

Mars Rover Navigation

Mars Pathfinder Rover

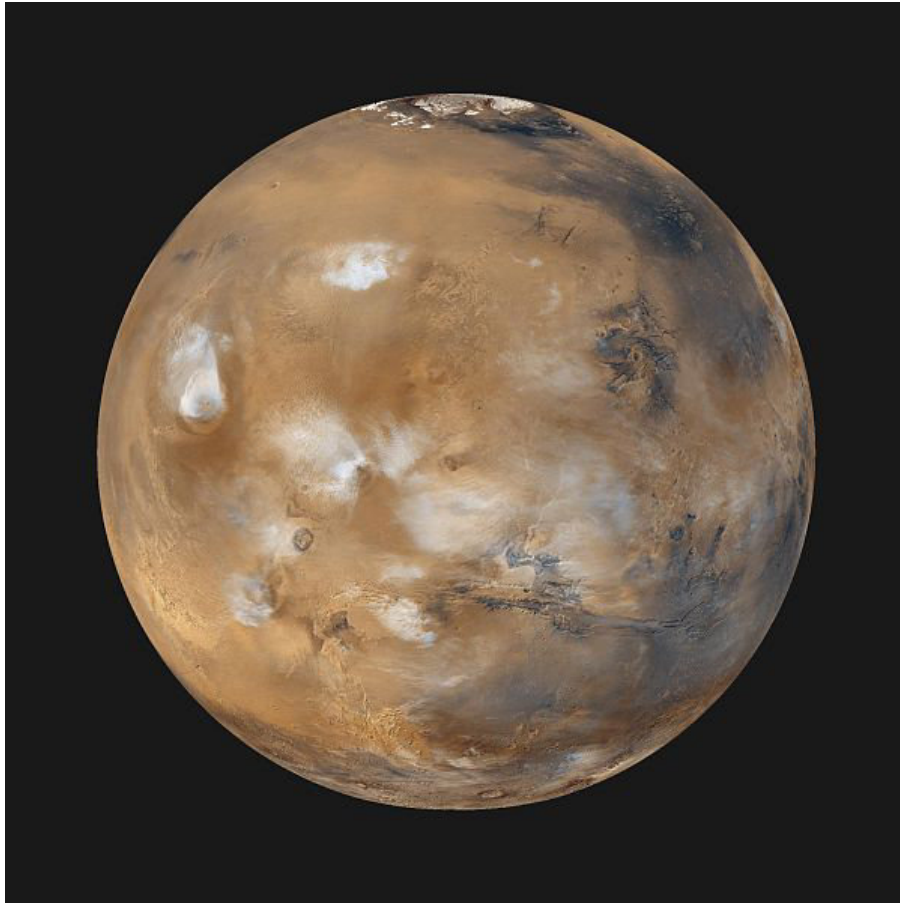
Mars Exploration Rover

ExoMars Rover

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2. Rover
 - a. Mars Pathfinder Rover
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3. Perspective
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1. Introduction



- Why Space Travel?
- Why Mars?
- Why Rover?

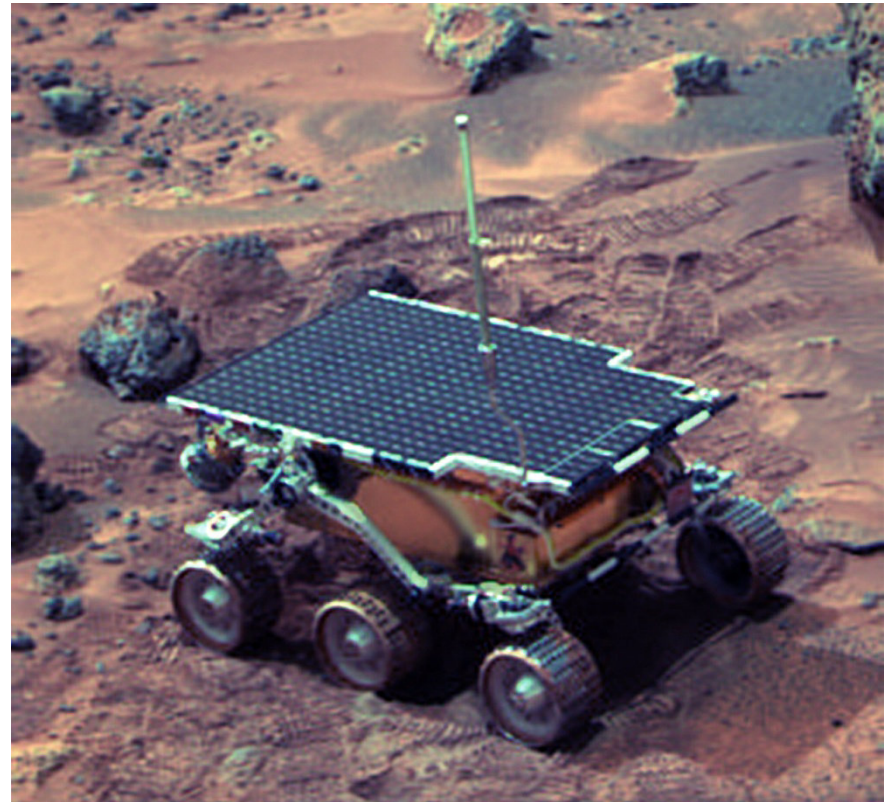
2. Rover

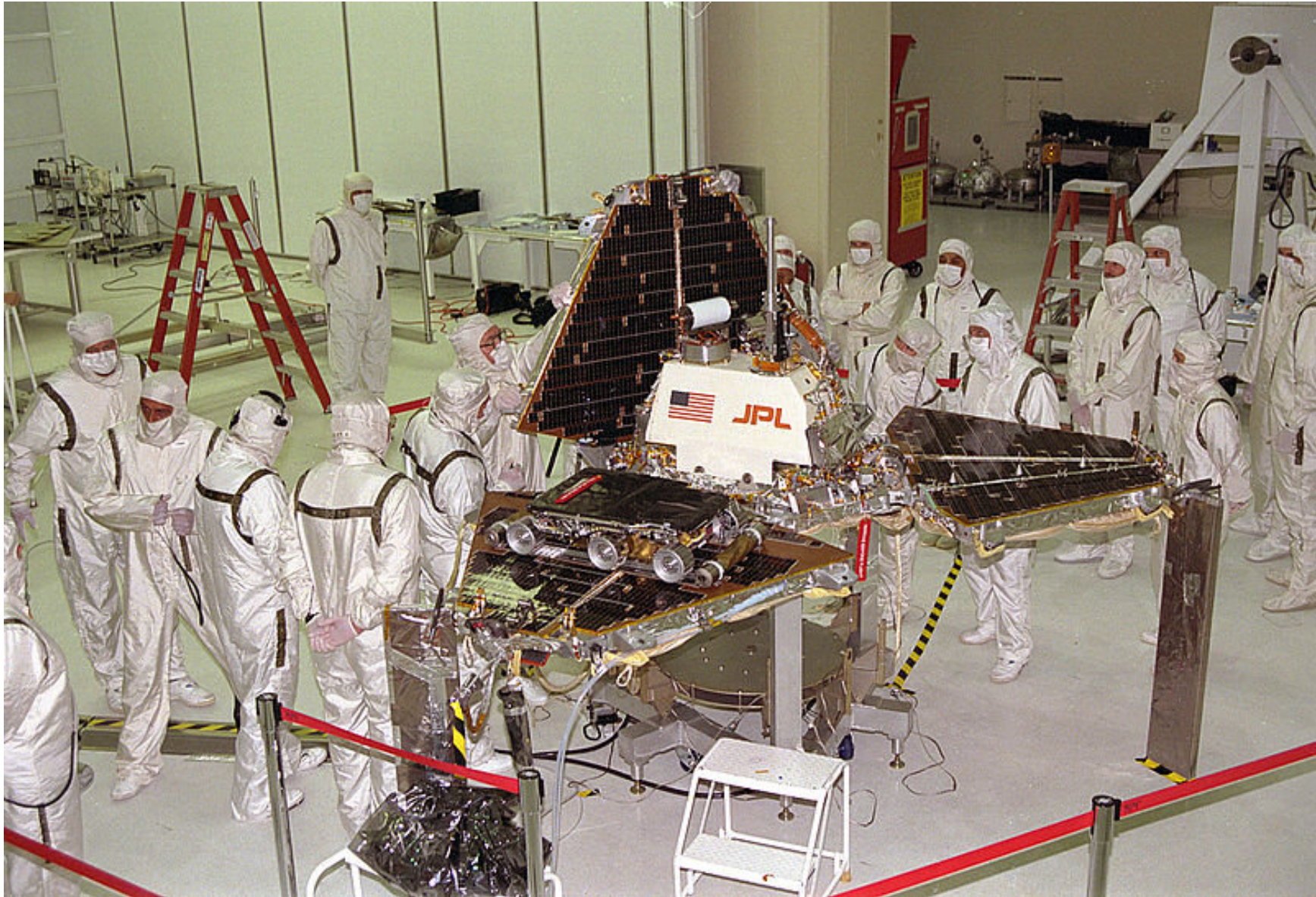
- Exploration
- Transportation
- Requirements
 - Autonomy
 - Reliability
 - Compactness



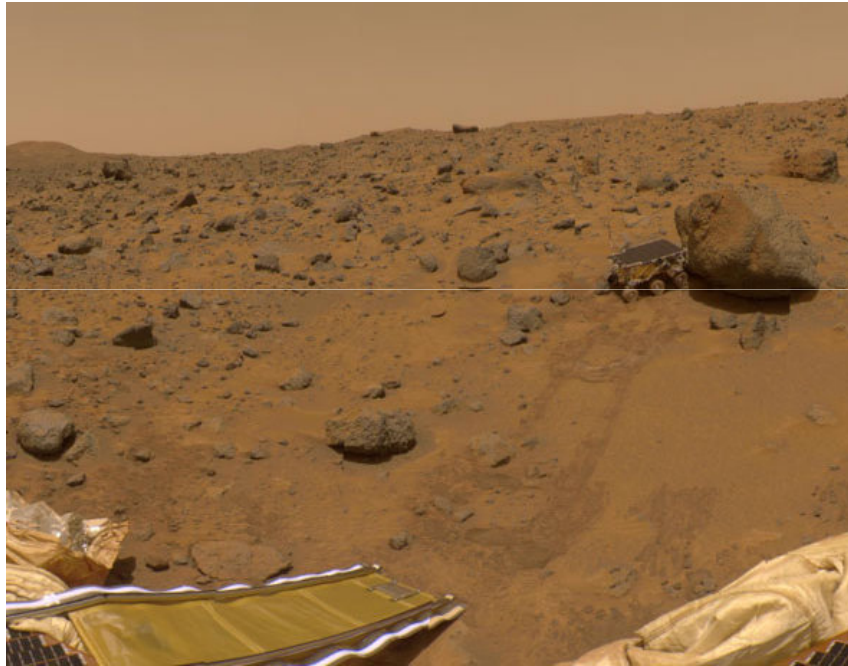
a. Mars Pathfinder Rover

- Sojourner
- 1996-1997
- 65 x 48 x 30 cm
- 3 month
- Images and chemical analyses
- 1 cm/s





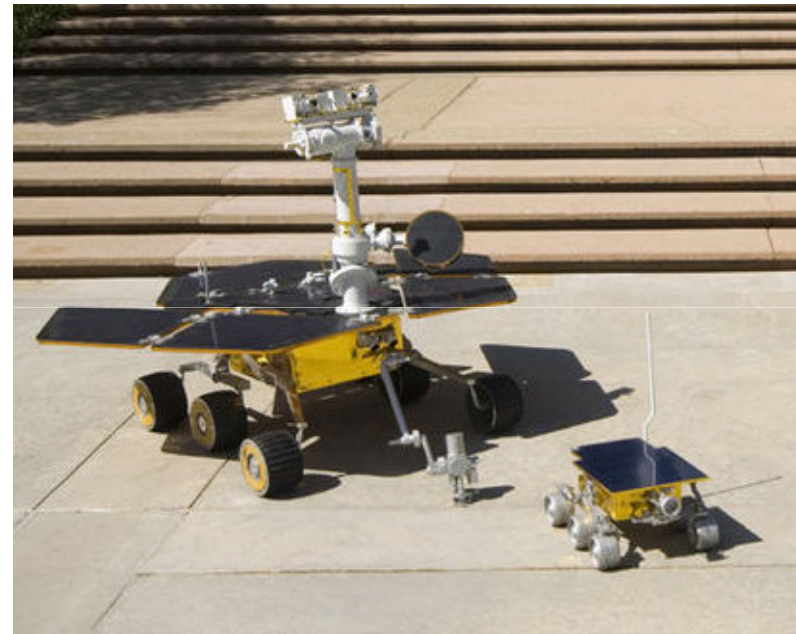
a. MPR Navigation



- Semi-autonomous
- Images sent to Earth
- GoTo-XY command
 - Waypoints
 - Time
- Hazard Avoidance
- Odometry

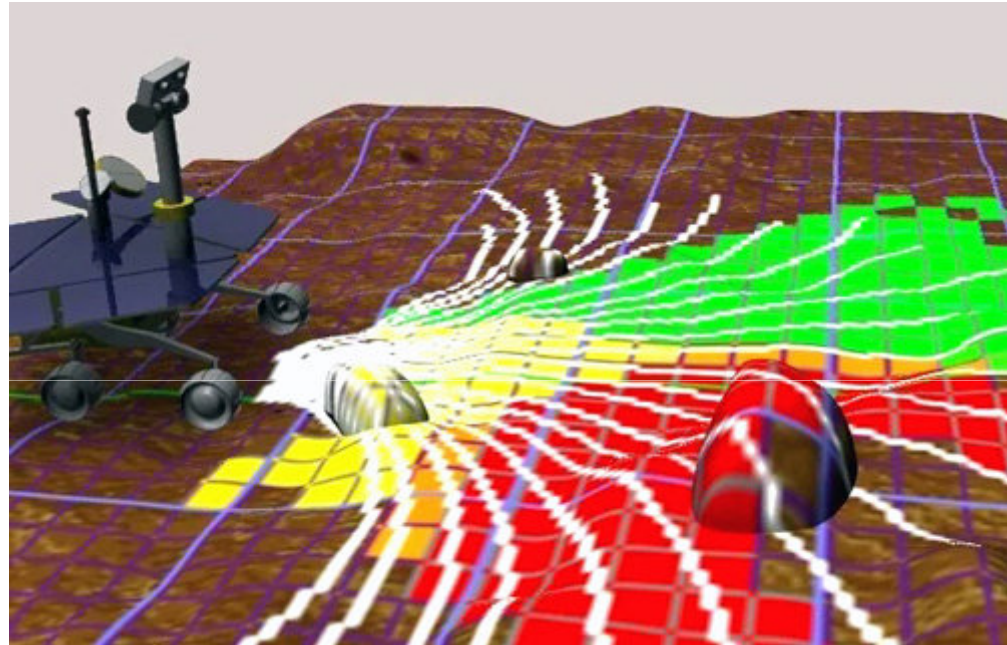
b. Mars Exploration Rover

- MER-B (Opportunity)
- since 2004
- 2 month
- Water occurrence
- 5 cm/s, but not faster



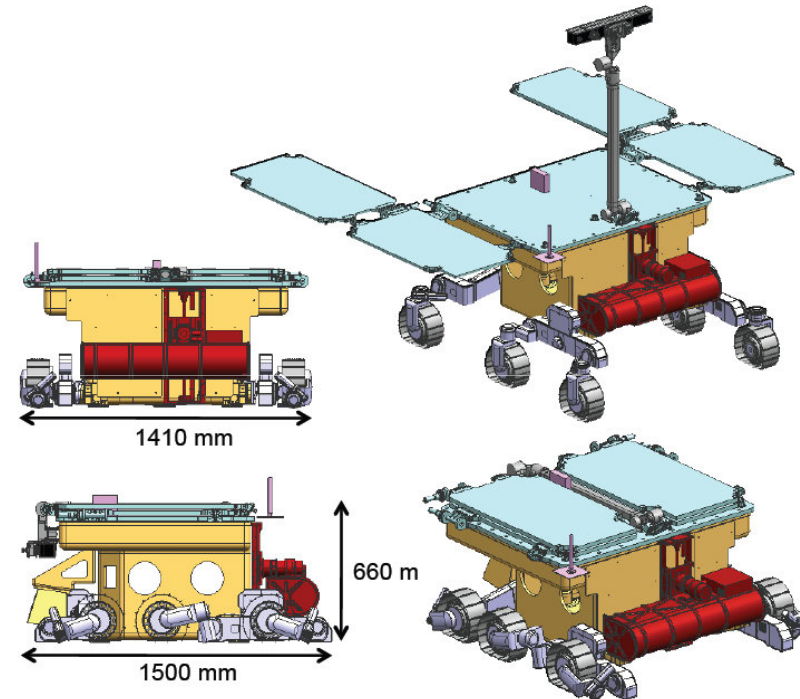
b. MER Navigation

- Autonomous
- Waypoints
- Stereo View
 - 3D Mapping
 - 15.000 points
- Path of least resistance
- Odometry and comparison of images



c. ExoMars Rover

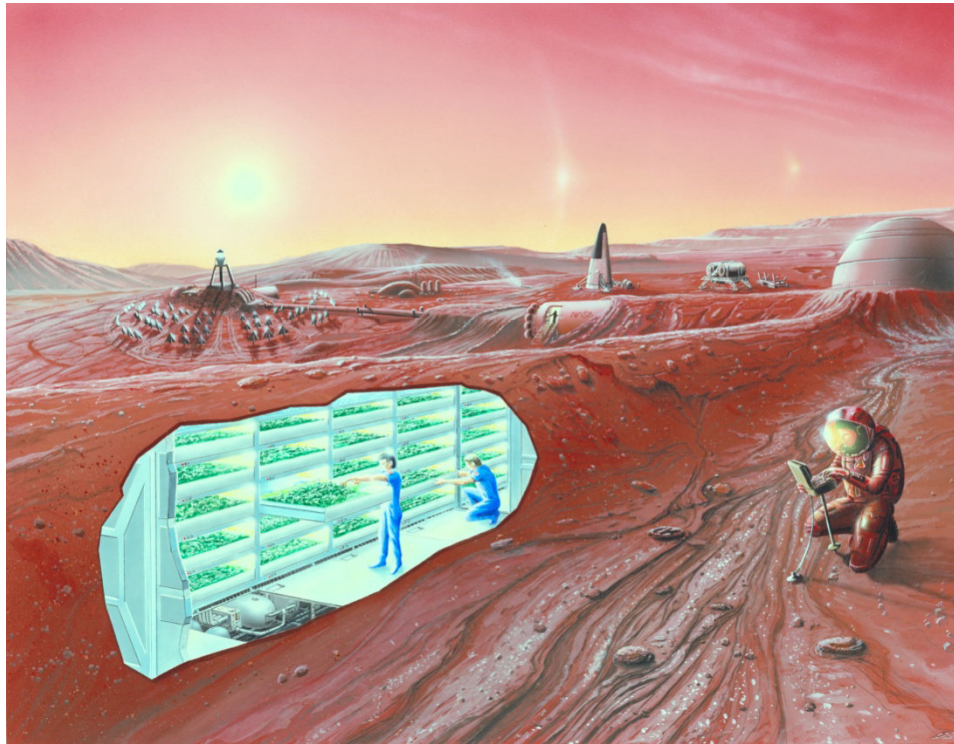
- 2018
- Russia
- Ideas:
 - Efficient algorithms
 - Modular design
- Better view
- Inertial navigation and sun sensor



c. ExoMars Navigation

- Modules
 - Perception
 - Decision
 - Action
- Navigation *during* traverse

3. Perspective



- Sample Return Mission
- No Return Mission
- Living on Mars
- Mars Orbiter Mission, India

4. Conclusion

- Last 20 years
 - Hardware developments
 - First experiments
 - Experiences
- Future
 - More efficient software
 - More/ better data

References

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