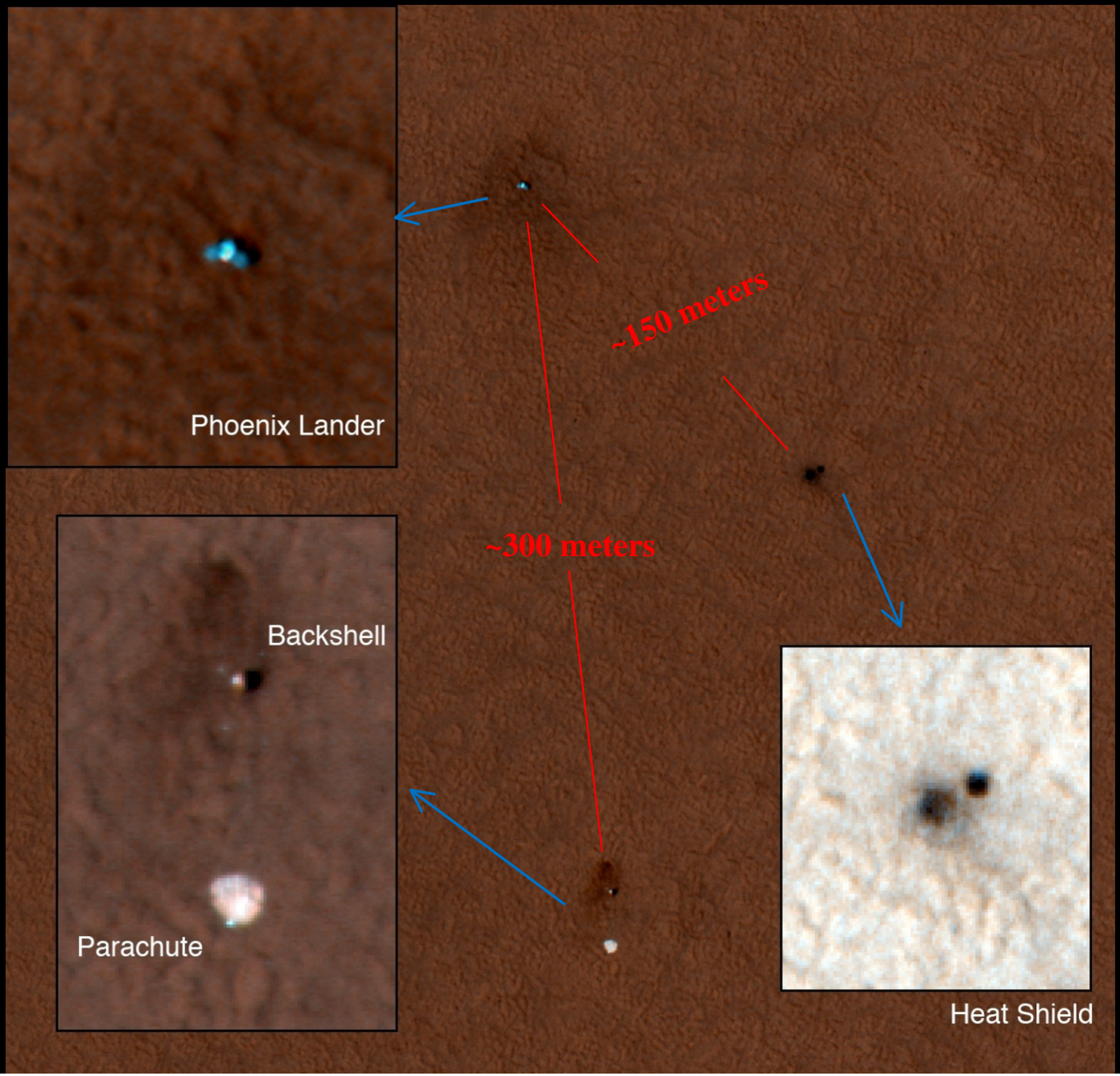

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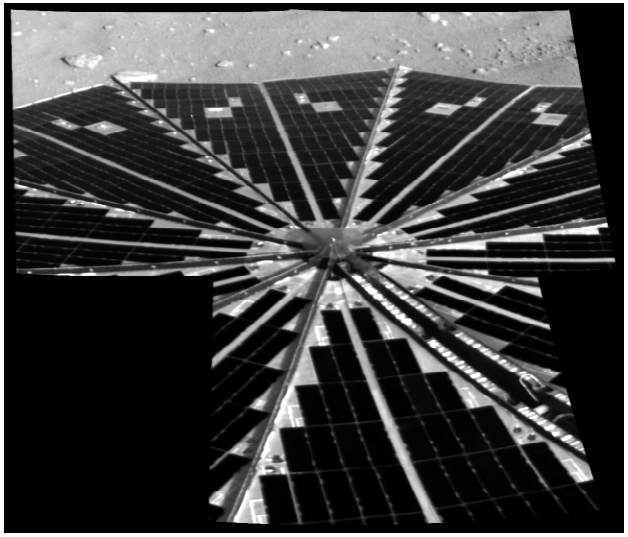

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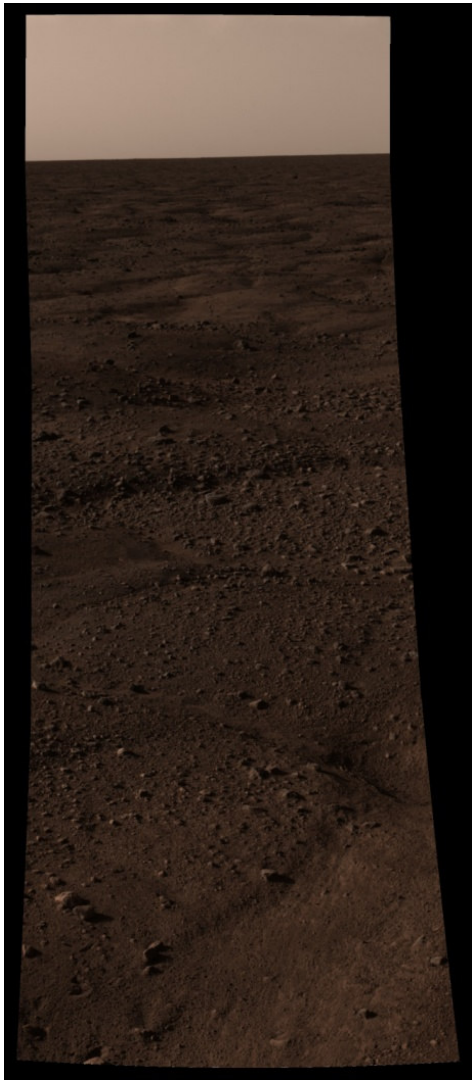

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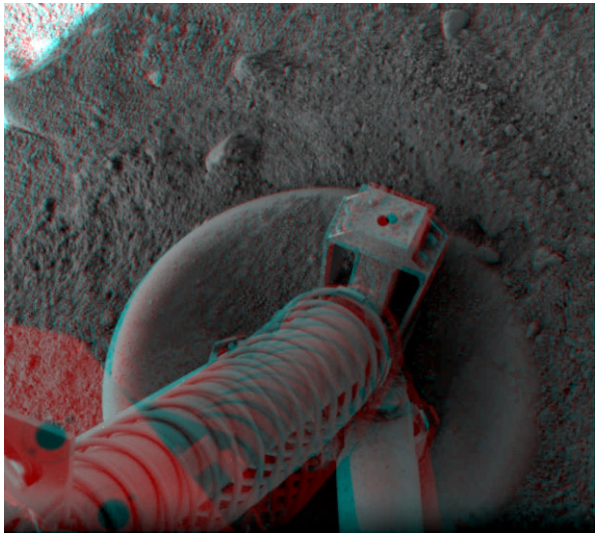

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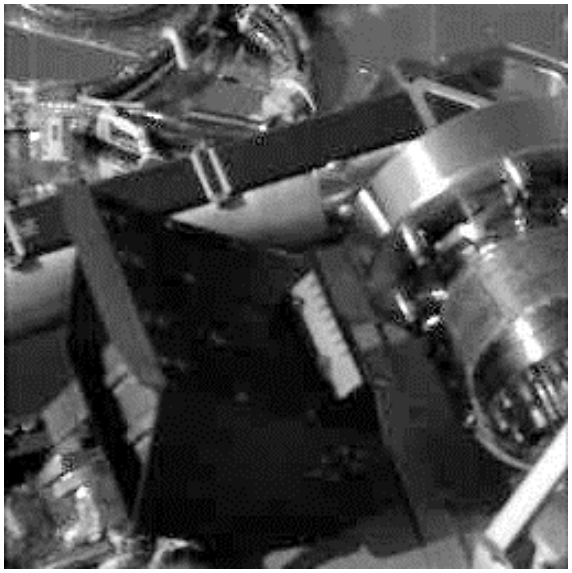

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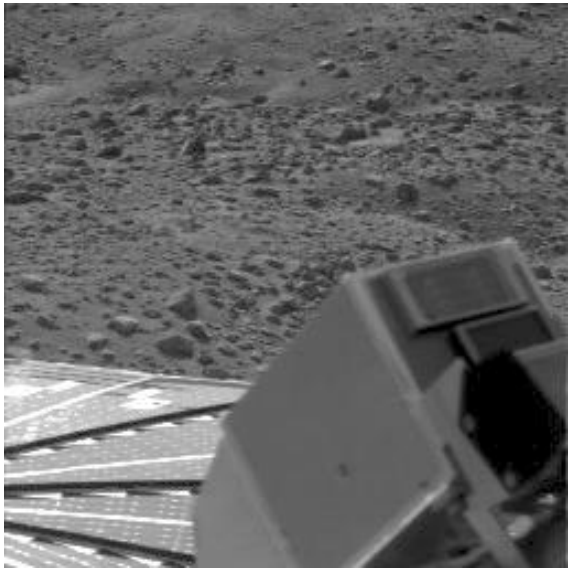

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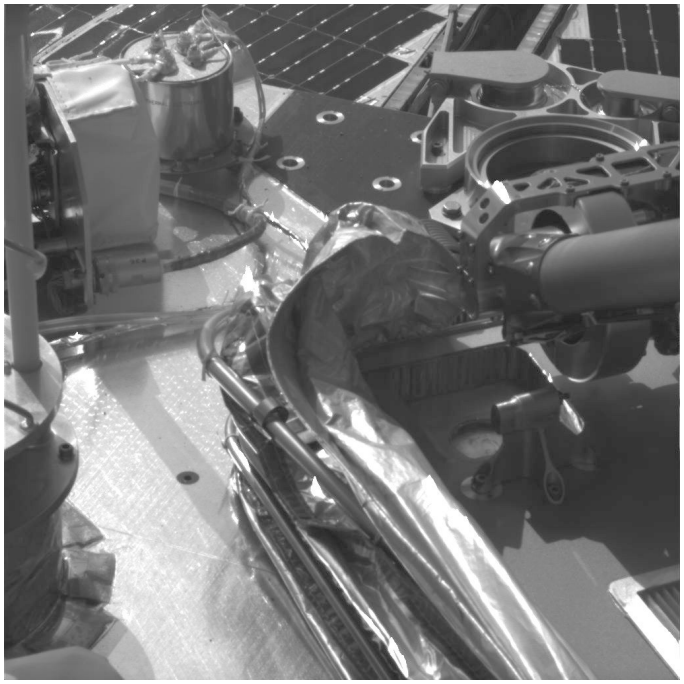

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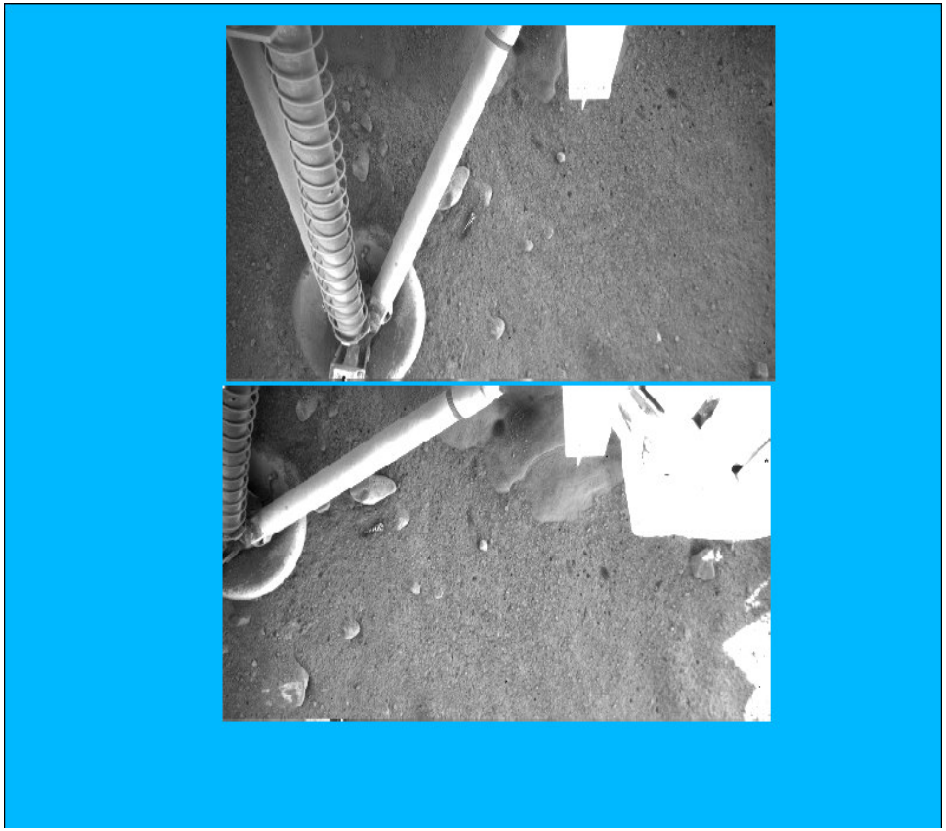

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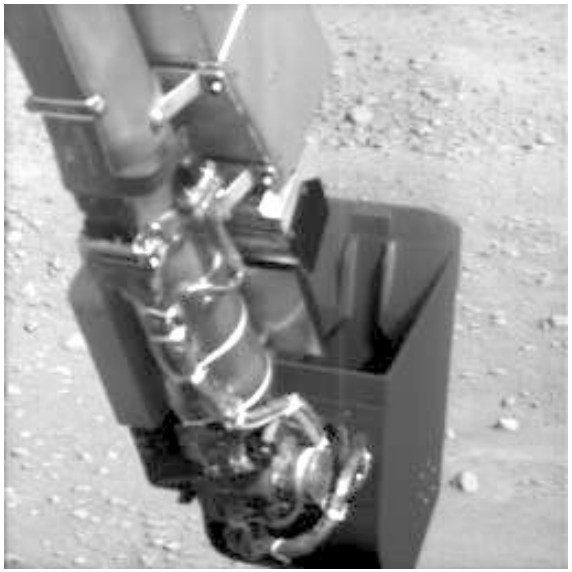

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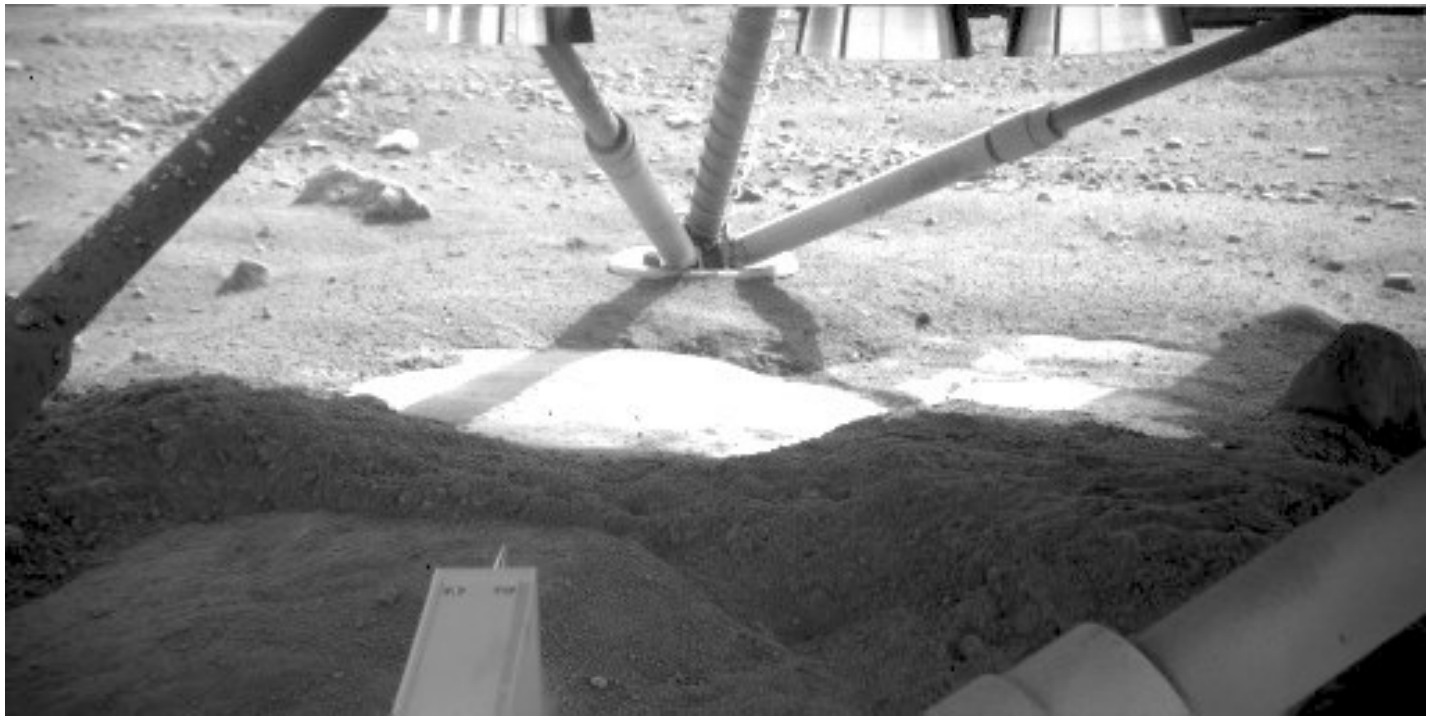
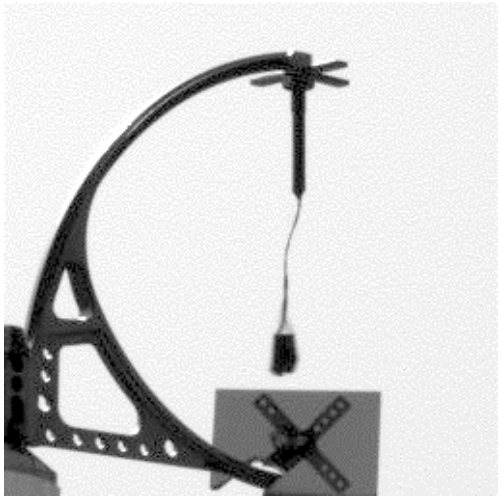


Tell Tale Movie



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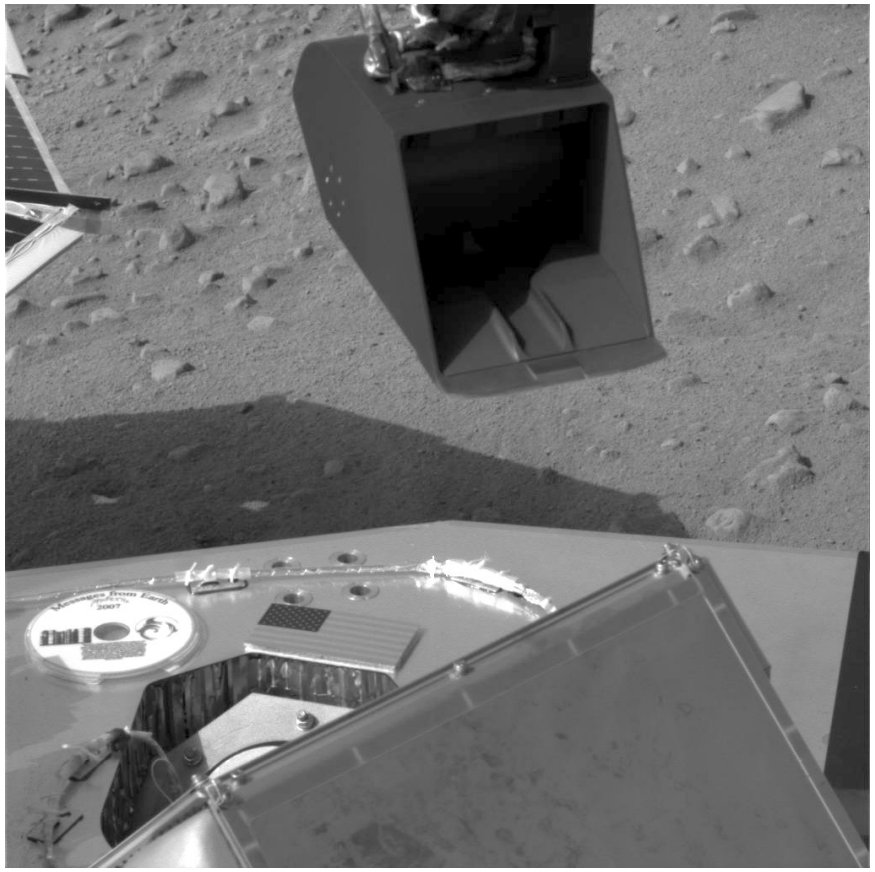
Sol-6

LOCKHEED MARTIN



Arm traversing to pay-dirt

Scoop Touches Mars
(“One Small Step”)

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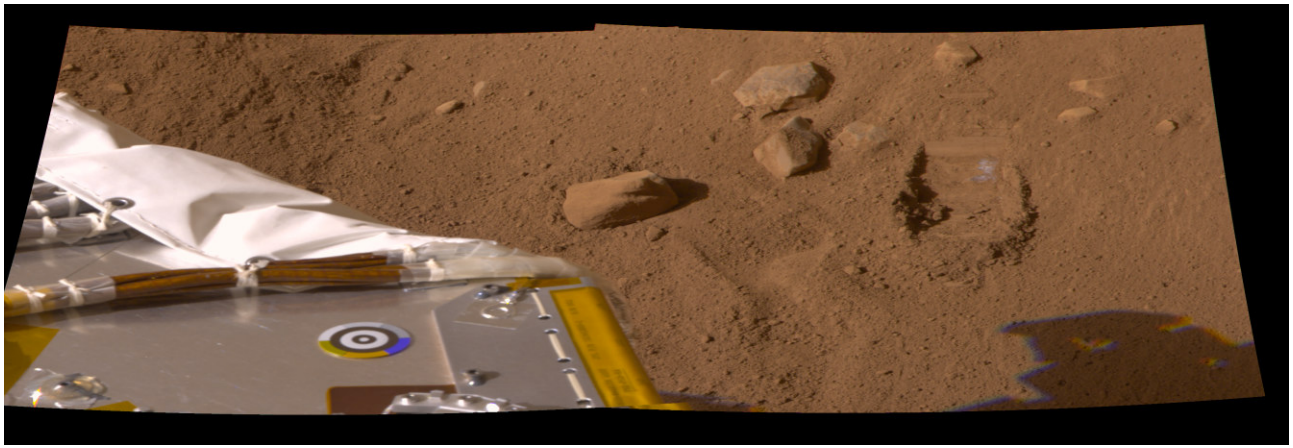
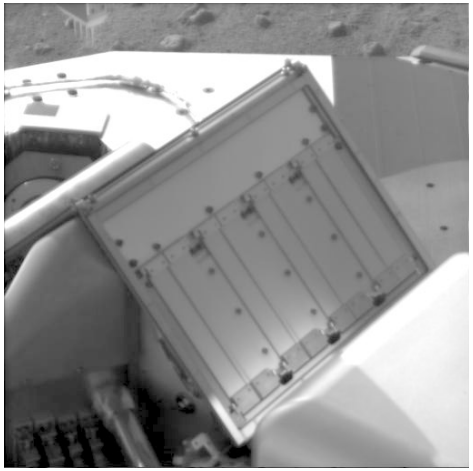
Sol-7

LOCKHEED MARTIN



First Martian Dig

Martian Soil In RA Scoop

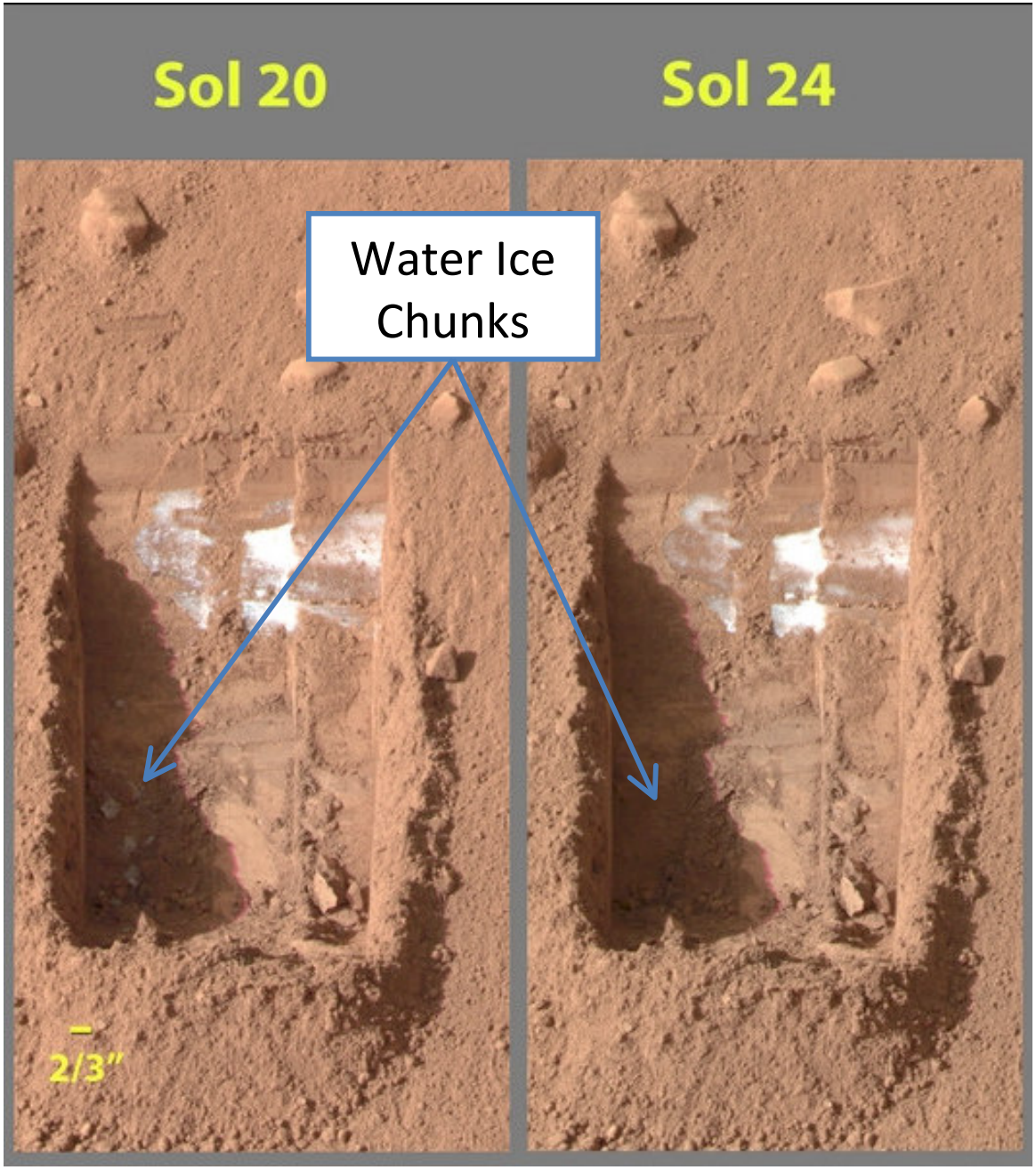


TEGA Cover Side One Deployed

TEGA Cover Side two deployed (but needs tightening)

New Delivery Technique RASP "Sprinkle"

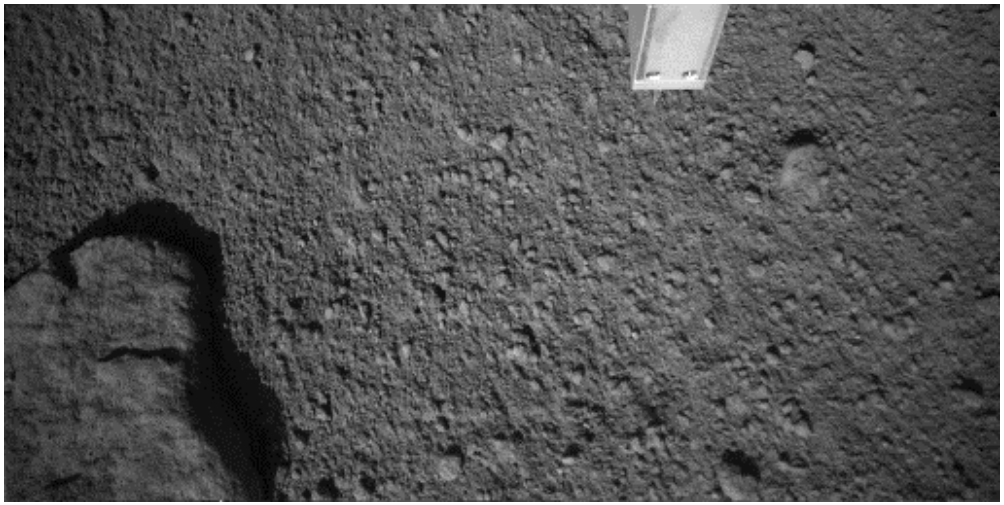
Sol-25



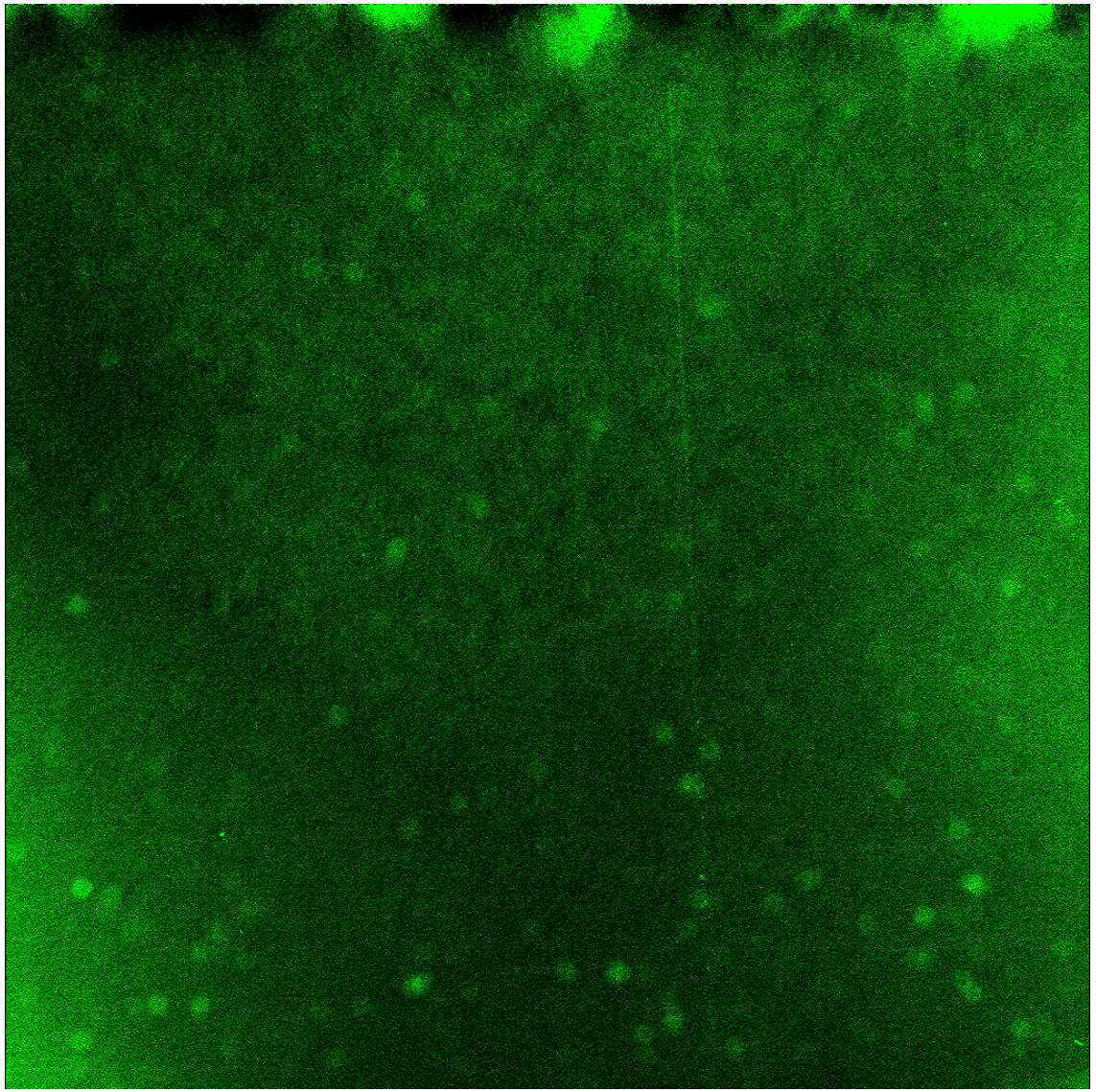
Water Ice Confirmed!!

Sublimation of ice chunks over 4 sol period consistent with water at measured temperatures and pressures

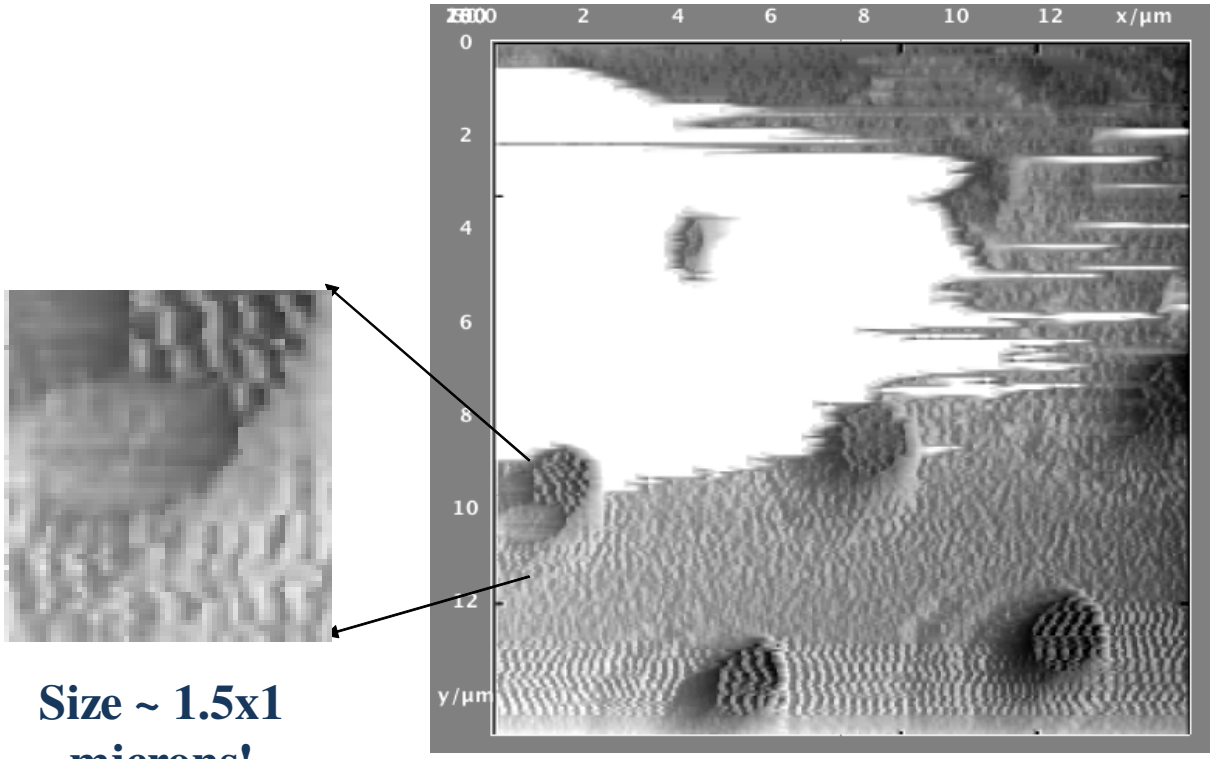
Sol-41



Second Wet Chemistry Lab Acquisition And Delivery



Laser Light Show On Mars



Size ~ 1.5x1 microns!

First Atomic Force Microscope Image of Martian Grain

Neverland & Headless

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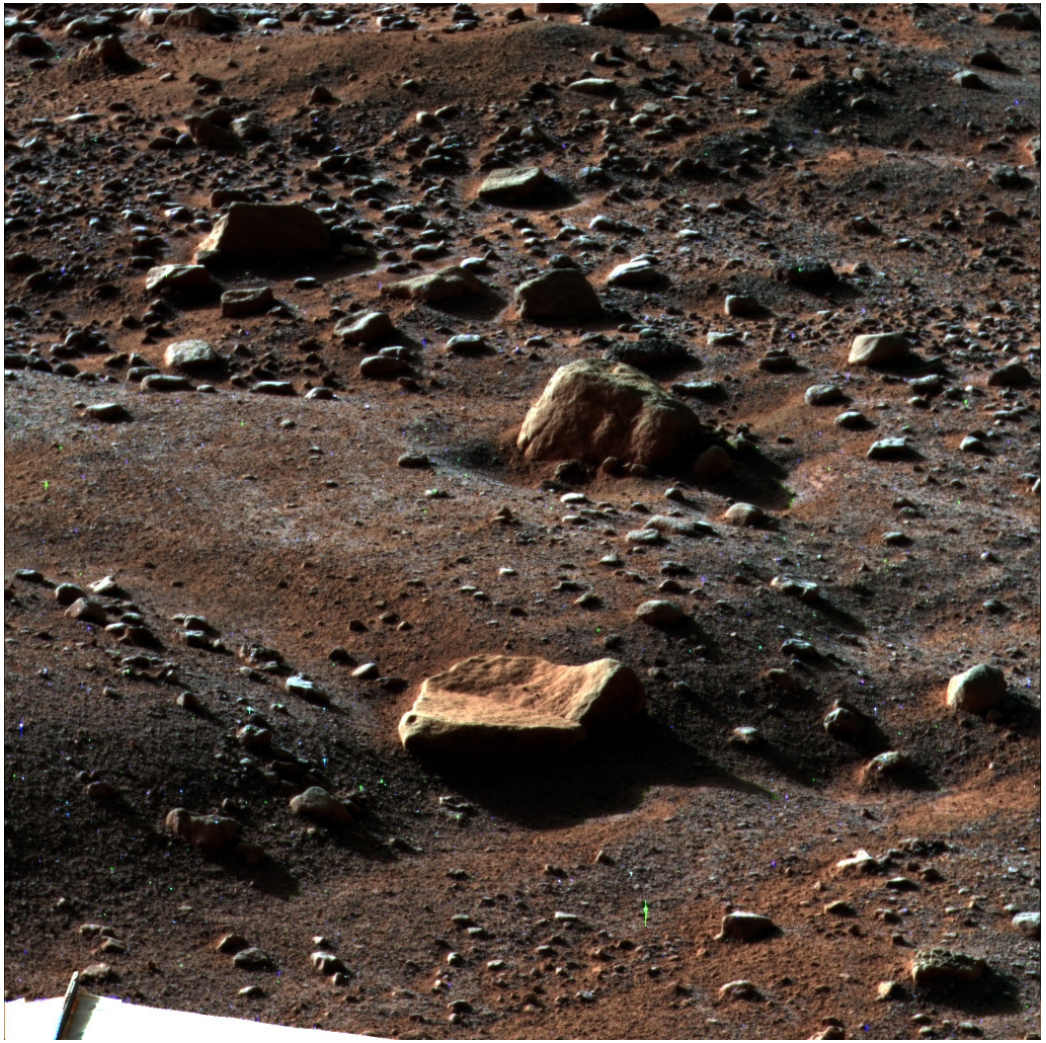
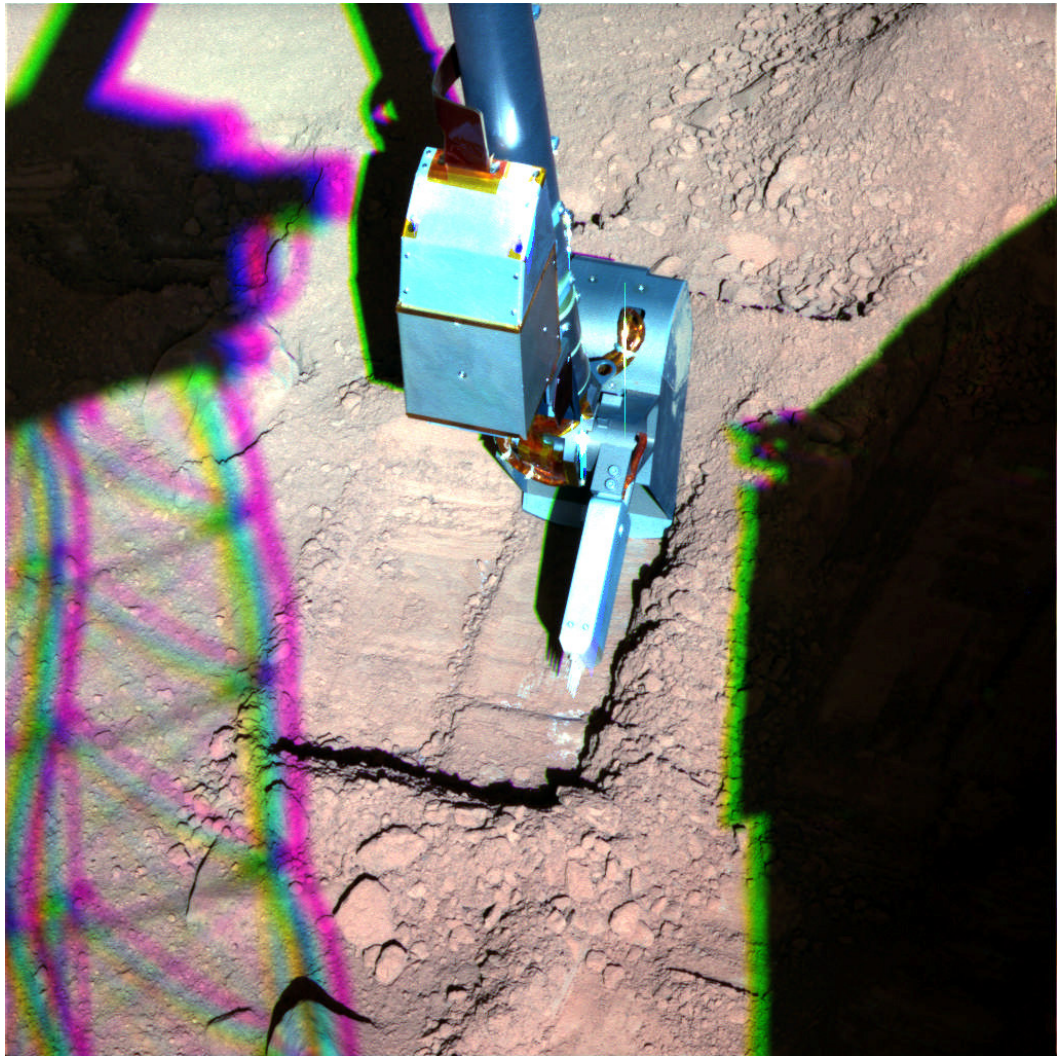
Sol-77

LOCKHEED MARTIN



Frost Forming



Burned Alive
Sample Acquisition

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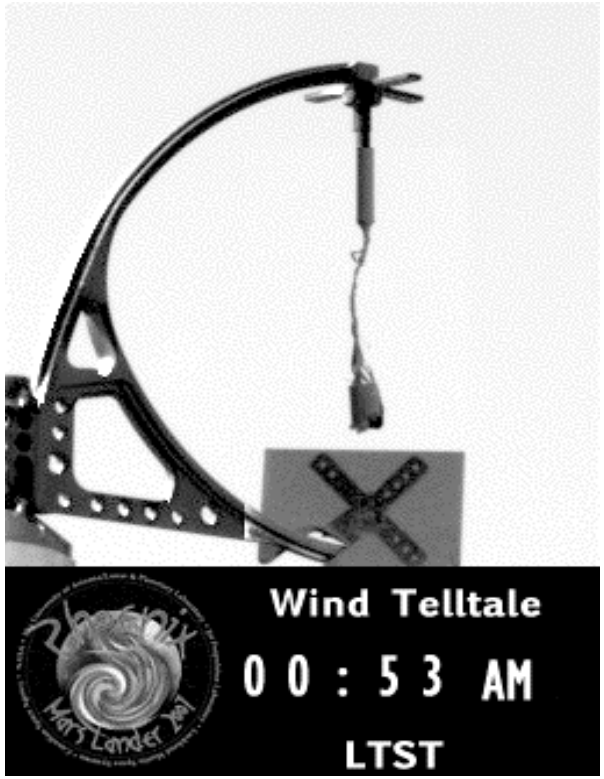
Sol-80

LOCKHEED MARTIN

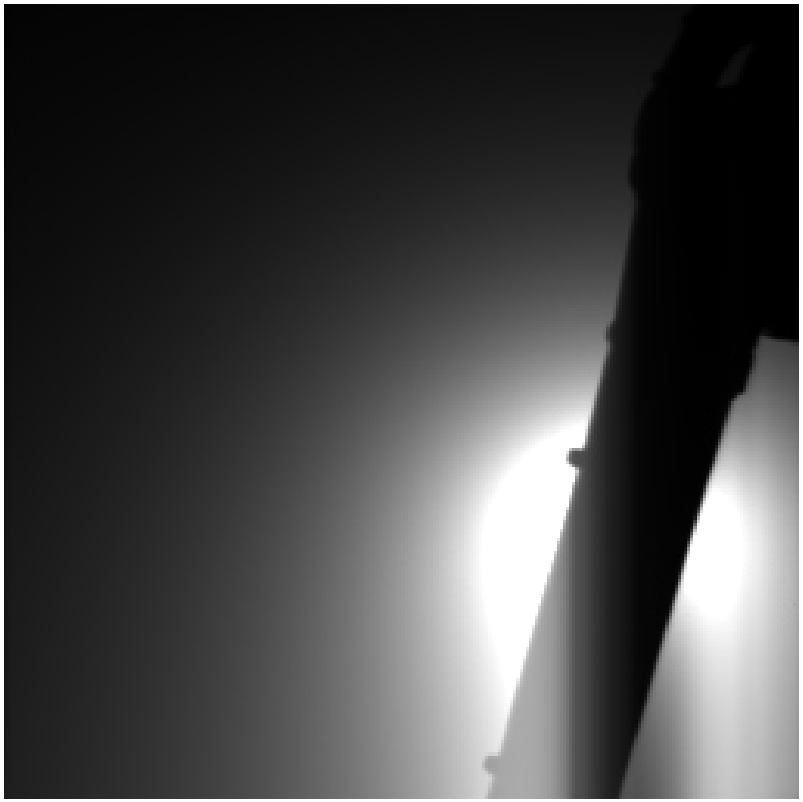


Frost On Tell-Tale Mirror

Polar Projection

Sol-91

Sunrise



“RA Eclipse”

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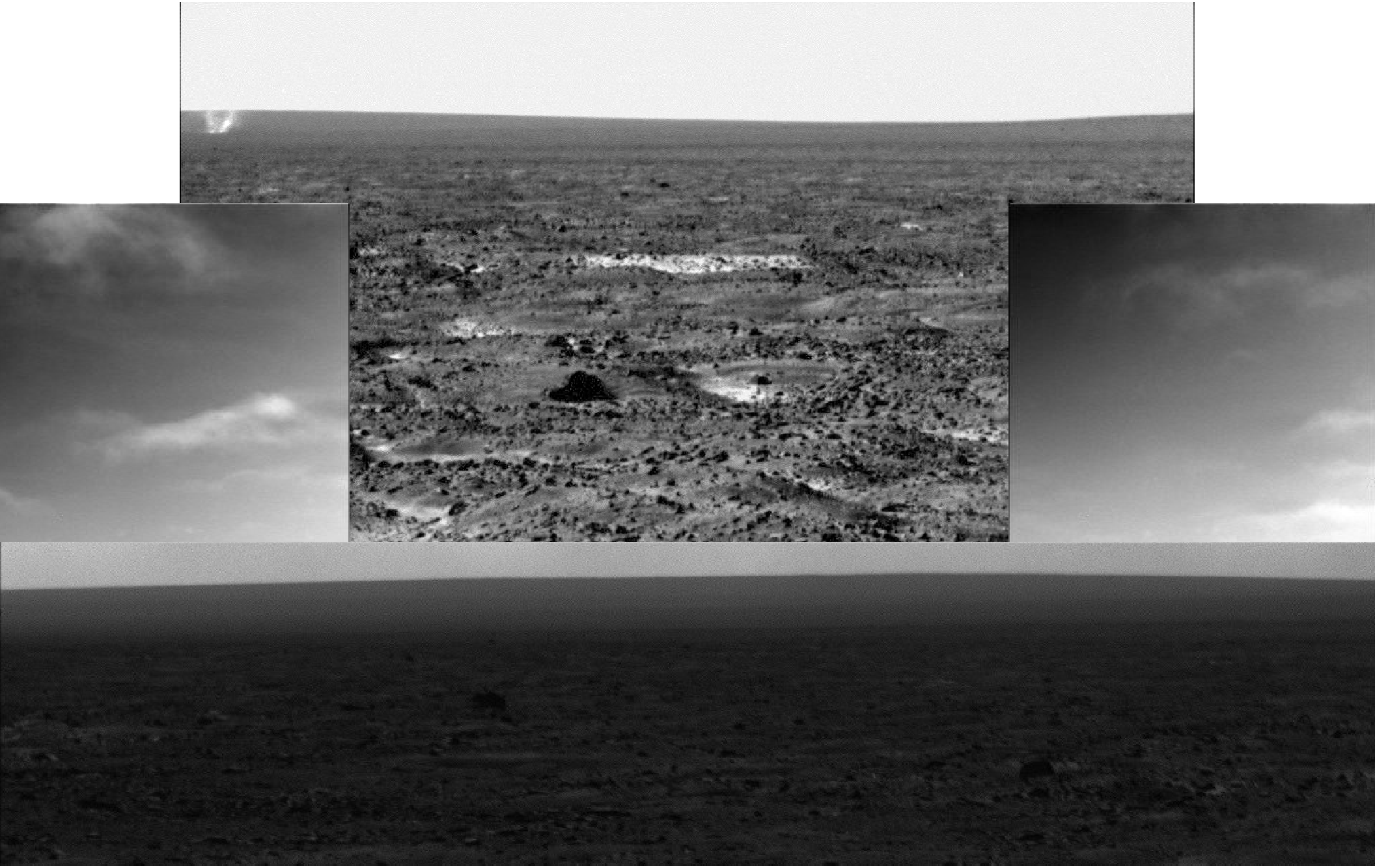
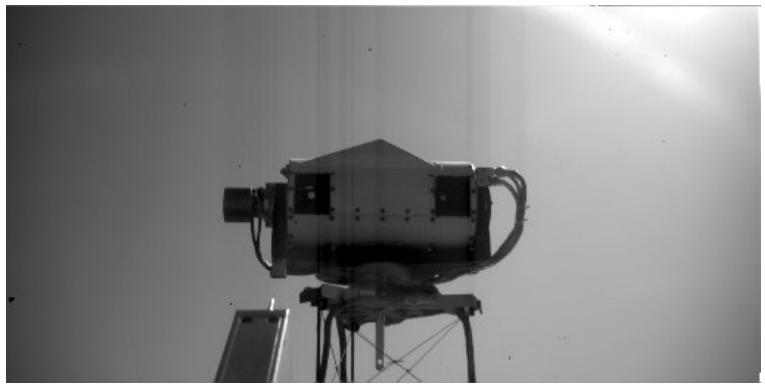
LOCKHEED MARTIN

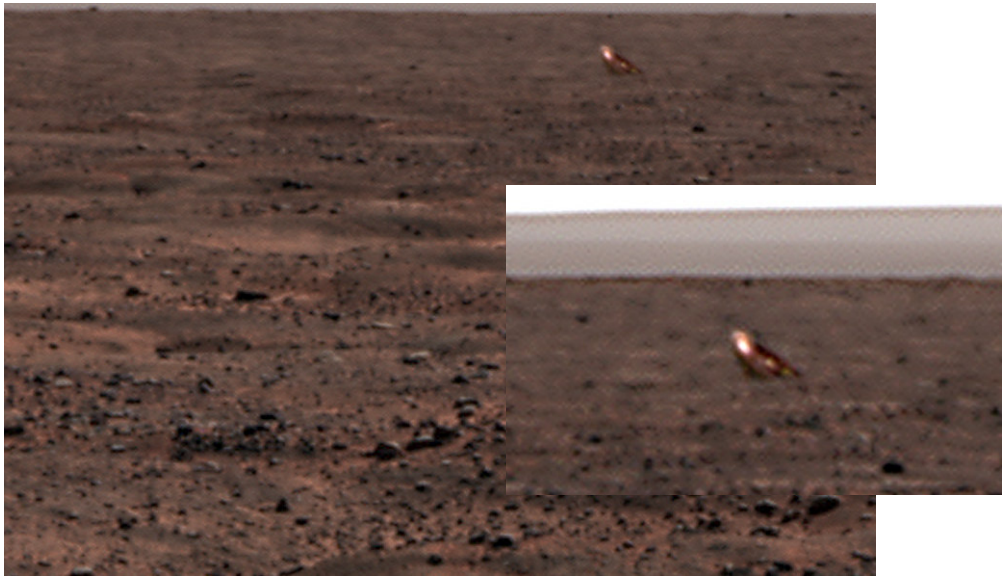
Sol-106/ Sol-109



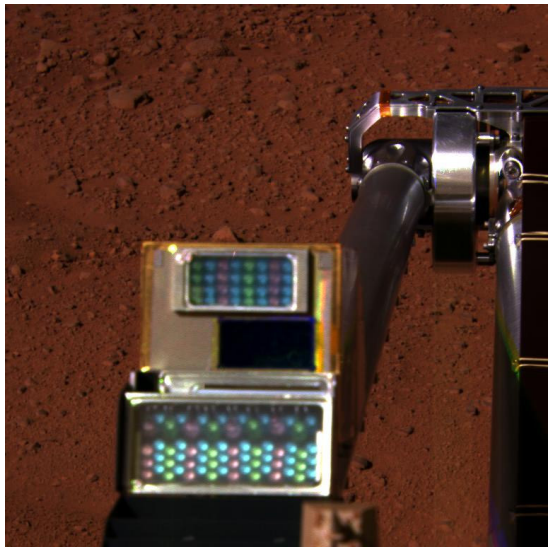
Sols 110 - 116

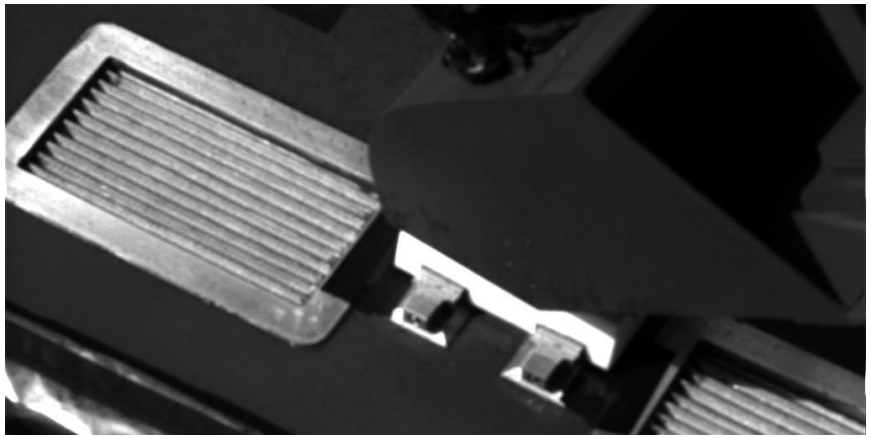


Camera's photo's of each other



Backshell





OFB Touch Test

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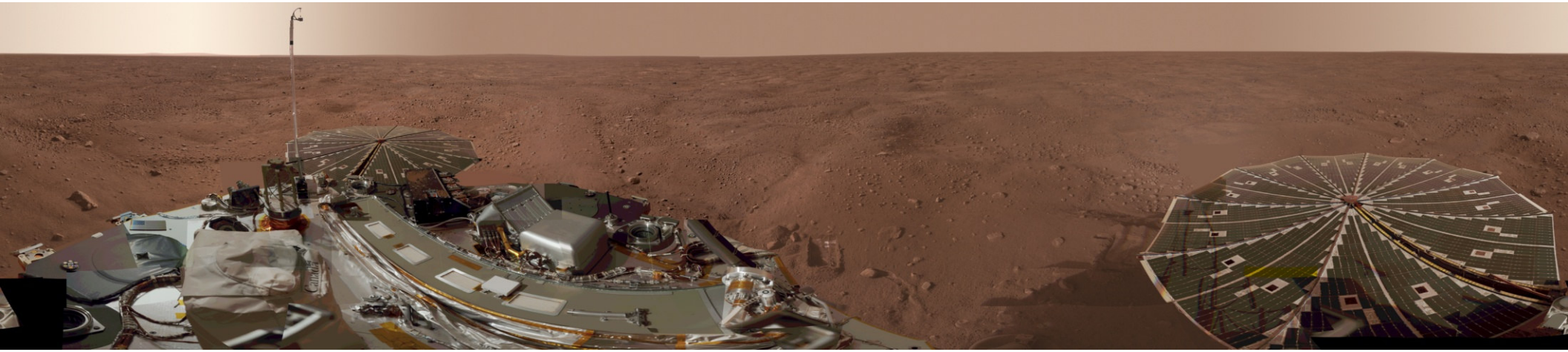
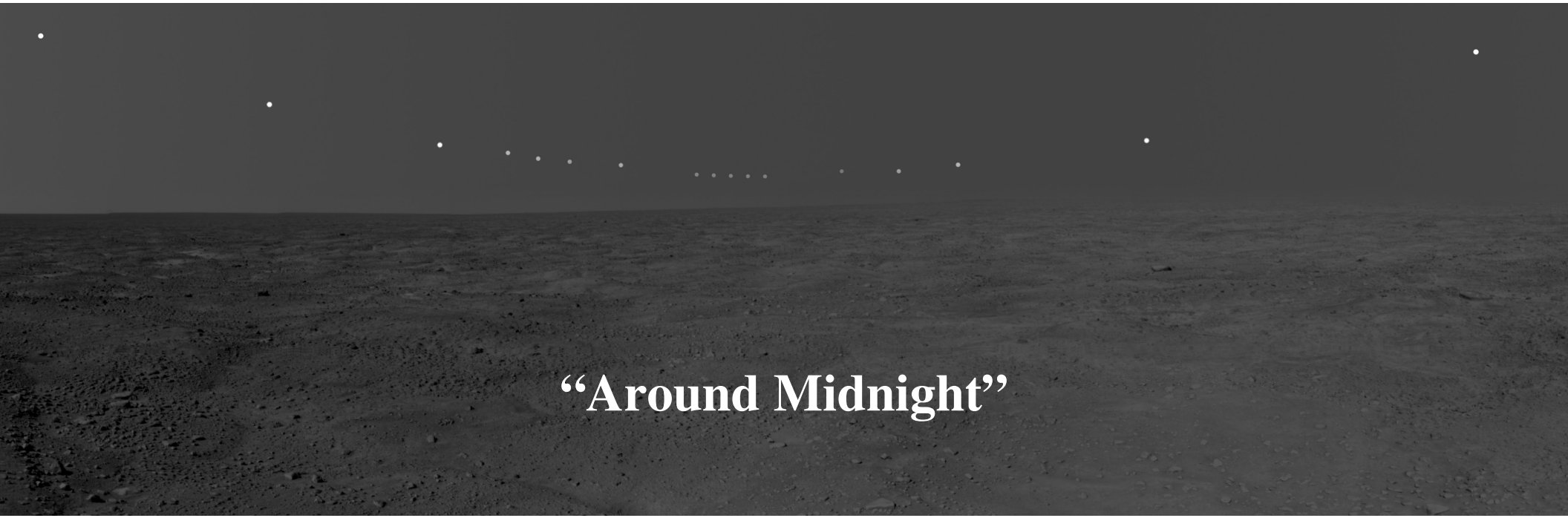
Panoramas

LOCKHEED MARTIN





"Around Midnight"