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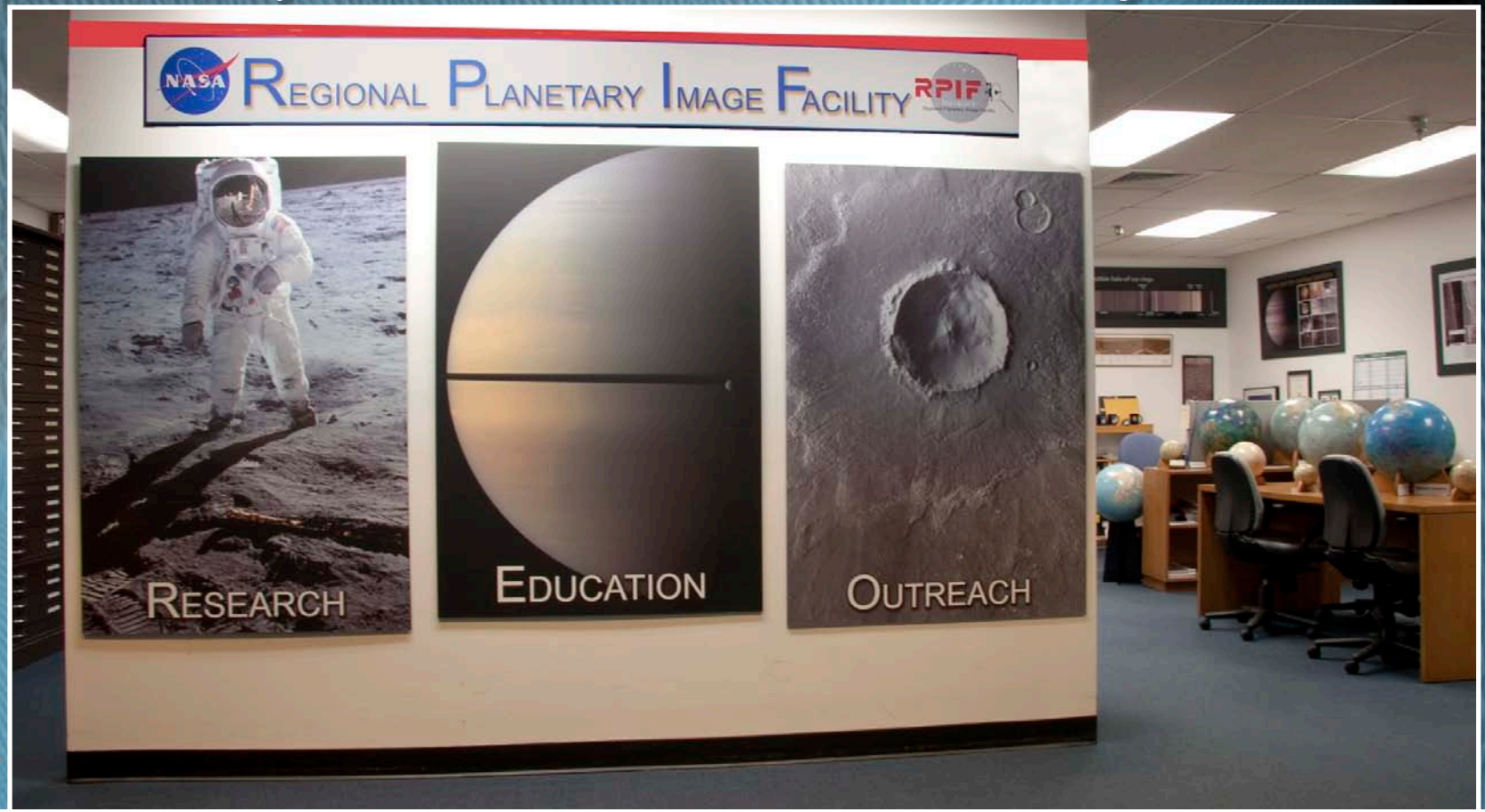
# RPIF Senior Review 2015

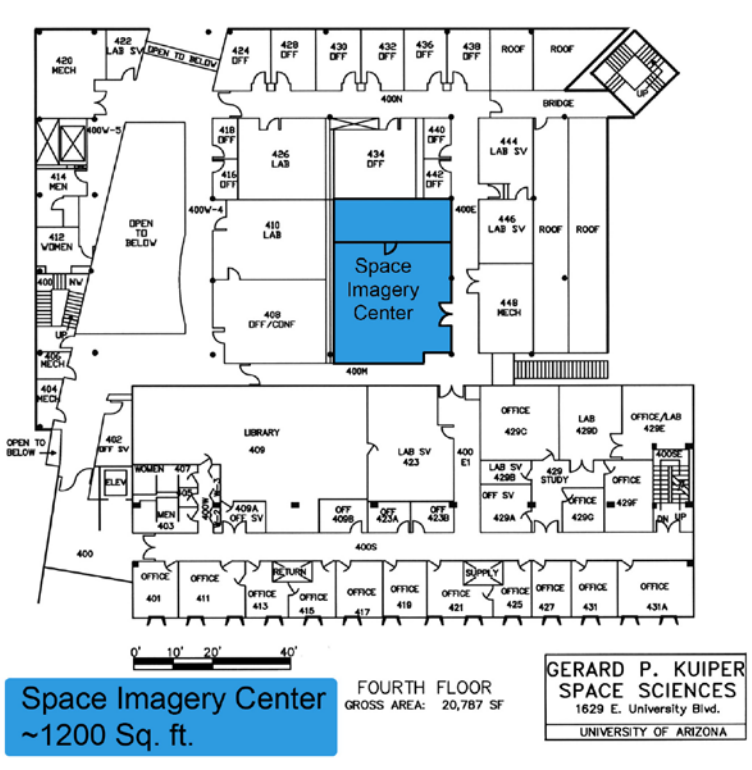
# Space Imagery Center
# University of Arizona

Director: Shane Byrne

Data Manager: Maria Schuchardt



- Established in 1977
- Library is 1200 sq. ft
  - with extra storage in basement
- MOU with NASA
  - Data manager and Physical Space provided by LPL
- Large Physical Collection
  - Prints/Negatives/CDS of the following missions (~400,000) Lunar Orbiter, Surveyor, Ranger, Apollo, Gemini, Mariner 6 - 10, Pioneer 10 & 11, Voyager, Viking, Pathfinder, Mars Global Surveyor, Magellan
  - Maps: 1,900, not including duplicates
  - Much gray literature and historical books and artifacts




- **Archiving**
- **Research**
- **Education & Public Outreach**

- Scanning of maps and atlases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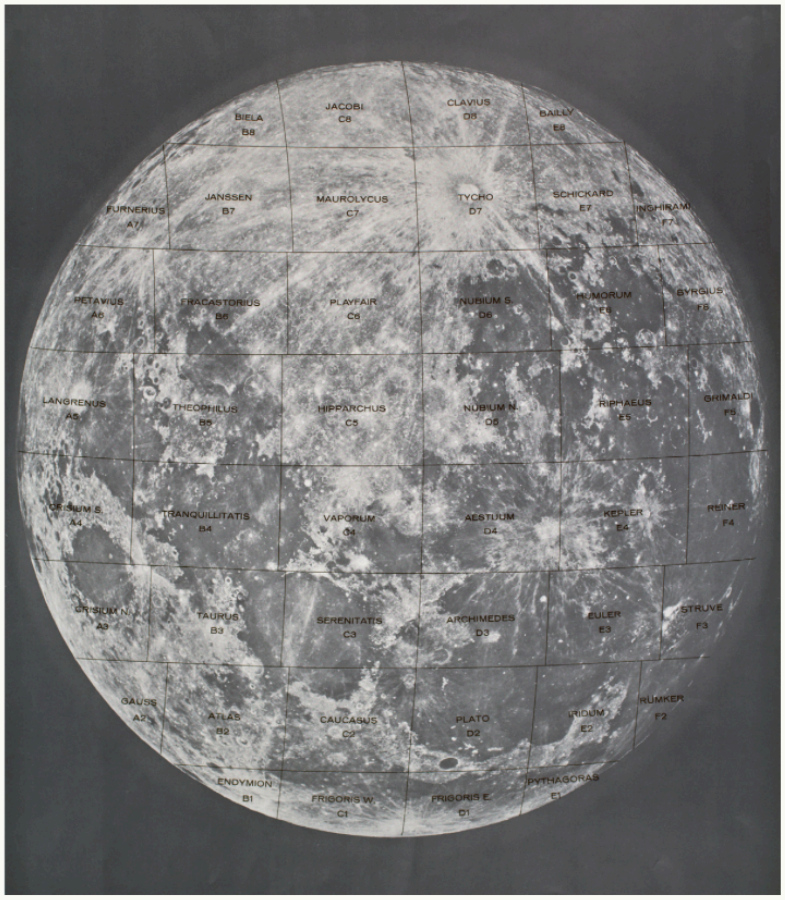
## PHOTOGRAPHIC LUNAR ATLAS

PLA 1960 Intro (PDF)

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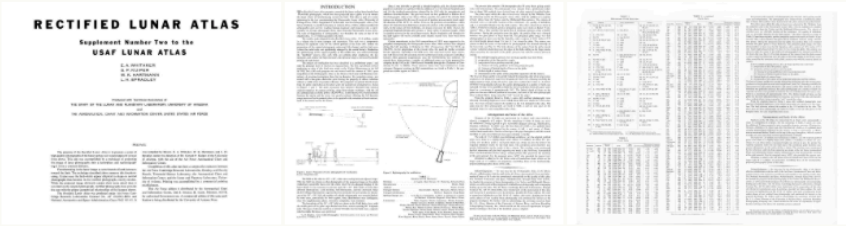
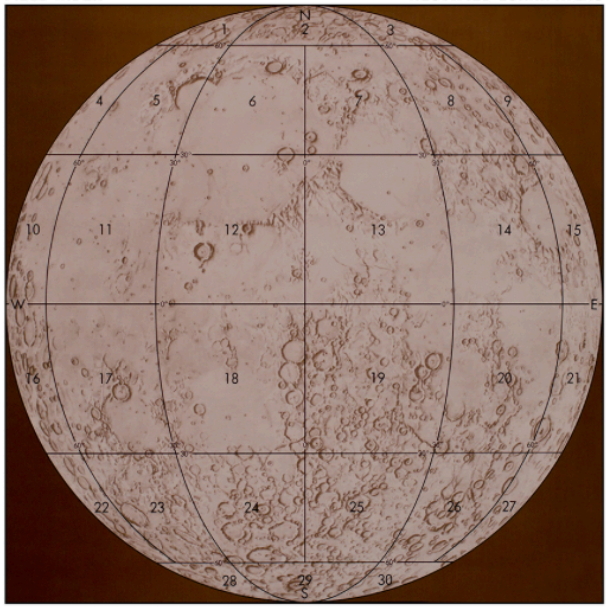
## RECTIFIED LUNAR ATLAS



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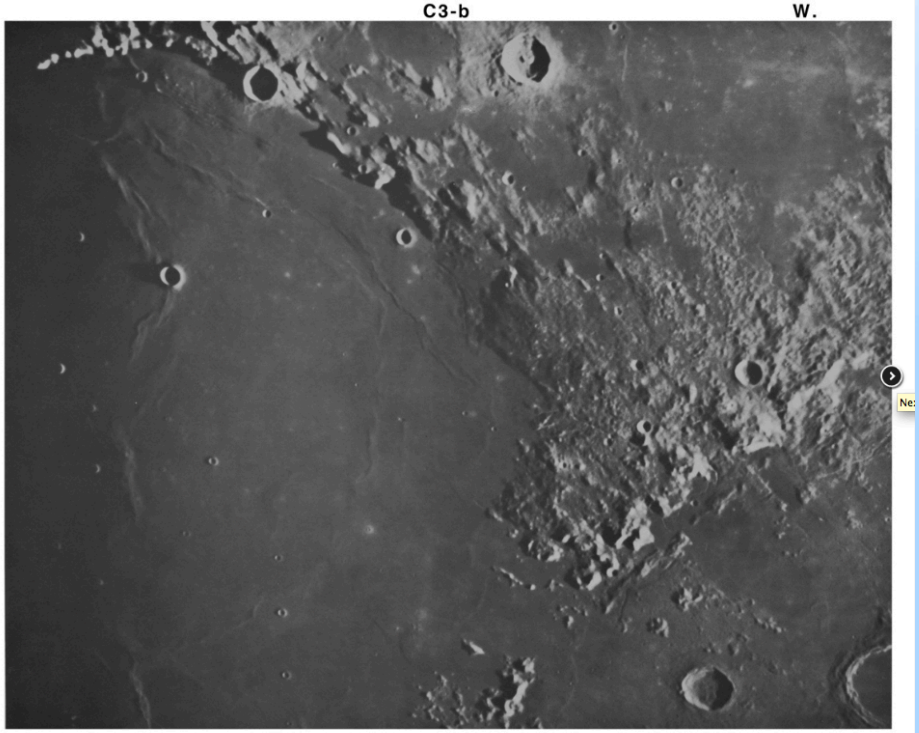
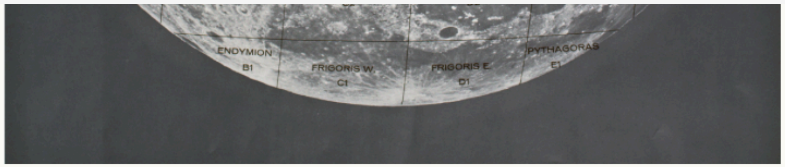
## PHOTOGRAPHIC LUNAR ATLAS

C3-b W.



Download C3-b.tif

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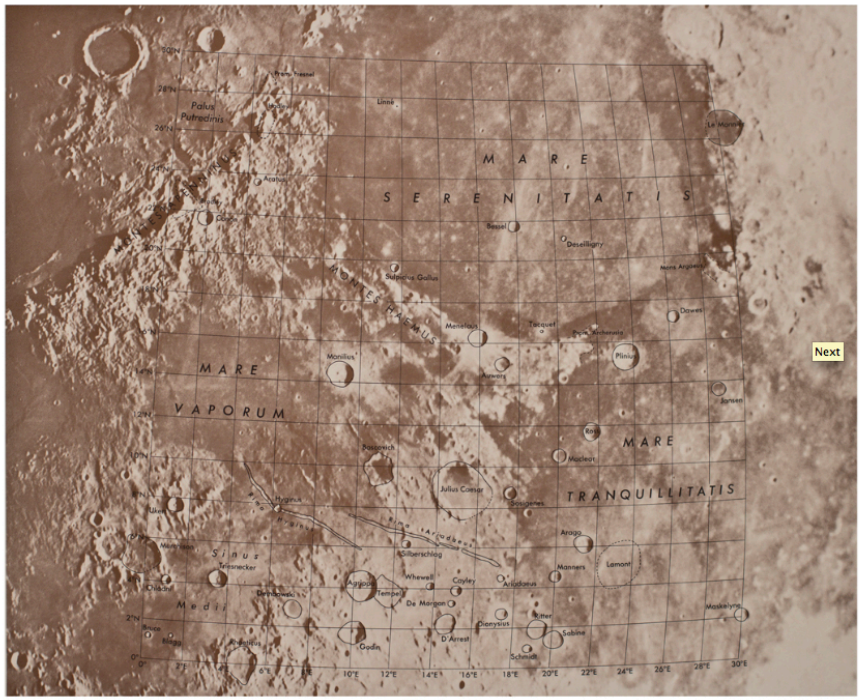
13-a RECTIFIED LUNAR ATLAS

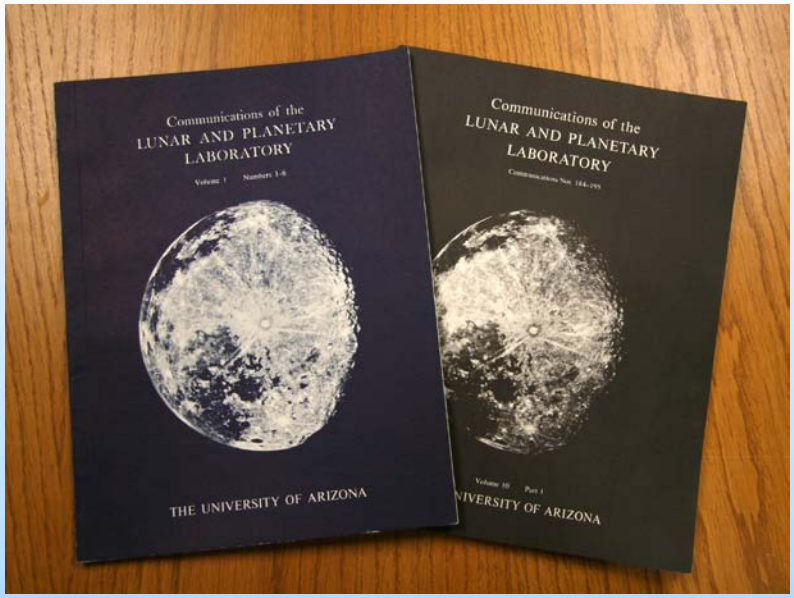



Positions of meridians and parallels taken from the Orthographic Atlas of the Moon. Adopted nomenclature explained in Introduction.

Scale 1:3,500,000 approximate
3.5 kilometers per millimeter 55 miles per inch

North is uppermost and selenographic east to the right, following the convention adopted by the I.A.U. at Berkeley in 1961.

Download 13-a (8.17 MB)




- Communications of the Lunar and Planetary Laboratory
  - Peer-reviewed journal that ran from 1962-1973
  - PDFs of all papers online
  - Metadata searchable on NASA ADS, with links to PDFs


- 20 years of geologic fieldtrip guides scanned and made available online
  - LPL's Planetary Analogue Fieldtrip class
  - Covers a few hundred geologic stops
  - Widely distributed throughout the south-west

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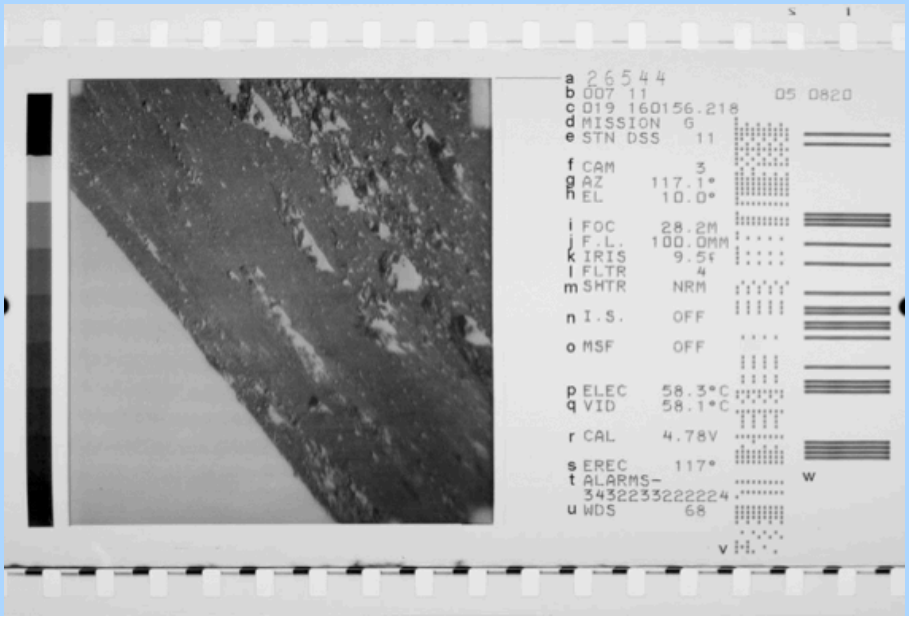
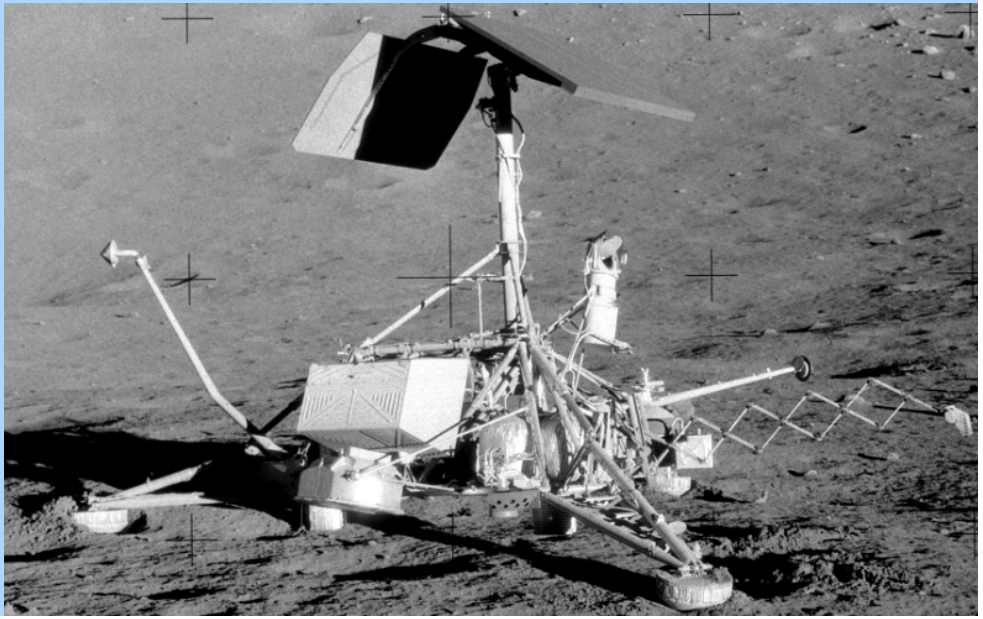
**Current work:**

Scanning the Lunar Surveyor Imaging Dataset

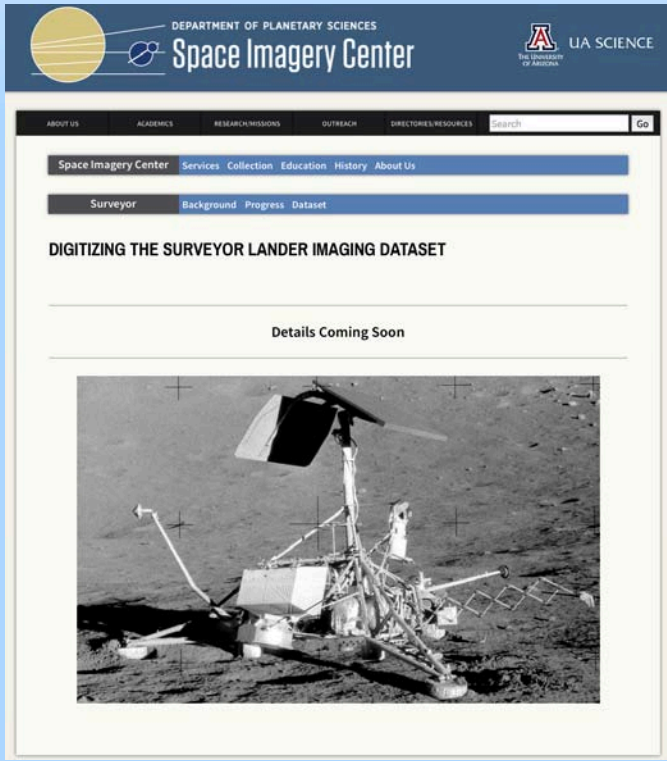
- Possible with additional LASER funds
- Will generate a PDS archive of ~88,000 images



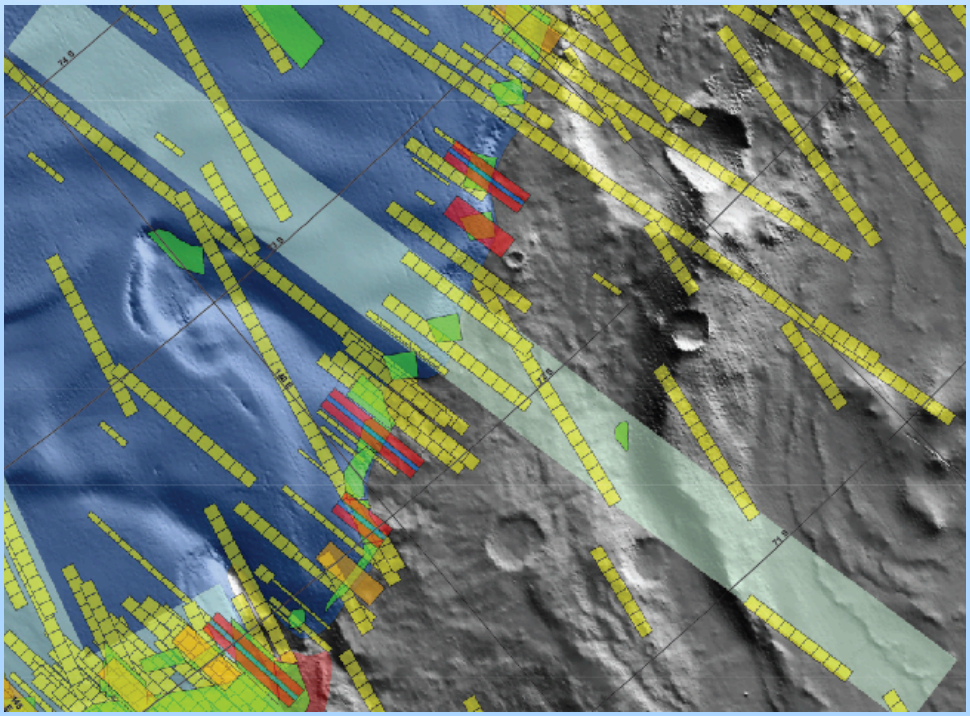
# The Future

- Scanning Maps and Atlases
  - Large format scanner (48”)
  - That do not duplicate existing online content
- Surveyor digital archive
  - Digital data from scanning
  - Gray literature
  - Surveyor related publications
  - Regenerate landing site mosaics
- Audio Archive
  - Initial digitization of early LPL symposia complete
  - Plans to archive interviews with Planetary Scientists involved with early missions
- Continue to conserve and digitize…
  - Earth telescopic data, gray literature, ~$10^5$ hard copy prints from early lunar and planetary missions, ~2000 USGS geologic maps, etc…



- Archiving
- Research
- Education & Public Outreach

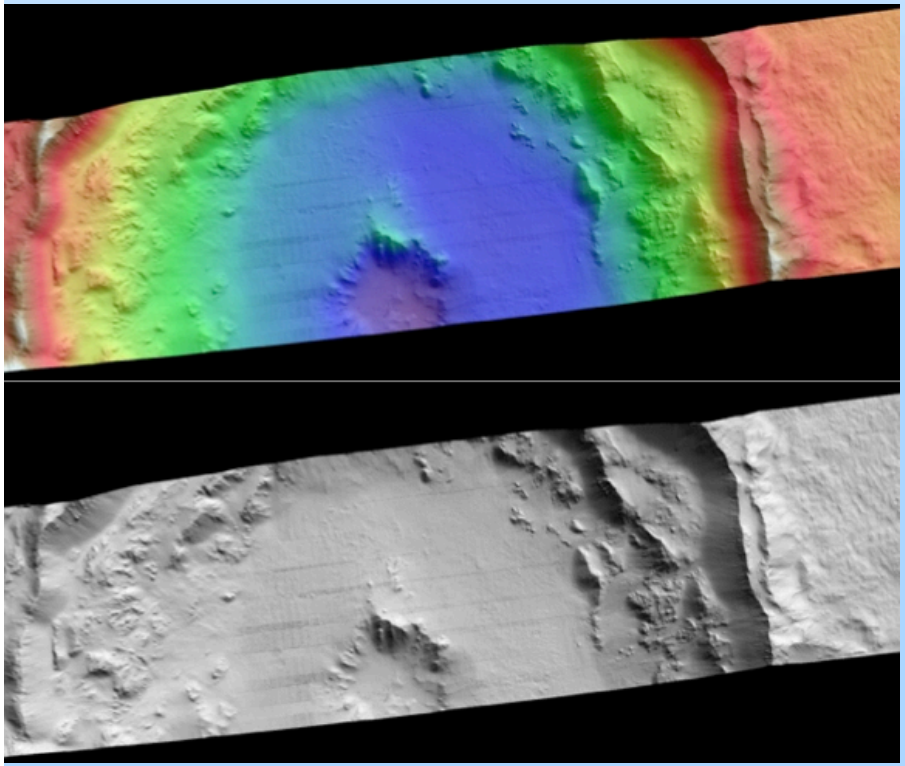
- Assistance with data preparation
  - Especially GIS data
- Accessible hardware running GIS software
  - A useful service while ArcGIS licenses were expensive



- Target selection for ongoing instruments/ missions
  - HiRISE
  - Messenger

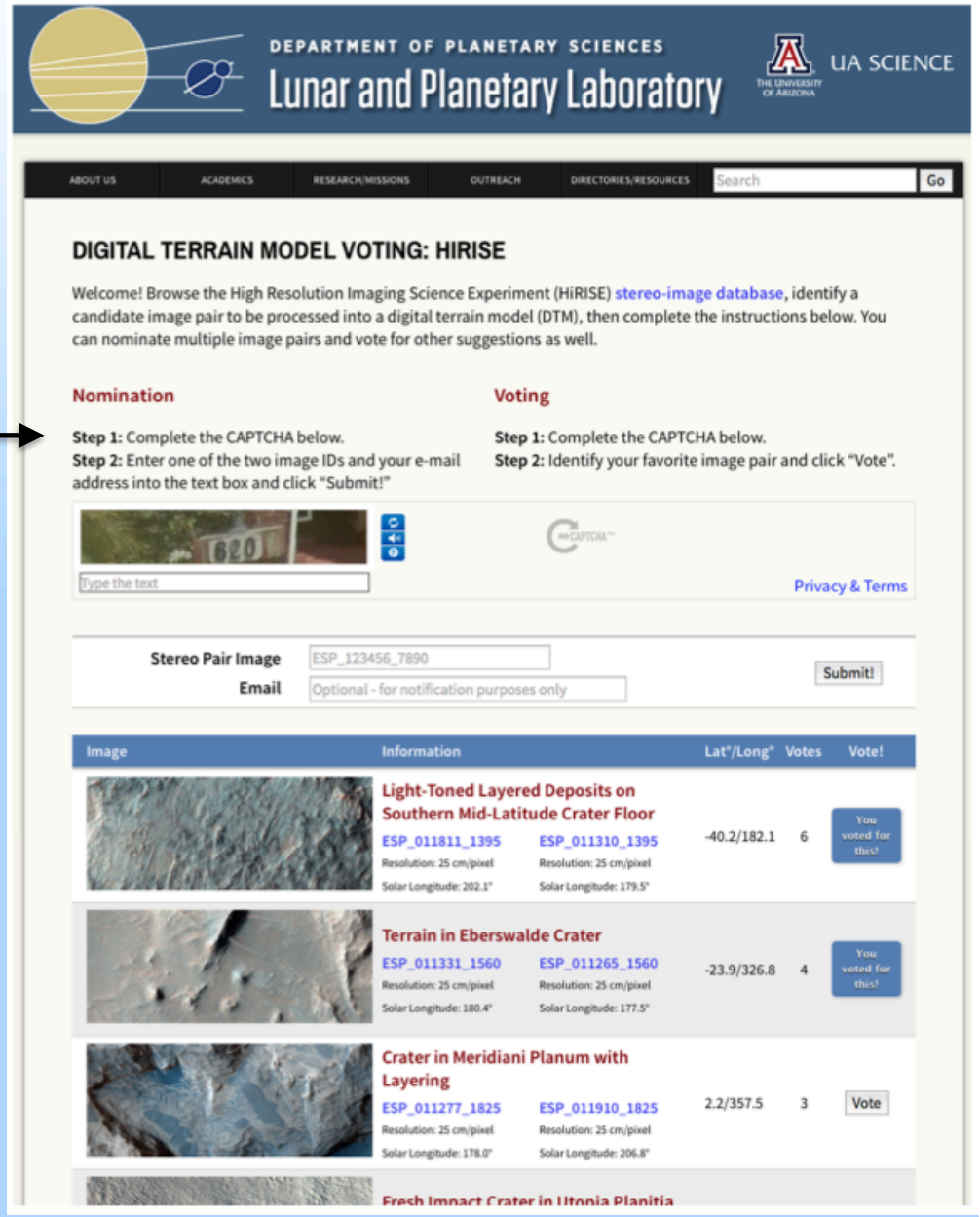
**Current work:**

- Assembly of a three-station stereogrammetry lab
- Our industry partner BAE Systems have provided an academic license worth multiple $100K
- RPIF money leveraged with the Lunar and Planetary Lab and another faculty member allowed us to acquire three stations with specialized polarizing displays
- Currently in high use by faculty, postdocs, graduate students and Spacegrant undergrads



# The Future

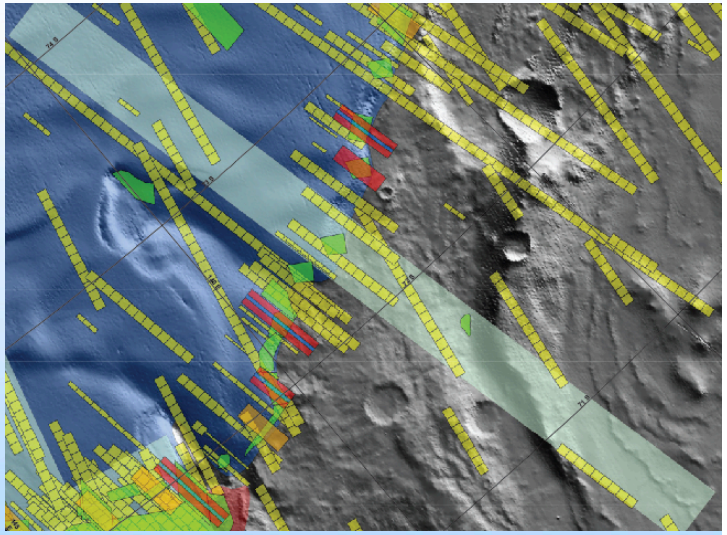
- Community requested DTMs
  - Currently this capacity rests mostly with spacecraft teams
  - We plan to solicit DTM requests online from the Planetary Science community
  - We plan to purchase another two workstations and hire undergraduates to do the processing (we've cloned the procedures developed by the HiRISE team)
  - A PDART proposal to leverage RPIF infrastructure is currently under review

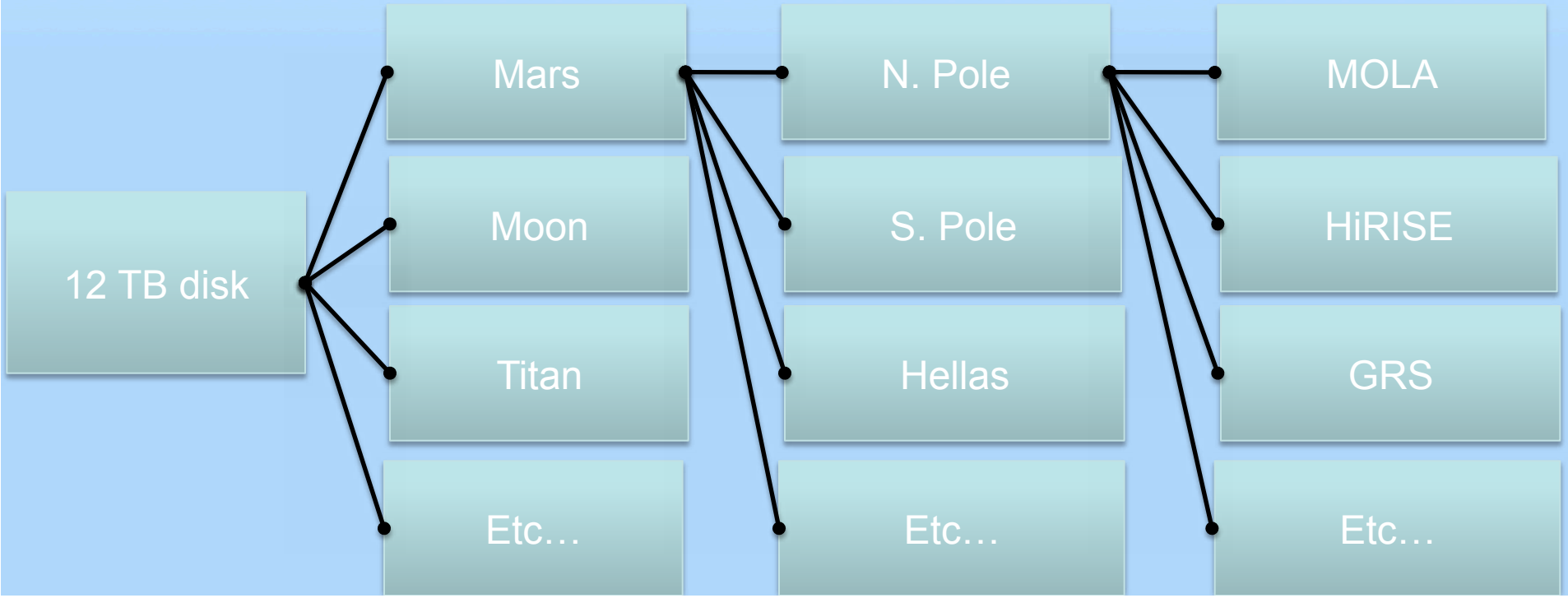


# The Future

GIS data bundles

- Space Imagery Center has assisted many researchers with digital data analysis through use of GIS.
- Such investments of work have typically not been preserved (except as publications)
- We will Sample GIS project files can ship with the data





- Archiving
- Research
- Education & Public Outreach

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# The Present and the Future

- Summer Open Houses
- Evening Lecture Series

- K12 School Visits
- University of Arizona Classes

- Partnering with Local Collaborators

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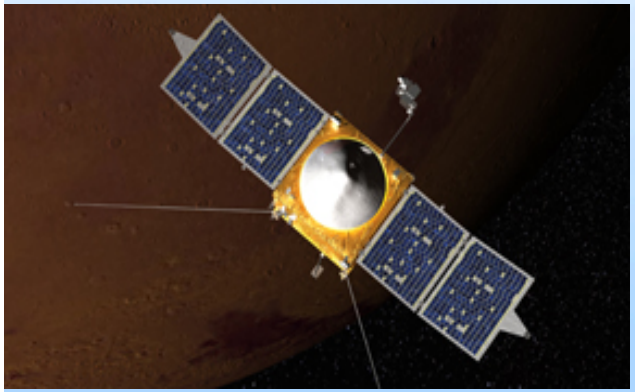
- Summer Open Houses
  - Our main annual event: Attracts 100s of people per year

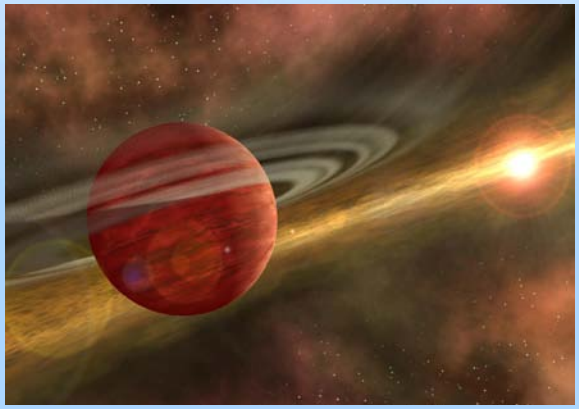
- 2007, May 5th: "Cinco de Mars" - Phoenix Mission exhibit. 450 Participants.
- 2008, May 25th: Phoenix Mission Landing Event. 1500 Participants.
- 2009, July 18th: 40th Anniversary of Apollo 11's moon landing. 500 Participants.
- 2010, Jan. 30th: Arizona Meteorites. 330 Participants.
- 2011, April 12th: 50th Anniversary of Yuri Gagarin's flight. 150 Participants.
- 2012, July, 28th: Curiosity Mission and Landing. 693 Participants.
- 2013, July 20th: Jupiter and Beyond the Infinite, 773 Participants.
- 2014, July 20th: Everything Lunar, 531 Participants

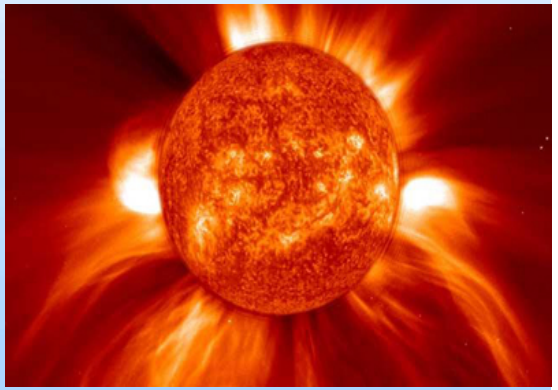

- # Evening Lecture Series
  - Series of three Planetary Science Lectures each Fall Semester
  - Over 100 attendees per lecture on average
  - All lectures available on iTunes



***A Comet Approaches Mars***
**Dr. Roger Yelle**

***Imaging Exoplanets***
**Dr. Travis Barman**





***The Big Boundary***
**Dr. Walter Harris**

- # Public Talks
  - Tucson Amateur Astronomical Society
  - College of Science Science Café
  - Retirement groups
  - Other public events e.g. MSL landing

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- K12 School Visits and Tours
  - In the past five years we've presented to 1000s of K12 students. Both through School visits and in-house tours
  - Hosted ~100 visiting teachers
  - Educational meteorite kits and a telescope are also used.

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# Teacher Workshops


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# • University of Arizona Classes

4-5 classes/semester
~1800 students/year

LASC 195A
Water and Life on Mars

PTYS 170B1
The Universe and Humanity:
Origin and Destiny

PTYS 206
The Golden Age of Planetary Exploration

PTYS 214
Astrobiology: A Planetary Perspective

PTYS 554
Evolution of Planetary Surfaces

PTYS 594
Planetary Geology Field Studies

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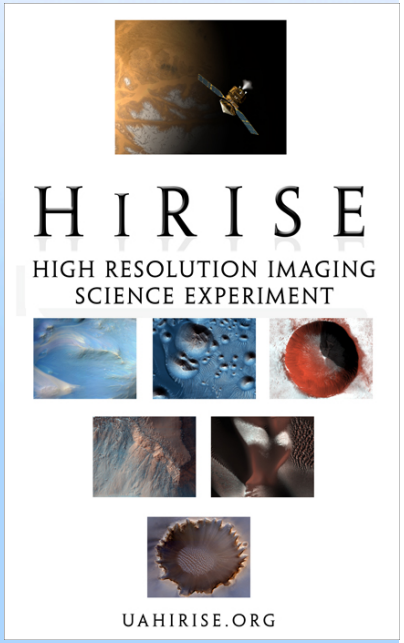
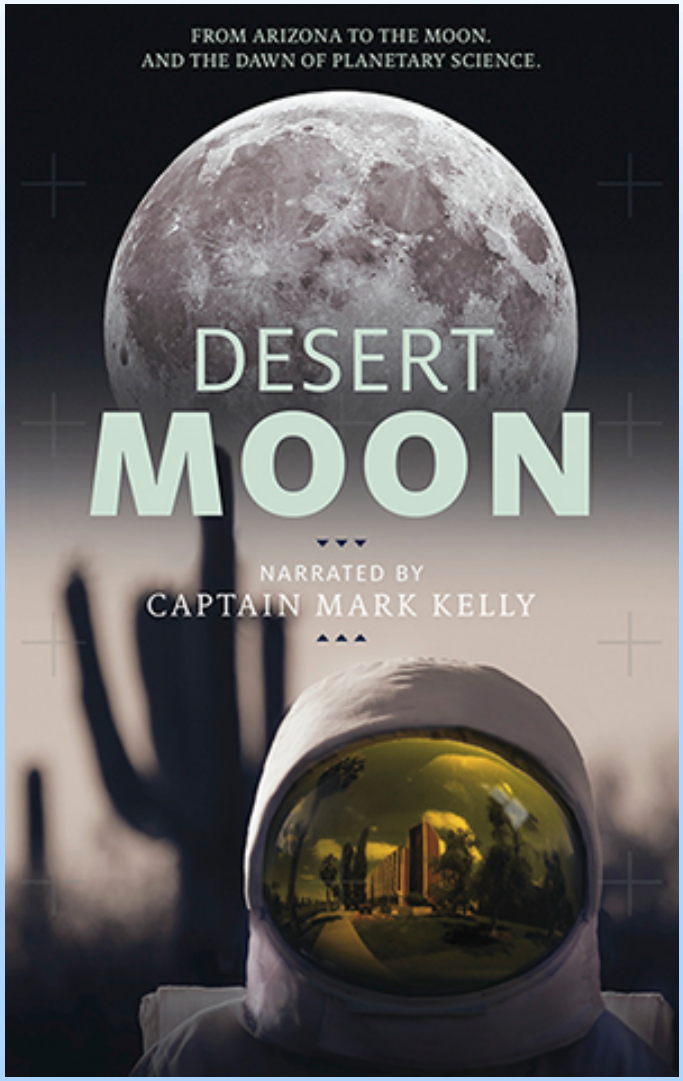
- Partnering with Local Collaborators
  - HiRISE
  - UA College of Science
  - Arizona Space Grant
  - Biosphere 2
  - Center for Creative Photography
  - Flandrau Science Center
  - Pima Air and Space Museum
  - Tucson Festival of Books
  - Girl Scouts
  - Kuiper Circle Community Outreach Committee





Working with various organizations to produce media and exhibits

## The Space Imagery Center @ LPL

- Archiving
- Research
- Education & Public Outreach

# EXTRAS

(need to fill in more of these)

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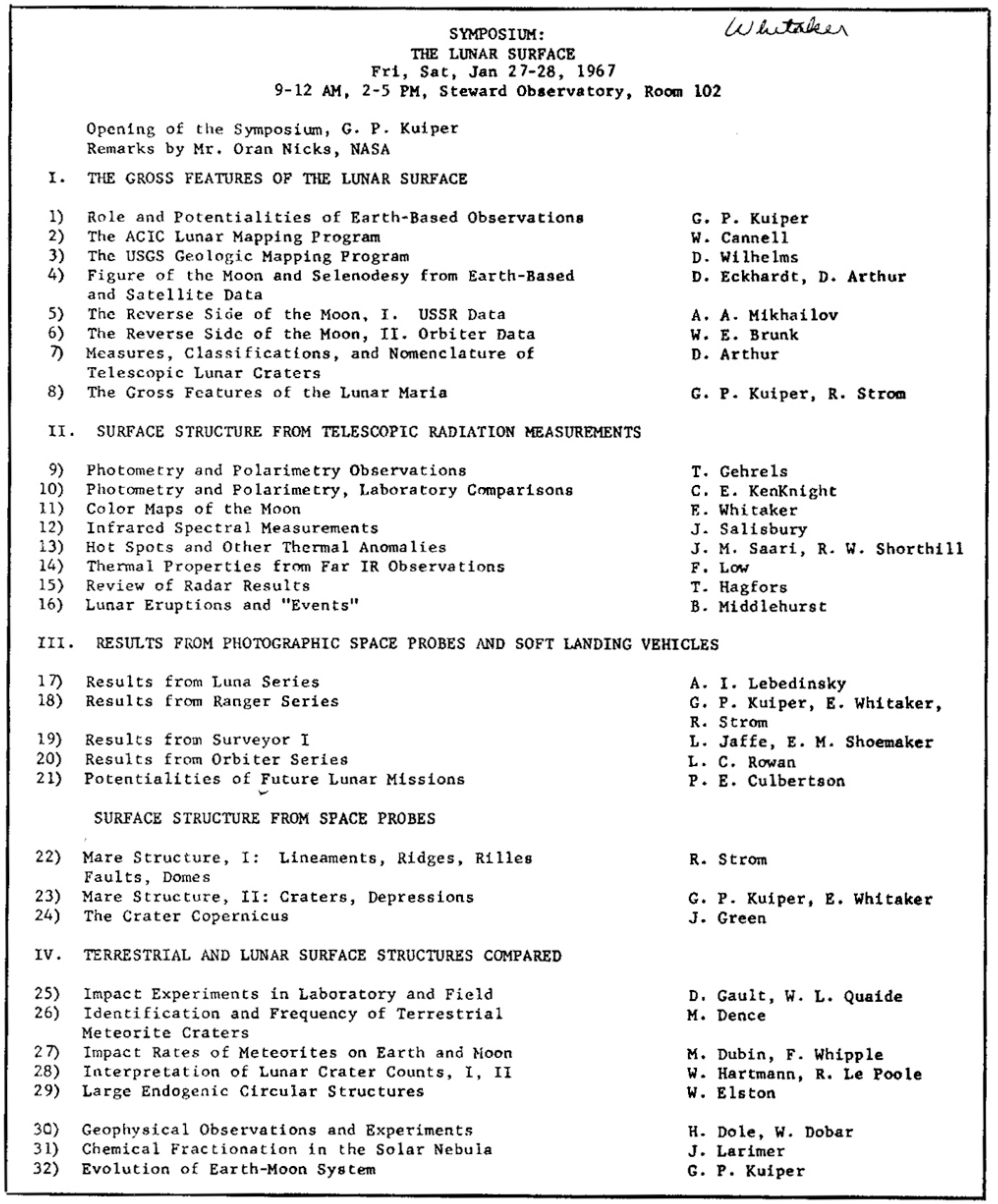
# Audio files

Put audio recordings online

27 lectures from Symposium

Kuiper talks:
*Origin of the Moon and Planets*
*Lunar Surface*
Kuiper Memorial Service

Dr. Kuiper
Lunar surface
Feb. 15, 1973



Whitaker

SYMPOSIUM:
THE LUNAR SURFACE
Fri, Sat, Jan 27-28, 1967
9-12 AM, 2-5 PM, Steward Observatory, Room 102

Opening of the Symposium, G. P. Kuiper
Remarks by Mr. Oran Nicks, NASA

I. THE GROSS FEATURES OF THE LUNAR SURFACE

| | | |
|---|---|---|
| 1) | Role and Potentialities of Earth-Based Observations | G. P. Kuiper |
| 2) | The ACIC Lunar Mapping Program | W. Cannell |
| 3) | The USGS Geologic Mapping Program | D. Wilhelms |
| 4) | Figure of the Moon and Selenodesy from Earth-Based and Satellite Data | D. Eckhardt, D. Arthur |
| 5) | The Reverse Side of the Moon, I. USSR Data | A. A. Mikhailov |
| 6) | The Reverse Side of the Moon, II. Orbiter Data | W. E. Brunk |
| 7) | Measures, Classifications, and Nomenclature of Telescopic Lunar Craters | D. Arthur |
| 8) | The Gross Features of the Lunar Maria | G. P. Kuiper, R. Strom |

II. SURFACE STRUCTURE FROM TELESCOPIC RADIATION MEASUREMENTS

| | | |
|---|---|---|
| 9) | Photometry and Polarimetry Observations | T. Gehrels |
| 10) | Photometry and Polarimetry, Laboratory Comparisons | C. E. KenKnight |
| 11) | Color Maps of the Moon | E. Whitaker |
| 12) | Infrared Spectral Measurements | J. Salisbury |
| 13) | Hot Spots and Other Thermal Anomalies | J. M. Saari, R. W. Shorthill |
| 14) | Thermal Properties from Far IR Observations | F. Low |
| 15) | Review of Radar Results | T. Hagfors |
| 16) | Lunar Eruptions and "Events" | B. Middlehurst |

III. RESULTS FROM PHOTOGRAPHIC SPACE PROBES AND SOFT LANDING VEHICLES

| | | |
|---|---|---|
| 17) | Results from Luna Series | A. I. Lebedinsky |
| 18) | Results from Ranger Series | G. P. Kuiper, E. Whitaker, R. Strom |
| 19) | Results from Surveyor I | L. Jaffe, E. M. Shoemaker |
| 20) | Results from Orbiter Series | L. C. Rowan |
| 21) | Potentialities of Future Lunar Missions | P. E. Culbertson |

SURFACE STRUCTURE FROM SPACE PROBES

| | | |
|---|---|---|
| 22) | Mare Structure, I: Lineaments, Ridges, Rilles Faults, Domes | R. Strom |
| 23) | Mare Structure, II: Craters, Depressions | G. P. Kuiper, E. Whitaker |
| 24) | The Crater Copernicus | J. Green |

IV. TERRESTRIAL AND LUNAR SURFACE STRUCTURES COMPARED

| | | |
|---|---|---|
| 25) | Impact Experiments in Laboratory and Field | D. Gault, W. L. Quaide |
| 26) | Identification and Frequency of Terrestrial Meteorite Craters | M. Dence |
| 27) | Impact Rates of Meteorites on Earth and Moon | M. Dubin, F. Whipple |
| 28) | Interpretation of Lunar Crater Counts, I, II | W. Hartmann, R. Le Poole |
| 29) | Large Endogenic Circular Structures | W. Elston |
| 30) | Geophysical Observations and Experiments | H. Dole, W. Dobar |
| 31) | Chemical Fractionation in the Solar Nebula | J. Larimer |
| 32) | Evolution of Earth-Moon System | G. P. Kuiper |

- Banks et al., Crater Population and Resurfacing of the Martian North Polar Layered Deposits, J. Geophys. Res., 115, E08006, 2010.
- Becerra et al., Transient Bright "Halos" on the South Polar Residual Cap of Mars: Implications for Mass-Balance, Icarus, In Press, 2014.
- Burleigh et al., Small Impacts Trigger Dust Landslides on Mars, LPSC, 2009.
- Diniega et al., Seasonality of Present-day Martian Dune-Gully Activity, Geology, 38(11), 1047-1050, 2010.
- Sharma and Byrne, Comparison of Titan's north polar lakes with terrestrial analogs, Geophys. Res. lett., 38, L24203, 2011.
- Sharma and Byrne, Constraints on Titan's topography through fractal analysis of shorelines, Icarus, 209(2), 723-737, 2010.
- Turner et al. (2012), Near-UV and optical observations of the transiting exoplanet TrES-3b, Month. Note. Royal Astron. Soc., 48.