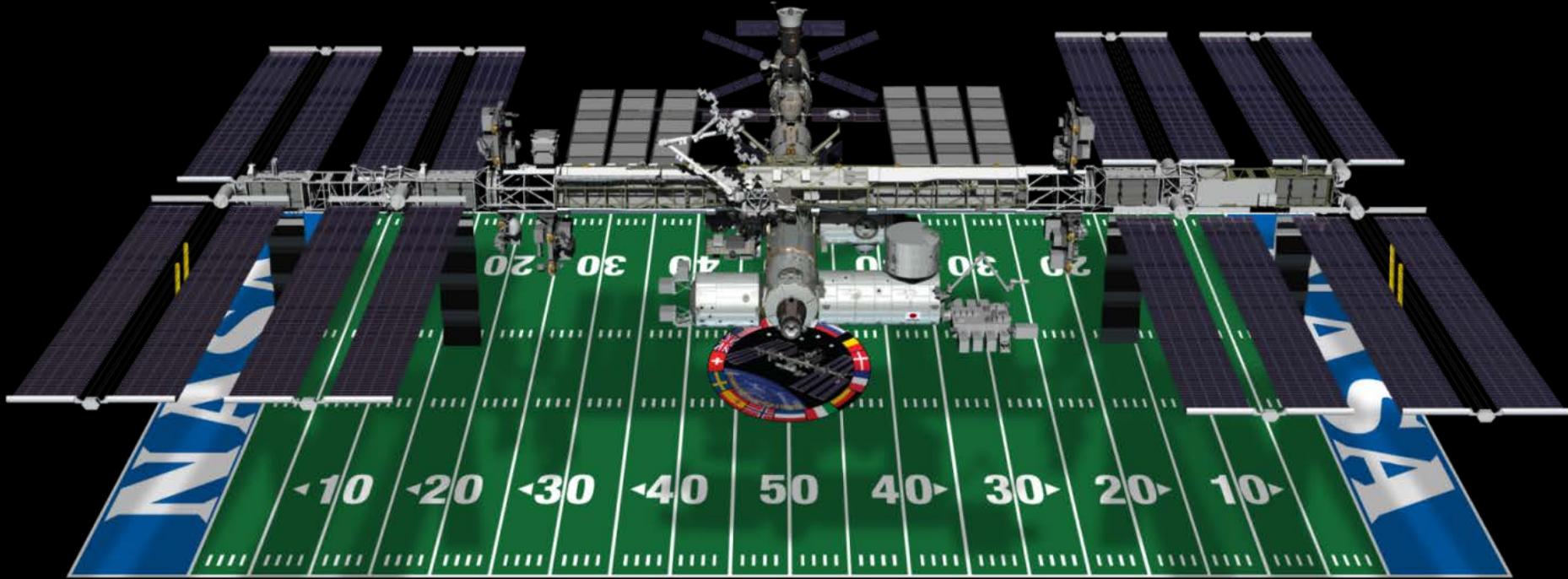


# International Space Station Benefits for Humanity



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UN-COPOUS, Vienna  
February 2014



**Spacecraft Mass: 799,046 lb (362,441 kg)**

**Velocity: 17,500 mph (28,200 km/h)**

**Altitude: ~220 miles above Earth (400 km)**

**Power: 80 kW continuous**

**Science Capability: Laboratories built by US, Europe, Japan, and  
Russia**

**Extended through *at least* 2024**

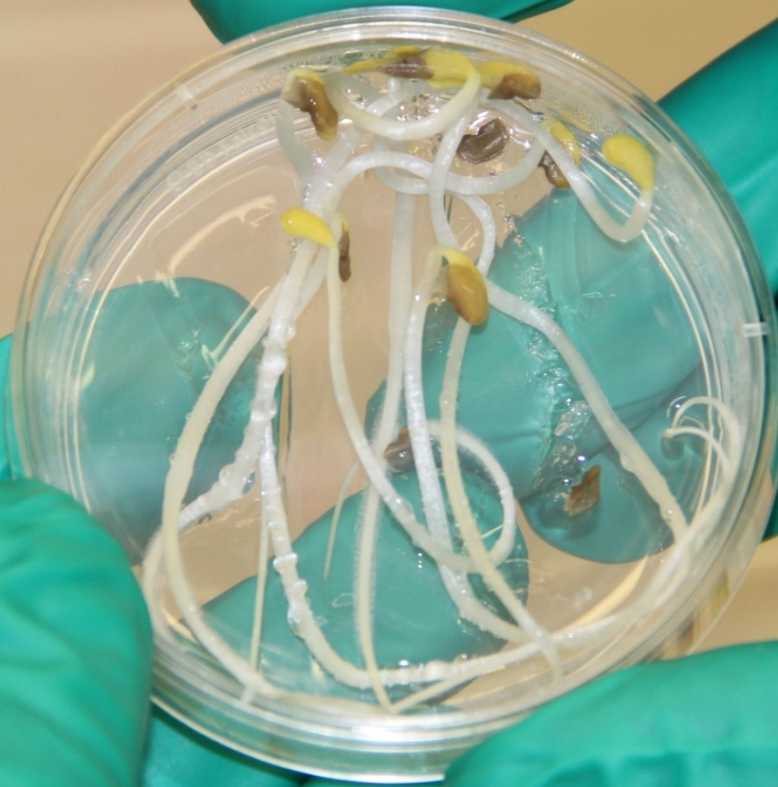


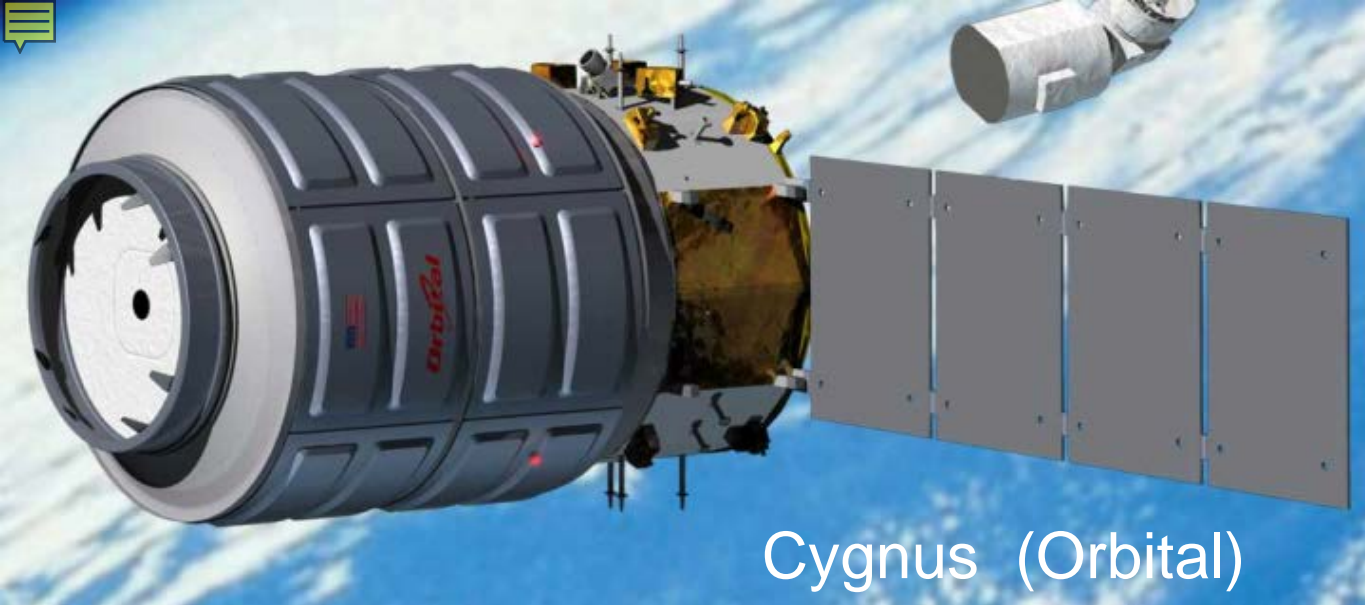


Developing and testing  
technologies and operations for  
Future Exploration beyond Earth  
Orbit



# Research Discoveries and Benefits to Life on Earth





Cygnus (Orbital)

Developing a sustainable commercial market in Low Earth Orbit



Dragon (SpaceX)





International partnership  
structure extendable to future  
human exploration endeavors



# Global Exploration Roadmap



2013

2020

2030

## International Space Station



General Research and Exploration Preparatory Activities

Note: ISS partner agencies have agreed to use the ISS until at least 2020.

Commercial or Government Low-Earth Orbit Platforms and Missions

## Robotic Missions to Discover and Prepare

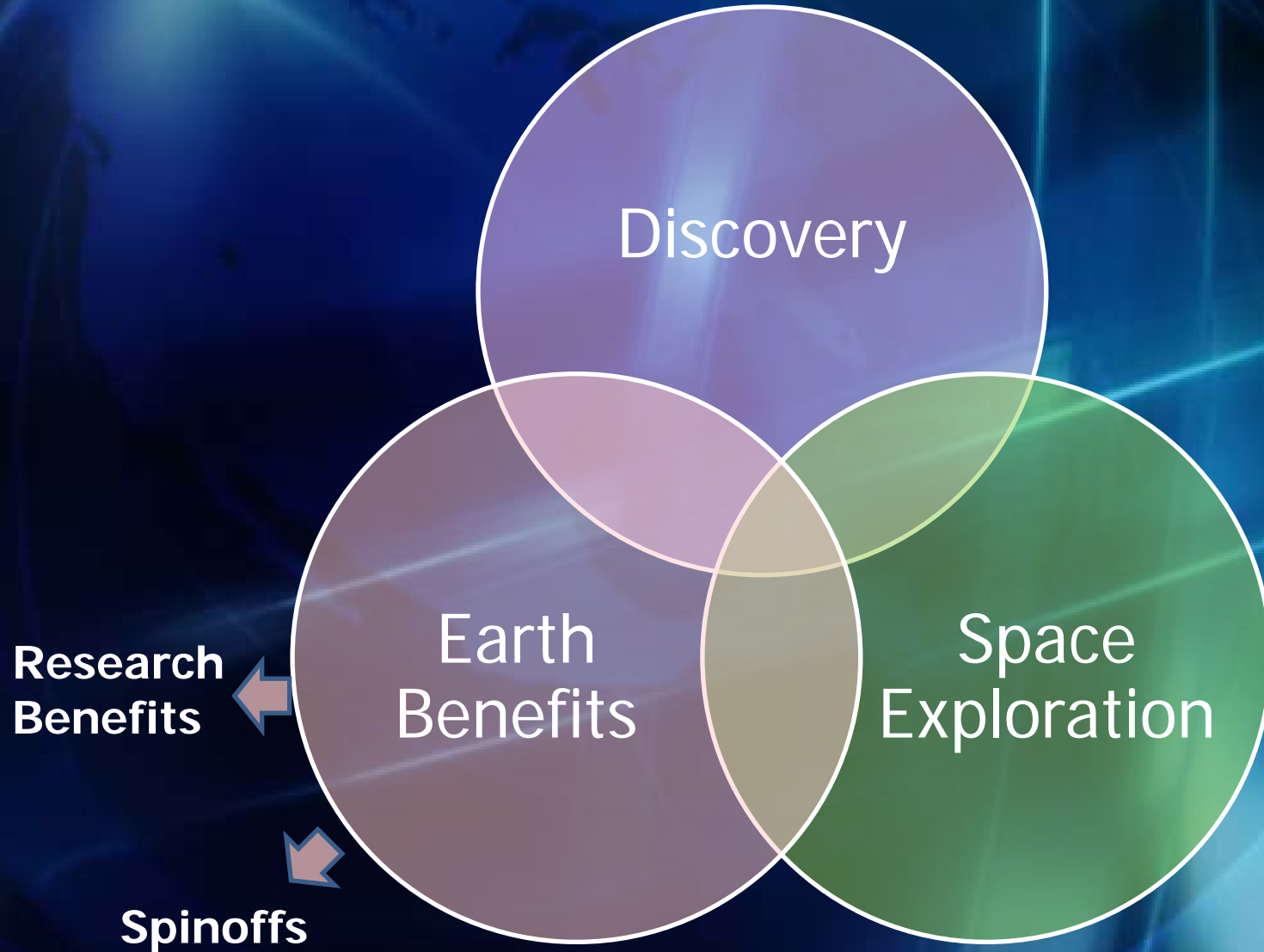


Mars Sample Return and Precursor Opportunities

## Human Missions Beyond Low-Earth Orbit



# What kind of benefits come from research in space?





# Major types of benefits on Earth



Health



Earth Observation & Disaster Response



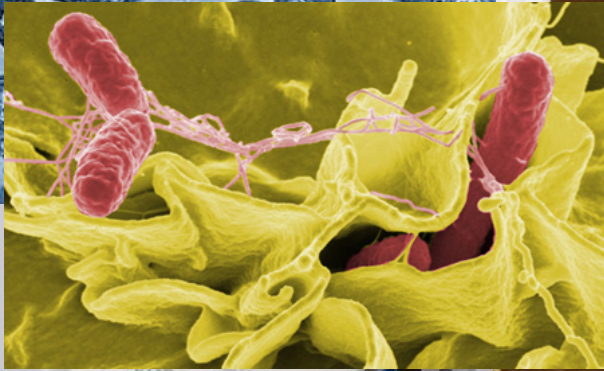
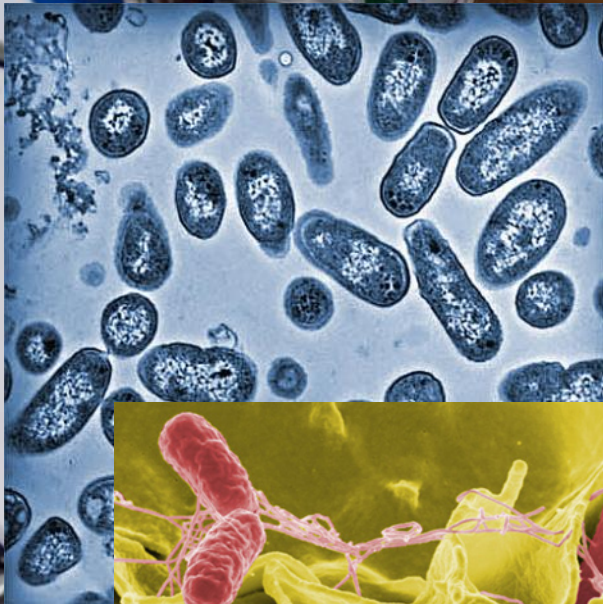
Education



Everyday Technologies



# Microbial Virulence



Top image credit: Pacific Northwest National Laboratory

Bottom image credit: Rocky Mountain Laboratories

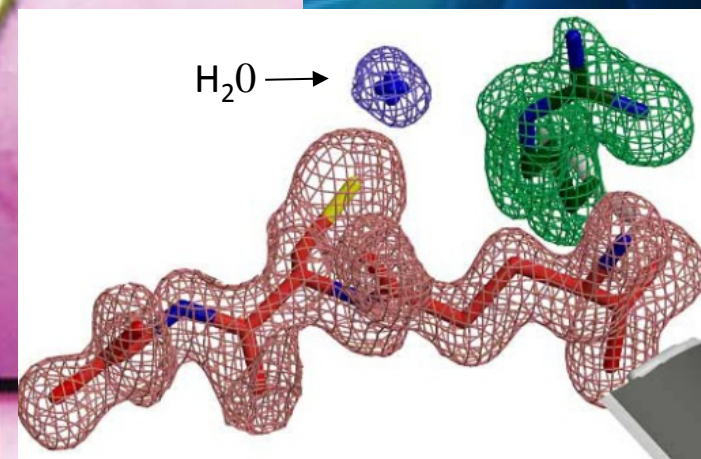
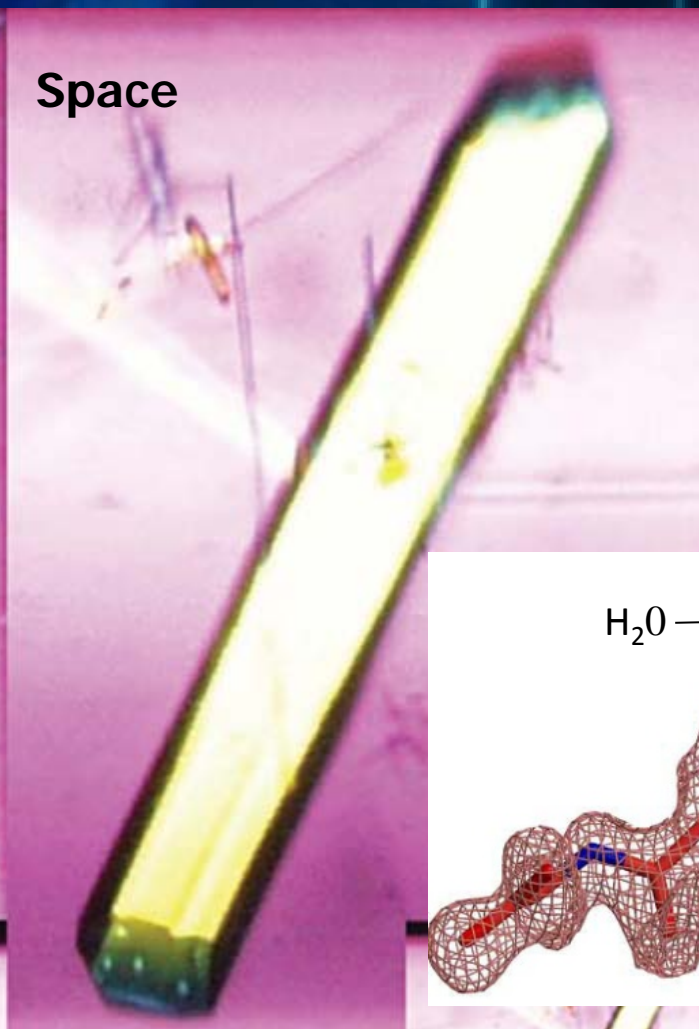
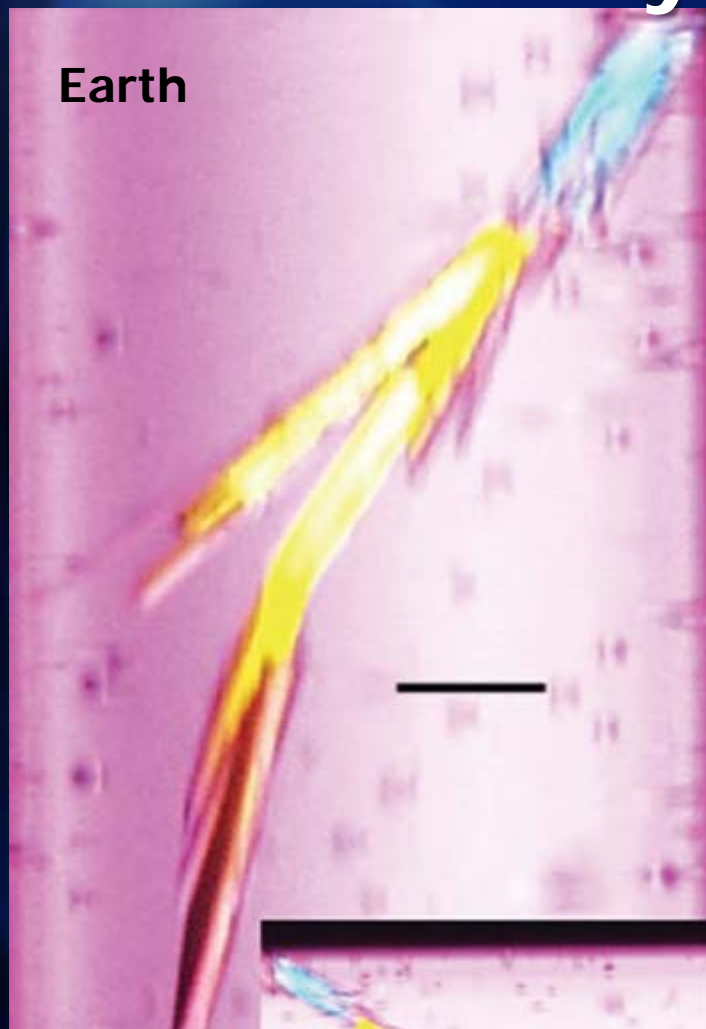
Source: ISS Chief Scientist, NASA



A microscopic view of various cells, likely cancer cells, showing different stages of division and morphology. The cells are stained, highlighting their nuclei and cytoplasm. The background is a warm, orange-brown color.

# A New Method to Deliver Cancer Treatments

# Candidate Treatment for Duchenne's Muscular Dystrophy from Protein Crystallization

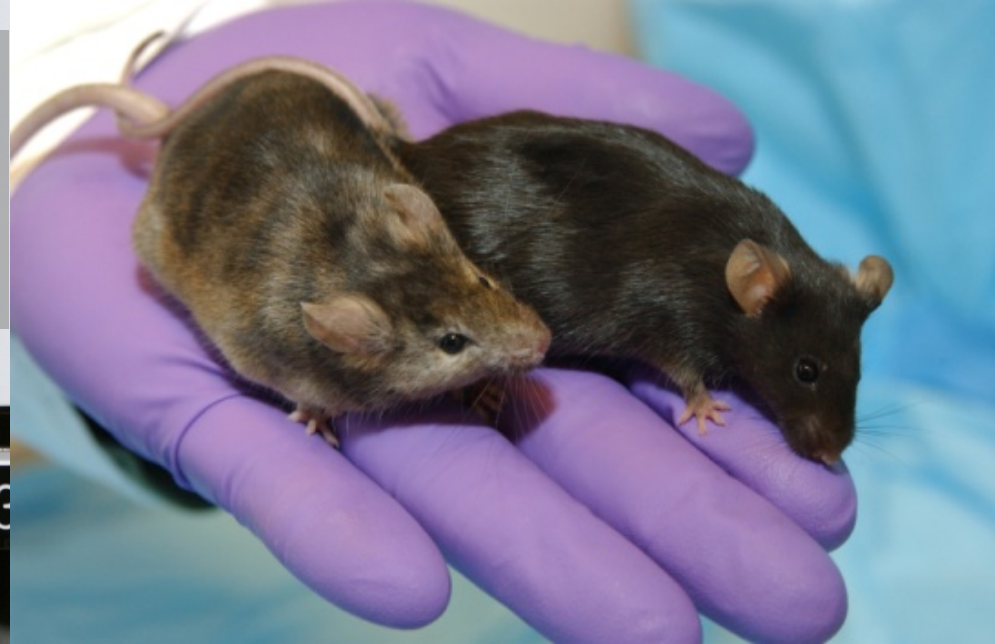




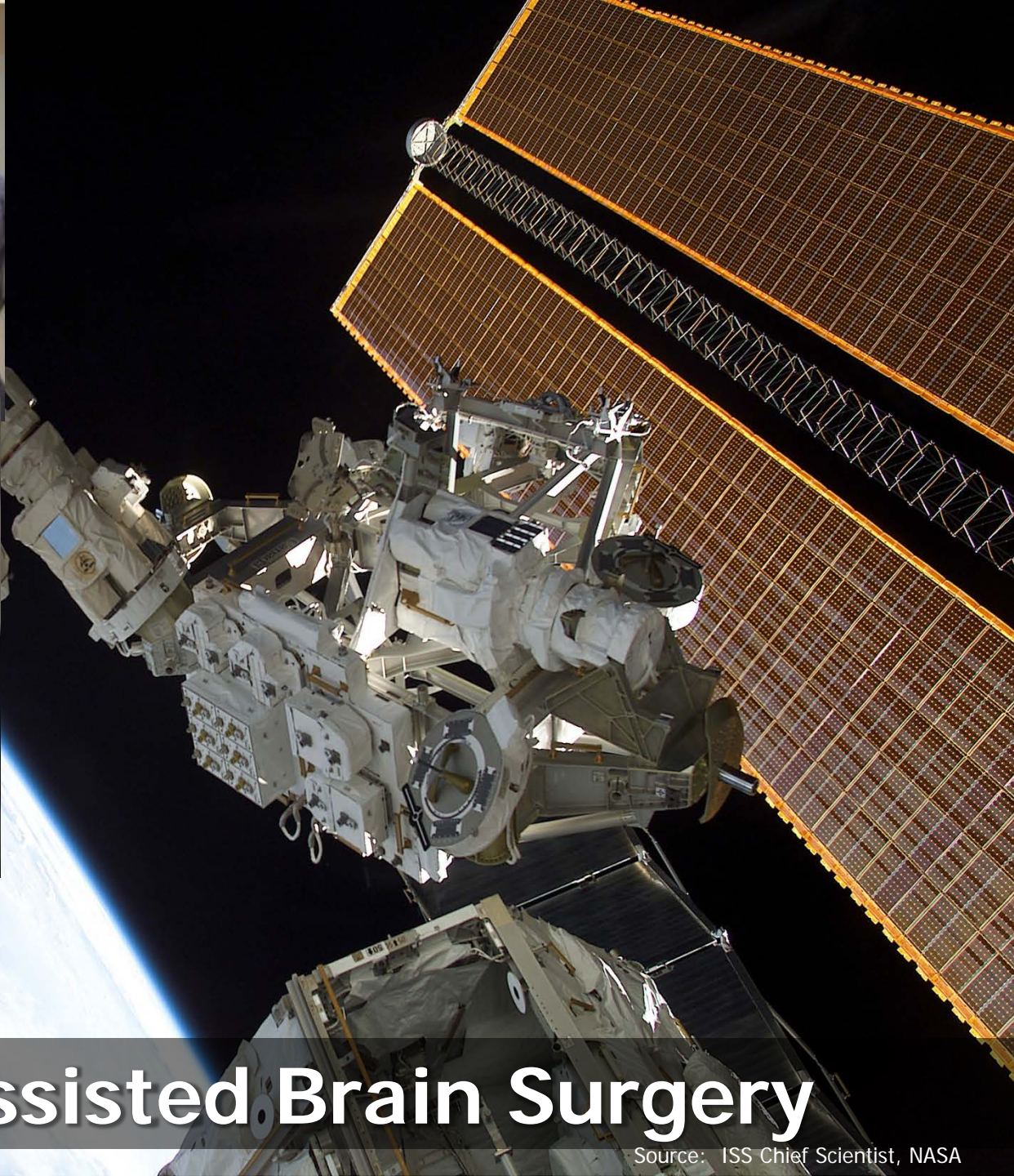


Getting scientific  
Results from  
"Bench to Bedside"

# Mechanisms for New Osteoporosis Drugs







# Robotically Assisted Brain Surgery

Source: ISS Chief Scientist, NASA



# Telemedicine Advancements





# Water recycling technologies





# Disaster Response Networks

Sarychev Peak, Kuril Islands, ISS020-E-9048, 12 June 2009



Pensacola Bay January 16, 2012

# Water Quality Monitoring

Chlorophyll a

Chla

- 0.3 - 5.0 (ug/L)
- 5.1 - 10.0
- 10.1 - 15.0
- 15.1 - 20.0
- 20.1 - 40.0

World Imagery



0 2.5 5 10 15 20

# Inspiring the Next Generation

*International Space Station  
Education Opportunities and Accomplishments  
2000-2012*

Alleyne\_Cover 9-10-2012.jpg



## Education Summary 2000- 2012

**5** ISS Partners

**44** Countries

**25,000** Schools

**2,800,000** Teachers

**43,100,000** Students

**1,700,000** Students in inquiry-  
based learning

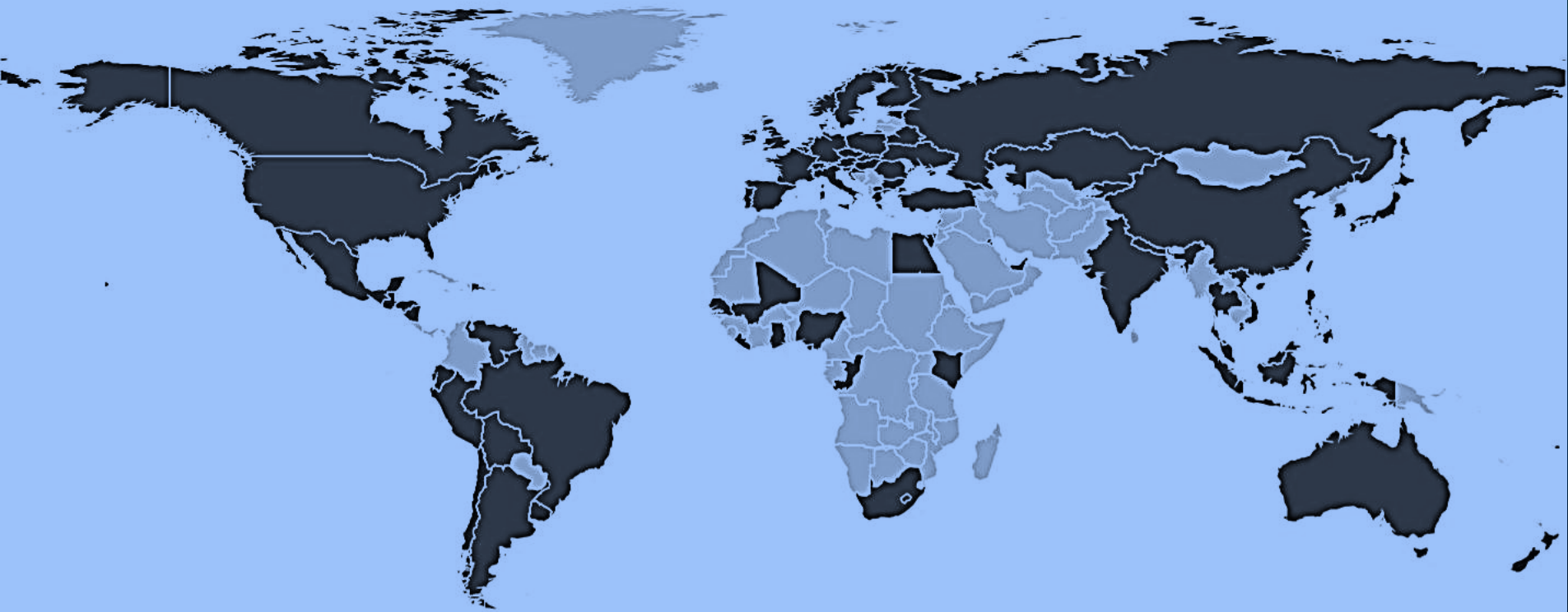
Published on ISS Benefits for Humanity website

[http://www.nasa.gov/mission\\_pages/station/research/benefits/index.html](http://www.nasa.gov/mission_pages/station/research/benefits/index.html)

(direct link to document:) [http://www.nasa.gov/pdf/696998main\\_ISS%20Education\\_Publication%202012\\_%20final\\_100512.pdf](http://www.nasa.gov/pdf/696998main_ISS%20Education_Publication%202012_%20final_100512.pdf)



Over 80 Countries have participated in research or education on the space station

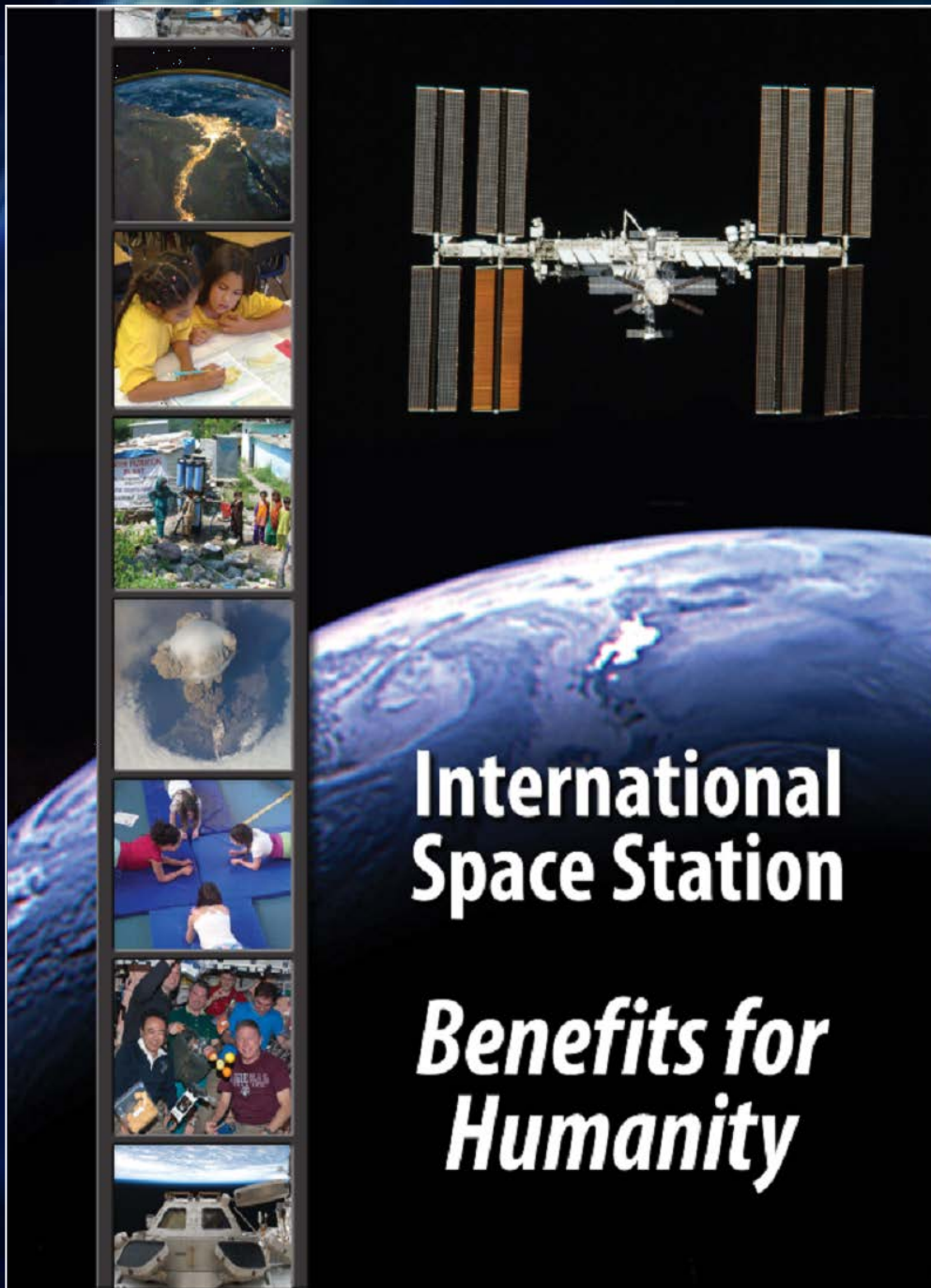




# The future to 2024 (and beyond)...

- More research
- More international partnerships
- Ever increasing benefits to the world
- Successful future human exploration of space





**International  
Space Station**

***Benefits for  
Humanity***

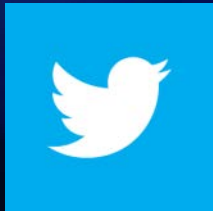
# ISS benefits for Humanity Document

[http://www.nasa.gov/mission\\_pages/  
station/research/benefits/index.html](http://www.nasa.gov/mission_pages/station/research/benefits/index.html)



ISS Research & Technology ([link](#))

<http://www.nasa.gov/iss-science/>

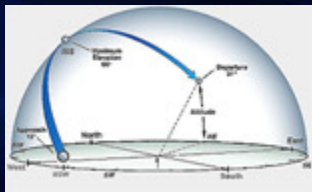


@ISS\_Research ([link](#))



ISS Research Blog "A Lab Aloft" ([link](#))

[http://blogs.nasa.gov/ISS\\_Science\\_Blog/](http://blogs.nasa.gov/ISS_Science_Blog/)



See the ISS over Your Town ([link](#))

<http://spaceflight.nasa.gov/realdata/sightings/>