

# Galaxy Education in the 21<sup>st</sup> Century

## Galaxy Forum Kansas

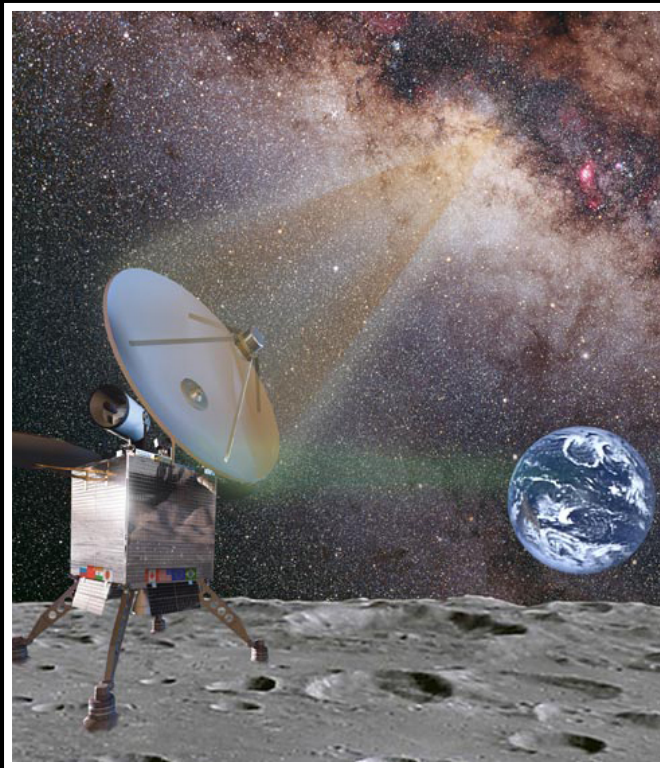
*Kansas Cosmosphere, Hutchinson, Kansas*

*Saturday, August 22, 2009 – 09:30-11:30am*



# International Lunar Observatory Association (ILOA) August 2009 Update

Steve Durst, ILOA / Space Age Publishing Company  
Hawai`i and California, USA



- **Galactic / Inter-Stellar**
- **Earth-Moon / Inter-Global**
- **Hawaiian**
- **Multi-Functional**

# ILOA – 3 Missions



- **ILO-X Precursor Mission**  
(NET 2011)
- **ILO-1 Polar Mission**  
(NET 2012)
- **ILO Human Service Mission**

# International Lunar Observatory (ILO)

## ILO-X Precursor:

- **Odyssey Moon / MDA**
- **US\$30M Google Lunar X Prize**
- **ILO 2 Kg Technology Demonstrator Payload**
  - **AMIE Camera / Space-X**
- **Equatorial Mission**
- **Galaxy First Light Imaging, Lunar / Earth Observation**
- **Communications / Broadcasting**



# **Primary and Secondary ILO Mission Objectives:**

- **First Light Galaxy Imaging**
- **Initial landing site observation, local surveillance**
- **Earth observations: albedo, geocorona, etc.**
- **Search for Earth-like planets**
- **Search for Extra-Terrestrial Intelligence (SETI)**
- **Analyze interstellar molecules to determine origin of Solar System**
- **VLF observation**
- **Observe signs of life on Mars, Europa, Titan, etc.**
- **Search for dangerous NEOs**
- **Sun-Earth observations, solar storm warnings**
- **More**

# ILO Galaxy First Light Imaging



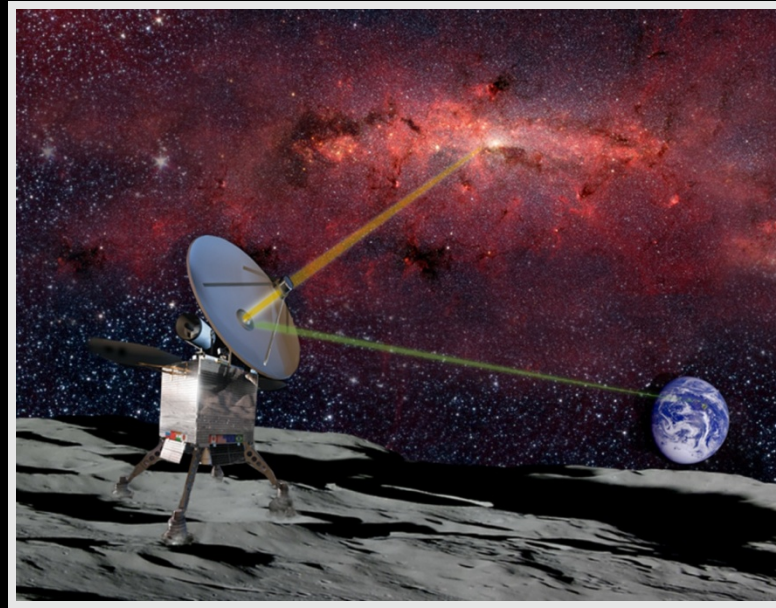


**We are here**

## **Why Galaxy Education, Consciousness & Awareness is Important for the 21st Century:**

- **Education – for primary, secondary higher, and highest education: Knowledge, understanding of humanity's place in the Universe – our Milky Way Galaxy occupies a mid-position domain between Solar System finiteness and Cosmos infinity**
- **Astrophysics / Astronomy – Galaxy studies internationally are of increasing interest and value; study of our local stellar neighborhood for familiarity; center / central 10 parsecs with supermassive black hole is most dynamic region of Milky Way**
- **History of Human Civilization / Archaeoastronomy**
- **NASA, World Space Agencies – 21st Century Program and Policy Development Advance through Galaxy understanding**
- **Galacticity – may be as important for the 21st Century, as is Relativity to 20th**





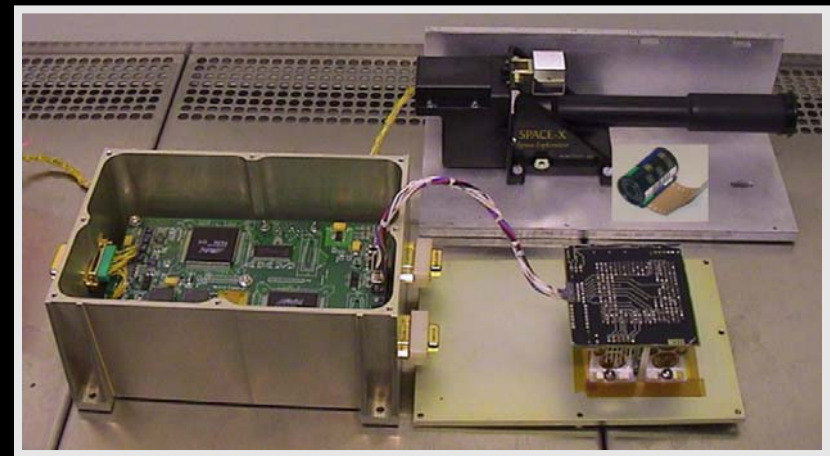
ILO Imaging Galaxy Center



EarthRise Photo : 1968 / Apollo 8

# Instrumentation

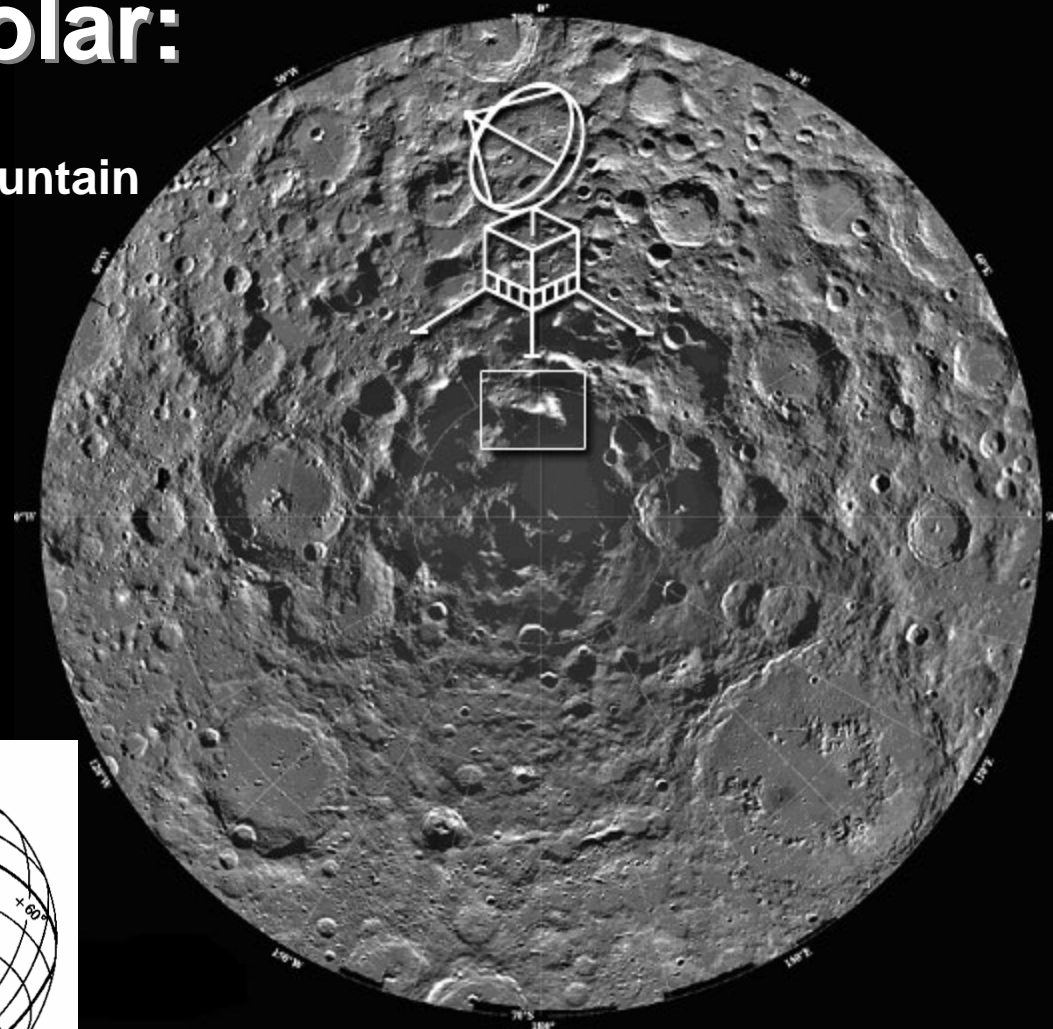
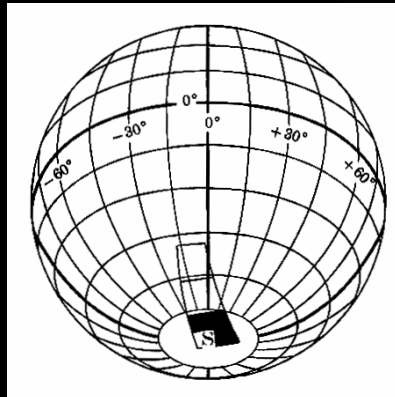
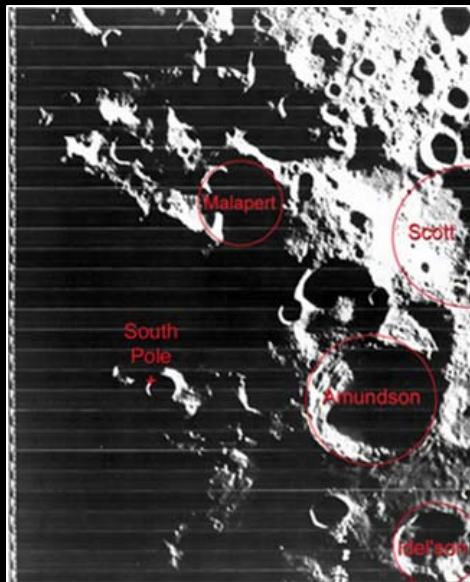
- Candidate Instrument – AMIE Camera
- UV / Vis / NIR CCD Imaging Array of 1024 x 1024 pixels
- Field of View –  $5.3^\circ \times 5.3^\circ = 738$  parsecs on a side (0.72 pc / pixel)
- Mass = 2 kg



# International Lunar Observatory (ILO)

## ILO-1 Polar:

- ILO to be Located at 'Malapert' Mountain
- 'Electrification' of the Moon



# Lunar Commercial Communications:

*The International Lunar Observatory requires communications capacity to transmit astrophysical data to satisfy its primary mission. Bandwidth not utilized for astrophysical data transmission can be made available on a commercial basis.*

## Commercial Usage of Additional Bandwidth

Pre-sold Bandwidth	Bandwidth Available Upon Emplacement (May be pre-sold when launch date set)		Future Need
<p><b><u>Space Calendar Broadcast</u></b></p> <p>This Space Calendar will be transmitted from the Moon. Advertisers will pay a premium rate for transmission of their ads from the lunar surface.</p>	<p><b><u>Internet Search Engine Giants</u></b></p> <p>Search engine giants, such as Google and Yahoo, as well as other internet businesses, will be able to purchase bandwidth and use it to provide special services from the lunar surface, which might include local imagery. Interactive games may be developed which actually take place on the Moon.</p>	<p><b><u>Specialty Advertising Opportunities</u></b></p> <p>Large corporations will be able to use a Moon email system to capture the attention and interest of consumers for products which may relate to any of the numerous associations modern culture attributes to Luna.</p>	<p><b><u>In Situ Communications and Monitoring Capabilities for Robotic Project Operators</u></b></p> <p>As the wave of robotic and mining/excavation missions arrive on the lunar surface, they will do so with the knowledge that communications and surface monitoring capabilities in the region of Malapert Mountain and Shackleton Crater will be in place and available for purchase.</p>

# 'The First, Best Space Calendar in the Business'



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"The First, Best Space Calendar in the Business" Vol 26, No 33

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**Europe Advancing Launch Vehicle Triumvirate, Potential Human Transport Capacity**

On Friday, August 21 at 22:09 an Ariane 5 rocket will launch the CSAT 12 communications satellite for Japan and Optus D3 communications spacecraft for Australia from the Europe Spaceport in Kourou, French Guiana. The heavy lift launcher of choice for satellite operators around the world, Ariane 5 has achieved 31 consecutive successful launches since 2003. Originally launched at the launch vehicle has the capacity to deliver 20 mt to LEO, 7 mt to lunar transfer orbit and 5 mt to Mars. This year, 2 other launch vehicles are joining Ariane 5 at the Spaceport in French Guiana, the world's only dedicated commercial launch site. Soyuz, the longest operating launcher, is providing medium weight missions; and Vega, a new generation launch vehicle, provides highly efficient access to LEO and SSO for medium to small payloads. Arianspace plans to launch about 10 missions annually from the Spaceport (7 Ariane 5, 2 Soyuz and 1 Vega). Although Europe itself currently provides no human access to space, the German Space Agency and EADS Astrium are pursuing a project to adapt the recently developed ATV (CL) into a crew transportation system. The project is predicted to take 10 years and cost approximately € 2B (US\$2.95B). (Credit: Arianspace, ESA)



**SETI Institute Explores the Presence of Life Beyond Earth**

The question as to whether life exists on Mars will be the focus for this week's Colloquium Series, 'Mars: The Water Story and Prospect for Life', held at the SETI (Search for Extraterrestrial Intelligence) Institute in Mountain View, CA on August 19. Michael Carr (PI), a geologist with the US Geological Survey, will present the most recent evidence suggesting early Mars once had an aqueous environment with the potential to support life. Mars has evolved to be less habitable, but astrobiologists have not ruled out the possibility that life could still exist in isolated niches on the red planet. This need to explore, understand and explain the origin, nature and prevalence of life in the universe is the mission of The SETI Institute. The private, nonprofit organization employs over 150 scientists, educators and support staff who are dedicated to scientific research, education and public outreach. The Institute is made up of 2 centers. The Carl Sagan Center for the Study of Life in the Universe pursues the discovery of extrasolar planets, potential for life on Mars and other bodies within the Solar System. The Center for SETI Research develops signal processing technology used to search for signals from advanced civilizations in our galaxy. COSMOS Magazine of Australia has a program to send messages to outer space in hopes of communicating with extraterrestrial life. From Aug 11-24, people can go to the website, [HelloFromEarth.net](http://HelloFromEarth.net), to post messages that will be transmitted to Gliese 581d, the nearest Earth-like planet outside the solar system most likely to support life. (Picture: Carl Sagan (RL)) (Credit: NASA - Cosmos Studio, SETI, HelloFromEarth.net)

**THIS WEEK**

AUGUST	SEPTEMBER	OCTOBER	LEGEND
M T W T F S S	M T W T F S S	M T W T F S S	● All times for beneficial events in local time unless noted.
3 4 5 6 7 8 9	1 2 3 4 5 6	1 2 3 4	○ All times for international beneficial events in local time unless noted.
10 11 12 13 14 15 16	7 8 9 10 11 12 13	5 6 7 8 9 10 11	★ All times for space events, and.
17 18 19 20 21 22 23	14 15 16 17 18 19 20	12 13 14 15 16 17 18	☆ All times for international space / astro events in Hawaii Standard Time unless noted. Add 10 hours to obtain UT (Universal Time) Greenwich, England.
24 25 26 27 28 29 30	21 22 23 24 25 26 27	19 20 21 22 23 24 25	
31	28 29 30	26 27 28 29 30 31	

**Weekly Planet Watch** – Morning Planets: Venus (E), Mars (E) / Evening Planets: Mercury (W), Saturn (W), Jupiter (GE)

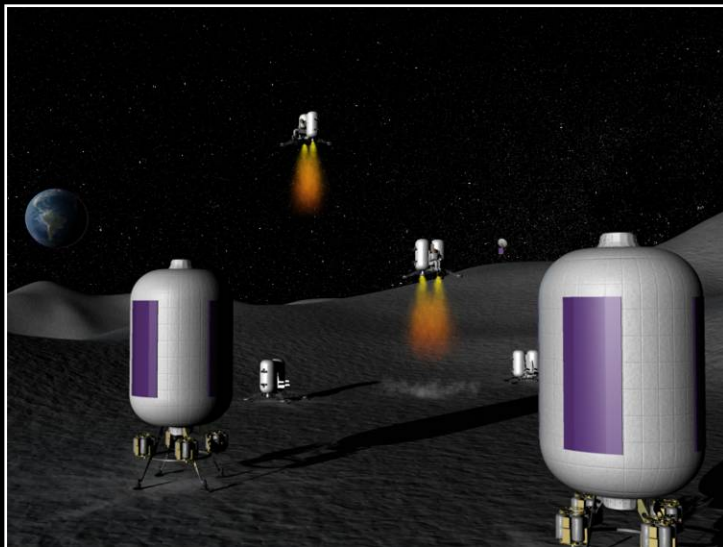
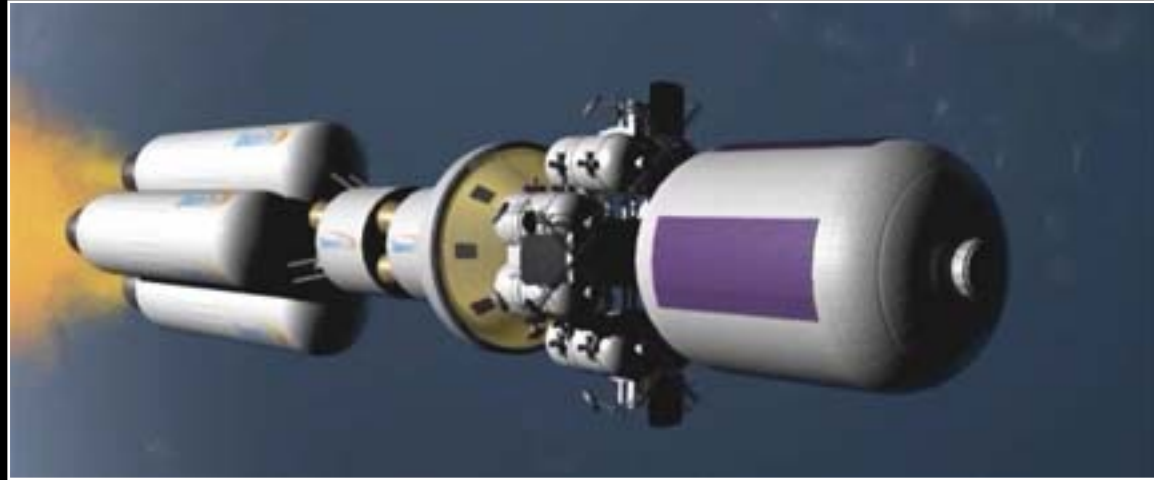
**MONDAY**

- ★ Aug 17 — **International Space Station, LEO:** E20 crew making preparations for arrival of next space shuttle mission Discovery/STS-128 set to launch on August 26, [http://www.nasa.gov/mission\\_pages/station/main/index.html](http://www.nasa.gov/mission_pages/station/main/index.html).
- ★ Aug 17 — **NASA Lunar Reconnaissance Orbiter LRO, Lunar Orbit:** NASA LRO continues to collect data in commissioning orbit and is on track for mission orbit insertion at the end of August. [http://twitter.com/RO\\_NASA](http://twitter.com/RO_NASA).
- ★ Aug 17 — **India Chandrayaan-1 Lunar Orbiter, Lunar Orbit:** Space agencies and scientific institutes who have scientific payloads on board ISRO Chandrayaan-1 given a window of January 2010 to collect all data they need as space craft nears 2 year lifetime. <http://www.hindu.com/2009/08/17/stories/2009081701200.htm>
- ★ Aug 17 — **NASA Mars Reconnaissance Orbiter (MRO), Red Planet:** MRO science observation capabilities fully restored after space craft unexpectedly switches to safe mode. <http://www.space.com/missionlaunches/090817-mro-computer-revived.html>.
- ★ Aug 17 — **Launch Delta 2 / GPS 2R-21 (M8), Cape Canaveral FL:** The United Launch Alliance Delta 2 rocket will launch the 8th modernized NAVSTAR Global Positioning System Block 2R military navigation satellite. <http://www.spaceflightnow.com/tracking/index.html>.
- Aug 17-21 — **Royal Astronomical Society, Cambridge, United Kingdom:** 'Dynamics of Discs and Planets.' <http://www.newton.ac.uk/programmes/ODP/09p01.html>.
- Aug 17-21 — **Nordic Network of Astrophysics and Cosmology, Oskar Klein Center, et al, Stockholm, Sweden:** 'Reionization with Multi-Frequency Datasets.' <http://agenda.albanova.se/conferenceDisplay.py?confid=1186>.
- Aug 17-21 — **Niels Bohr International Academy, Danish Astrophysics Research School, et al, Copenhagen, Denmark:** 'Summer School on Stellar Collapse, Compact Objects, Supermassive and Gamma-Ray Bursts.' <https://indico.nbi.ku.dk/conferenceDisplay.py?confid=70>.
- Aug 17-21 — **Kavli Institute for Theoretical Physics, Santa Barbara CA:** 'Stellar Death and Supernovae.' [http://www.kitp.ucsb.edu/activities/aut07id\\_877](http://www.kitp.ucsb.edu/activities/aut07id_877).
- ☆ Aug 17 — **Moon:** 1.7° NNE of Venus, 12.00; 6.0° SSW of Pollux, 16.00; 0.48° NNW of Vesta 21.00.

*Continued from ...*

- Jun 29 — **International Space University / NASA Ames Research Center, Moffett Field CA:** '21st ISU Summer Session Program,' through August 26, [http://www.isu.net/edu/index.php?option=com\\_content&task=blog&agegoryid=58&Itemid=185](http://www.isu.net/edu/index.php?option=com_content&task=blog&agegoryid=58&Itemid=185).
- Jul 7 — **NASA, X PRIZE Foundation, Open location USA:** 'Lunar Lander Challenge Competition,' through October 31, <http://space.xprize.org/>.
- Aug 15 — **Australia Government Department of Innovation, Industry, Science and Research, Australia:** 'National Science Week 2009,' through August 23, <http://www.scienceweek.gov.au/national/Pages/default.aspx>.

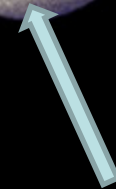
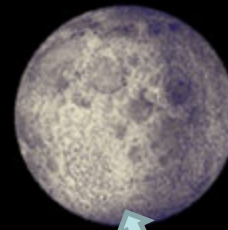
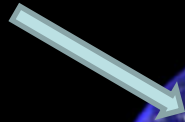
# Human Service Mission



SpaceDev Inc – Dream Chaser, ALOHA Chair

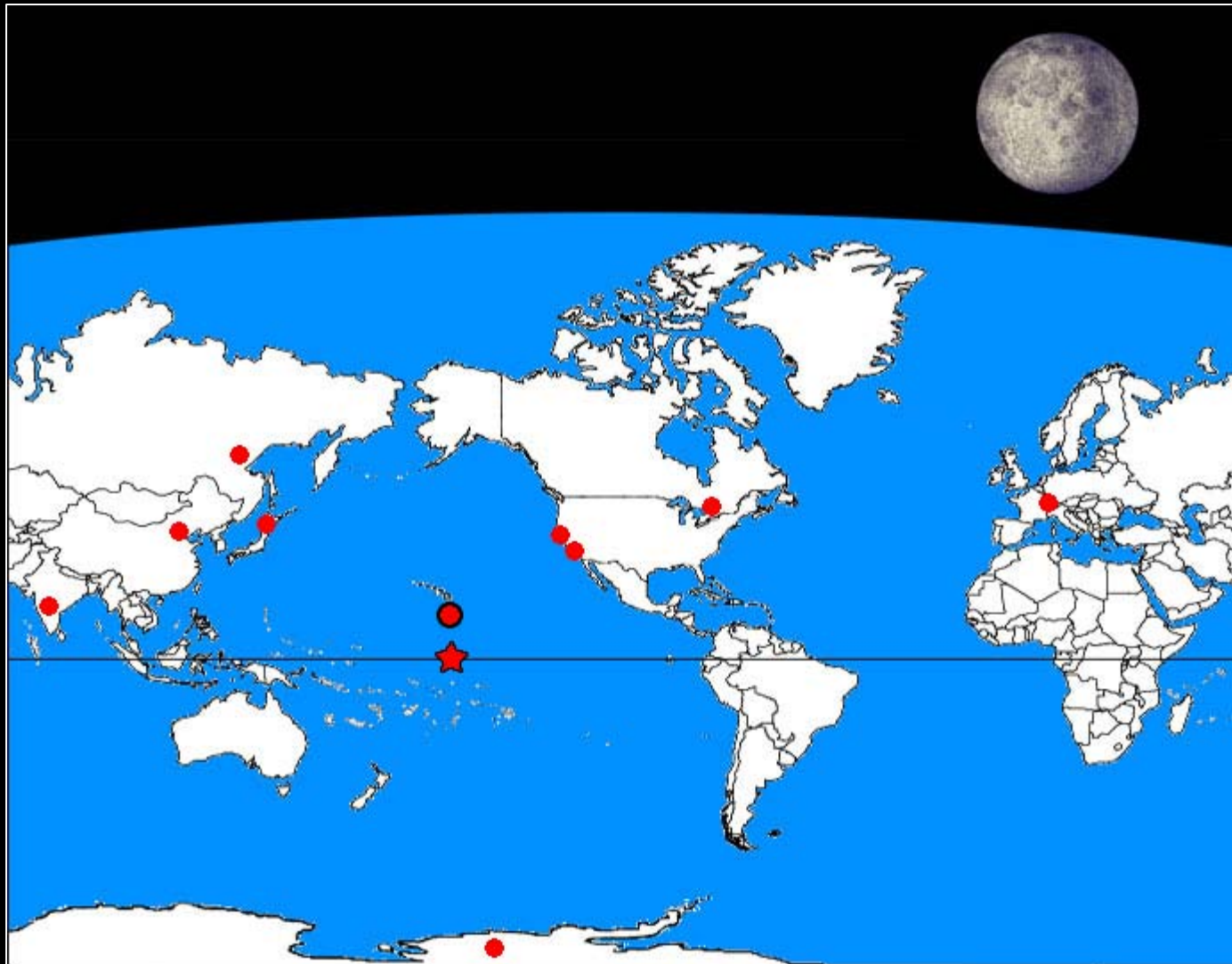
# Inter-Global / Earth-Moon / Cislunar System

ILOA: Hawai'i



ILO: Malapert Mountain

# *A Global / Interglobal Mission*





# ***A Global / Interglobal Mission***

- **Canada** –Canada France Hawai`i Telescope Corporation, MDA, Optech, University of British Columbia Astronomy Department, CASCA, National Research Council, Canada Space Agency
- **China** – National Astronomical Observatory of China, Chinese Academy of Sciences, Shanghai Astronomical Observatory, Chinese Society of Astronautics, CNSA, Beijing Planetarium
- **India** – India Space Research Organization, Physical Research Laboratory, Indian Institute of Astrophysics
- **Japan** – JAXA / JSPECS, Shimizu Corporation
- **Europe** – Space-X Space Exploration Institute, European Space Agency
- **Russia** – Keldysh Institute, Vernadsky Institute, Sternberg State Astronomical Institute, Russia Space Agency
- **Hawai`i / USA** – Kimo Pihana, UH Hilo Astronomy / Space Age Publishing Company, SpaceDev, NASA

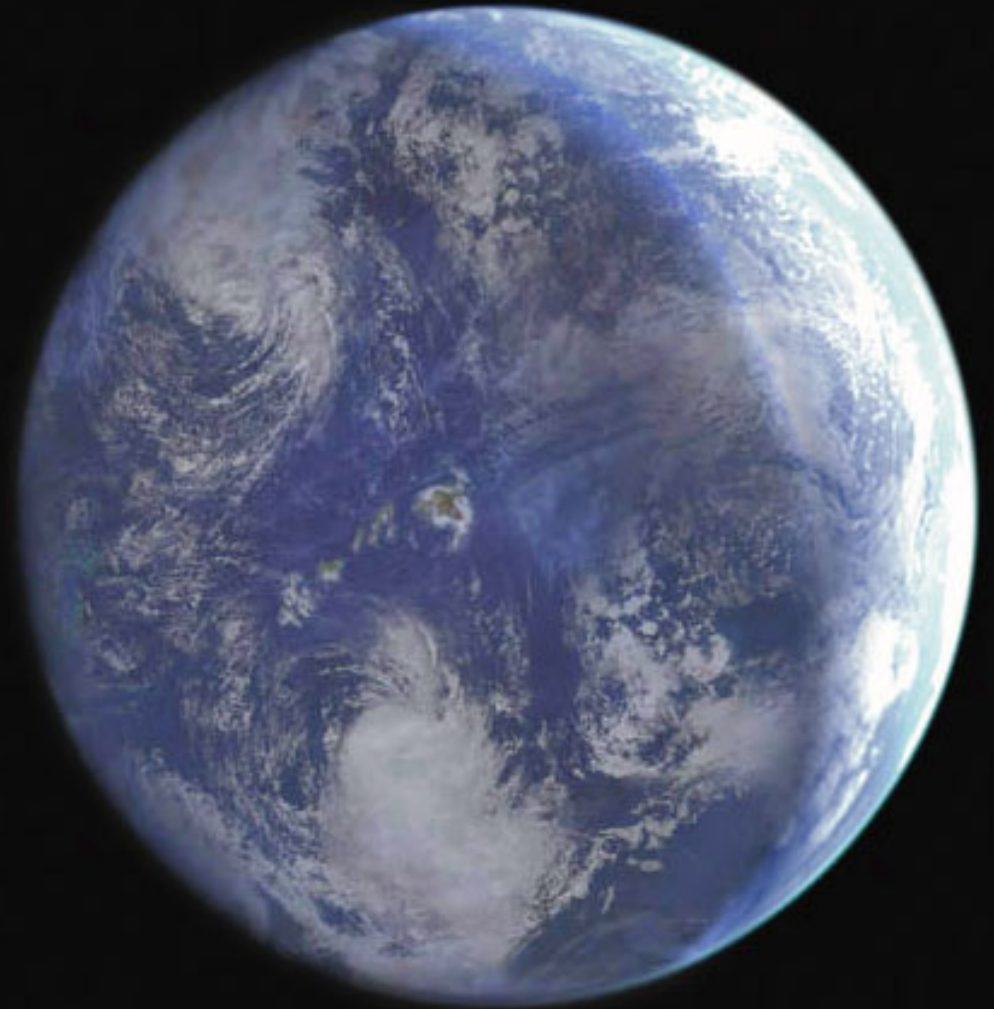
# International Lunar Observatory Association

## ILOA / ILO Assets ...

- 6 SpaceDev Studies 2003-2008 (ILO / Human Service Mission)
- Master / Business Plan
- MoUs with CFHT, NAOC / International Partnerships
- AMIE Camera, Cisco Systems Router
- ILOA Updates / Website / Office
- Lunar Commercial Communications Workshops
- Galaxy Forum 2008, Galaxy Forum 2009
- Non-Profit 501(c)3 Status
- Board of Directors, Exec. Committee with Operating Reserves
- Next Board of Directors Meeting 5-6 December 2008, Hawai'i Island

# International Lunar Observatory Association

- ILOA to be Based in Hawai`i
- Center of Pacific Hemisphere
- Global Support Centers
- Maintain Hawai`i Preeminence in Astrophysics for Next 100 Years



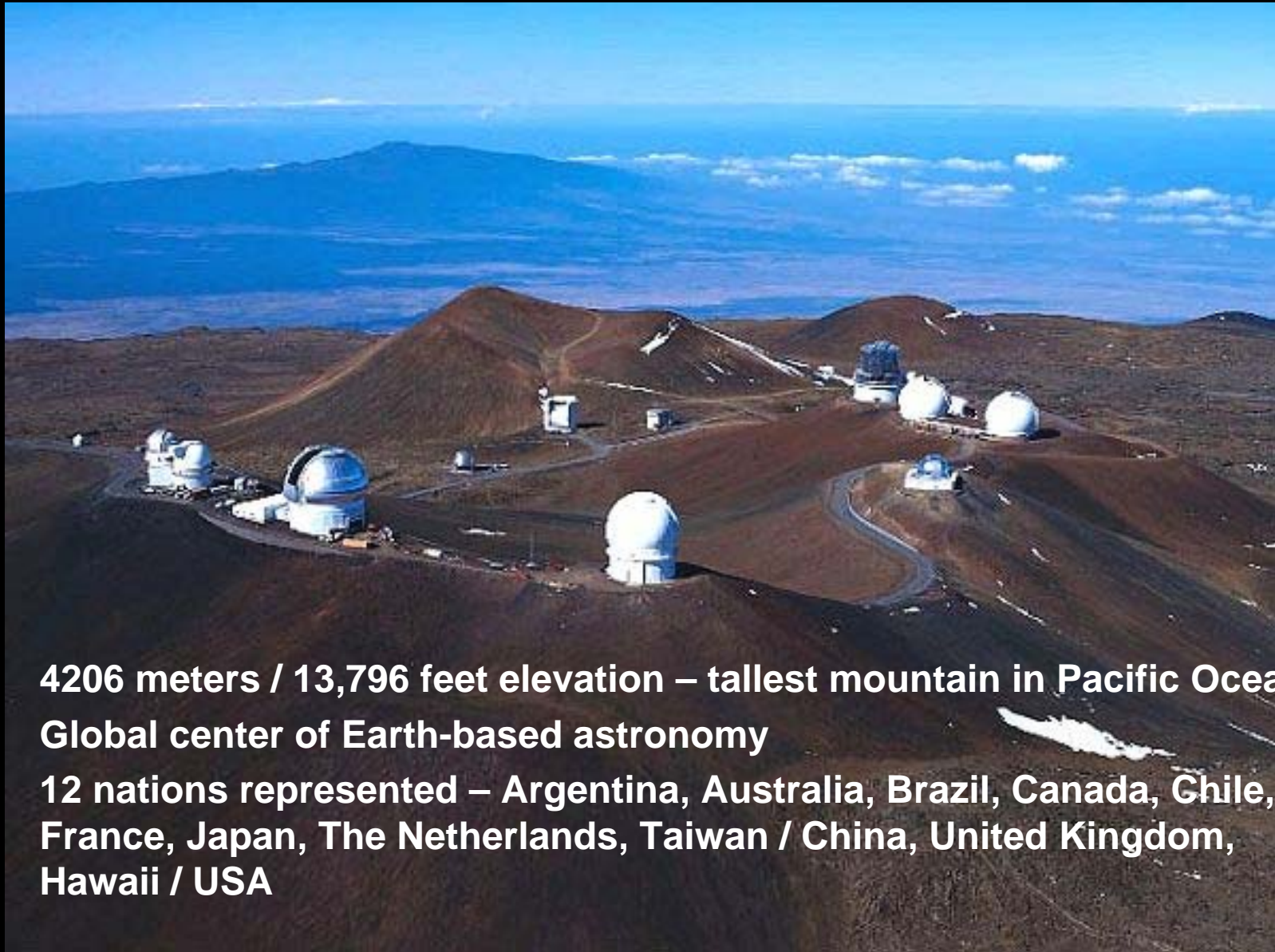
# **Why Is Hawai`i Important to Space Exploration?**

## **Geographic Advantages:**

- **Center of Pacific Hemisphere**
- **Southern-most site in USA / equatorial proximity**
- **Mid-Pacific islands bi-directional launch capacity (equatorial or polar)**
- **Mauna Kea – highest point in Pacific**

**And Aloha!**

# Mauna Kea Summit Observatories



- 4206 meters / 13,796 feet elevation – tallest mountain in Pacific Ocean
- Global center of Earth-based astronomy
- 12 nations represented – Argentina, Australia, Brazil, Canada, Chile, France, Japan, The Netherlands, Taiwan / China, United Kingdom, Hawaii / USA

# **Multi-Functional**

**The ILO is a Multi-Functional ...**

- **Astrophysical Observatory**
- **Power Station**
- **Communications Center**
- **Site Characterizer**
- **Property Rights Agent**
- **Virtual Dynamic Nexus Website**
- **Hawai`i Astronomy Booster**
- **Toehold for Human Lunar Buildout**

## ILOA Spectrum of Participation

# *Put Your Name on the Moon!*

### **1** *Endorse*

Become an Endorser of the ILOA by simply providing us with your name and public support.

***All people of the planet*** are invited to participate and will get their name on the Moon!

### **2** *Invest*

Interested in valuable astrophysical data, lunar broadcasting opportunities and ownership?

The ILOA seeks qualified financial Investors from:

- *Science/astronomy, space agency and government institutions*
- *Communications and NewSpace companies*
- *Philanthropists*

### **3** *Direct*

A select group of specialized and qualified Directors will be chosen to operate the ILOA and command the ILO mission and its follow-on human service mission.

# ALOHA!

For more information about the ILO / ILOA, contact:

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