International Lunar Observatory Association | Space Age Publishing Company

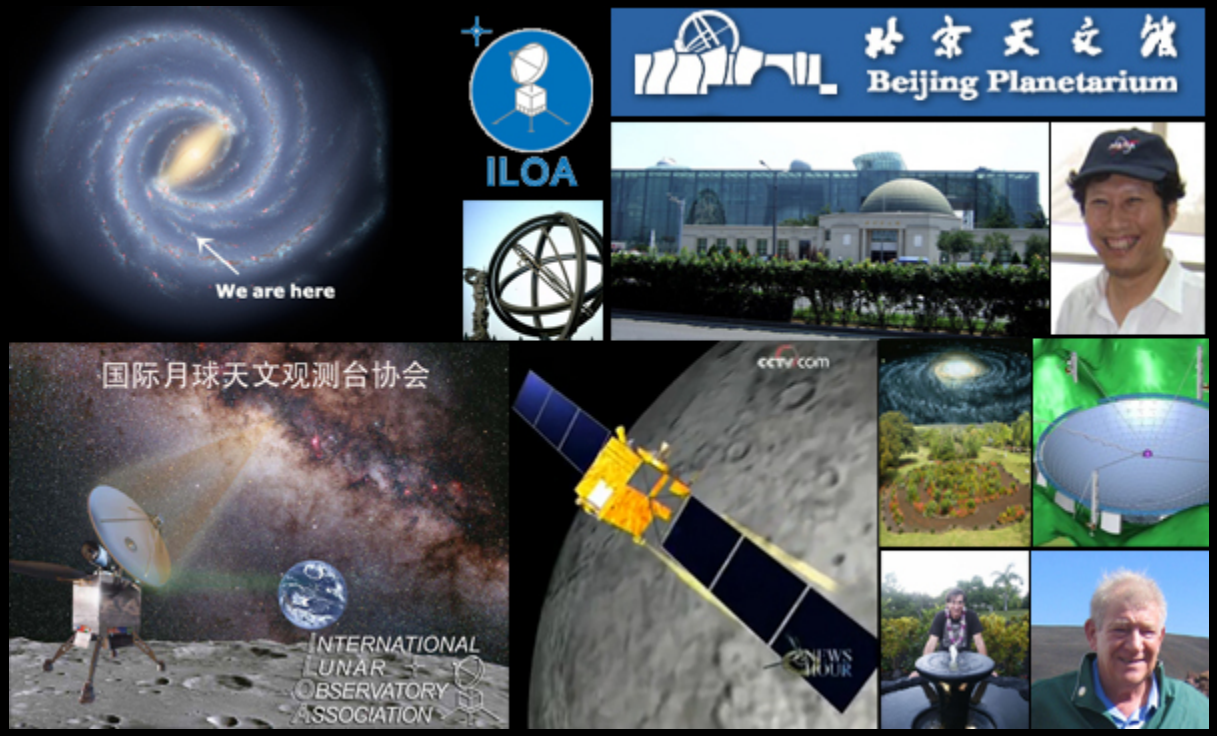
Galaxy Education in the 21st Century

Galaxy Forum China - Beijing

Beijing Planetarium, Beijing, China

Saturday, August 14, 2010 – 3:30 - 6pm

银河



International Lunar Observatory Association | Space Age Publishing Company

Galaxy Education in the 21st Century

Galaxy Forum China - Beijing

Beijing Planetarium, Beijing, China

Saturday, August 14, 2010 – 3:30 - 6pm

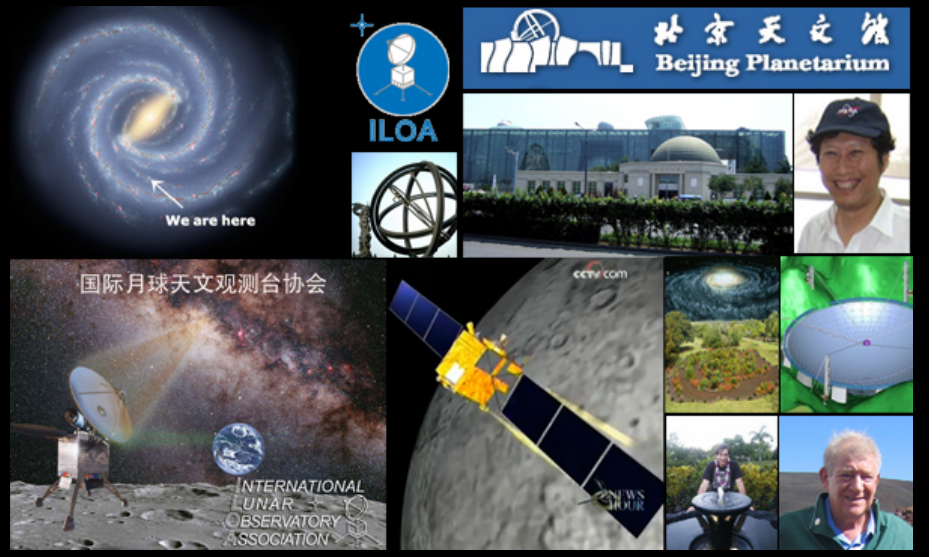
银河

21世纪银河系教育

中国银河系论坛---北京

北京天文馆，北京，中国

星期六，8月14日，下午3点半至6点



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

国际月球天文观测台协会（ILOA）
2010年8月稿

史蒂夫 德斯特，ILOA/宇宙时代出版社
夏威夷，加利福利亚，美国

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

Galaxy Forum Architecture

21st Century Education

银河系论坛平台
21世纪教育

- Silicon Valley, California, USA
- Hawaii Island, USA: Kona, Waimea, Hilo
- Kansas, USA
- Vancouver, Canada
- Beijing, China
- Bangalore, India
- Prague, Czech Republic (October 2010)
- Tokyo, Japan (December 2010)

China Non-Profit Philanthropy

中国公益慈善组织

THE YAO MING FOUNDATION | IMPROVING THE LIVES OF CHILDREN IN THE US AND CHINA

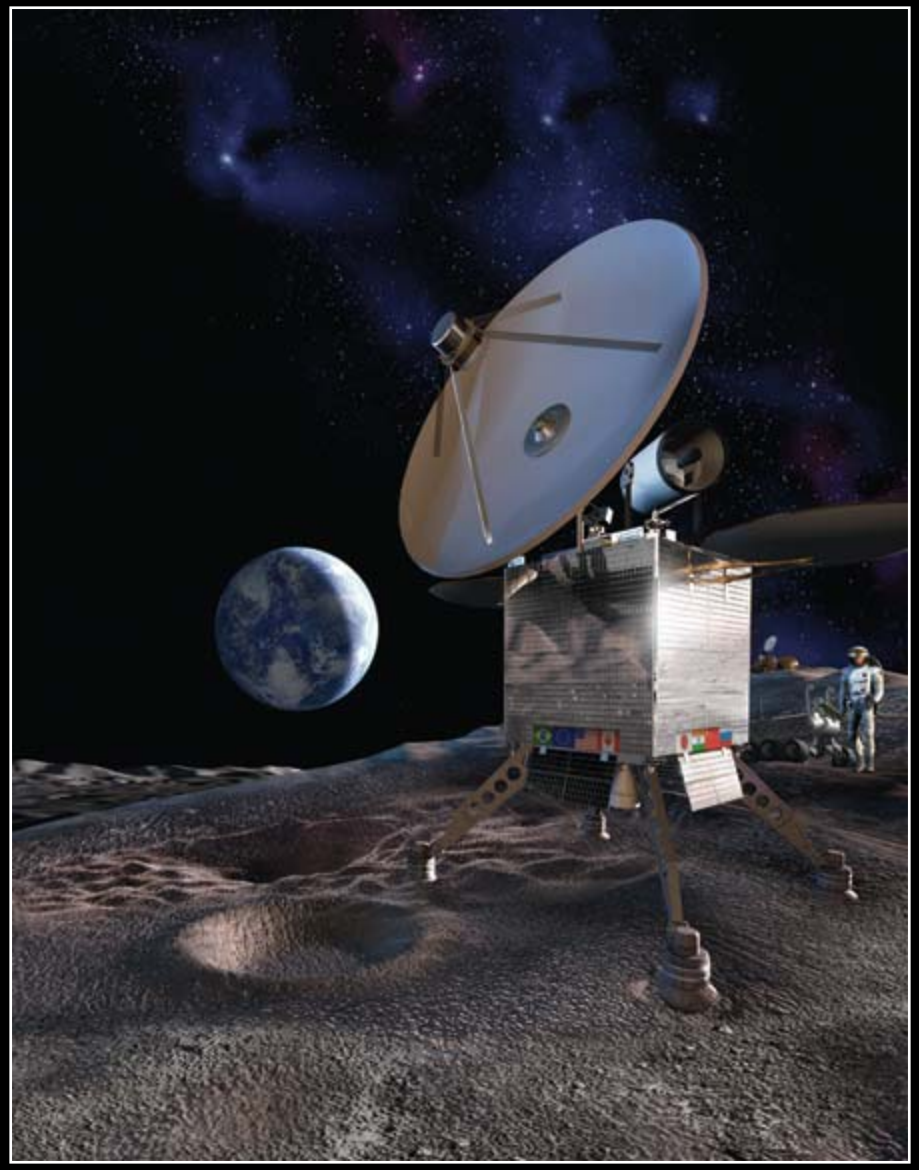
one foundation

TANG FOUNDATIONS
Bridging understanding between the US and China.

China Space Foundation

ILOA – 3 Missions

ILOA---三项使命



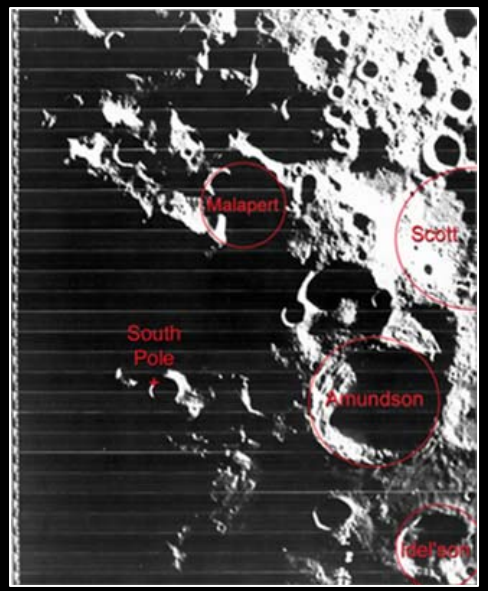
- **ILO-1 Polar Mission**
  (NET 2012)
- **ILO Precursor Mission**
  (NLT 2012)
- **ILO Human Service Mission**

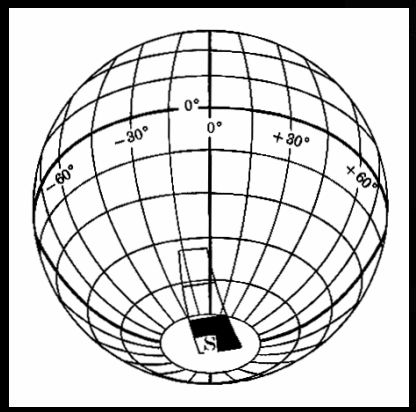
International Lunar Observatory (ILO)
ILO-1 Polar:

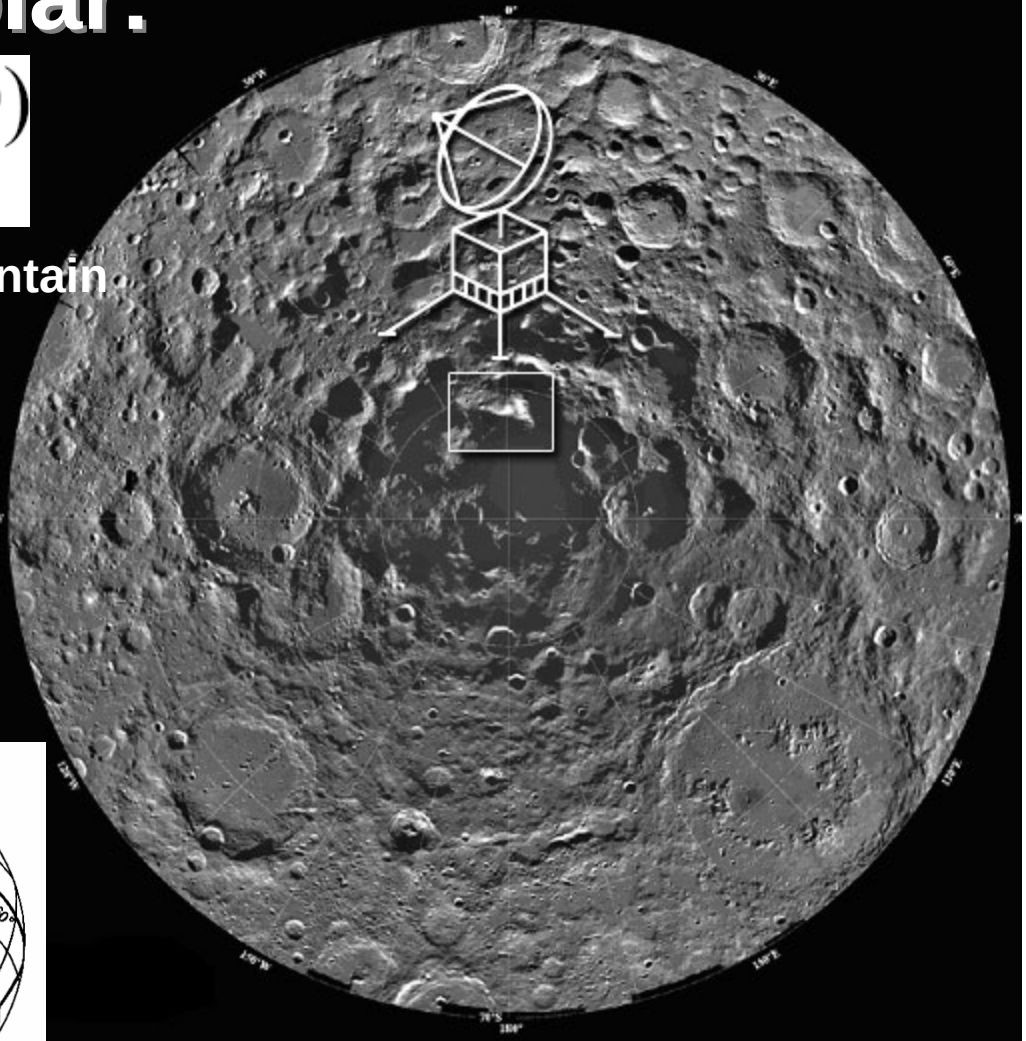
国际月球观测台(ILO)

ILO-1南极

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







Shackleton Crater Location

Shackleton 月球坑地点

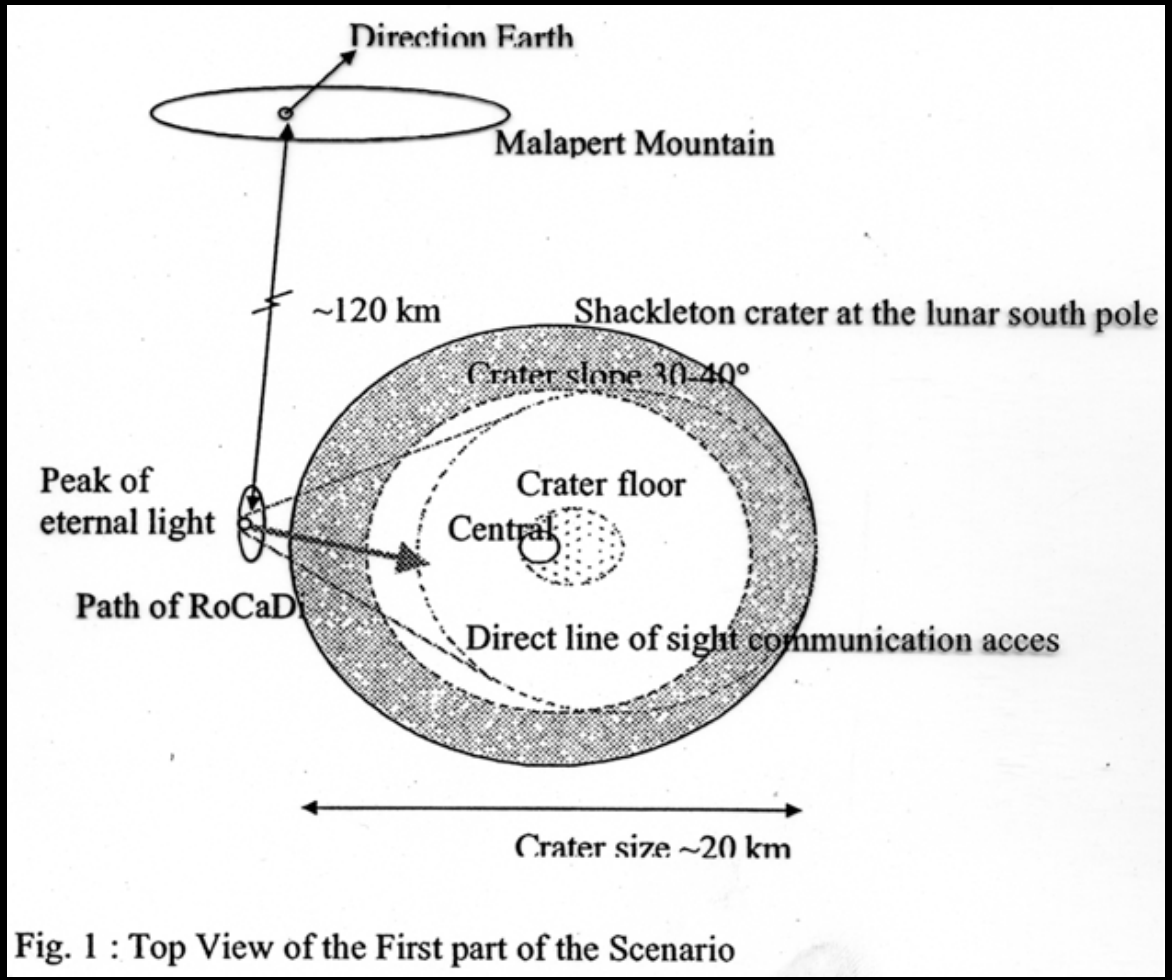
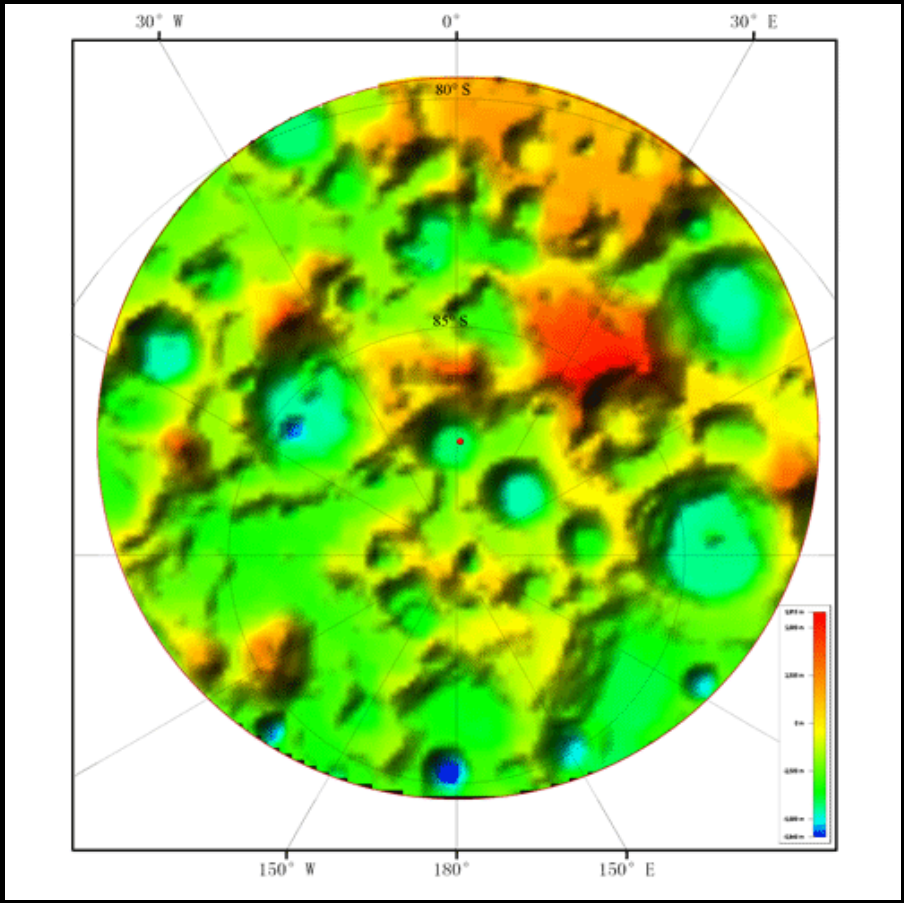


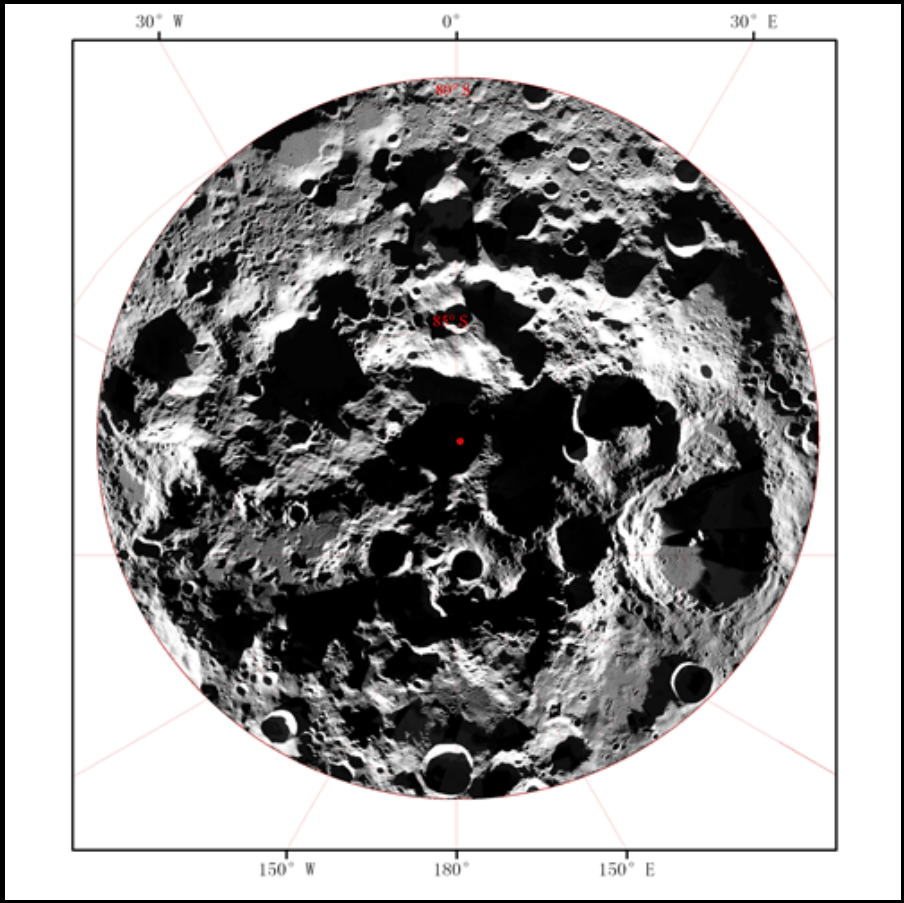
Fig. 1 : Top View of the First part of the Scenario

Graphic: Paul van Susante

Lunar South Pole – Chang'e

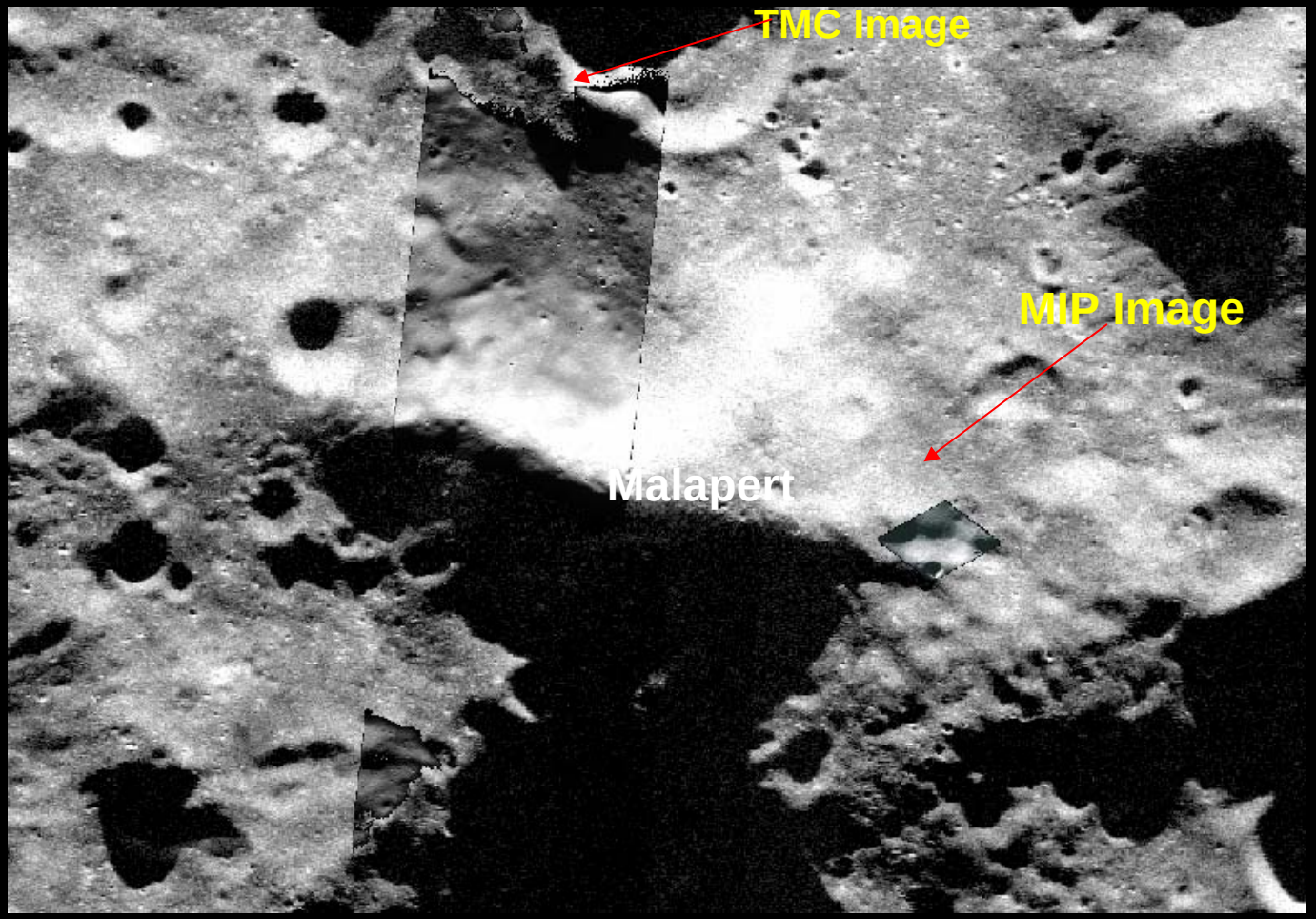
月球南极---嫦娥一号图像





Lunar South Pole - Chandrayaan

月球南极---Chandrayaan （印度）

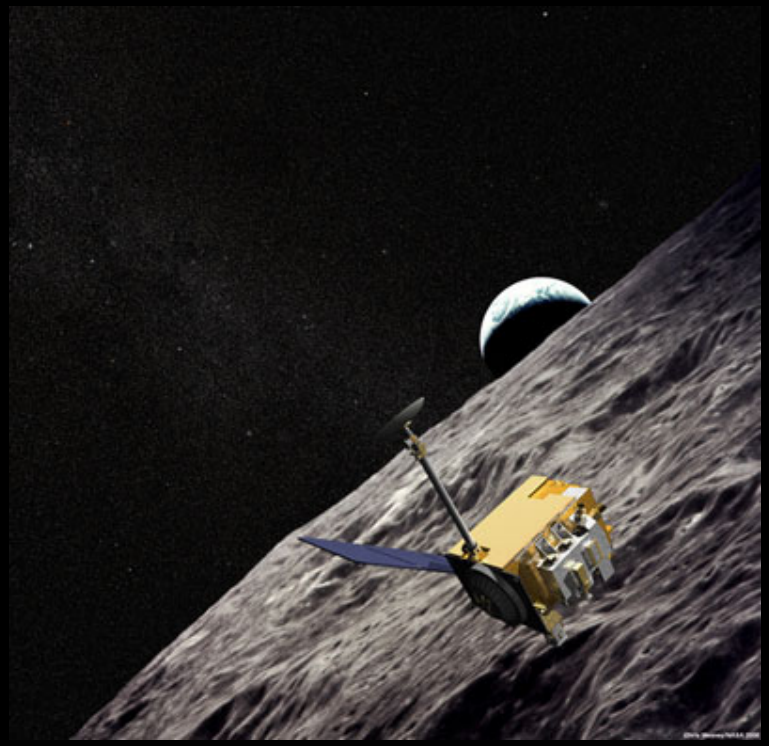


Lunar South Pole – Kaguya

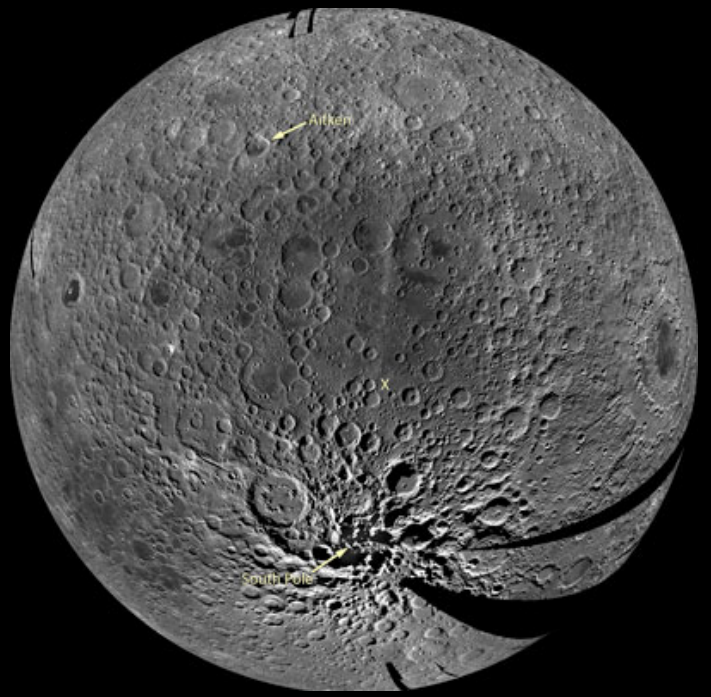
月球南极---Kaguya（日本）

Lunar South Pole – USA Lunar Reconnaissance Orbiter (LRO)

月球南极 -- 月球探测卫星 （LRO）



LRO – artist's conception



South Pole with Aitken Basin
via LROC Wide angle camera - 50km

Primary and Secondary ILO Mission Objectives:

国际月球天文观测台主要及次要使命目标

- 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

国际月球天文观测台主要及次要使命目标

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

为什么要认识到21世纪银河系教育的重要性:

- **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**

我们在这里
We are here

Two Major Spiral Arms:

Scutum-Centaurus & Perseus

Two Minor Spiral Arms:

Norma & Sagittarius

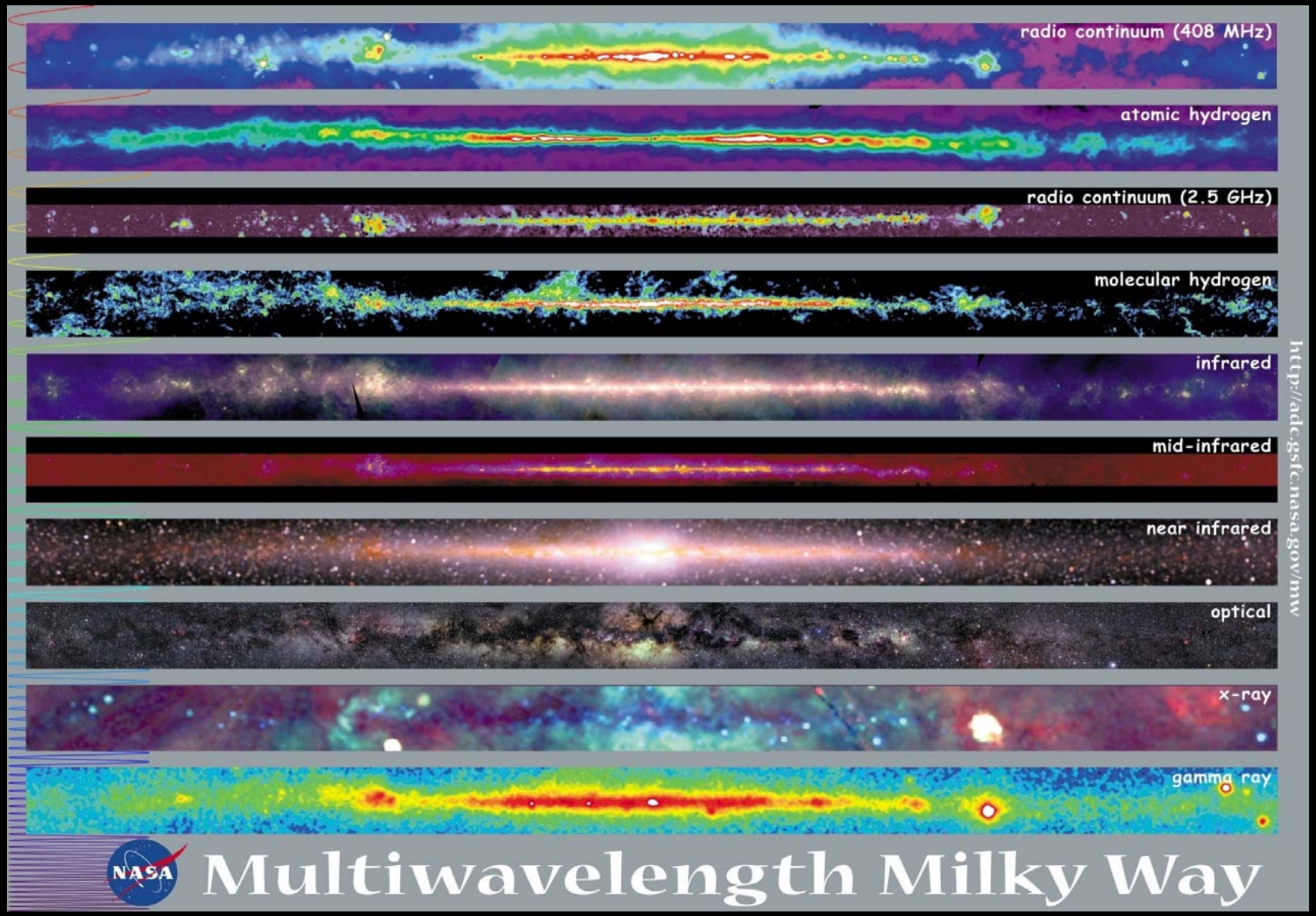
Far-3 Kiloparsec Arm Minor Spiral Arm just identified via radio-telescope Survey

2008 – Robert Benjamin, University of Wisconsin, Whitewater

NASA/JPL-Caltech, artist's image

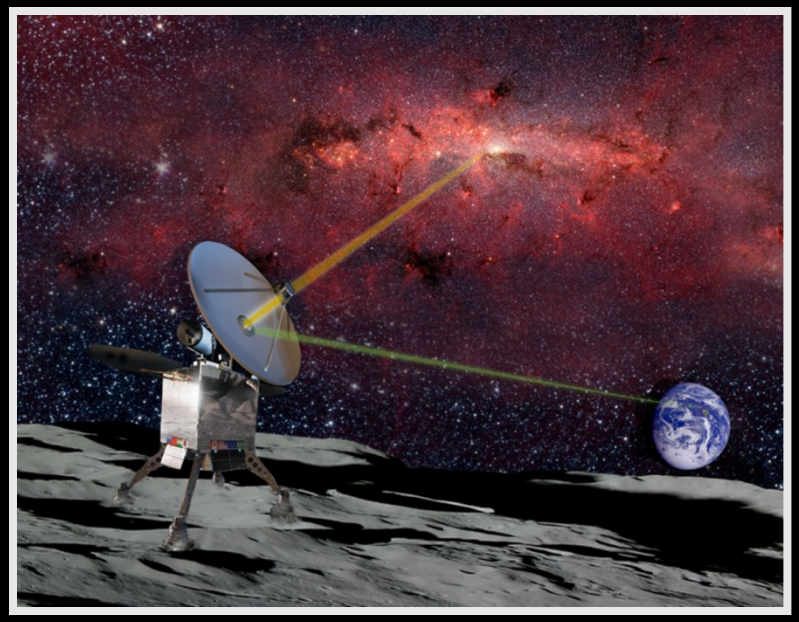
The Milky Way: Spitzer Infrared Space Telescope

银河系：Spitzer红外线望远镜


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

不同波长下的银河系

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



ILO Imaging Galaxy Center

ILO银河影像中心

EarthRise Photo : 1968 / Apollo 8

地球升起影像;1968/阿波罗

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

银河系第一署光线图像项目-
银盘的综合颜色

- 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 6th and 12th 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

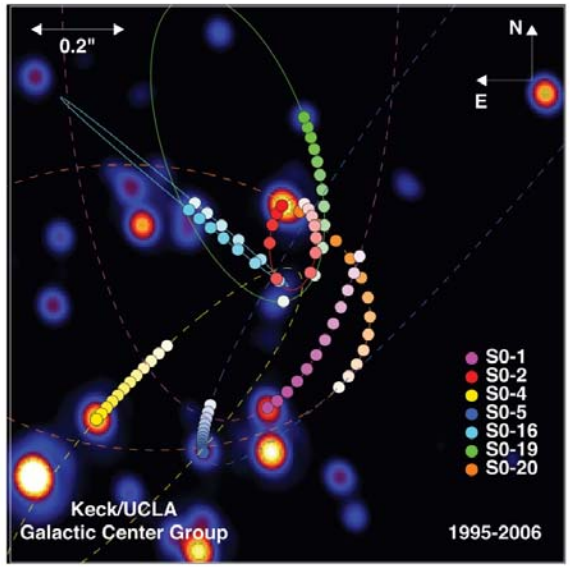
UCLA Galactic Center Group

Keck Observatory

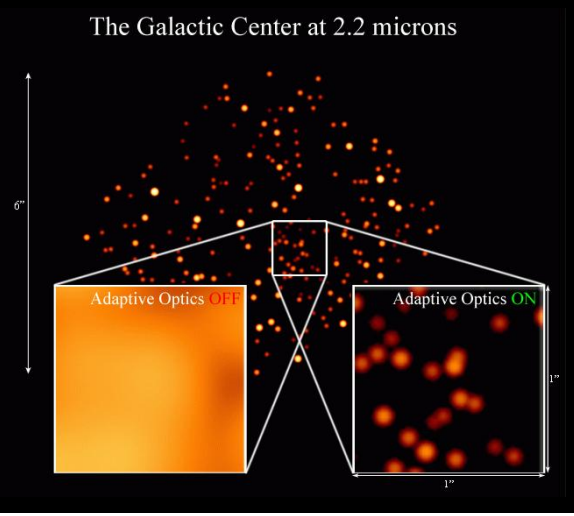
UCLA 银河系研究中心

Keck 天文观测台

Stellar Orbits in the Central Arcsec



Adaptive Optics



Galaxy Education Resources: 银河系教育组织及信息

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: 银河系教育组织及信息

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

Space Age Publishing Company

Galaxy Education Resources

银河系教育组织及信息

Galaxy Garden / Jon Lomberg

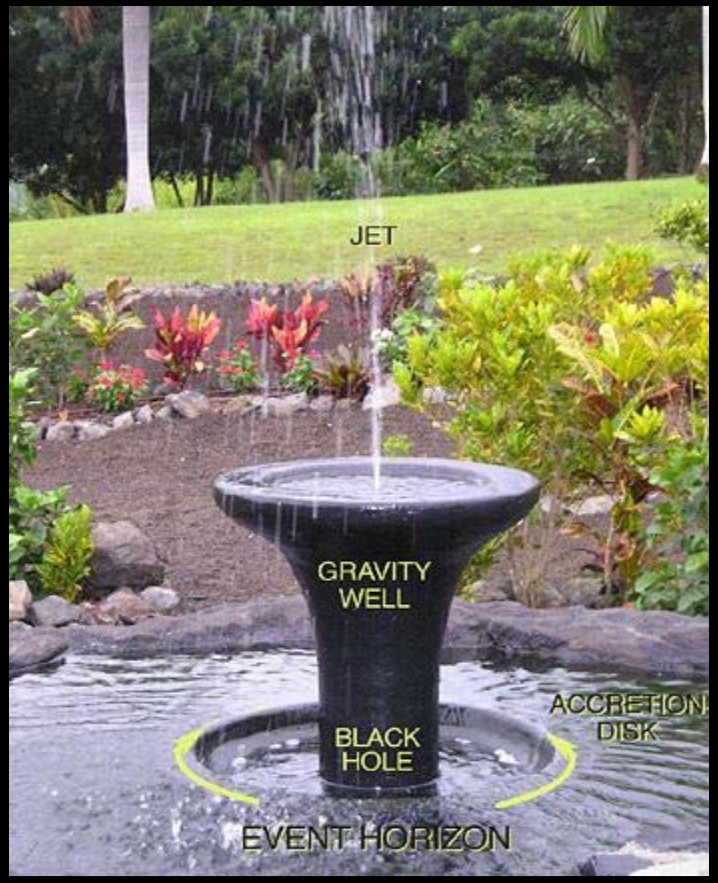
Kona, Hawai`i Island

银河系花园/乔恩-朗姆博格

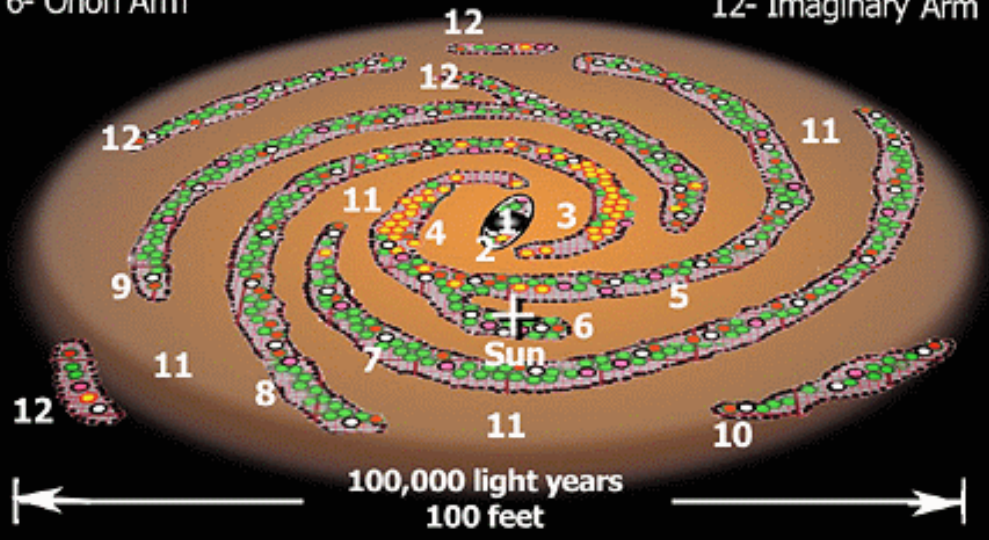
Kona， 夏威夷大岛

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

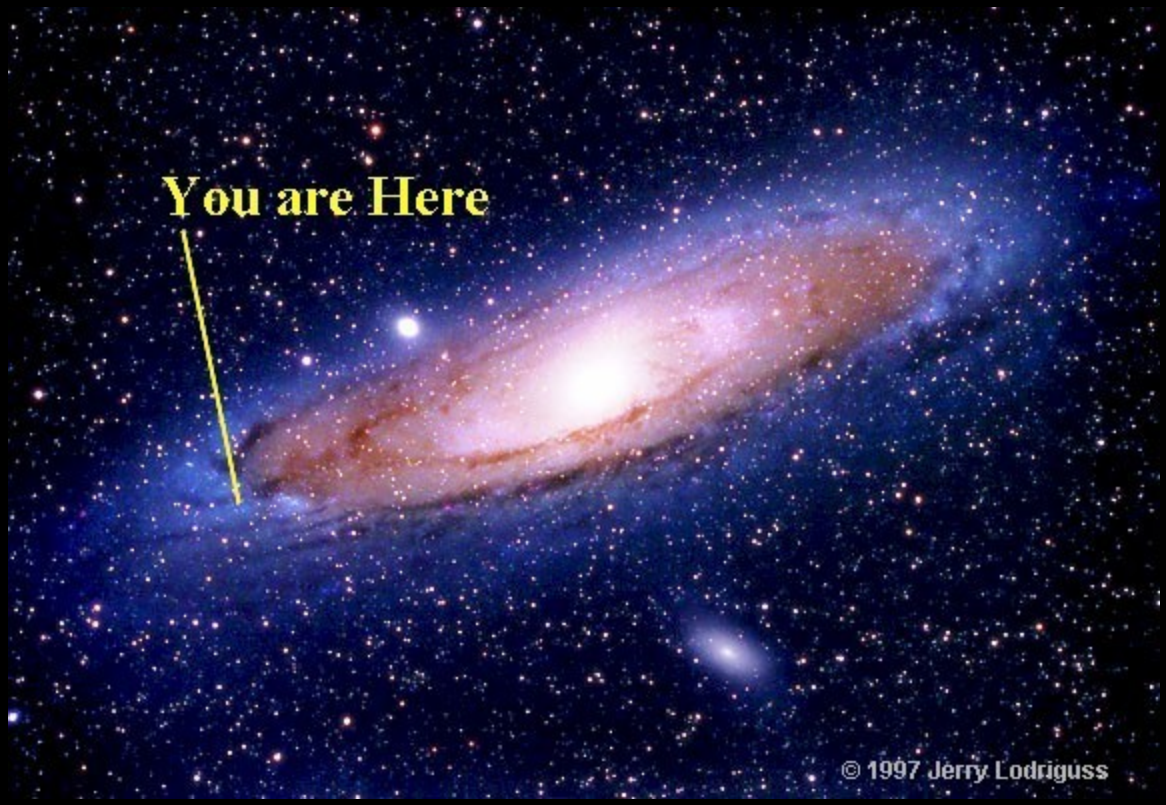
Barbara Morgan

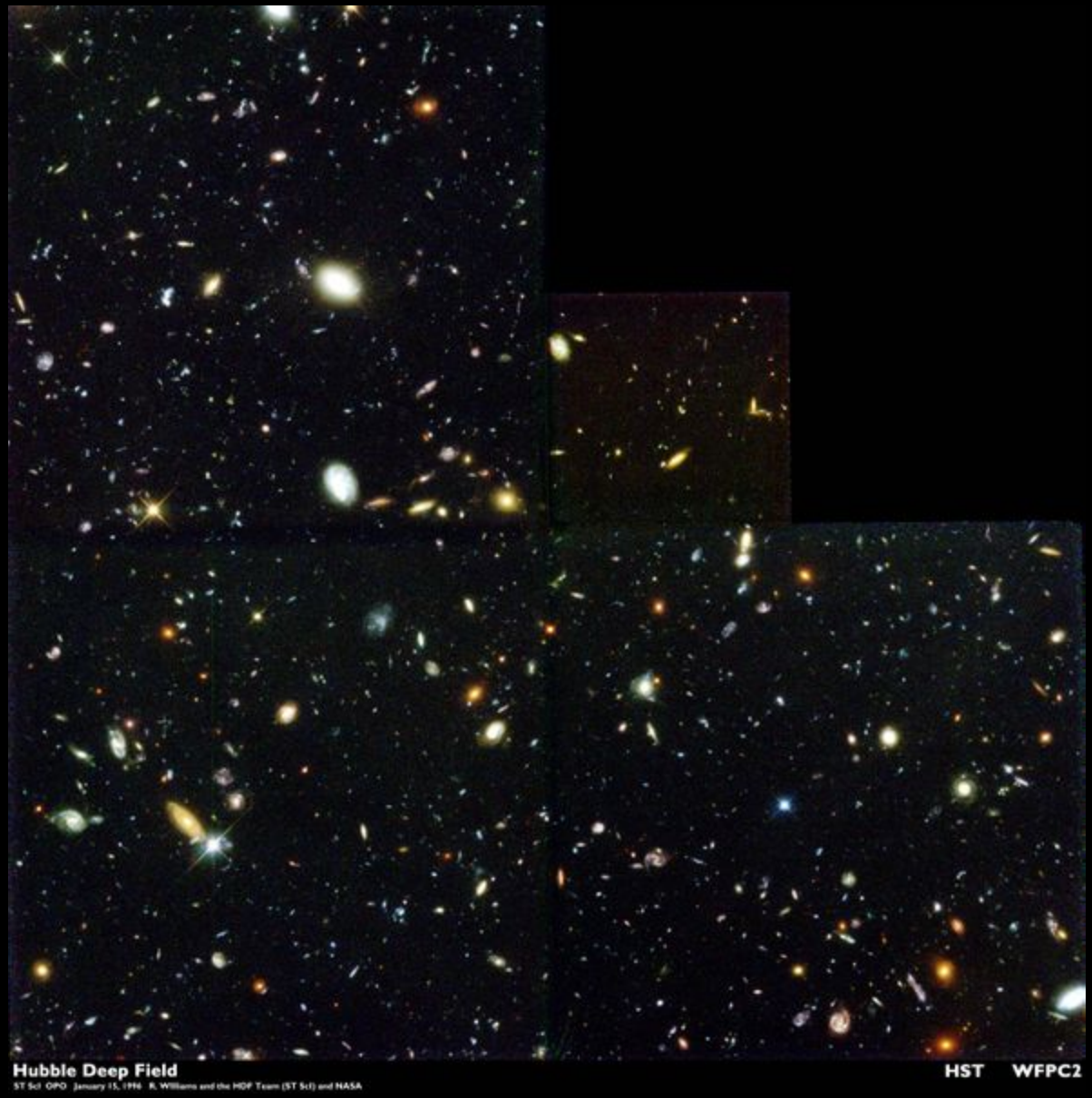
1st Teacher in Space

芭芭拉-莫根

第一个深空教育家

Challenger CENTER®


You are Here
© 1997 Jerry Lodriguss


Hubble Deep Field
HST WFPC2

Lunar Commercial Communications: 月球商业通讯

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 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** 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** 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** 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

第一个最佳深空日历已在运行

International Lunar Observatory (ILO)

国际月球天文观测台（ILO）

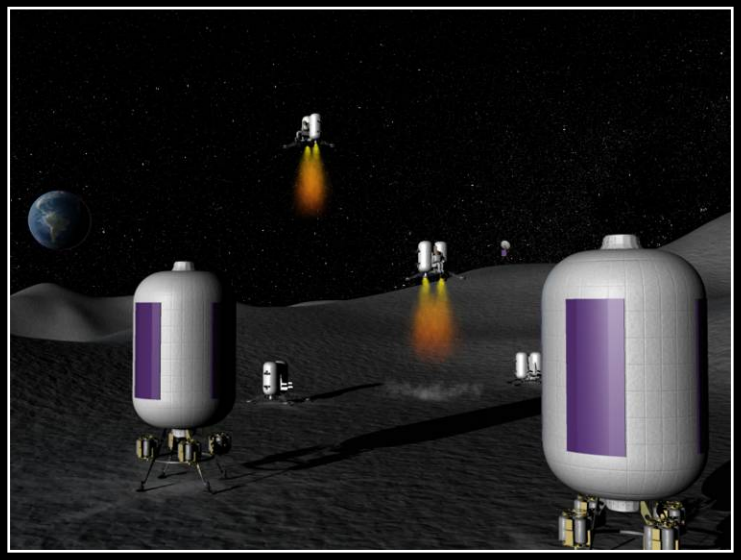
ILO-X 先驱号

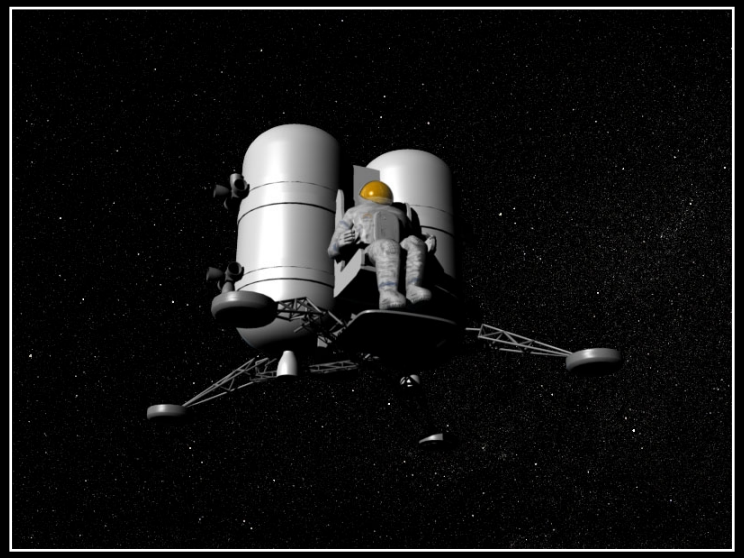
ILO-X Precursor:

- 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

人类服务使命

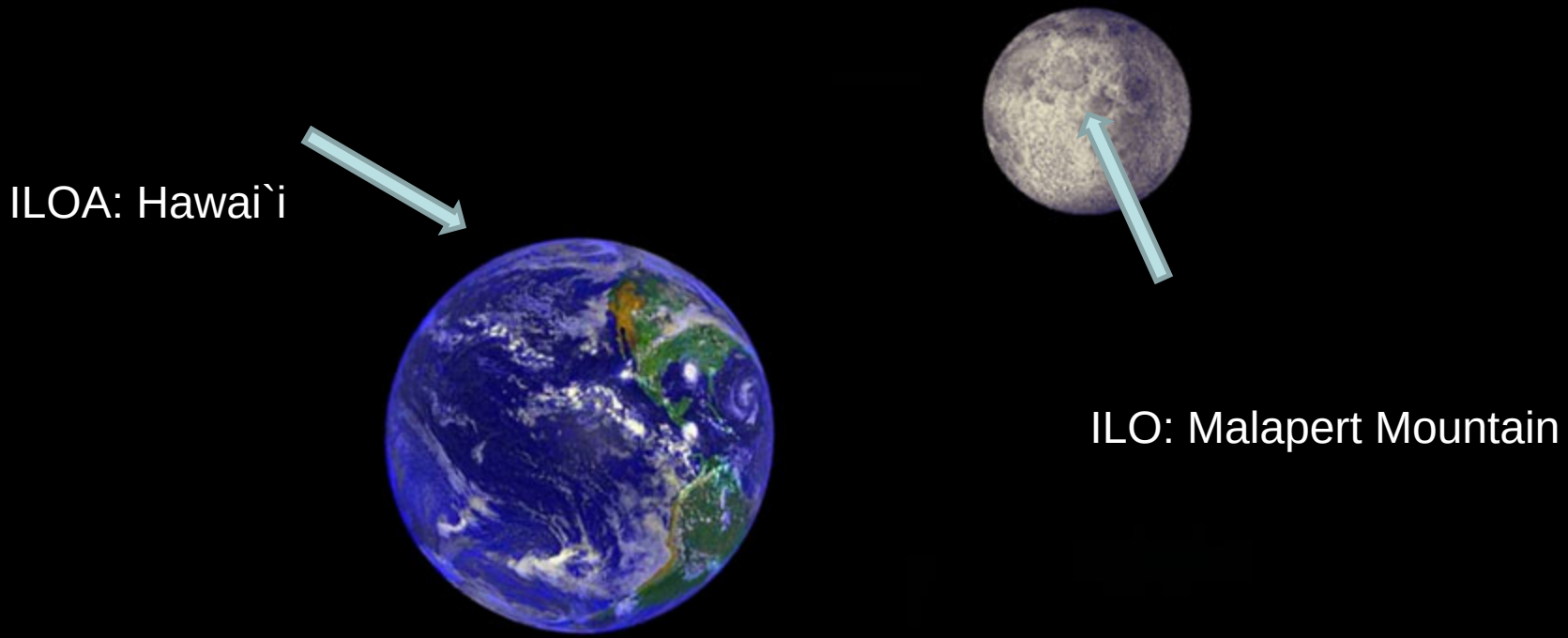




SpaceDev Inc – Dream Chaser, ALOHA Chair

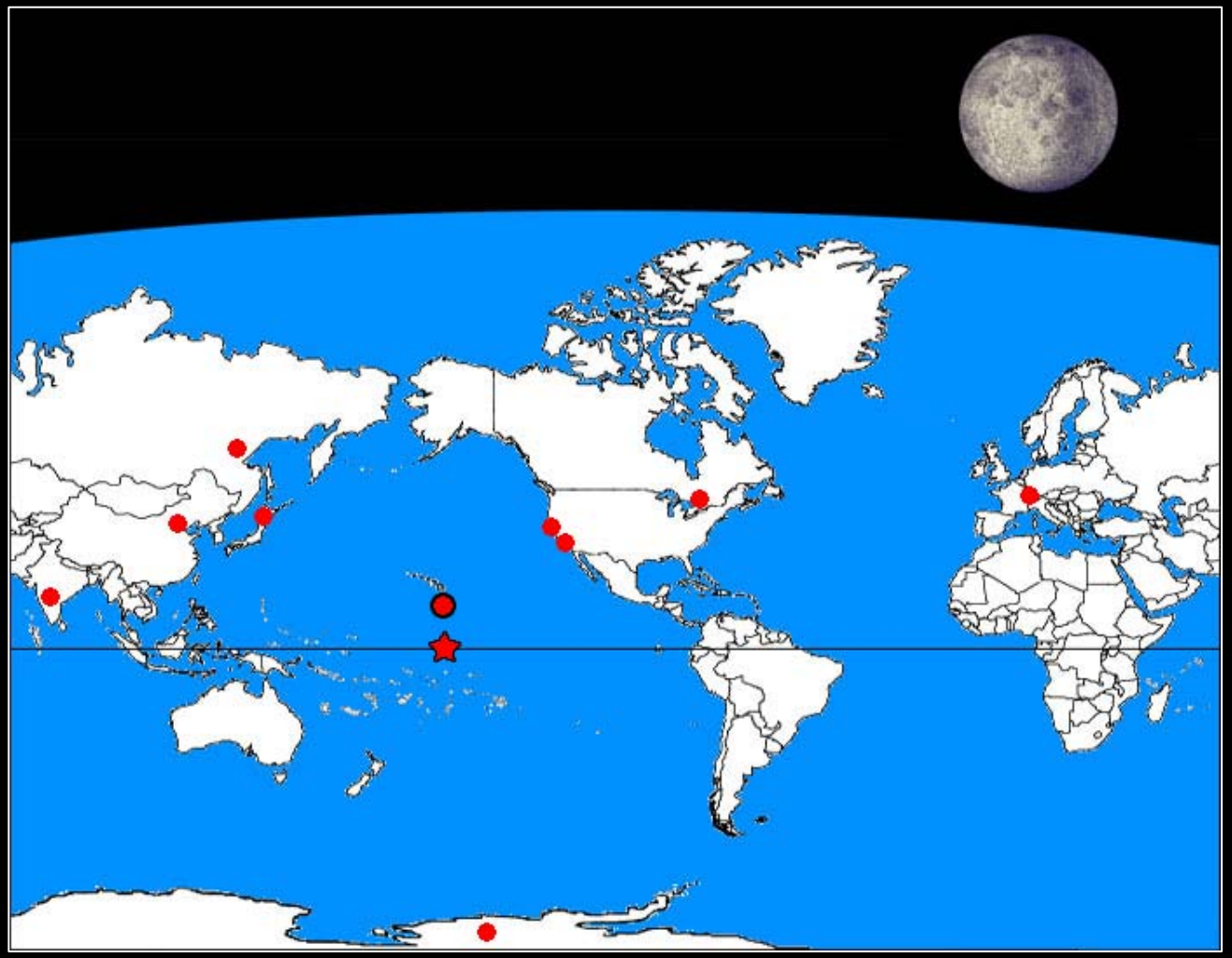
Inter-Global / Earth-Moon / Cislunar System

星际/地球-月球/Cislunar 系统



A Global / Interglobal Mission

地球-星际使命



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

ILOA合作伙伴

CFH

NAOC

ODYSSEY MOON

SPACE-X

इसरो isro

INTERNATIONAL SPACE UNIVERSITY

SPACE AGE PUBLISHING COMPANY

MDA

International Lunar Observatory Association

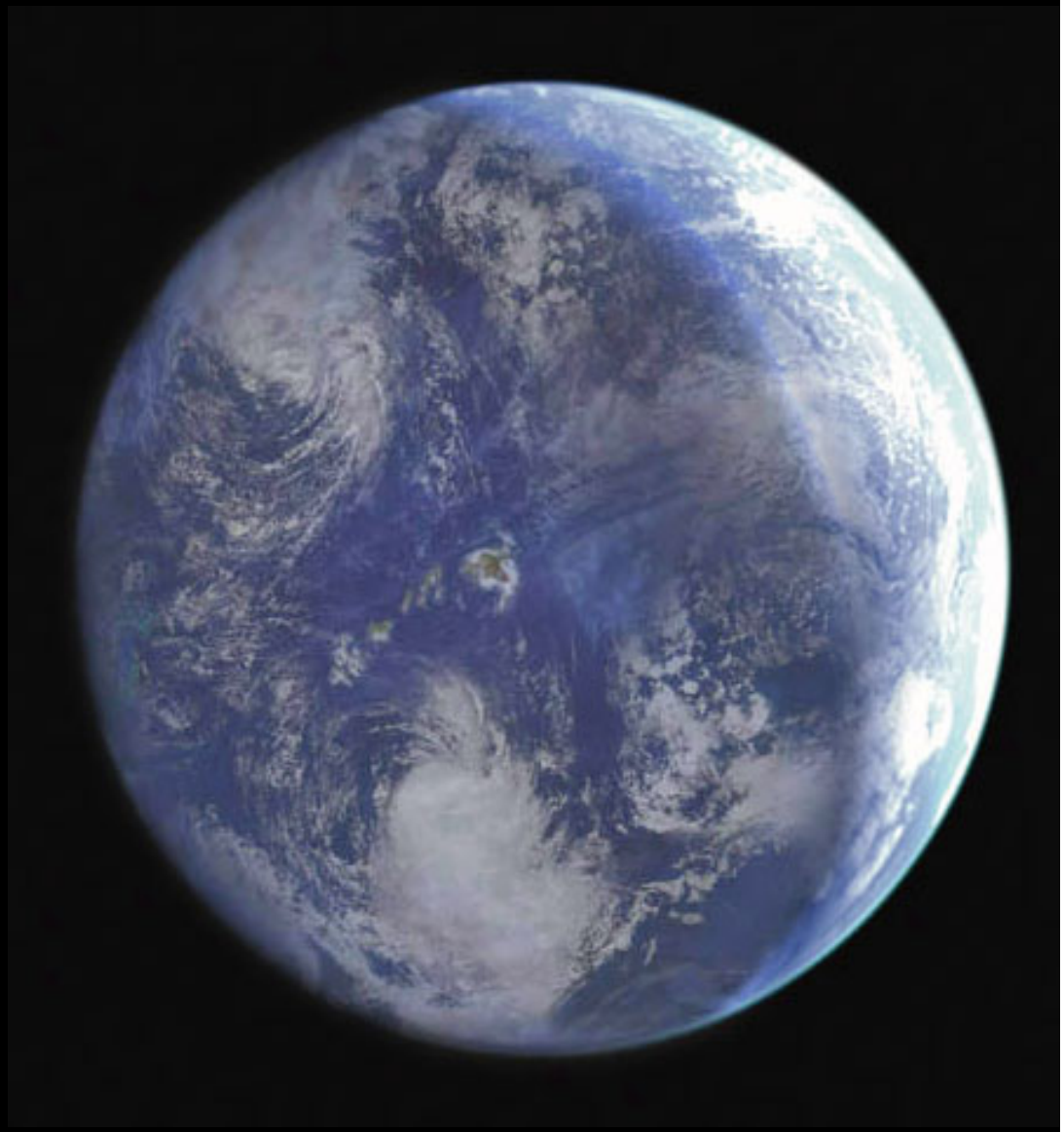
国际月球天文观测台协会

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 Meeting 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?

为什么夏威夷在深空探索中占有重要地位？

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

玛拉克雅山峰天文观测台群

- 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

综合功能

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

ILOA机构会员会籍

- **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!

谢谢！

For more information about the ILO / ILOA, contact:

Space Age Publishing Company
480 California Avenue, Suite 303
Palo Alto, CA 94306
Phone 650-324-3705
Fax 650-324-3716
Email news@spaceagepub.com
Web http://www.spaceagepub.com

ILO Association
65-1230 Mamalahoa Highway, D-20
Kamuela, HI 96743
Phone 808-885-3474
Fax 808-885-3475
Email info@iloa.org
Web http://www.iloa.org

SPACE AGE PUBLISHING COMPANY
www.spaceagepub.com
Hawaii and California, USA