



NASA Ames Research Center An Overview

Dr. Eugene Tu, Director

University of Colorado Boulder, April 28, 2017



EARTH *RIGHT* NOW

Your planet is changing. We're on it.



NASA

we're ^{OUT} there



OFF THE EARTH, FOR THE EARTH.



INTERNATIONAL Space Station

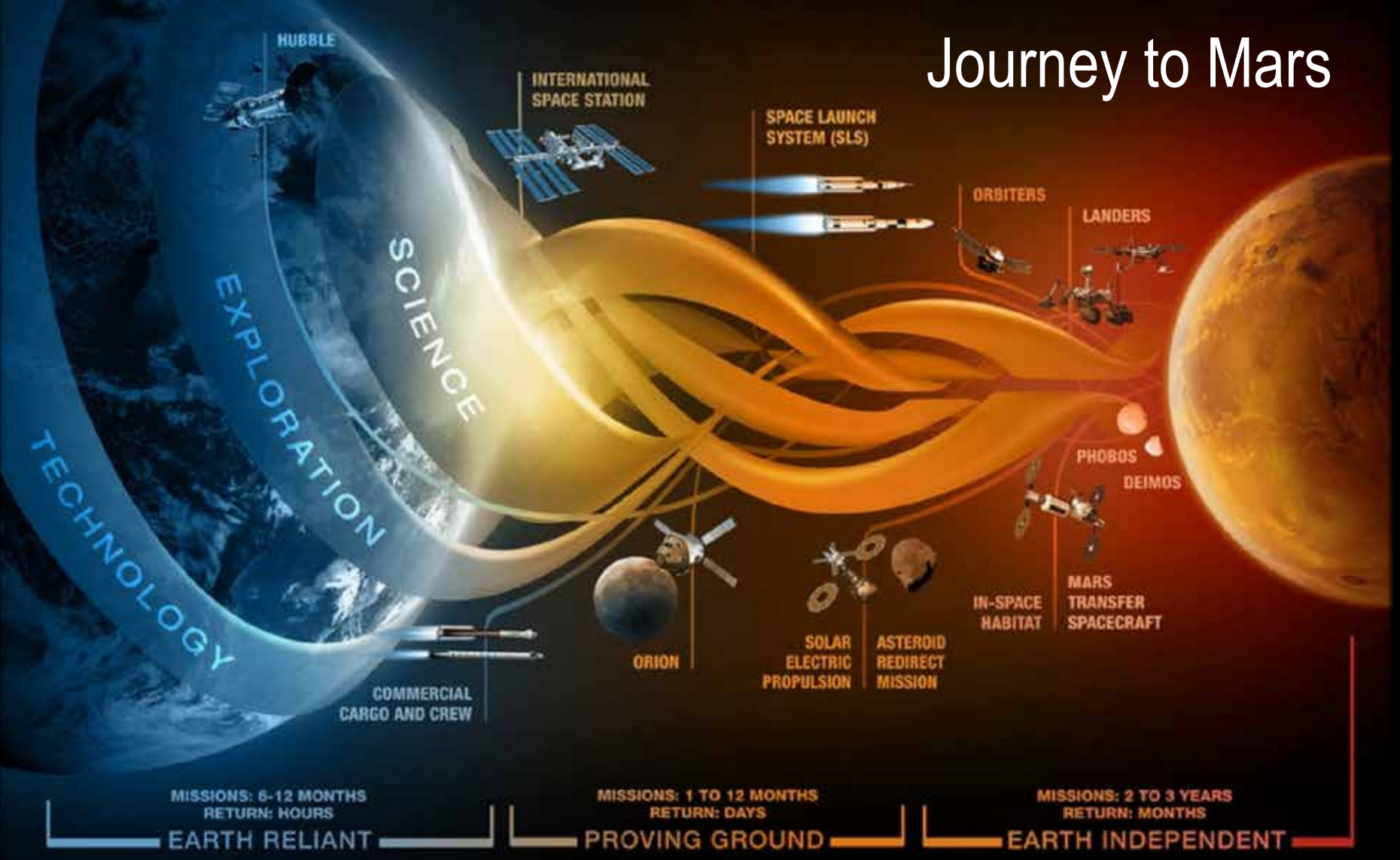
NASA'S JOURNEY TO

MARS














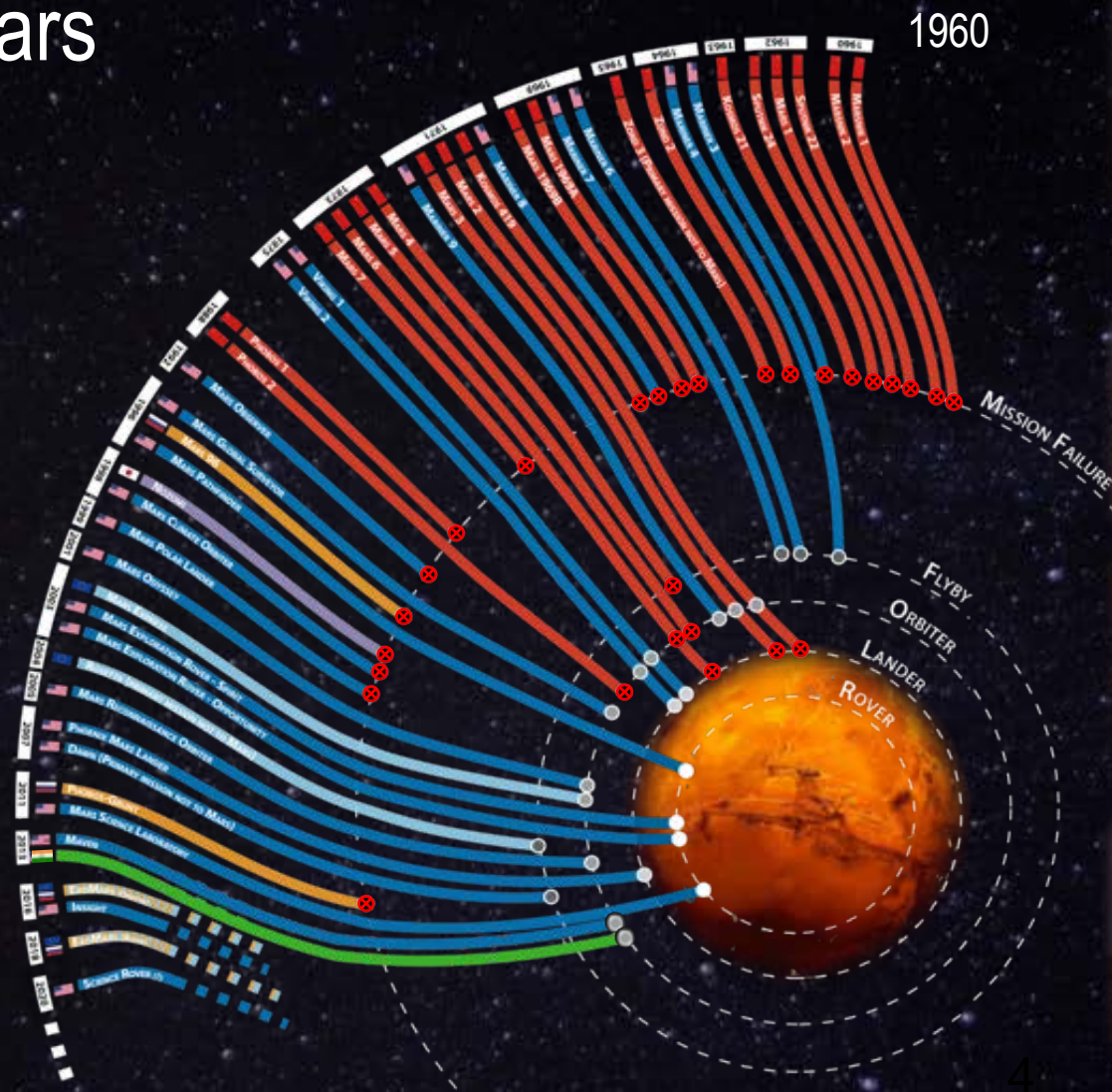
TECHNOLOGY DRIVES EXPLORATION

Journey to Mars



60 Years of Mars Exploration

-  Soviet Union
-  United States
-  Russia
-  Japan
-  ESA
-  India
-  MISSION FAILURE
-  FLYBY
-  ORBITER
-  LANDER
-  ROVER



2007 Phoenix Scout

2011 Curiosity Rover

2018 InSight Lander

2020 EXOMARS Rover (ESA)

Illustration by:
Bryan Christie Design
Updated: 2015

2020



Early NACA Laboratories



Joseph S. Ames



NACA

Langley

Ames

Lewis

Dryden

NASA

1915

1939

1940

1946

1958



NASA Centers and Installations



**Ames
Research
Center**

**Plum Brook
Station**

**Glenn Research
Center**

**Independent
Verification and
Validation Facility**

**Goddard Institute for
Space Studies**

**Goddard Space
Flight Center**

Headquarters

**Jet
Propulsion
Laboratory**

**Wallops
Flight
Facility**

**Armstrong Flight
Research Center**

**Kennedy
Space
Center**

**Langley
Research
Center**

**White Sands
Test Facility**

**Johnson
Space
Center**

**Michoud
Assembly
Facility**

**Stennis
Space
Center**

**Marshall Space
Flight Center**

75 Years of Innovation @ Ames

This collage features 75 hexagonal tiles, each representing a significant research project or milestone at NASA Ames. The tiles are arranged in a grid-like fashion, with years 1940, 1950, 1960, 1970, 1980, 1990, 2000, and 2015 prominently displayed in blue text. The projects include:

- 1940:** Conical Camber, Arcjet Research
- 1950:** Hypervelocity Free Flight, Apollo Re-Entry Shape, CFD
- 1960:** Flight Research, Life Sciences Research, Apollo Heat Shield Tests, Air Transportation System
- 1970:** Tiltrotor, Kuiper Observatory
- 1980:** ER-2, Nanotechnology
- 1990:** Human Centered Computing
- 2000:** Mars Science Lab, ISS, Pleiades
- 2015:** Kepler, SSERVI, Sustainability Base, Quantum Computing

Other notable projects include: Tektites, Apollo Guidance System, X-36, Lunar Prospector, SOFIA, NASA logo, Flight Simulator, Blunt Body Concept, Pioneer 10/11, Galileo, Space Biology, Transonic Flow, Lifting Body, Pioneer Venus, Viking, IRIS, Aero Institute, ECROSS, LADEE, Astrobology Institute, and the 80x120 Wind Tunnel.

Ames Research Center

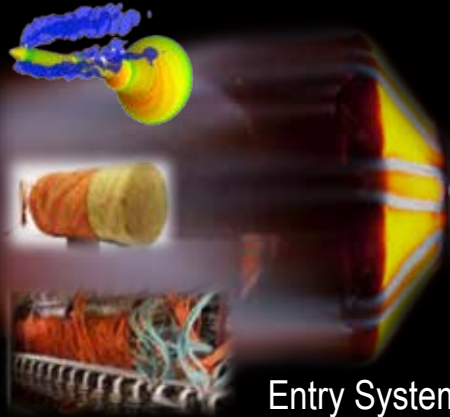
- Occupants: ~1130 civil servants; ~2,100 contractors; 1,650 tenants
855 summer students in 2016
- FY2016 Budget: ~\$915M (including reimbursable/EUL)
- ~1,900 acres (400 acres security perimeter); 5M building ft²
- Airfield: ~9,000 and 8,000 ft runways



Ames Core Competencies



Air Traffic Management



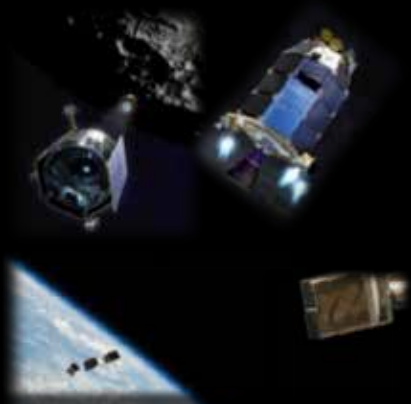
Entry Systems



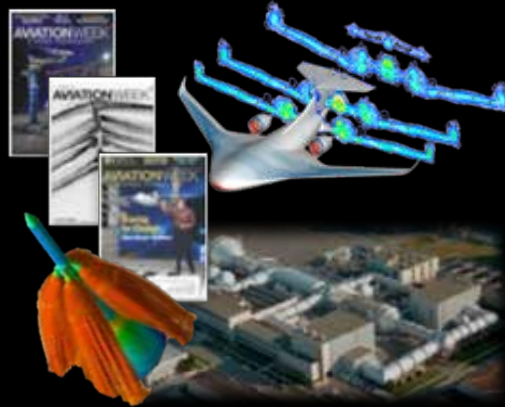
Advanced Computing & IT Systems



Intelligent/Adaptive Systems



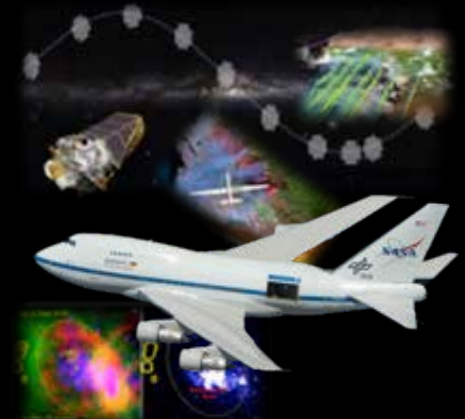
Cost-Effective Space Missions



Aerosciences



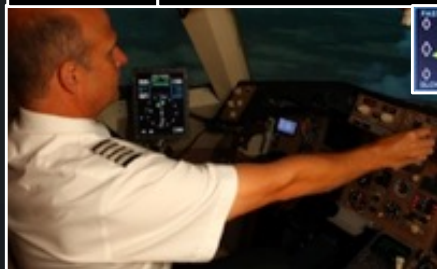
Astrobiology and Life Science



Space and Earth Sciences

Air Traffic Management

FIM Flight Deck Interval Management for Arrival Operations



CMS Controller-Managed Spacing in Terminal Airspace



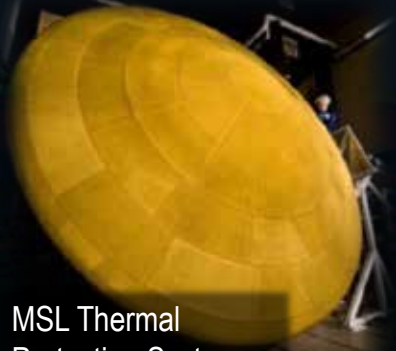
TMA-TM Traffic Management Advisor with Terminal Metering



UAS Traffic Management

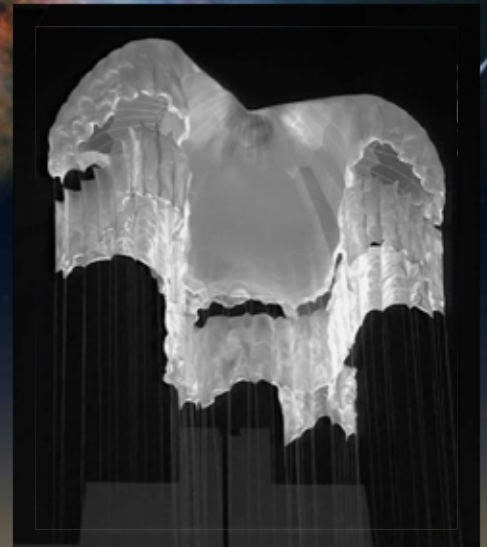
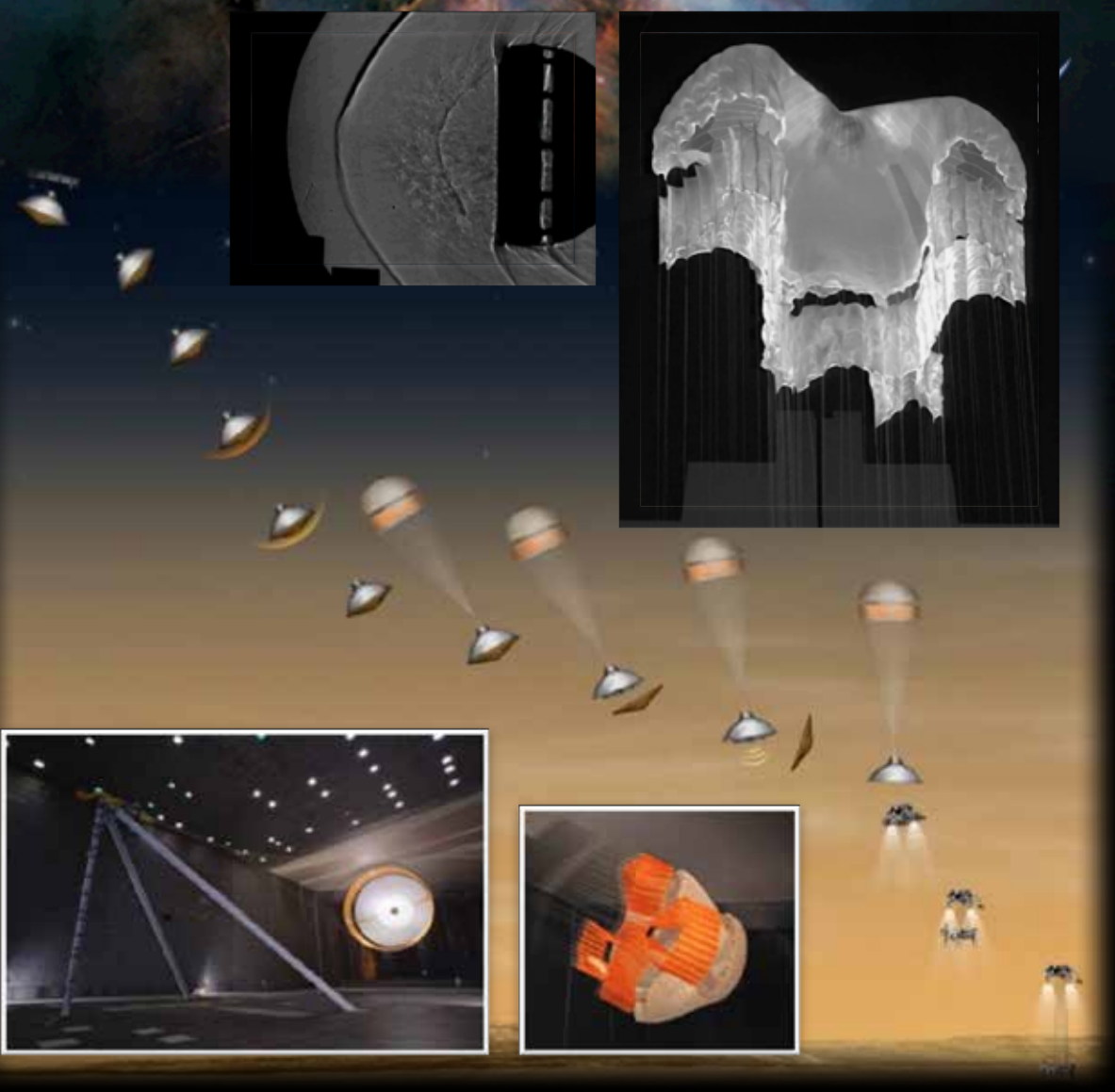
Air Traffic Demonstration – ATD-1

Entry Systems



MSL Thermal Protection System

PICA



ADEPT



MEDLI



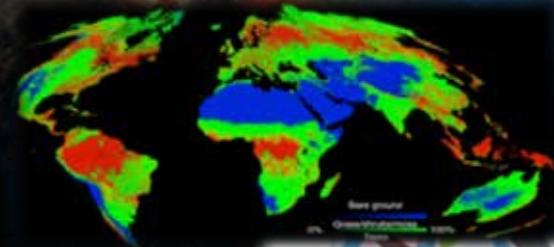
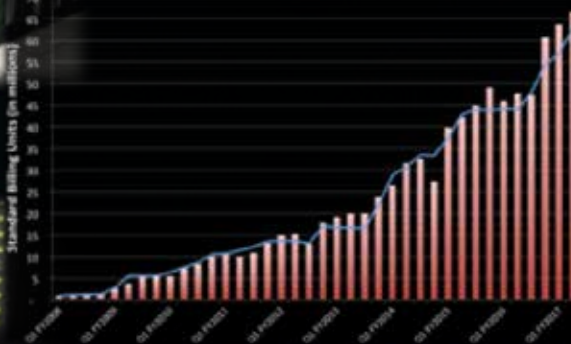
Interaction Heating Facility



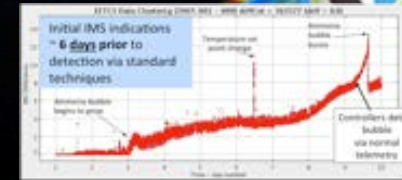
Advanced IT and Computing Systems



Supercomputing Systems



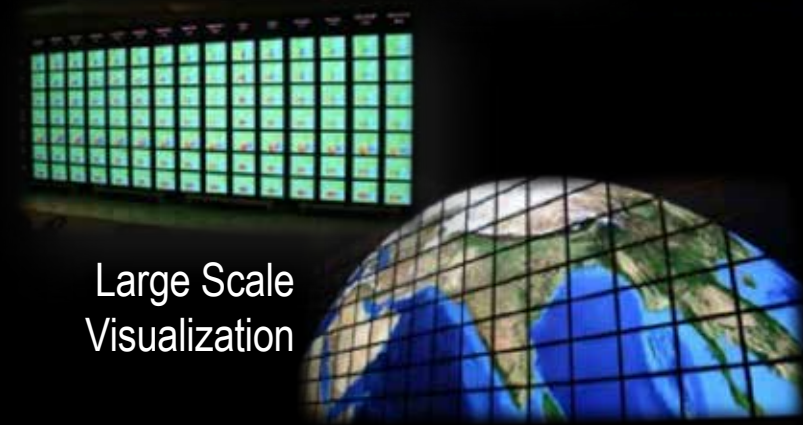
Big Data Analytics



NEX

Quantum Computing

Large Scale Visualization



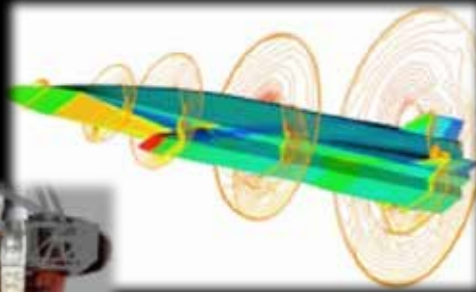
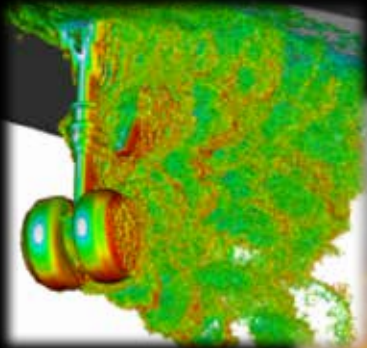
Enterprise Managed Cloud Computing



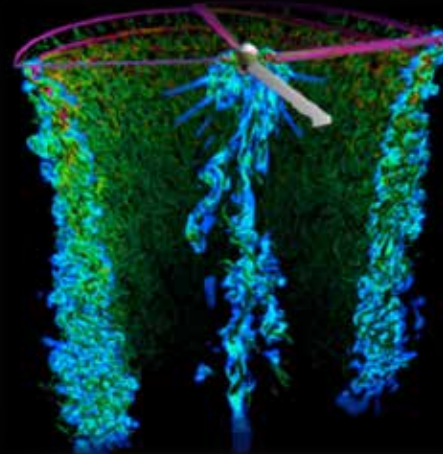
Disruptive Technologies

Modeling and Simulation

Advanced IT and Computing Systems



Capacity
Computing



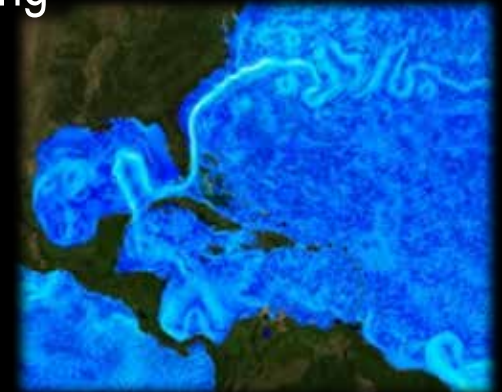
KEPLER



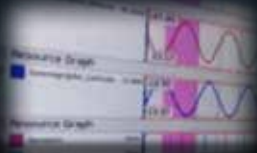
Time Critical Computing



Capability
Computing



Intelligent Adaptive Systems



Activity Mission Planning For **Mars**



Planning And Scheduling For **Human Robotic Teams** / Future



Astronauts Self-scheduling And Planning

Payload & Drill Subsystem



Planetary Lake Lander

Adaptive science for dynamic phenomena in deep-space missions. Field testing in Chile.



Activity Mission Planning For **Crew On ISS**

Distributed Ops Testing



Partnering Lander Concept



Self Driving Car

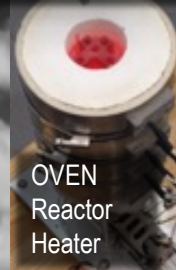
Adapt space robotics technology to "fleet management" use.



Synchronized Position Hold, Engage Reorient, Experimental Satellites



OVEN Reactor Heater



June 2026

#JOURNEYTOMARS

RESOURCE PROSPECTOR MISSION

SUCCESSFUL HARVEST OF RESOURCES FROM THE MOON

#THEMARTIAN



Astrobee Free-Flyer

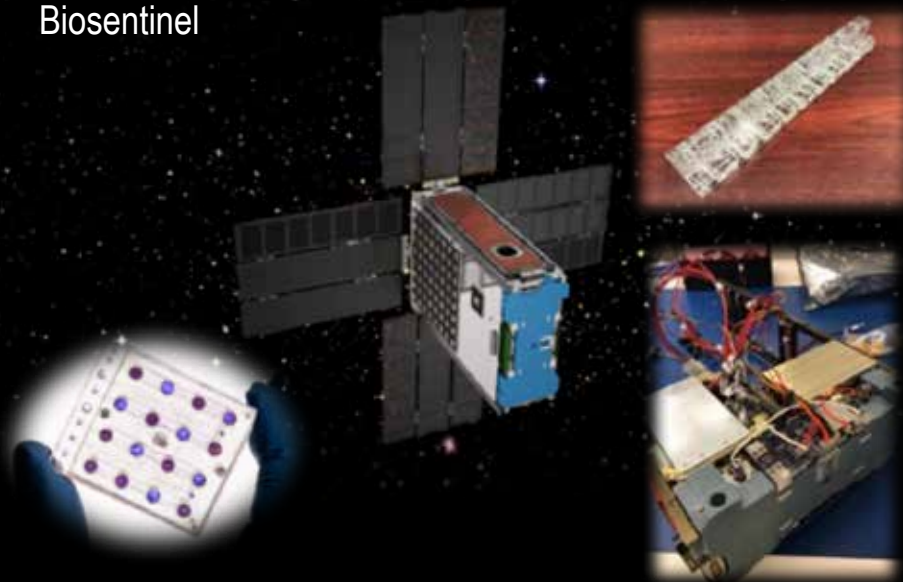
Autonomous nav, docking and recharge, and mobile sensor IVA work on the ISS



Cost-Effective Space Missions @ Ames



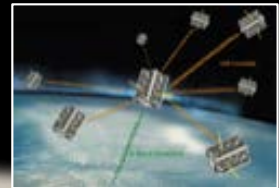
Biosentinel



TechEdSat-4



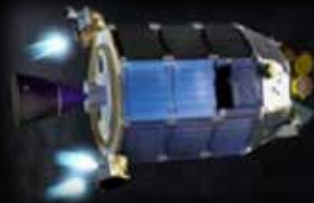
TechEdSat-5



LCROSS (2009)



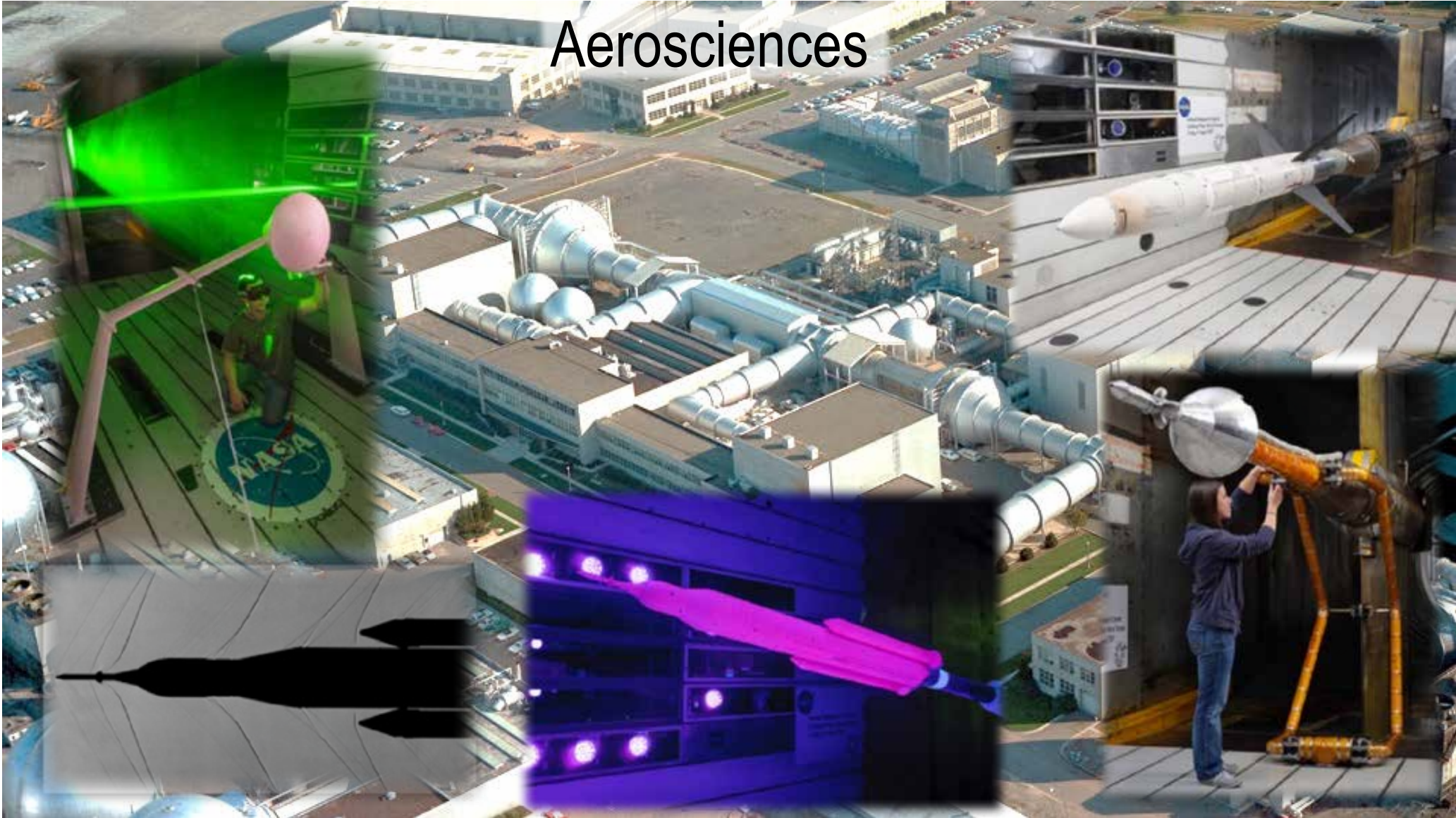
LADEE (2013)



PhoneSat (2013), EDSN (2013)



Aerosciences



Astrobiology and Life Sciences



Dry Electrode ECG System



GeneLab



Experimental cassette for Seedling Growth-2



Origin and Nature of Life, Co-evolution with Planet Earth



Mars: Habitability of Early Mars

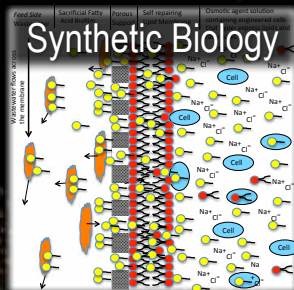


Icy Worlds: Habitability and Life Detection

Solar System and Beyond:
Our Journey of Discovery
Exoplanet Biosignatures



Rodent Research-1 (SpaceX-4)



Regenerable water processing membrane

Advanced Life Support Technologies



Water Recovery



Air Revitalization



Waste Recovery



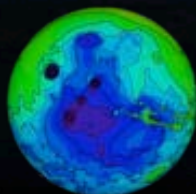
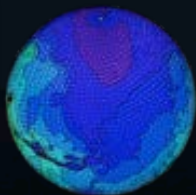
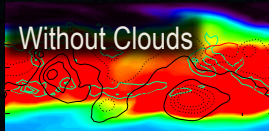
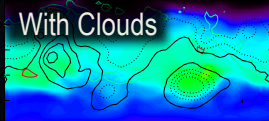
Technology: Technology Drives Exploration
Global Partnerships Employing Collaborative Technologies

NASA Astrobiology Institute

LIFE IN THE UNIVERSE

Space and Earth Sciences

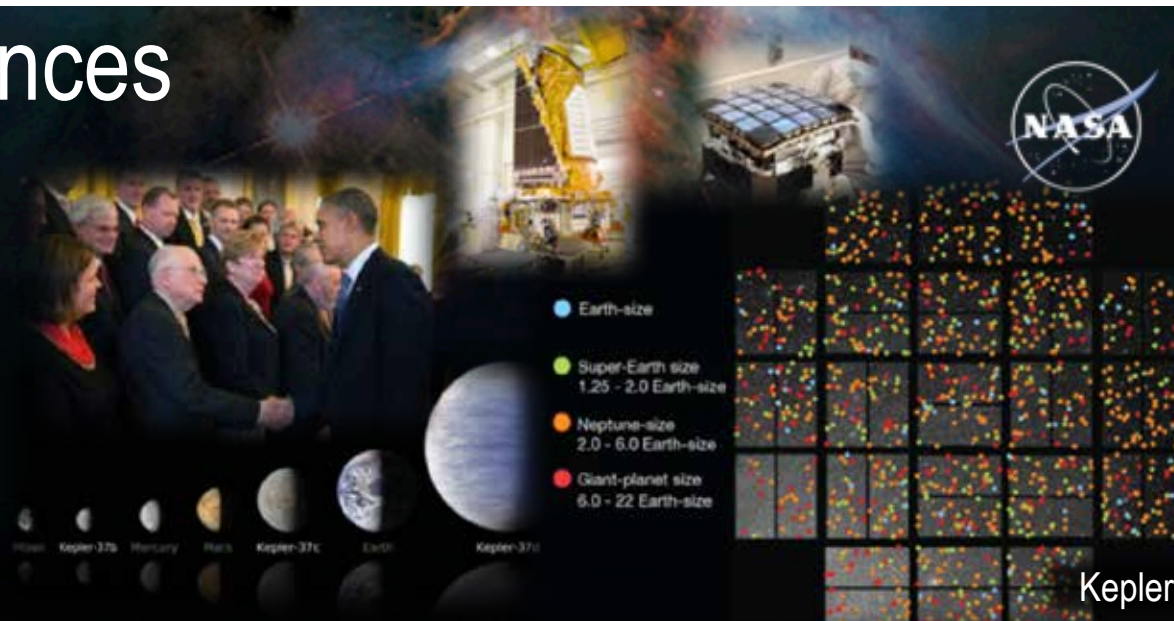
Understanding Mars Climate



Global Circulation Model



Field Studies in Antarctica



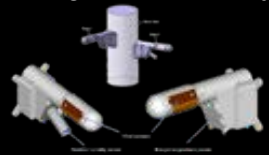
Earth-size
Super-Earth size
1.25 - 2.0 Earth-size
Neptune-size
2.0 - 6.0 Earth-size
Giant-planet size
6.0 - 22 Earth-size

Kepler-37b, Kepler-37c, Kepler-37d

Kepler

NASA

REMS



2007: CheMin installed in MSL



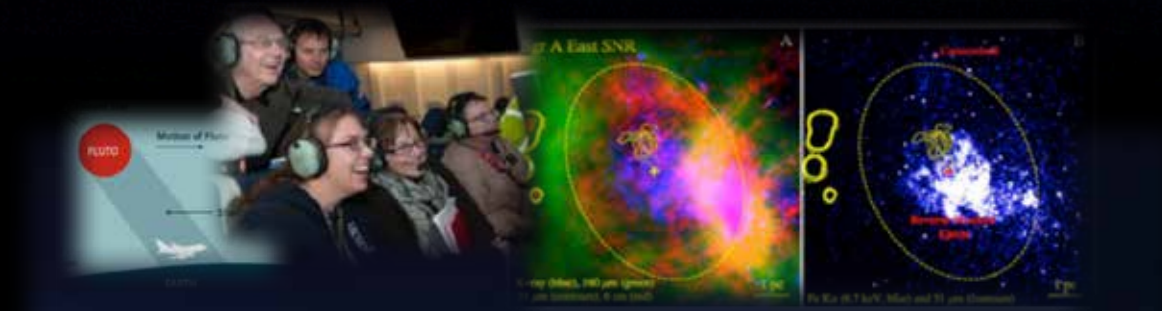
In Support of *Curiosity*



ChemCam



SAM



Pluto

Mercury of Pluto

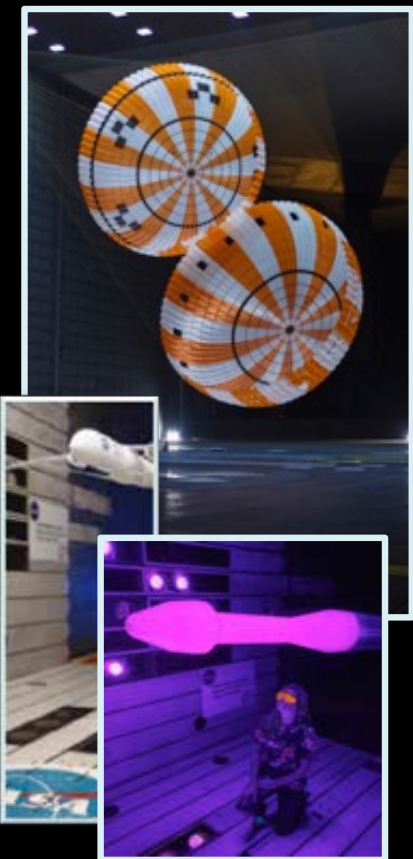
Exoplanet

Exoplanet



SOFIA

Major Research Facilities



Wind Tunnels



ARC Jet Complex



Range Complex



Simulators



Advanced Supercomputing

Partnerships at Ames

Commercial



Virtual Institutes



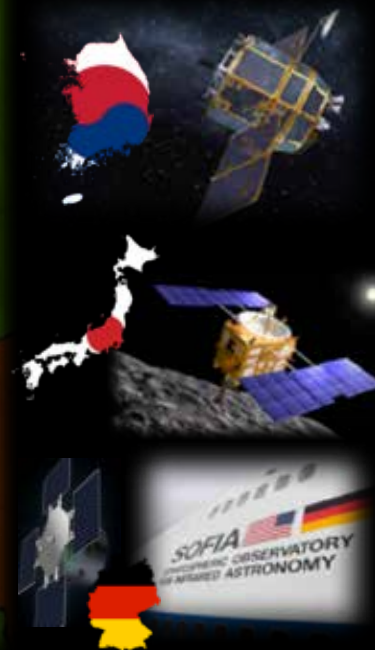
Inter-Agency



NASA Research Park



International



Academia



Analogy: History of Aviation



Commercial Space Transportation

Commercial Resupply Services

Commercial Crew Program



The Canadarm 2 reaches out to grapple the SpaceX Dragon cargo spacecraft and prepare it to be pulled into its port on the ISS. (4/17/2015)



Pad 39-A (11/9/67): Apollo 4, the first test flight of Saturn V.



Pad 39-A (4/12/81): STS-1, John Young and Bob Crippen flew Columbia for 2 days



Pad 39-A (2/19/17): SpaceX CRS-10 "Dragon", first launch from Pad 39-A since the final space shuttle mission.

Opportunities at Ames

Upcoming openings:

- Computer Scientists
- Engineers: Aerospace, Software, Electrical, Materials, Systems
- Physical Scientists: Astrobiology, Biosciences, Space, and Earth Sciences
- Business Operations (HR, Public Affairs, Procurement, IT)

Pathways and Education Programs: Internships, Fellowships, Intern Employment and Recent Graduate Program

- Engineering
- Physical Scientist
- Human Resources
- Finance
- Business Administration

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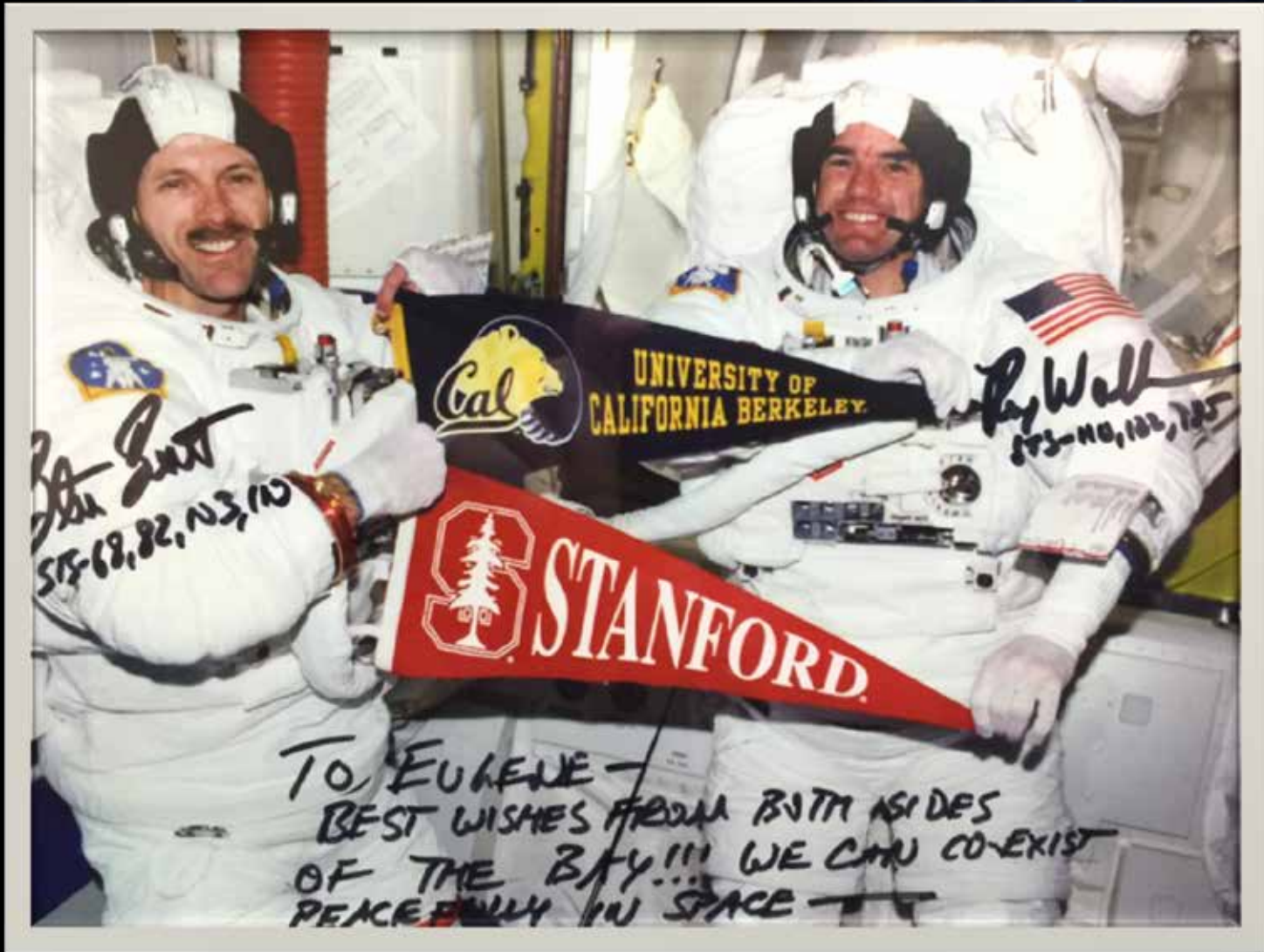
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Questions?

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