International Lunar Observatory Association | Space Age Publishing Company

# Galaxy Education in the 21st Century

# Galaxy Forum India

***Nehru Planetarium, Bangalore, India***

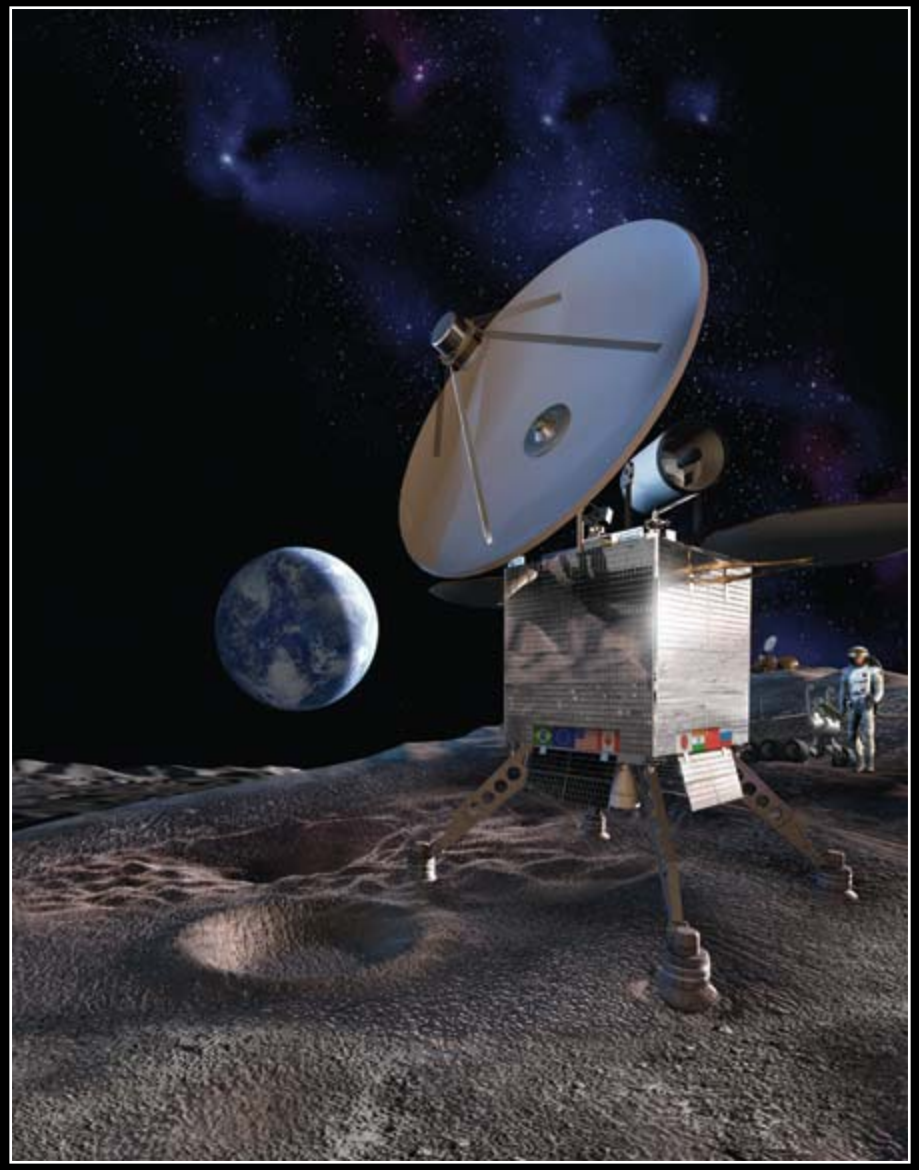
***Monday, August 9, 2010 – 9:30 - 5pm***

# International Lunar Observatory Association (ILOA) August 2010 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

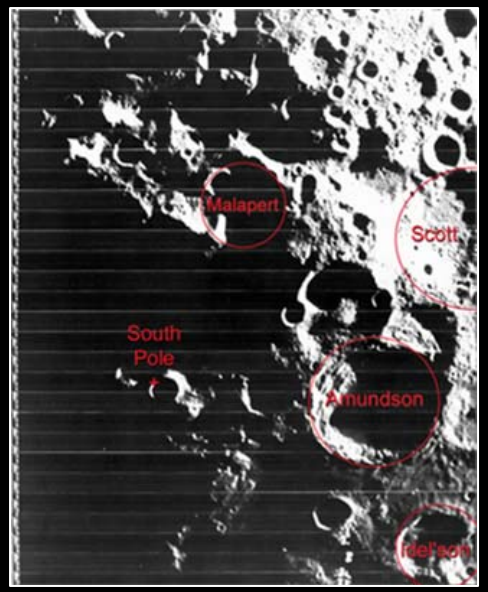


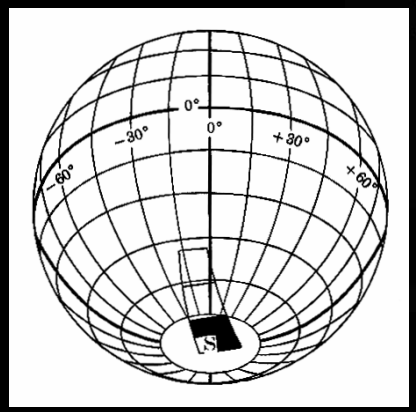
- **ILO-1 Polar Mission** (NET 2012)
- **ILO Precursor Mission** (NLT 2012)
- **ILO Human Service Mission**

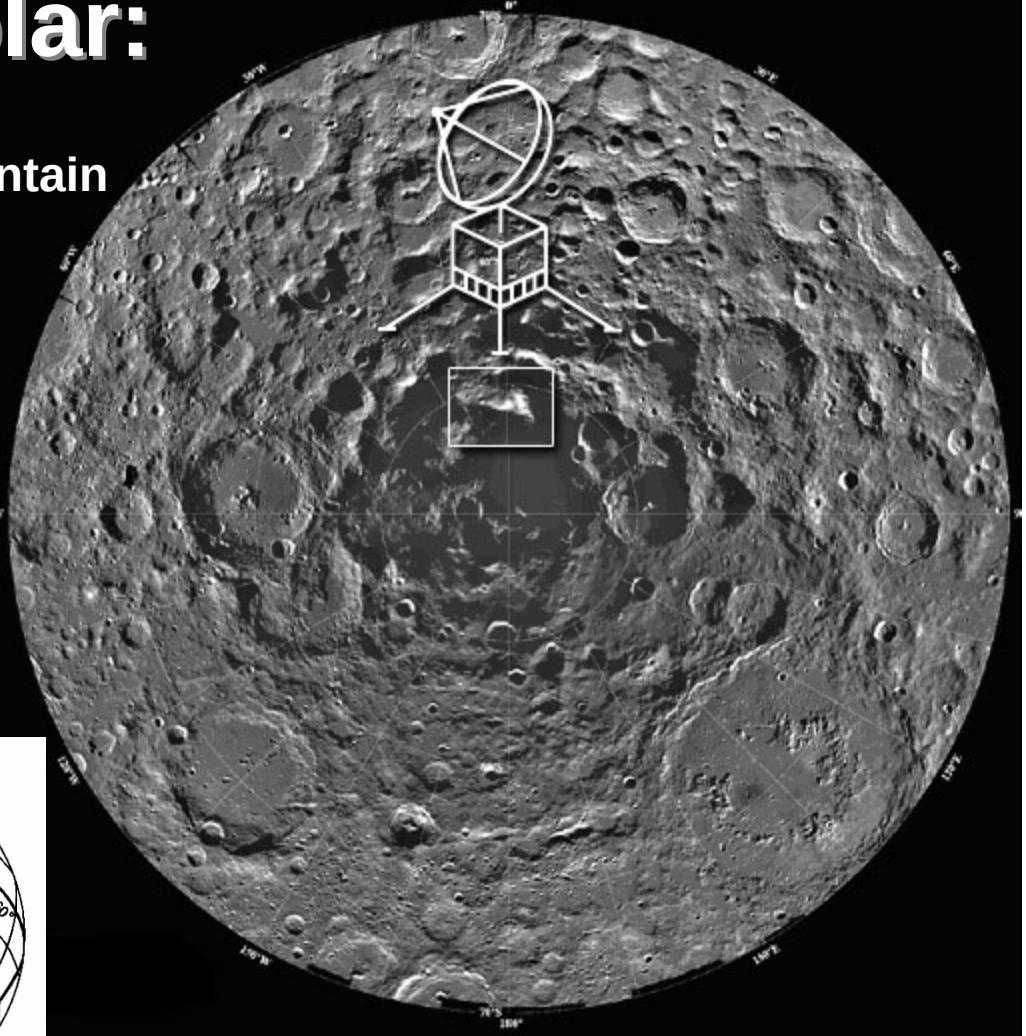
# International Lunar Observatory (ILO)

## ILO-1 Polar:

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



# Shackleton Crater Location

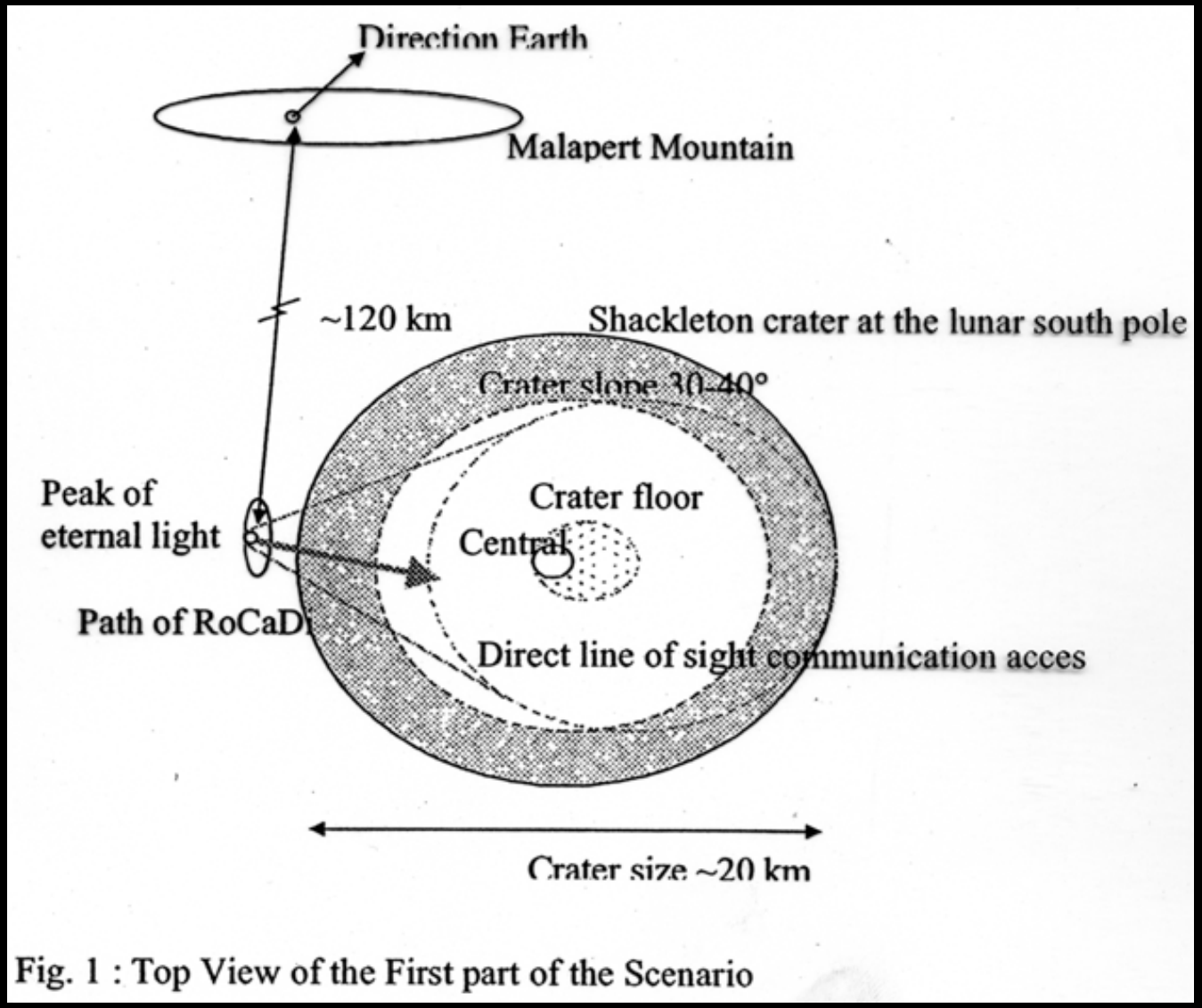
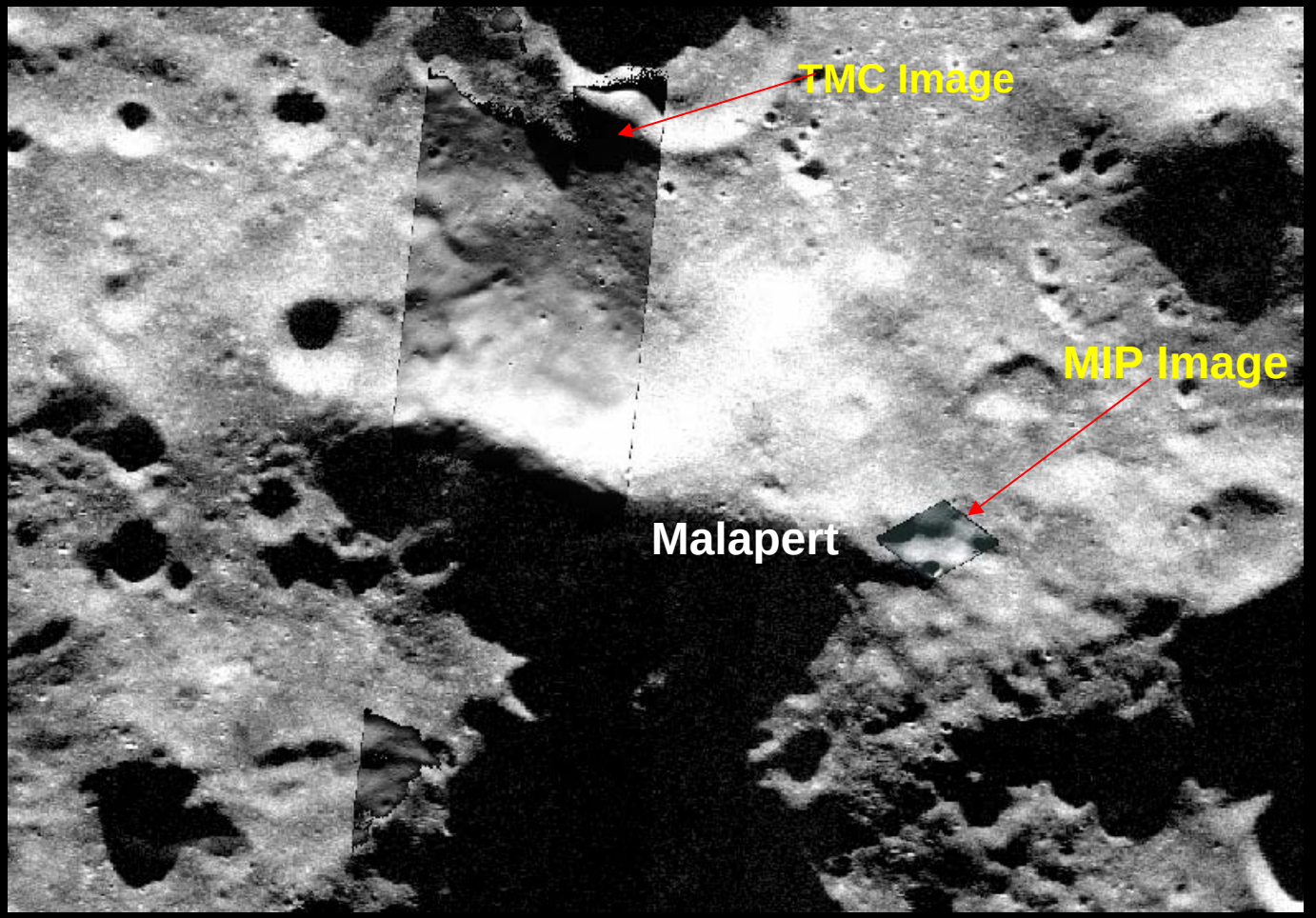


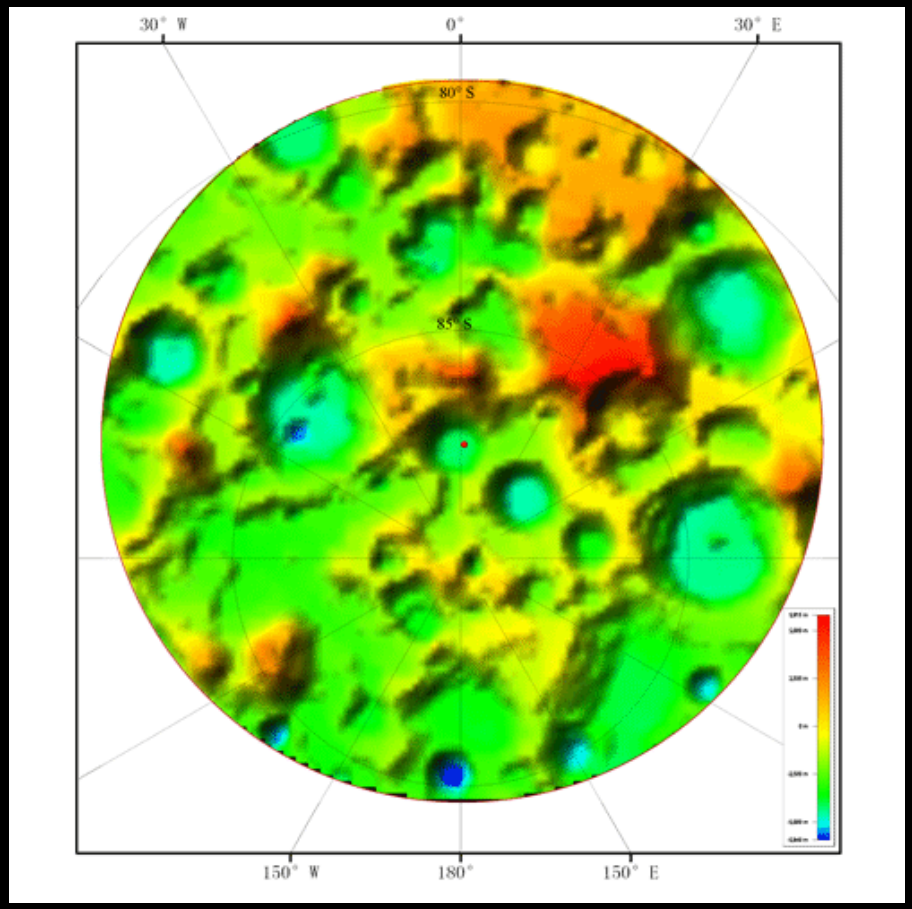

Fig. 1 : Top View of the First part of the Scenario

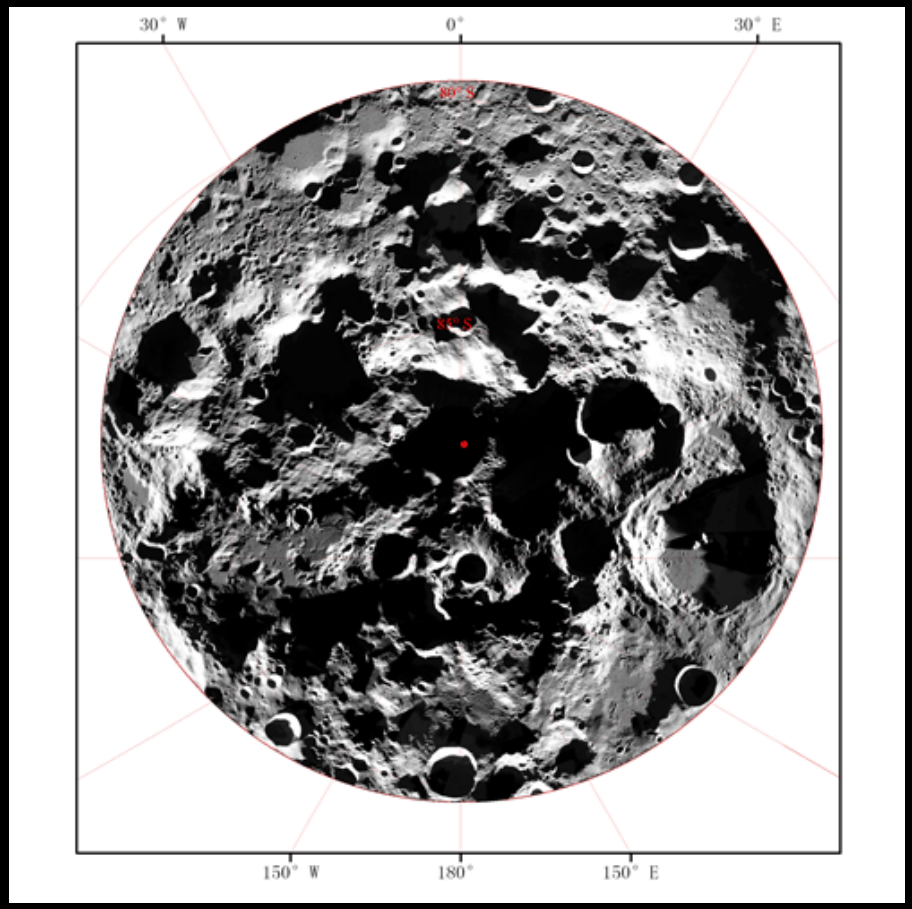
Graphic: Paul van Susante

# Lunar South Pole - Chandrayaan



# Lunar South Pole – Chang'e



# Lunar South Pole – Kaguya

# Galaxy Forum Architecture

- 21st Century Education
- International Cooperation
- Non-profit Philanthropy
- Website: www.iloa.org
- Email: info@iloa.org

# 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

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

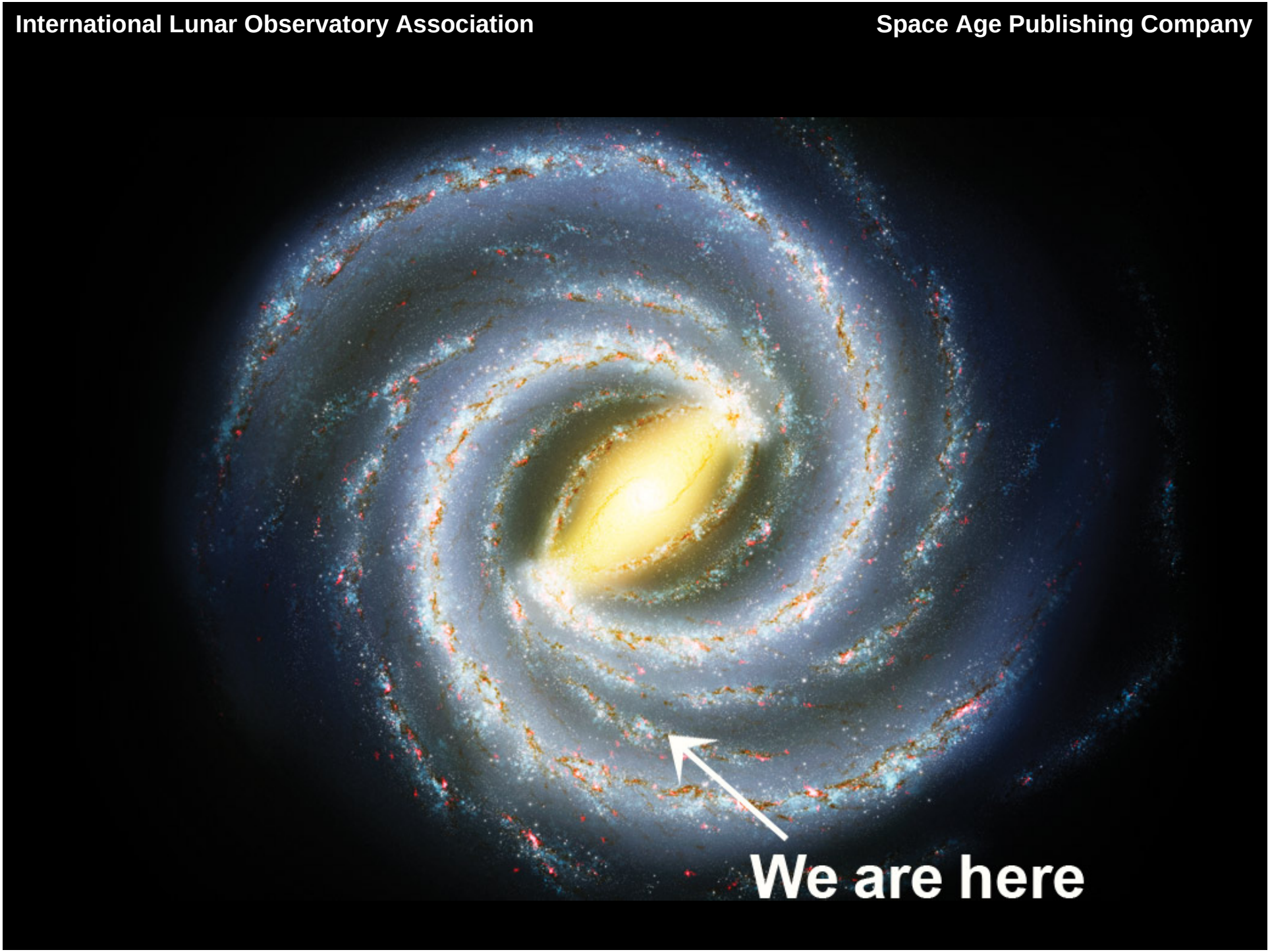
- **Education – for primary, secondary higher, and highest education: Knowledge, understanding of humanity's place in the Universe – our Milky Way Galaxy occupies a mid-position domain between Solar System finiteness and Cosmos infinity**

- **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**


We are here

**Two Major Spiral Arms:**

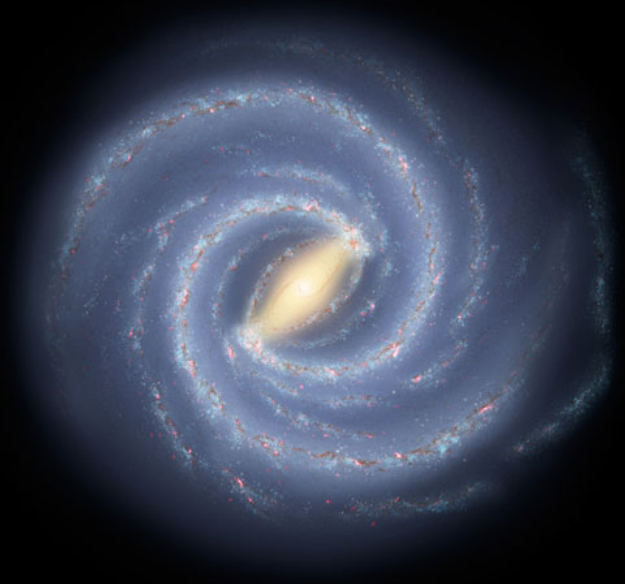
**Scutum-Centaurus & Perseus**

**Two Minor Spiral Arms:**

**Norma & Sagittarius**

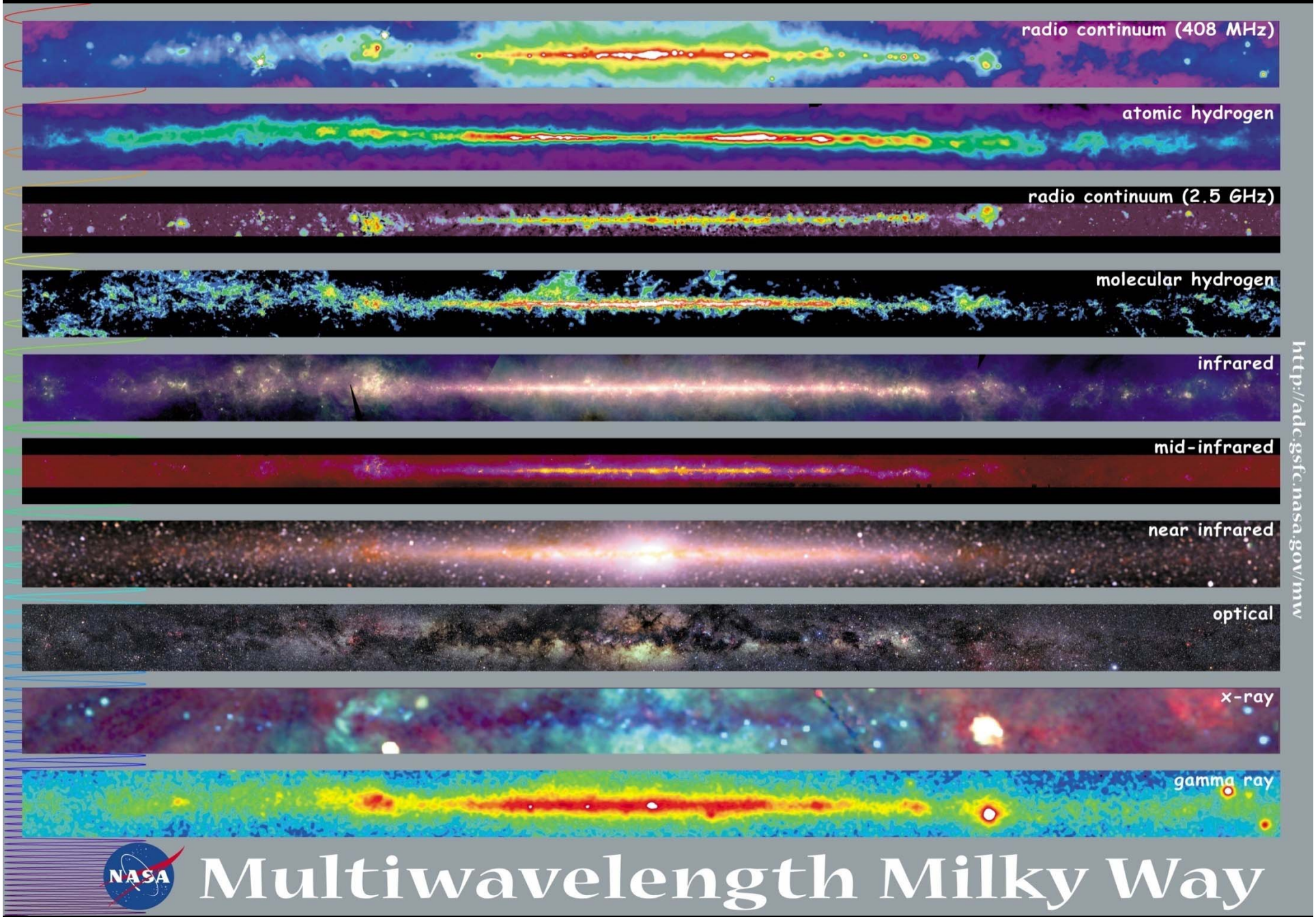
**Far-3 Kiloparsec Arm Minor Spiral Arm just identified via radio-telescope Survey**

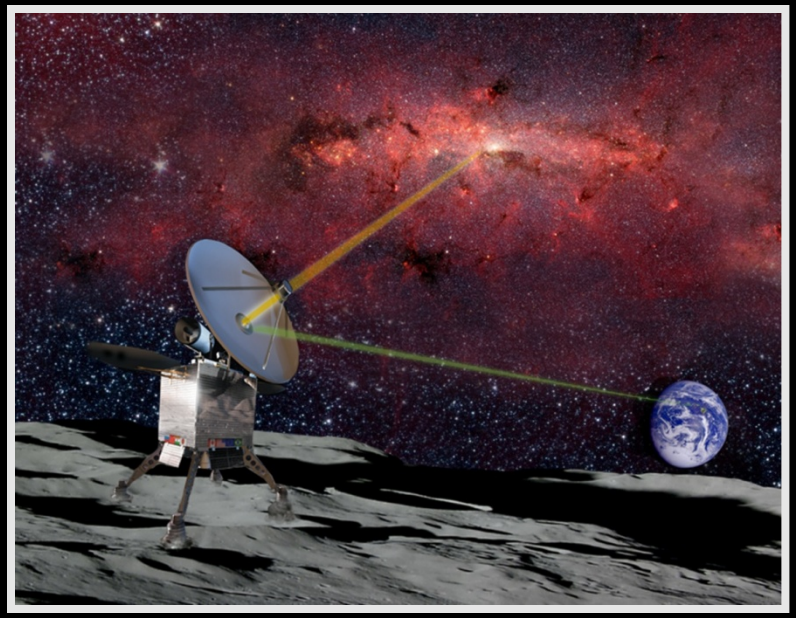
2008 – Robert Benjamin, University of Wisconsin, Whitewater



NASA/JPL-Caltech, artist's image

# The Milky Way: Spitzer Infrared Space Telescope


radio continuum (408 MHz)
atomic hydrogen
radio continuum (2.5 GHz)
molecular hydrogen
infrared
mid-infrared
near infrared
optical
x-ray
gamma ray
http://adc.gsfc.nasa.gov/mw
NASA
Multiwavelength Milky Way



ILO Imaging Galaxy Center

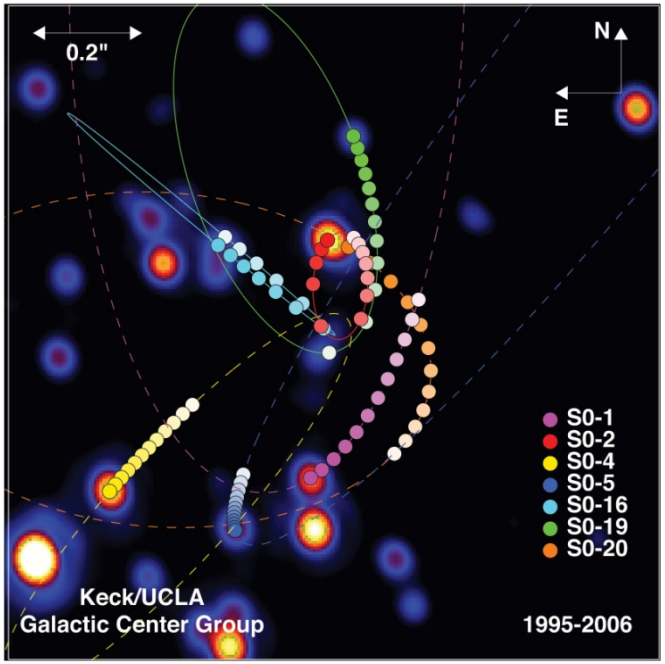
EarthRise Photo : 1968 / Apollo 8

# Galaxy First Light Imaging Program – Average Color of the Galactic Plane

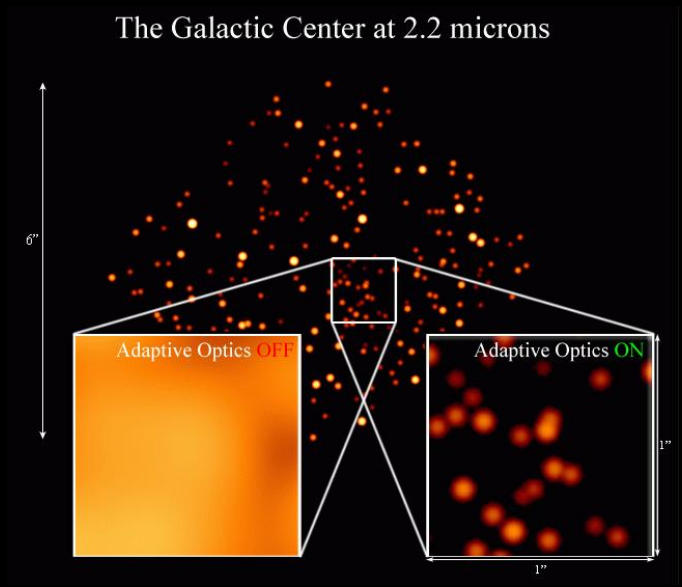
- 1 million pixel visible imager, 2.5º field of view, 2 polarizers and 6 color filters
- Limiting magnitude of ~12 for reasonable sample of Galactic plane from stars between 6$^{th}$ and 12$^{th}$ magnitudes
- Further weight of images by the known spectral response combined composite color image should be able to measure average color of galactic plane as perceived by human eye on a dark night

# Andrea Ghez
# UCLA Galactic Center Group
# Keck Observatory

## Stellar Orbits in the Central Arcsec




## Adaptive Optics



# Galaxy Education Resources:

1.Federation of Galaxy Explorers: Seeks to inspire and educate kids in space related science and engineering, including Moon Base One Initiative.
- Nicholas Eftimiades, Founder / Chairperson of the Board

2.Challenger Center: Learning Center Network gives students hands-on experience in science, engineering, research and space missions.
- June Scobee Rodgers, Founding Director and Chairman

3.International Space University: Graduate-level training to future leaders of the emerging global space community at locations around the world.
- Michael Simpson, President

4.Space Generation Advisory Council: Represents students and young space professionals to the United Nations, States, and space agencies.
- Alex Karl / Ben Baseley-Walker, Co-Chairperson

5. Students for the Exploration and Development of Space: Dedicated to expanding the role of human exploration through education.
- Joshua Nelson, Chair

# Galaxy Education Resources:

6. Galaxy Zoo: ‘Citizen Science’ online astronomy project that invites members of the public to assist in classifying over a million galaxies.
- Dan Andreescu, Kate Land, Chris Lintott, etc.

7. UCLA Galactic Center Group: Leading Galactic Center research group, dedicated to researching the innermost regions of the Milky Way.
- Andrea Ghez, Principal Investigator

8. Teachers in Space, Space Frontier Foundation: Giving teachers the opportunity to experience space firsthand via NewSpace companies.
- Edward Wright, Project Manager

9. The Planetary Society: Inspires and involves the world's public in space exploration through advocacy, projects, and education.
- Louis Friedman, former Executive Director

International Lunar Observatory Association

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# Galaxy Education Resources







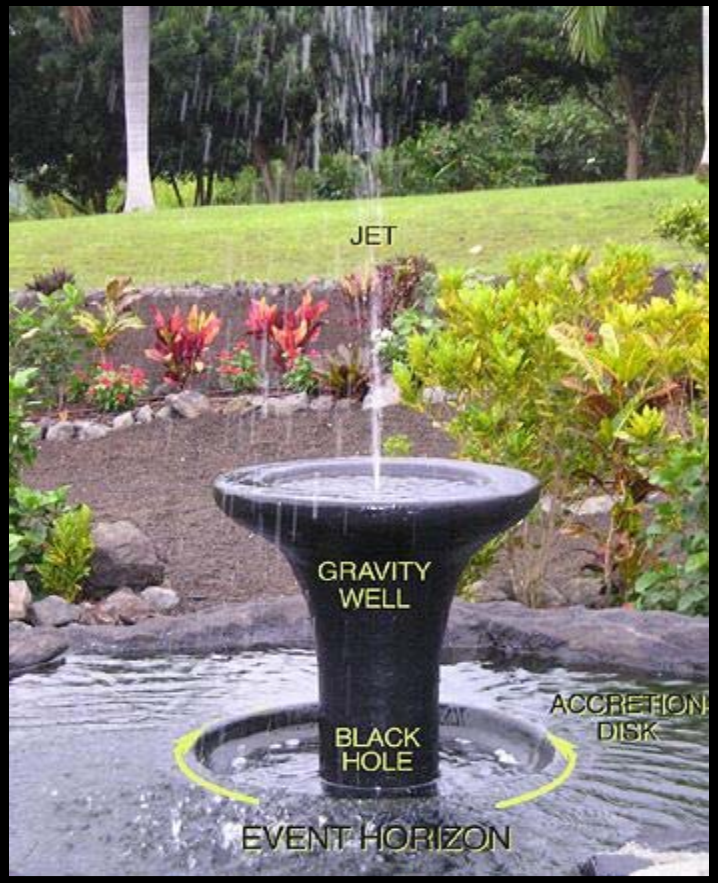


# Galaxy Garden / Jon Lomberg

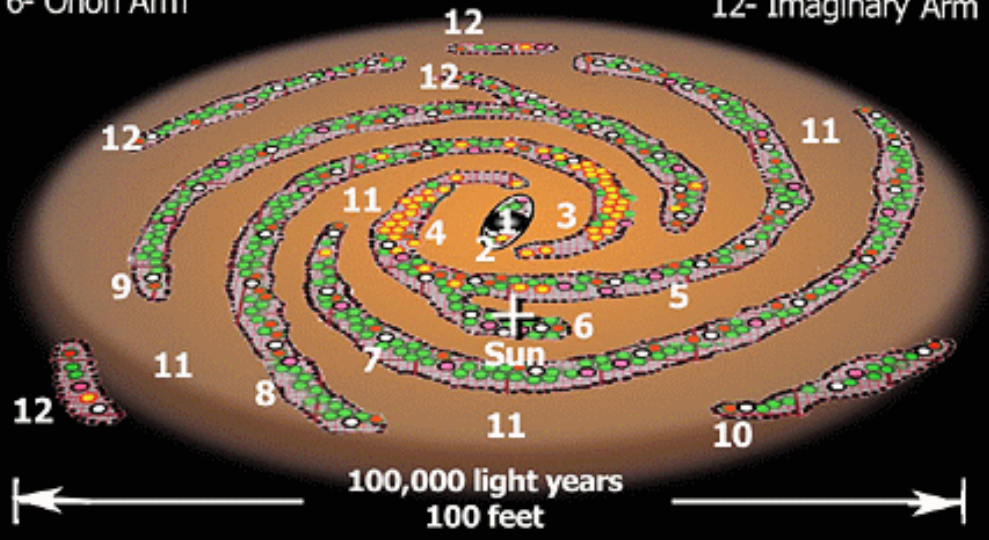
## Kona, Hawai`i Island


Portrait of the Milky Way

**International Lunar Observatory Association** **Space Age Publishing Company**




1- Center of the Galaxy
2- Galactic Bar
3- Three Kiloparsec Arms
4- Sagittarius Arm
5- Carina Arm
6- Orion Arm
7- Perseus Arm
8- Norma Arm
9- Scutum Arm
10- Outer Arm
11- Galactic disk
12- Imaginary Arm



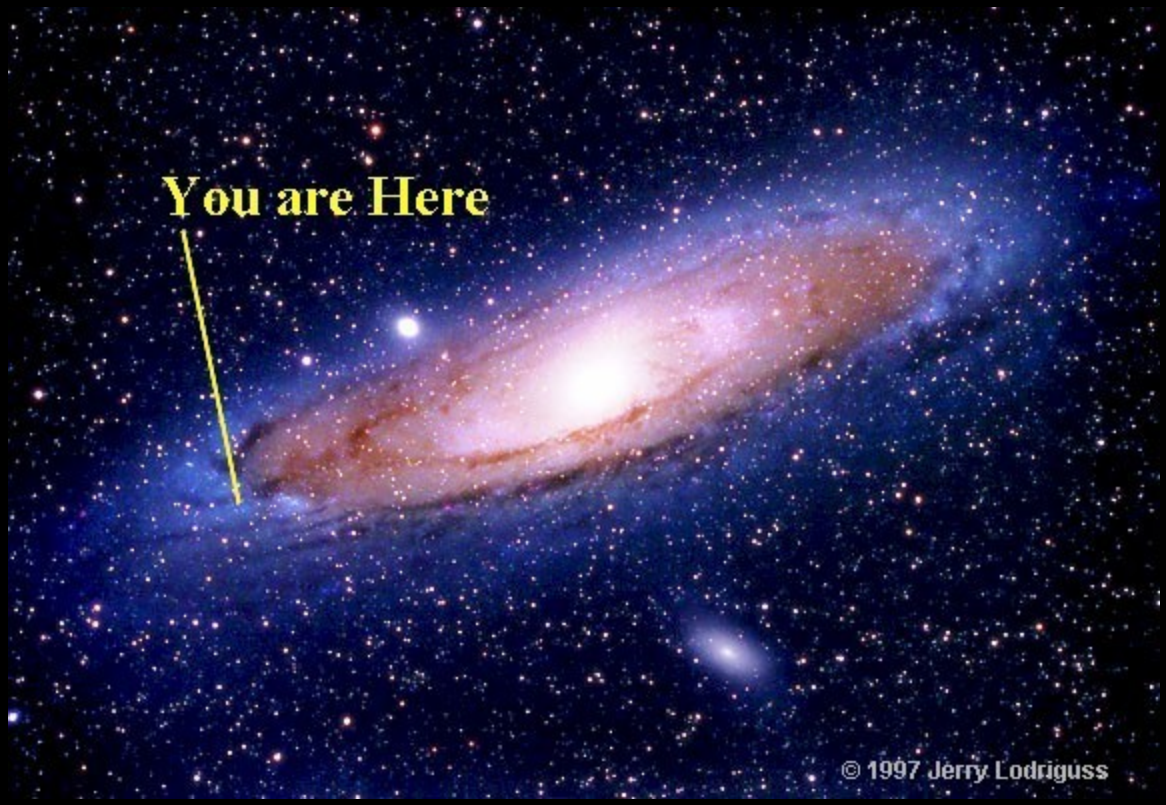

1 foot= 1000 light years

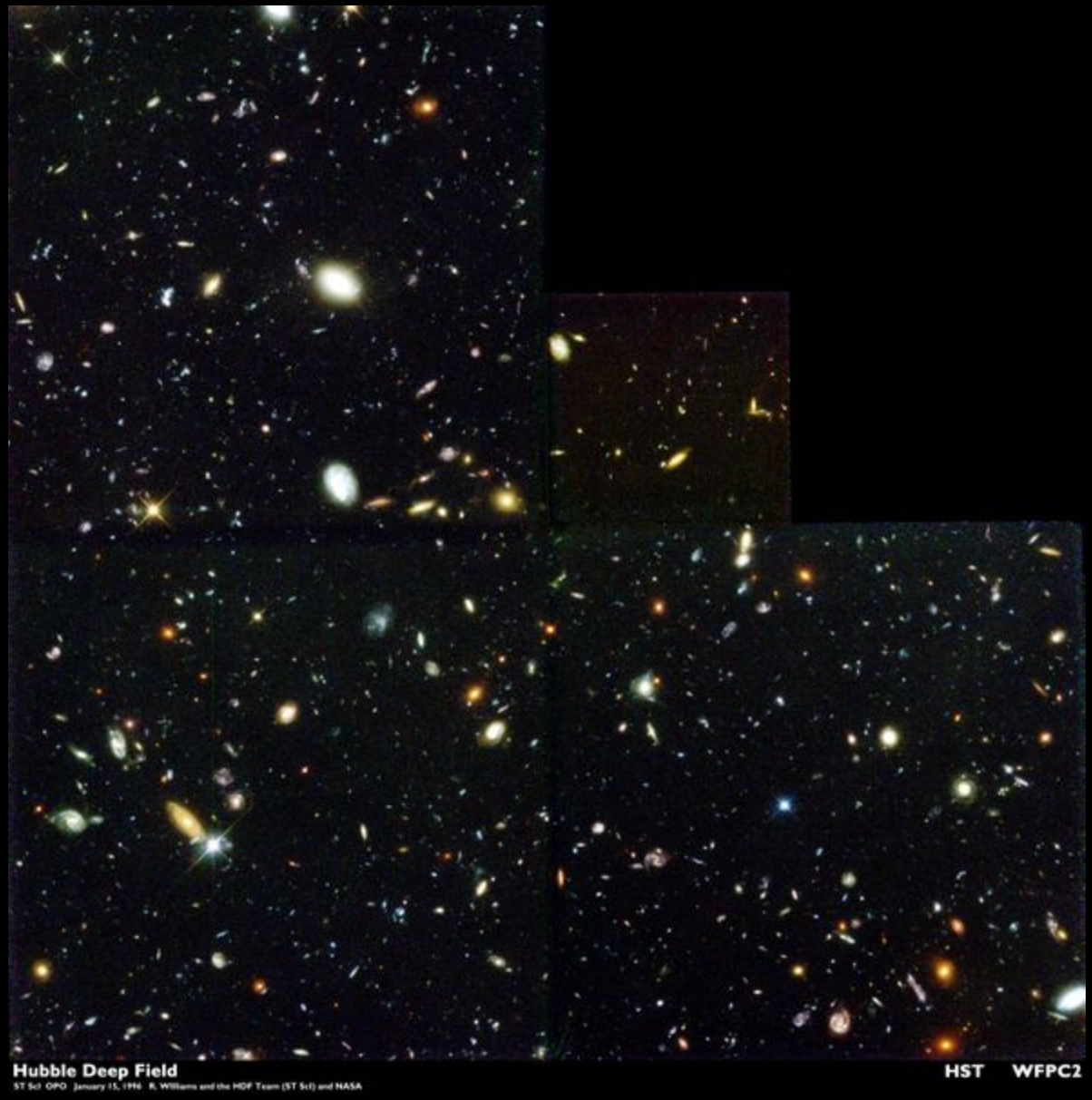
1 inch= 83 light years


# Barbara Morgan

## 1st Teacher in Space

Challenger CENTER®


You are Here
© 1997 Jerry Lodriguss


Hubble Deep Field
HST WFPC2

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# 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 |
|---|---|---|---|
| **Space Calendar Broadcast**<br>This Space Calendar will be transmitted from the Moon. Advertisers will pay a premium rate for transmission of their ads from the lunar surface. | **Internet Search Engine Giants**<br>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. | **Specialty Advertising Opportunities**<br>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. | **In Situ Communications and Monitoring Capabilities for Robotic Project Operators**<br>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. |

**International Lunar Observatory Association** **Space Age Publishing Company**

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

SPACE CALENDAR
AUGUST 9-15, 2010

*The First, Best Space Calendar in the Business*

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August 9-15, 2010 / Vol 29, No 32

**Emerging Galaxy Forum Asia Architecture to Advance Education, Philanthropy**

With its pioneering launch on 4 July 2008 in California, USA, the Galaxy Forum program is beginning to catalyze classrooms throughout Hawaii, mainland USA, Canada and China with its mission to enhance and advance 21st Century Education through awareness of our Milky Way Galaxy. Now entering its third year, the Galaxy Forum architecture is emerging in Asia with Forums scheduled in Bangalore, India (9 August), Beijing, China (14 Aug) and Tokyo, Japan (4 December), and others being planned for 2011 and beyond. Following 2 successful Galaxy Forums in Beijing in 2008 and 2009, this year's China event will take place at the Beijing Planetarium 23-meter Dome featuring prominent astronomy artist and Galaxy Garden creator Jon Lomberg and International Lunar Observatory Association Director Steve Durst. China press coverage on the Galaxy Forum Beijing is expected to attract considerable national and international attention throughout the world's most populous country and beyond. The events in India and Japan will be hosted at the Nehru Planetarium and Mirakan Space and Science Center, respectively. The Galaxy Forums connect educators, teachers, students and astronomers of all kinds in a series of community events featuring local experts discussing topics related to our Galaxy and others, as well as ways to integrate learning about our place in the Galaxy into all levels of all classrooms around the world. Galaxy Forum is also designed to attract philanthropic sponsors for the upcoming International Lunar Observatory mission, set to conduct observation and communication on the surface of the Moon NET December 2012 starting with the highly directional, educational and iconic "Galaxy First Light" image. (Credit: Galaxy Garden, Nehru Planetarium, Beijing Planetarium, ISRO, ILOA)

**Small Satellites, Space Elevator Focus of Innovative Technology Conferences**

Space industry leaders and advocates worldwide will gather in the USA to discuss the latest technological advances in space exploration. On August 9-12, the American Institute of Aeronautics and Astronautics and Utah State University will hold the 24th Annual Conference on Small Satellites in Logan UT. Small satellites have become instrumental in the space community with low manufacturing costs and a proven track record in scientific and commercial missions. This year's theme, 'Connecting the Dots: Bringing Visionaries, System Implementers & Mission Sponsors Together,' will focus on the increasing need for small satellites and enhancing synergistic efforts between technology advocates and investors. Jean-Michel Contant (TL), International Academy of Astronautics Secretary General will deliver the keynote address followed by technical sessions covering mission payloads, future missions of small satellites and a current market overview. Undergraduate and graduate students will also showcase their work on small satellite concepts and missions in the 18th Frank J. Redd Scholarship Competition. On Aug 13-15, The Space Engineering and Science Institute will present the 4th Space Elevator Conference in Redmond WA. Participants will discuss the International Space Elevator Consortium study on space debris and the 4 Pillars of Space Elevator Development in fields of science / technical, political / social, legal and economic. The 3-day technical event will feature SE overview, a keynote address on space debris mitigation by Jerome Pearson (BR), The NASA Centennial Challenge and Strong Tether Competition, 5 minute shotgun science sessions and free public presentations. (Credit: smallsat.org, spaceelevatorblog.com, NASA, n2yt.com, Alan Chan)

August | September | October

● = All times for terrestrial events in local time unless noted.
○ = All times for international terrestrial events in local time unless noted.
★ = All times for space events, and...
☆ = All times for international space / astro events in Hawaii Standard Time unless noted. Add 10 hours to obtain UT ('Universal Time,' Greenwich, England).

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

**MONDAY**

☆ Aug 9 — International Space Station, *LEO*

☆ Aug 9 — NASA Lunar Reconnaissance Orbiter (LRO), *Lunar Orbit*

Click here to submit your event to Space Calendar

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Space Calendar is launching to the Moon and aiming for the Stars!

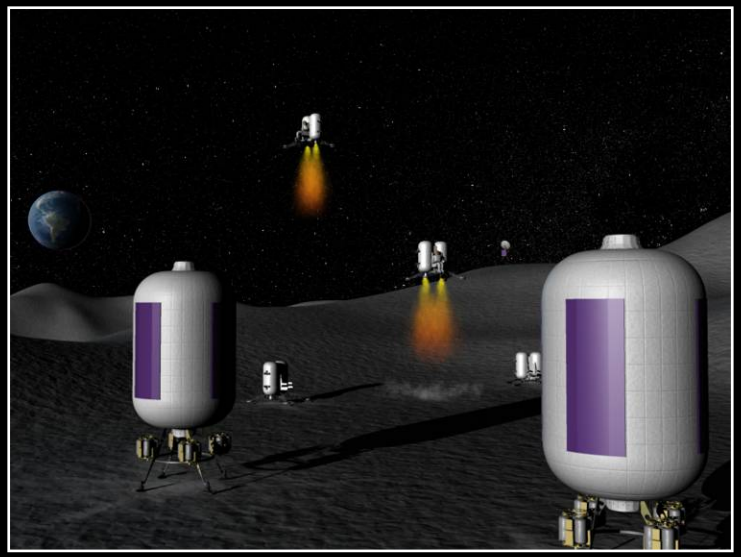
ISCOPS 2010

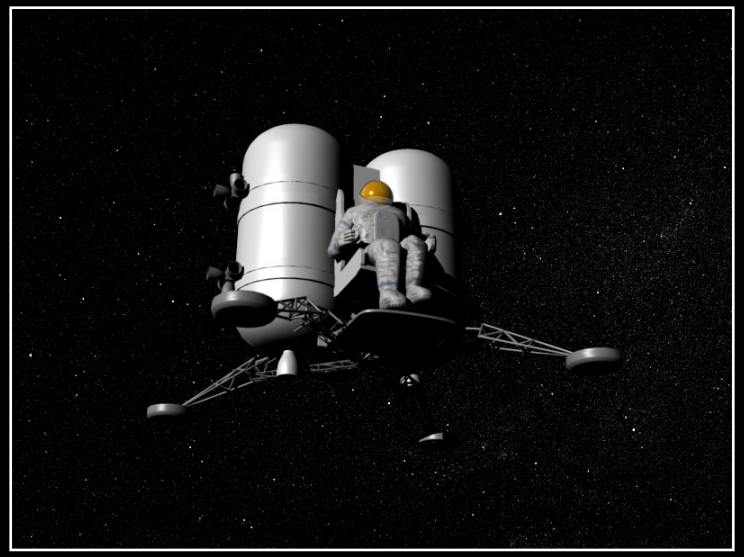
# International Lunar Observatory (ILO)

## 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

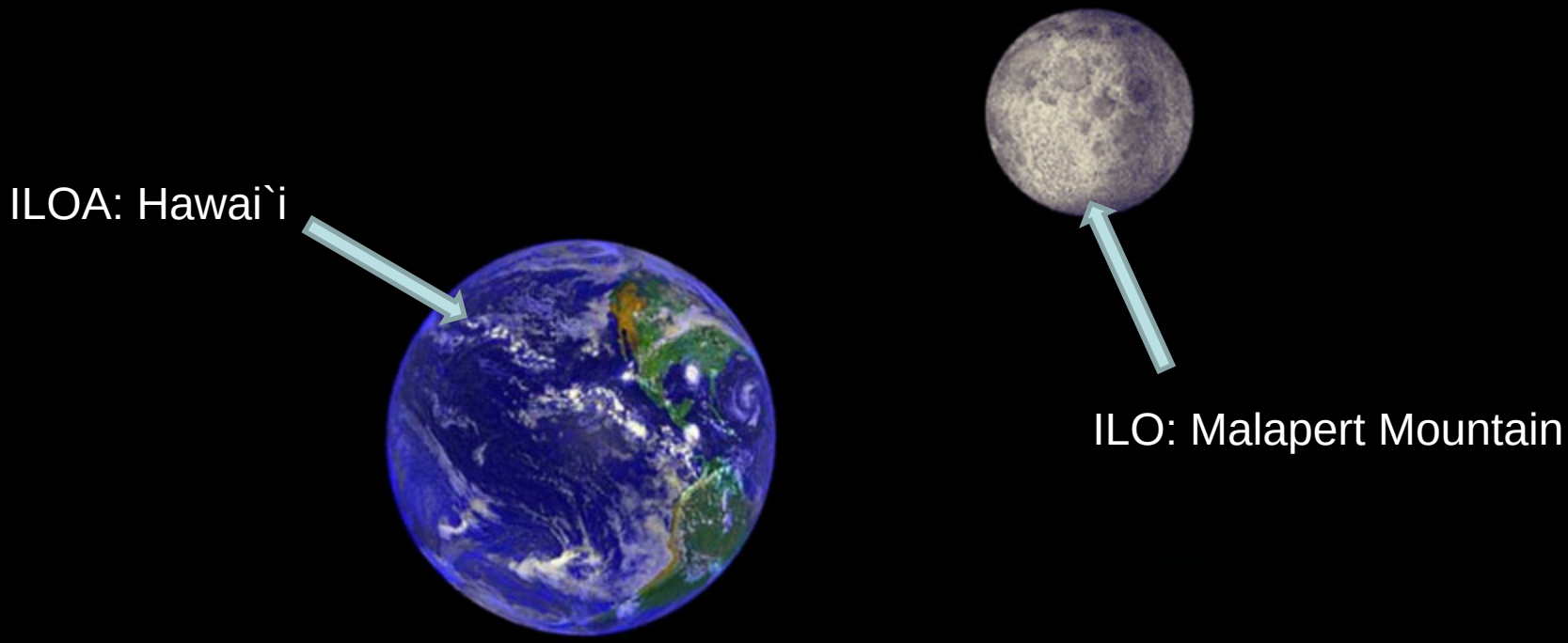
# Human Service Mission



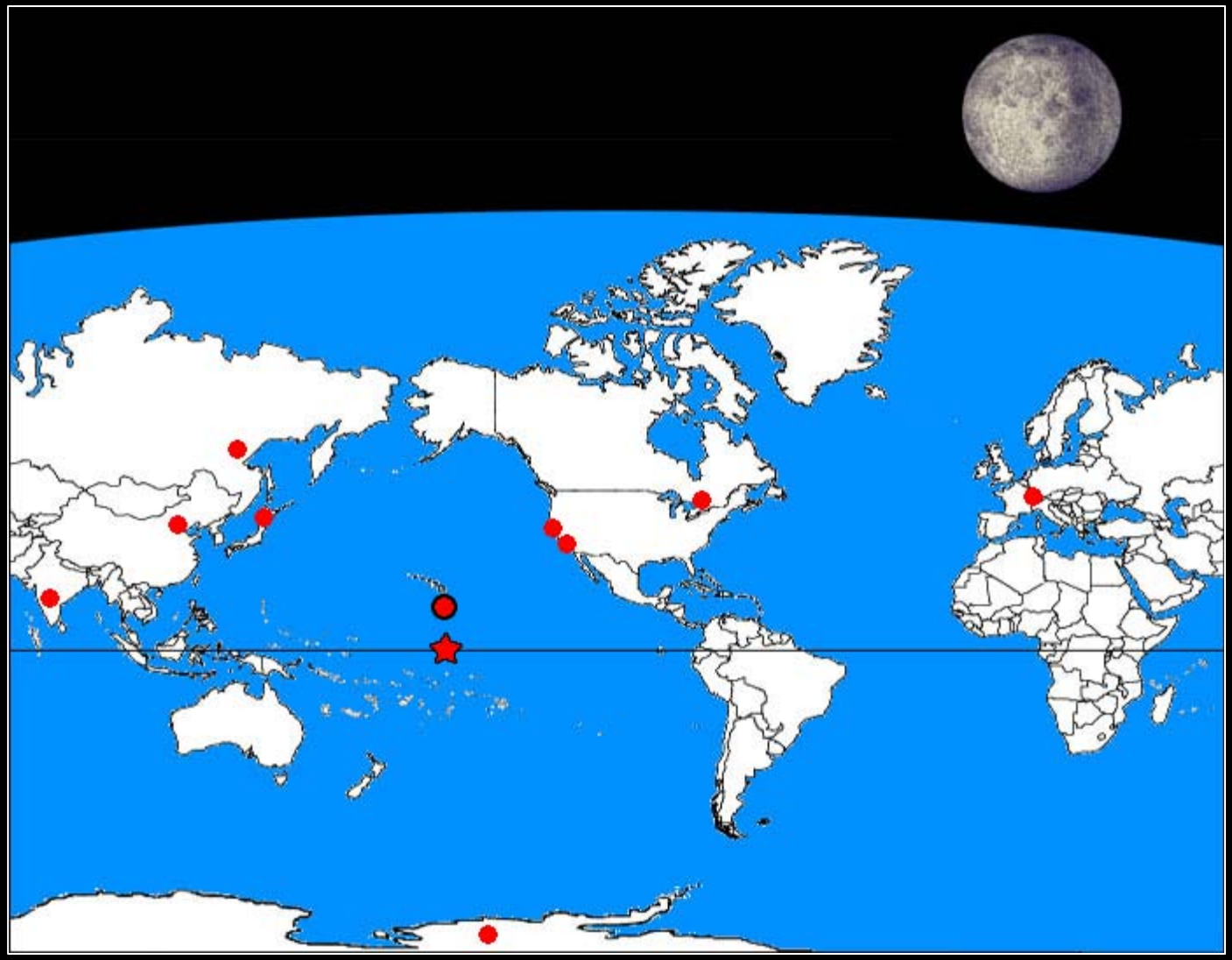


SpaceDev Inc – Dream Chaser, ALOHA Chair

# Inter-Global / Earth-Moon / Cislunar System



# *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

# ILOA Affiliates







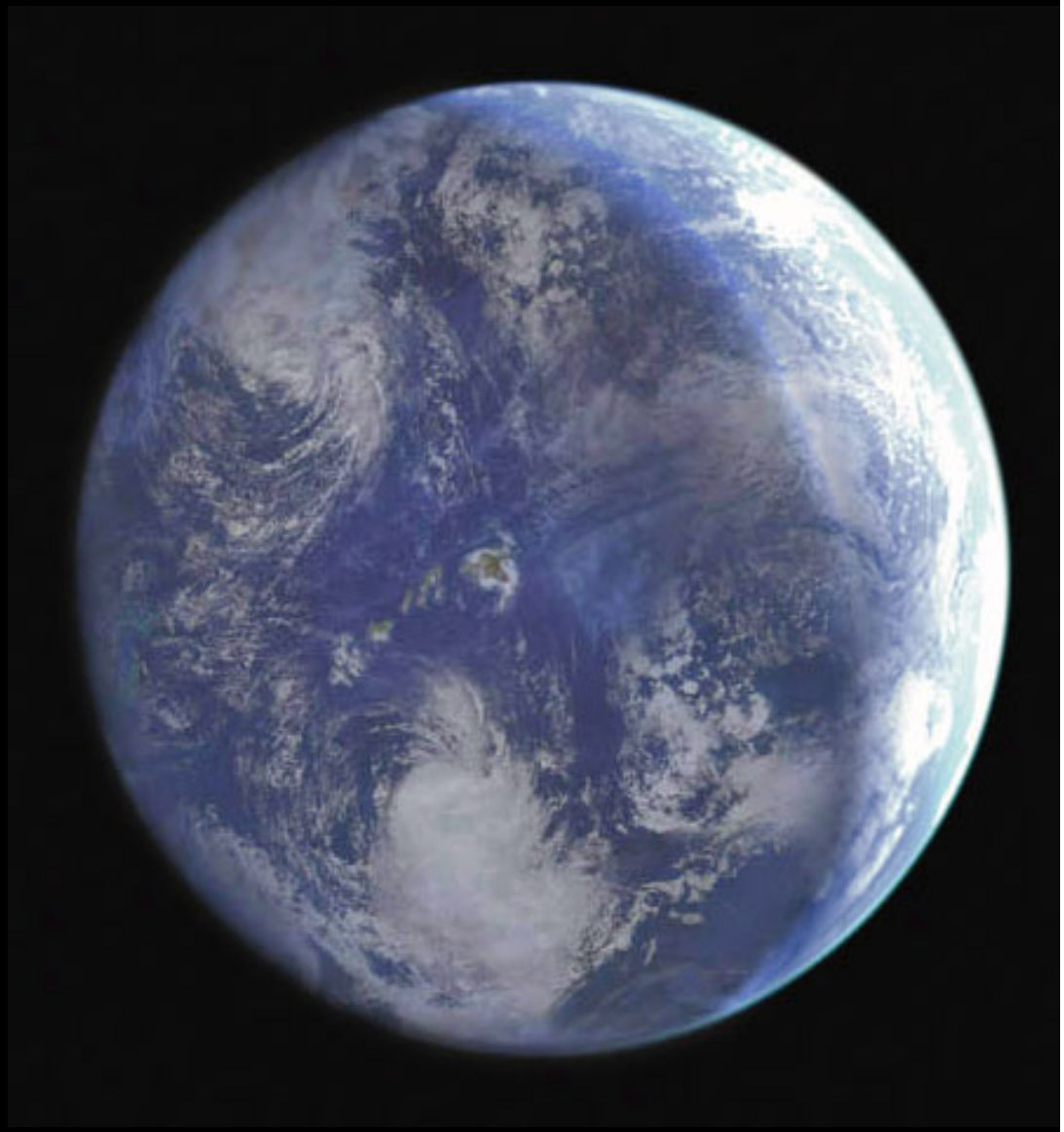

# International Lunar Observatory Association

## ILOA / ILO Assets …

- 2 MDA studies 2008-2010
- 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
- Galaxy Forum Architecture 2008 - present
- Non-Profit 501(c)3 Status
- Board of Directors, Exec. Committee with Operating Reserves
- Next Board of Directors Meetings 30 September Prague; 15-17 December 2010, 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



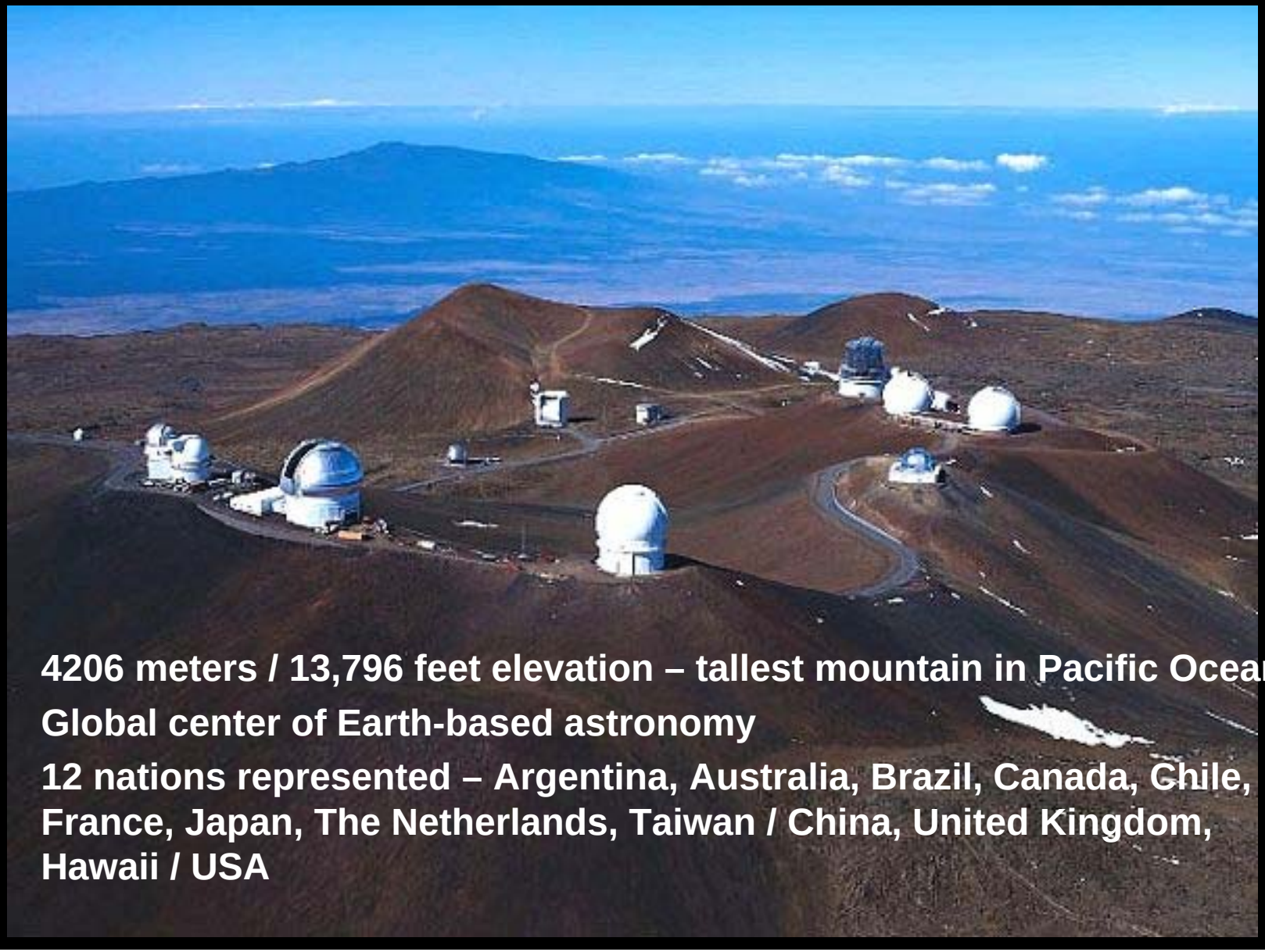
# Why Is Hawai`i Important to Space Exploration?

## 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 Institutional Membership

- **Observation**: In-situ lunar characterization; Stars, Moon, Earth; Science, Research, Development
- **Communication**: uplink / downlink nodes for surface and Earth line-of-sight relay
- **Education**: supports Galaxy Forum 21st Century architecture

Open to: Science and astronomy institutes, space and government agencies, Aerospace and NewSpace companies, private individuals, universities

Enterprise: establish 21st Century permanent lunar presence

# ALOHA!

For more information about the ILO / ILOA, contact:

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