



MARS

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Mars Exploration Mission Elements

- ▣ Trace Gas Orbiter
- ▣ Mars Sample Return
- ▣ MAX-C
- ▣ Network Mission



Trace Gas Orbiter

GOALS

- ▣ Provide extensive survey of key trace gases
- ▣ Help us understand history of earth's atmosphere and climate
- ▣ Life on Mars?

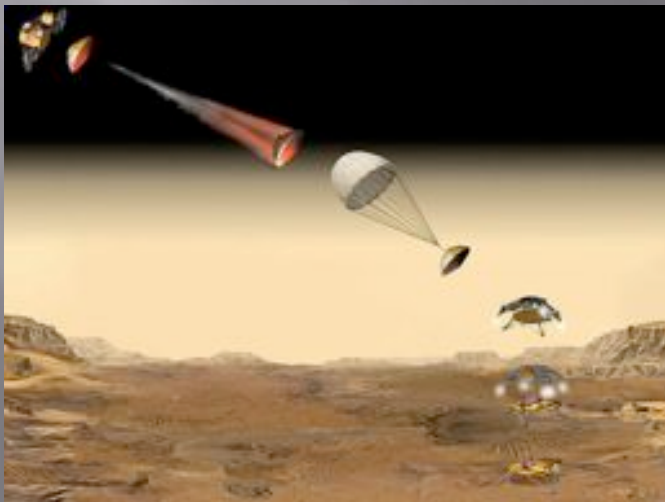
APPROACH

- ▣ High sensitivity spectrometers for trace gas detection
- ▣ Low-cost sounders and wide angle imagers with new microwave/sub-mm profilers
- ▣ Composition of crust and core

Mars Sample Return

GOALS

- ▣ Obtain >350 gm of well-characterized, isolated samples from high-priority site and return to earth



APPROACH

- ▣ Sample acquisition and caching rover
- ▣ Mars ascent vehicle
- ▣ Return orbiter

MAX-C

(Mars Sample Acquisition and Caching Rover)

GOALS

- ▣ Water activity
- ▣ Characterize site and prepare sample cache for retrieval
- ▣ Part one of Sample Return campaign

APPROACH

- ▣ Emphasis on quality sample cache
- ▣ Provide retrievable and carefully selected sample cache
- ▣ MER-class instruments

Network Mission

GOALS

- ▣ Lay out sites to look at:
 - Interior structure
 - Composition
 - Processes

- ▣ Geo/meteorological cycles

- ▣ Climate history

APPROACH

- ▣ Conduct interior measurements, particularly of seismic signals

- ▣ Does not require precision landing (advantage)

- ▣ Long term observing period (2+ years)

- ▣ Potential to build network over multiple launch opportunities



Possible Mission Set for Mars Exploration

2011

2013



MAVEN



Trace Gas Orbiter



Mars Sample Return Orbiter

ExoMars

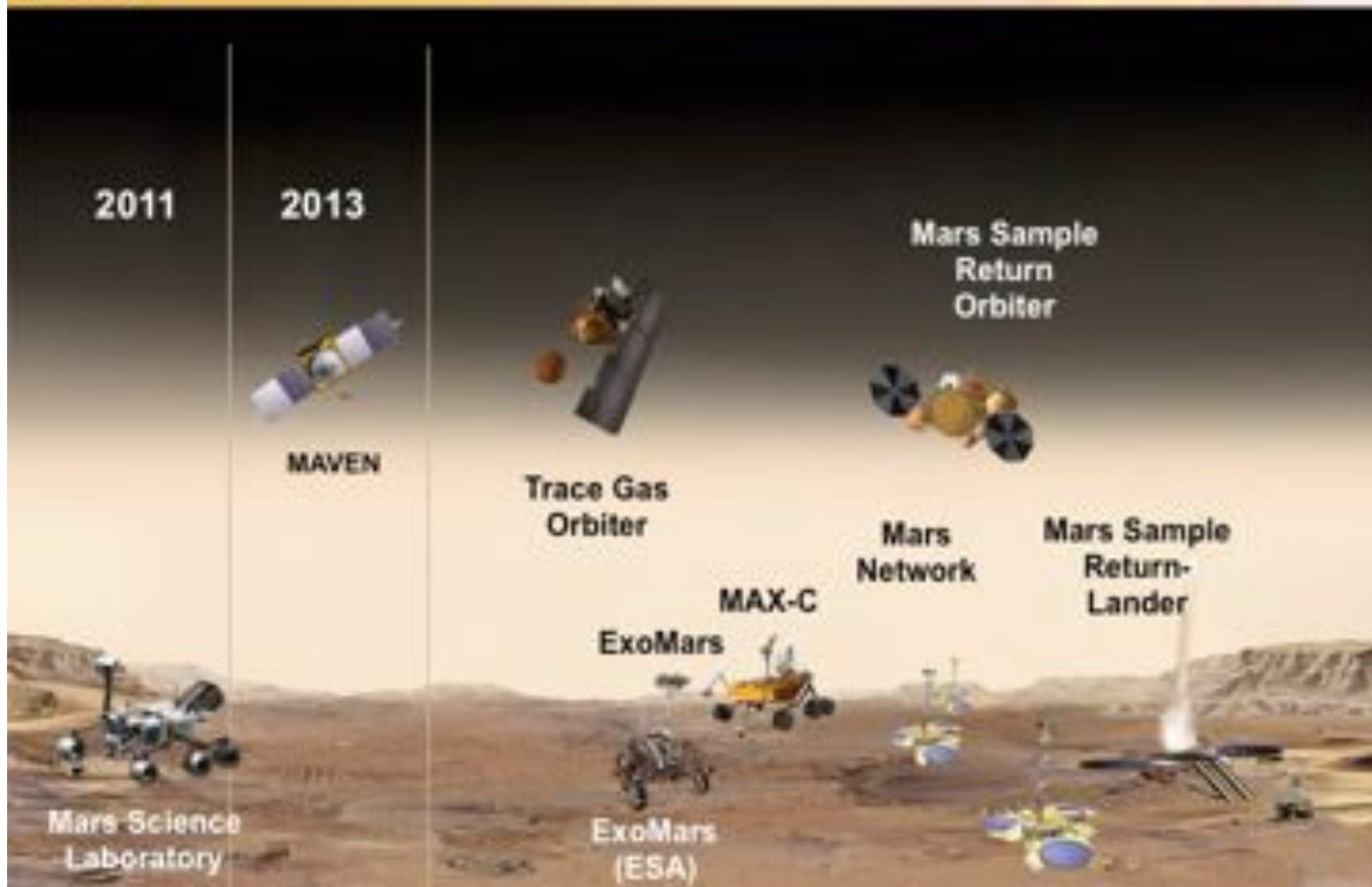
MAX-C

Mars Network

Mars Sample Return-Lander

Mars Science Laboratory

ExoMars (ESA)



Ground Based

- ▣ Develop:
 - Mars ascent vehicle (MAX-C)
 - MSR-O
 - Network of surface stations

- ▣ Improve:
 - Sample handling facilities (contamination control)

- ▣ Available:
 - LIDAR Laser Scanning Satellite
 - Magnetometers
 - RADAR technology



Why Mars is Important

- ▣ Possibility of life
- ▣ Climate Change
- ▣ Answer questions regarding formation of the solar system
- ▣ Science return per dollar

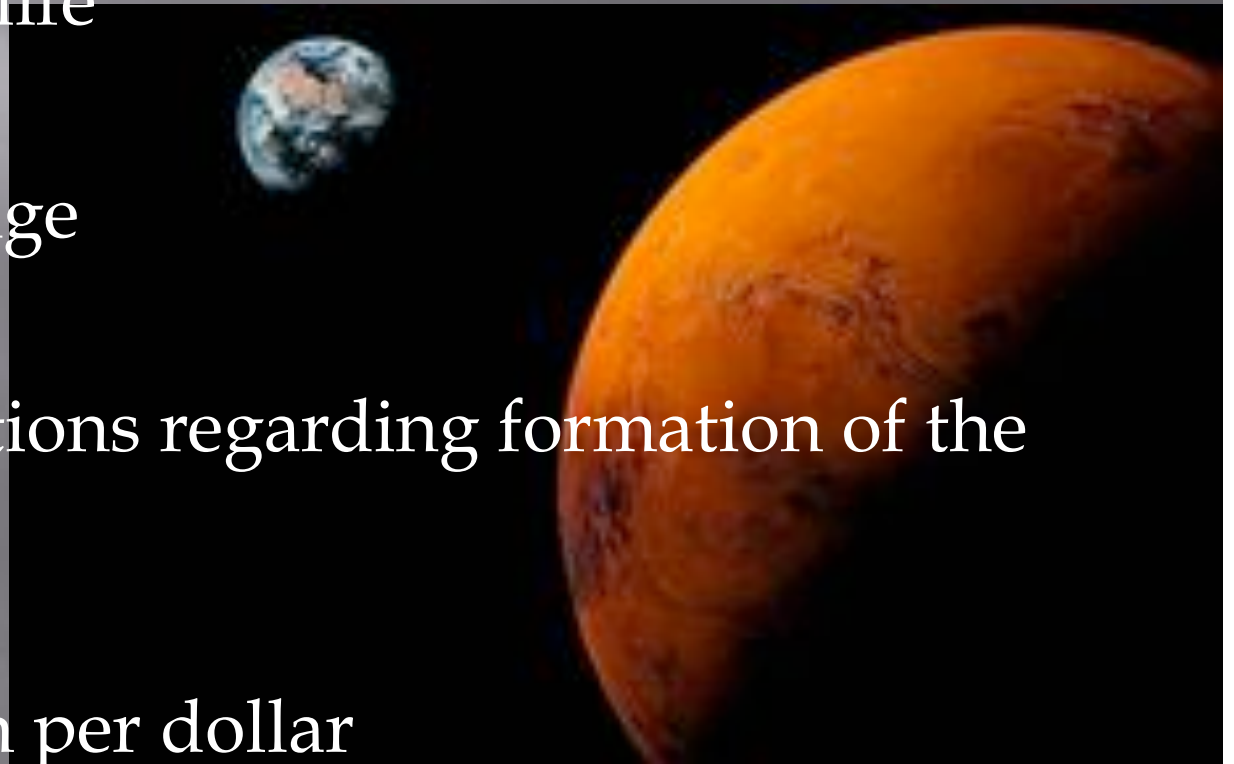


Image Resources

- Slide 1- <http://planetfacts.org/wp-content/uploads/2010/03/The-planet-mars.jpg>
- Slide 2- http://sci.esa.int/science-e-media/img/0c/Orbiter2016_Mars_02_410.jpg
- Slide 4- <http://astrobio.net/albums/mars/abu.jpg>
- Slide 7-
<http://www.spacepolicyonline.com/pages/images/stories/PSDS-AGU-Christensen.pdf>
- Slide 8- http://mars.jpl.nasa.gov/images/Mars_Exploration_Technology-fi.jpg
- Slide 9- <http://www.dailygalaxy.com/.a/6a00d8341bf7f753ef014e8689b86a970d-500wi>