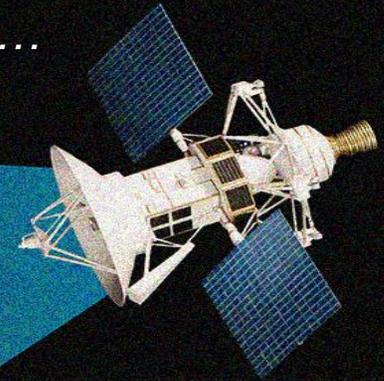


From orbit...



Venus Exploration Targets

Workshop: A Retrospective

In the atmosphere...



Organizing Committee:

Buck Sharpton

Lori Glaze

Larry Esposito

Kevin McGouldrick

Stephanie Johnston

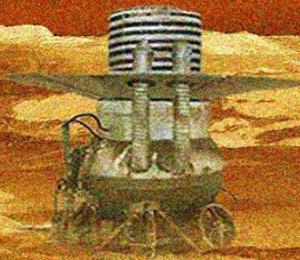
Chris Lee

Christophe Sotin

Marty Gilmore

Robbie Herrick

On the surface...



May 19-21, 2014

Lunar and Planetary Institute

Environmental Factors

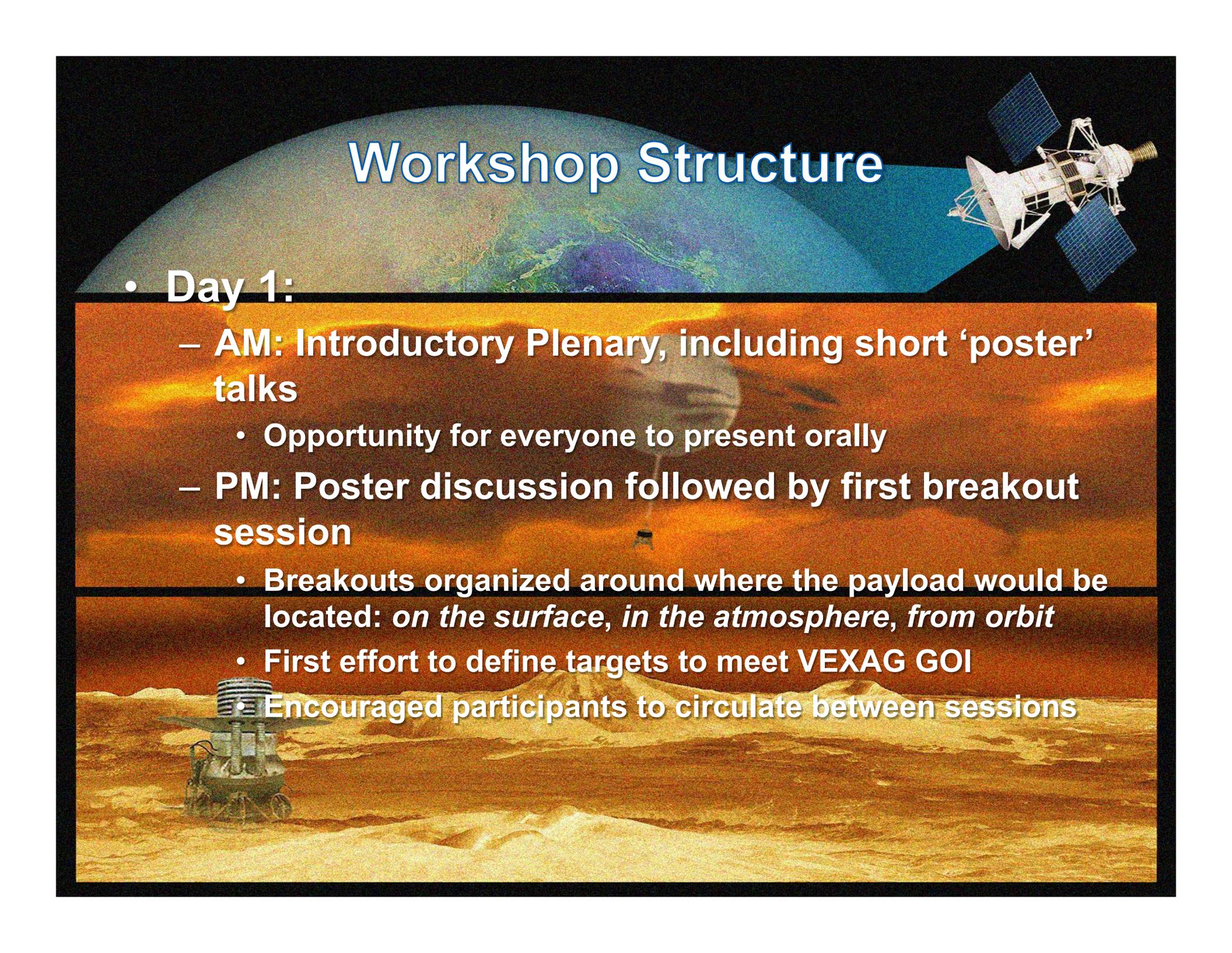


- **Organizing Committee launched 5 Sept. 2013**
 - Workshop dates set: 19-21 May 2014
 - Program designed; announcements circulated
 - Invited Venera D project scientists from Russia and US
 - **NASA HQ releases Discovery synopsis: Feb. 2014**
 - Implementation & Science Teams off to the races
 - **Geopolitical tensions mount: March, 2014**
 - Russian participants unable to attend workshop
 - **Nonetheless, the workshop attracted 51 participants from around the globe.**
- 



Workshop Goal

- To *identify and evaluate* key locations, transects, and regions for future exploration of Venus.
 - On the surface or within the atmosphere
 - Appropriate candidate targets include those requiring
 - landers,
 - atmospheric probes, gliders, or balloons, and
 - orbital missions.



Workshop Structure

- **Day 1:**

- **AM: Introductory Plenary, including short ‘poster’ talks**
 - Opportunity for everyone to present orally
- **PM: Poster discussion followed by first breakout session**
 - Breakouts organized around where the payload would be located: *on the surface, in the atmosphere, from orbit*
 - First effort to define targets to meet VEXAG GOI
 - Encouraged participants to circulate between sessions



Workshop Structure

- **Day 2:**

- **Morning Plenary**

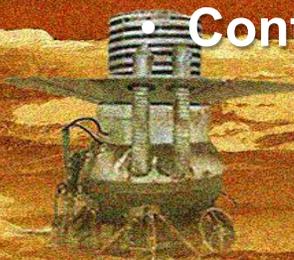
- Session leads summarized Day 1 progress

- **Morning Breakout Session**

- Continue to define targets
- Consider approaches needed at each target

- **Afternoon Plenary**

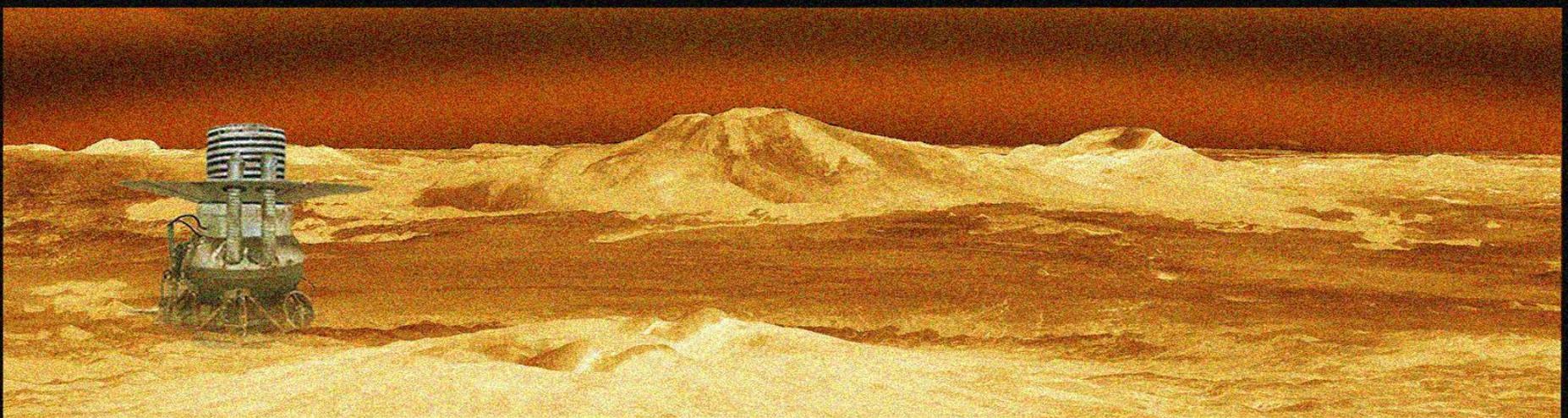
- **Afternoon Breakout Session**

- Continue discussions; add data requirements
- 



Workshop Structure

- **Day 3:**
 - **Capstone Plenary**
 - Extended discussion of workshop progress
 - **Adjourned at Noon**
 - **PM: Organizers convened to discuss results & path forward.**





Accomplishments

- **Surface:**

- Significant science achievable from low-risk areas such as plains

- Meets majority of objectives in VEXAG Goals 2 & 3
- Improved measurements of crust and lower atmosphere
- Safest: older plains devoid of ejecta, deformation features

- Tessera lander site would be scientifically optimal but more risky; risk mitigated by:

- High-resolution imaging and topography
 - Autonomous hazard avoidance technologies
- 

Accomplishments



- **Atmosphere:**

- Challenged by the complex matrix of 'domains':

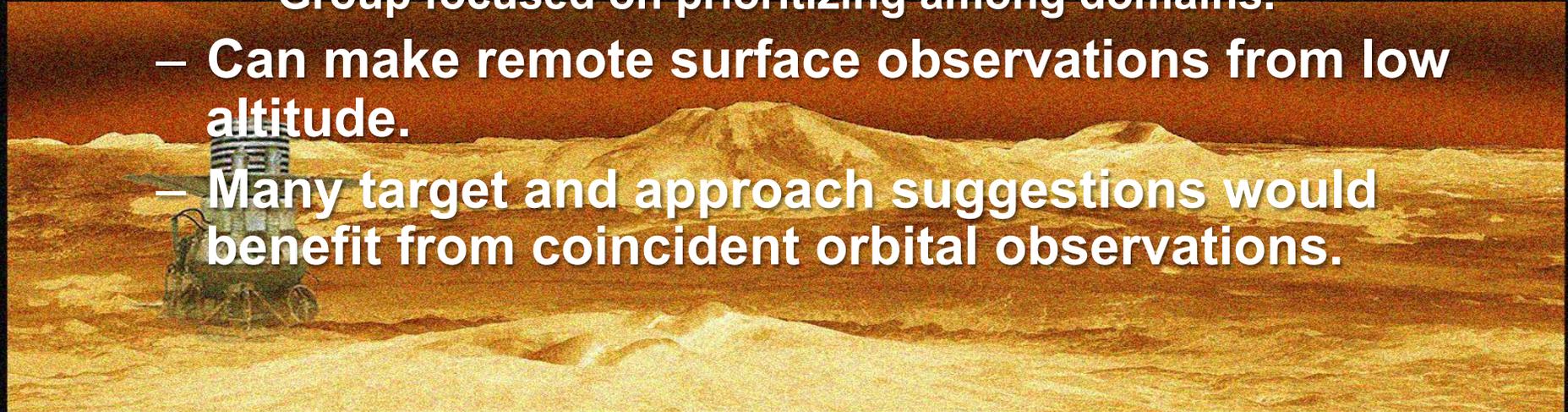
- Geographic location (x, y), height, time, duration
- No single, static 'target' is adequate

- Long-term, high spatial and temporal measurement of meteorological parameters is ideal but unrealistic.

- Group focused on prioritizing among domains.

- Can make remote surface observations from low altitude.

- Many target and approach suggestions would benefit from coincident orbital observations.





Accomplishments

- **Orbit:**

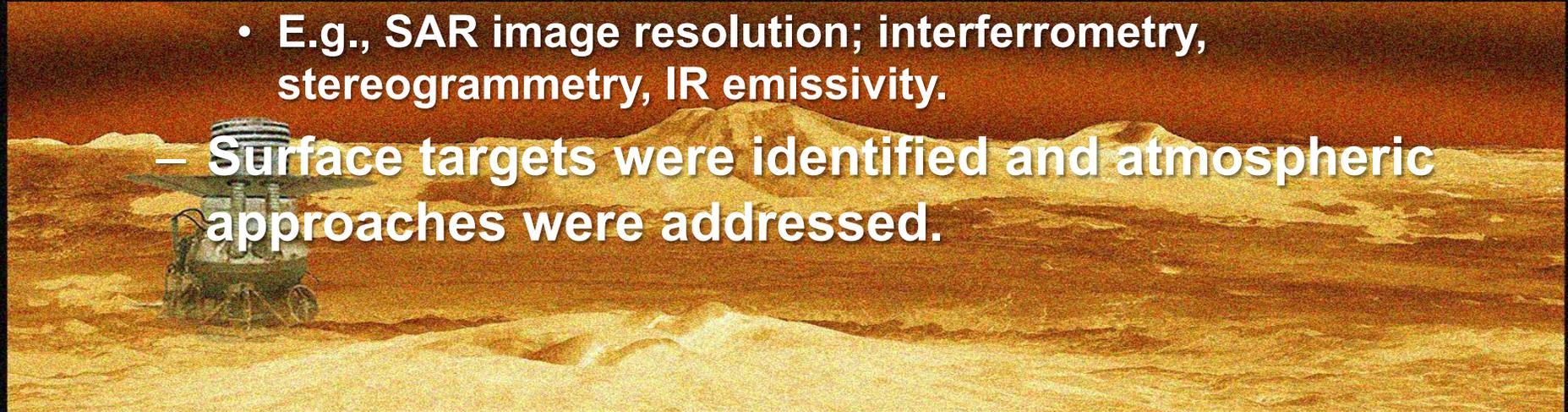
- Indirect but provide important regional context for in situ measurements

- Conversely, remote observations benefit from ground truth

- Technological advances offer vast improvements over current surface observations

- E.g., SAR image resolution; interferometry, stereogrammetry, IR emissivity.

- Surface targets were identified and atmospheric approaches were addressed.

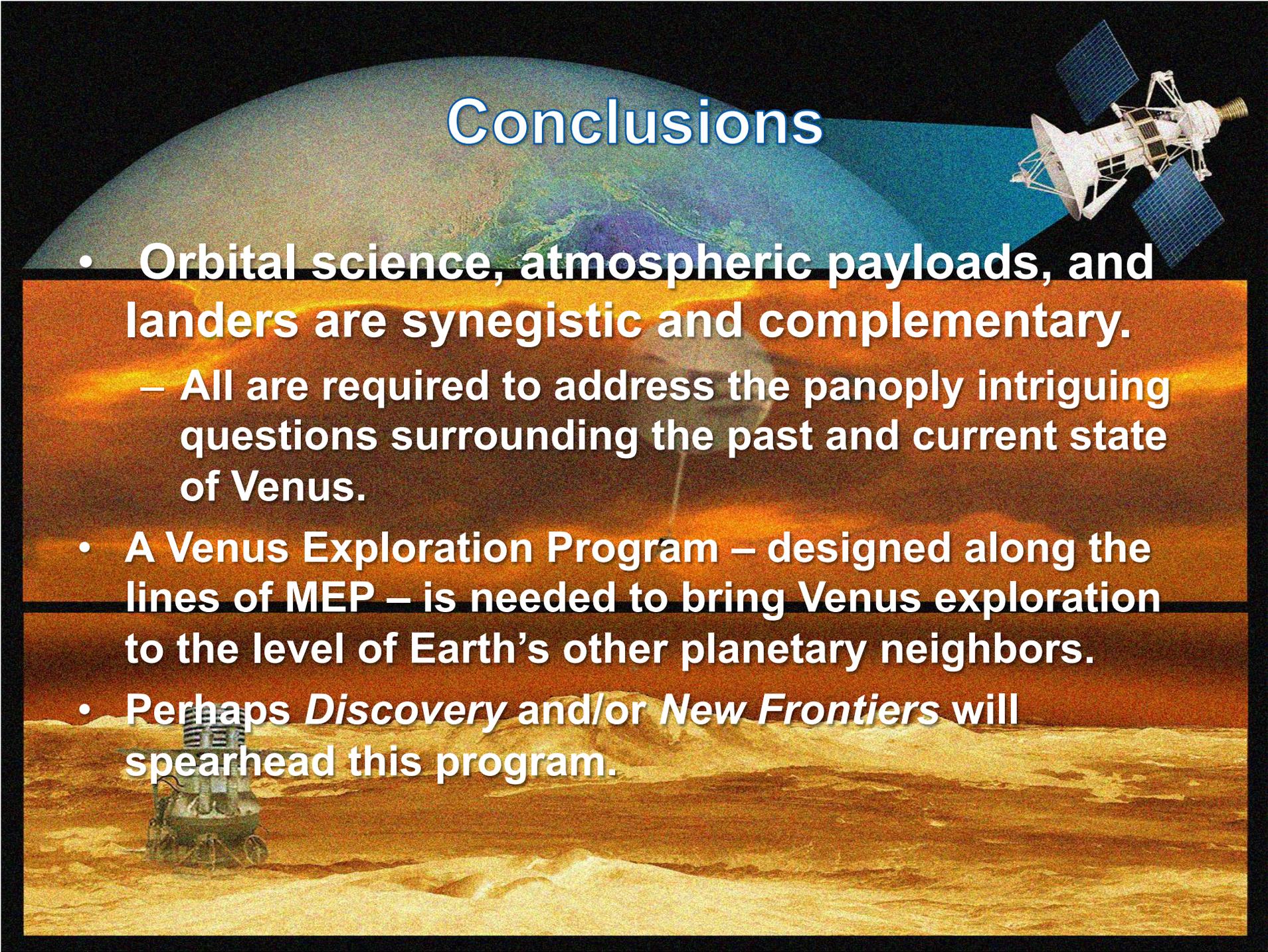




Next Steps

- 
- Report is being compiled now (some delay owing to Discovery proposals)
 - Report will be vetted by the community (specific reviews and community comment)
 - When completed, will be posted on the VEXAG website

Conclusions



- **Orbital science, atmospheric payloads, and landers are synergistic and complementary.**
 - All are required to address the panoply intriguing questions surrounding the past and current state of Venus.
- **A Venus Exploration Program – designed along the lines of MEP – is needed to bring Venus exploration to the level of Earth's other planetary neighbors.**
- **Perhaps *Discovery* and/or *New Frontiers* will spearhead this program.**