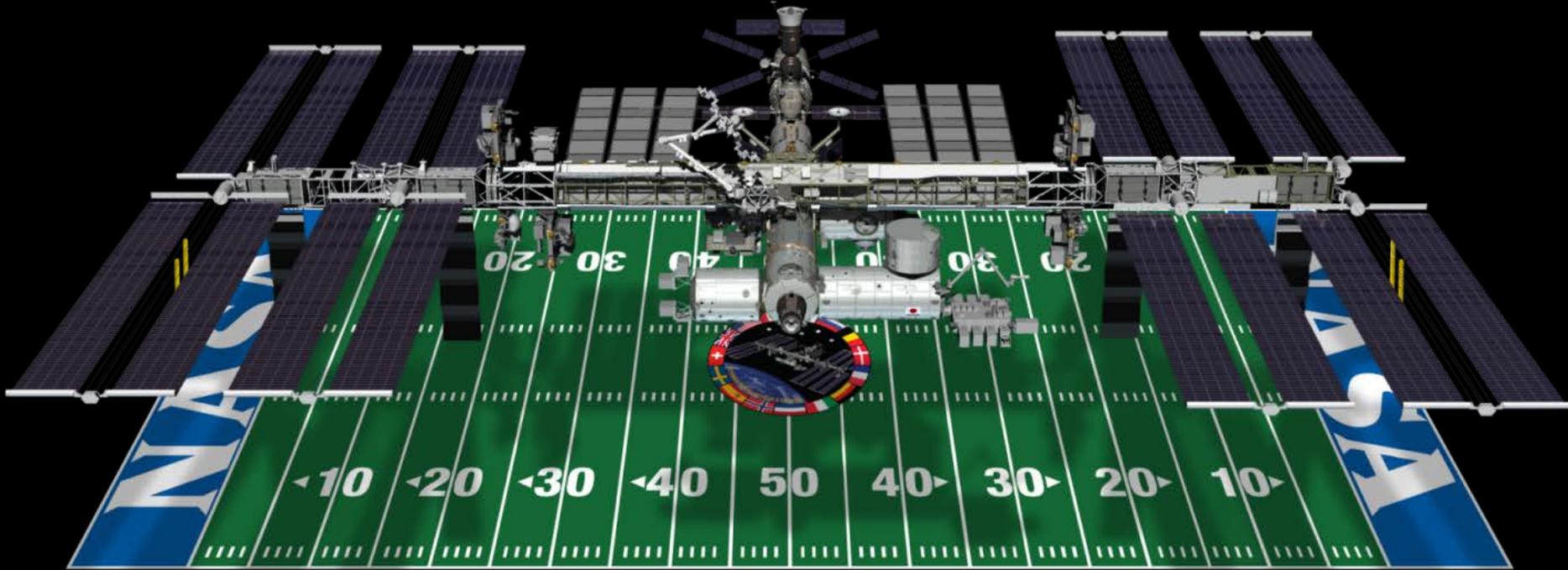


International Space Station Benefits for Humanity



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ISS Chief Scientist, NASA
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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**

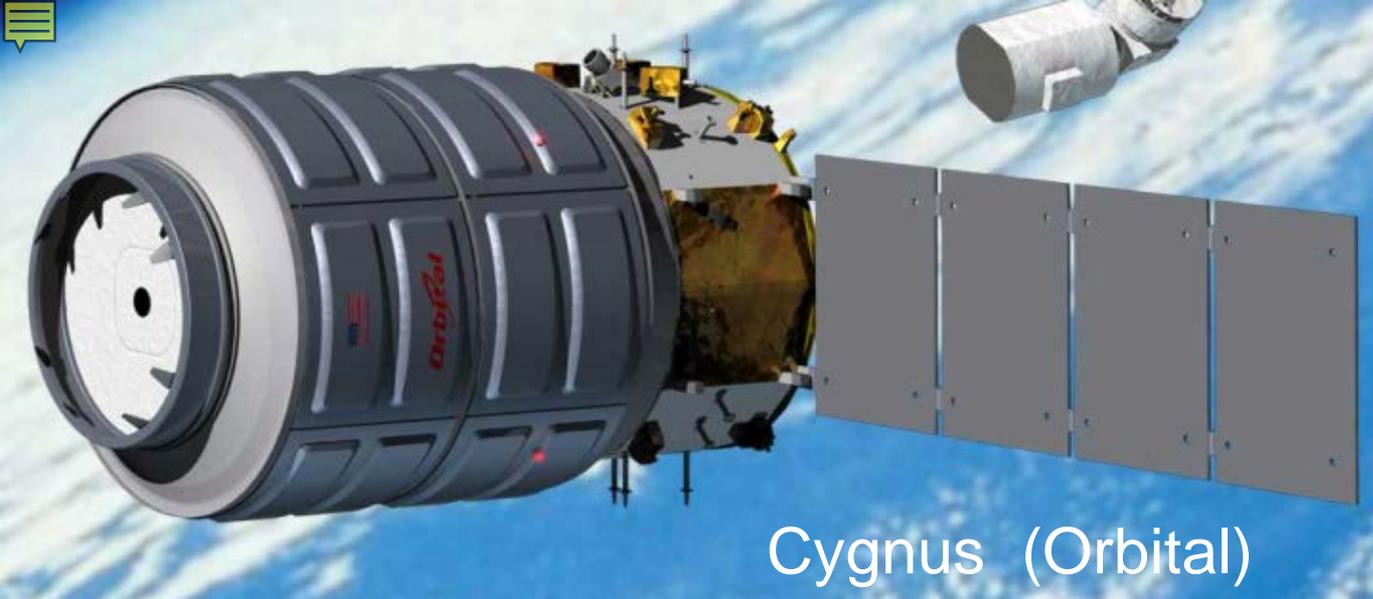
Extended through *at least* 2024



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



Explore Near-Earth Asteroid

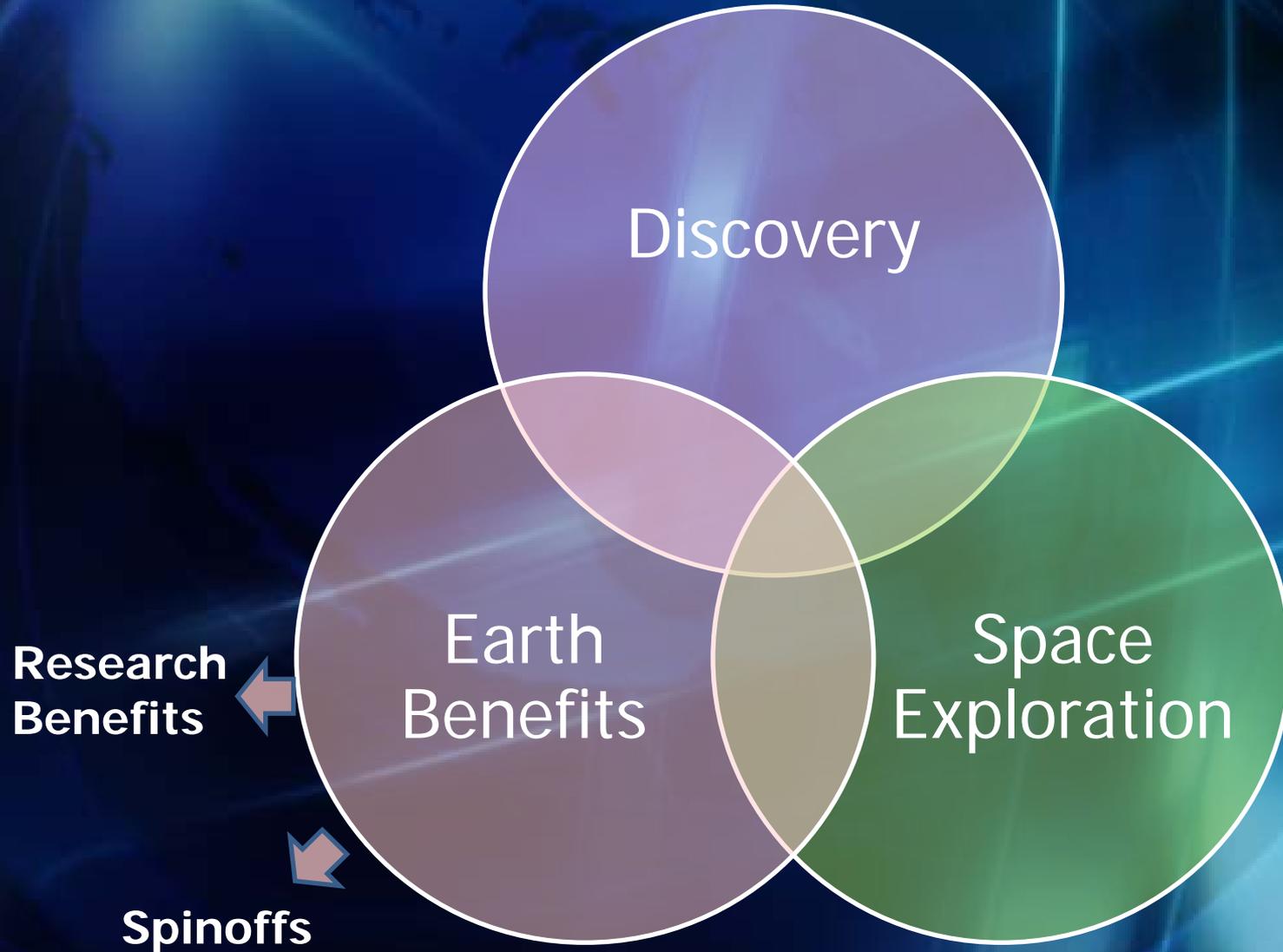
Extended Duration Crew Missions

Humans to Lunar Surface

Missions to Deep Space and Mars System

Sustainable Human Missions to Mars Surface

What kind of benefits come from research in space?



Major types of benefits on Earth



Health



Earth Observation & Disaster Response

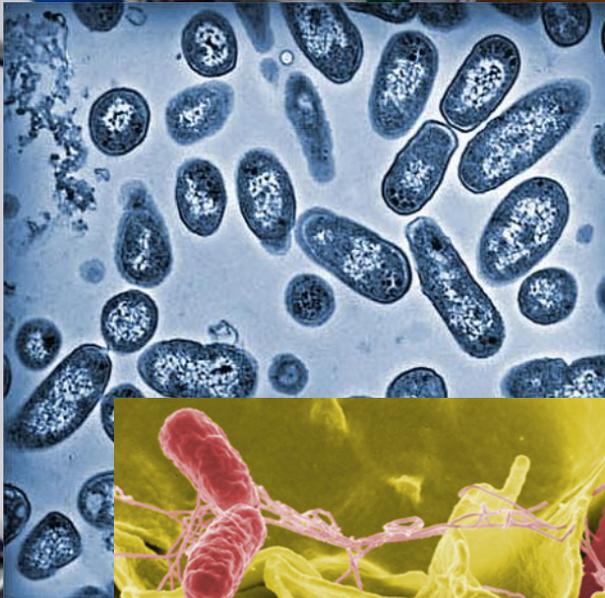


Education



Everyday Technologies

Microbial Virulence



Top image credit: Pacific Northwest National Laboratory

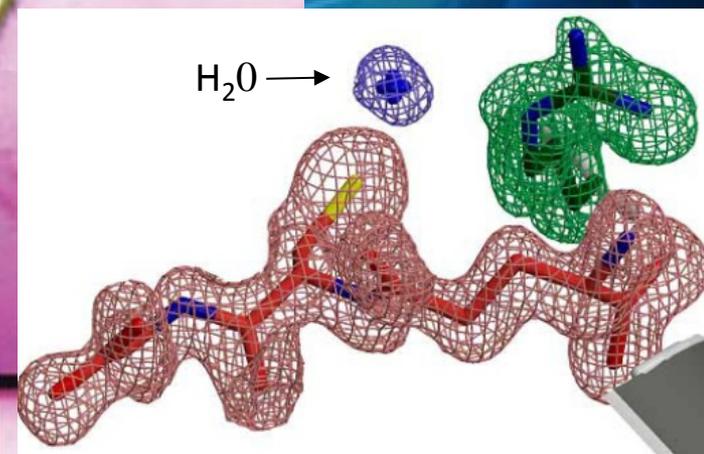
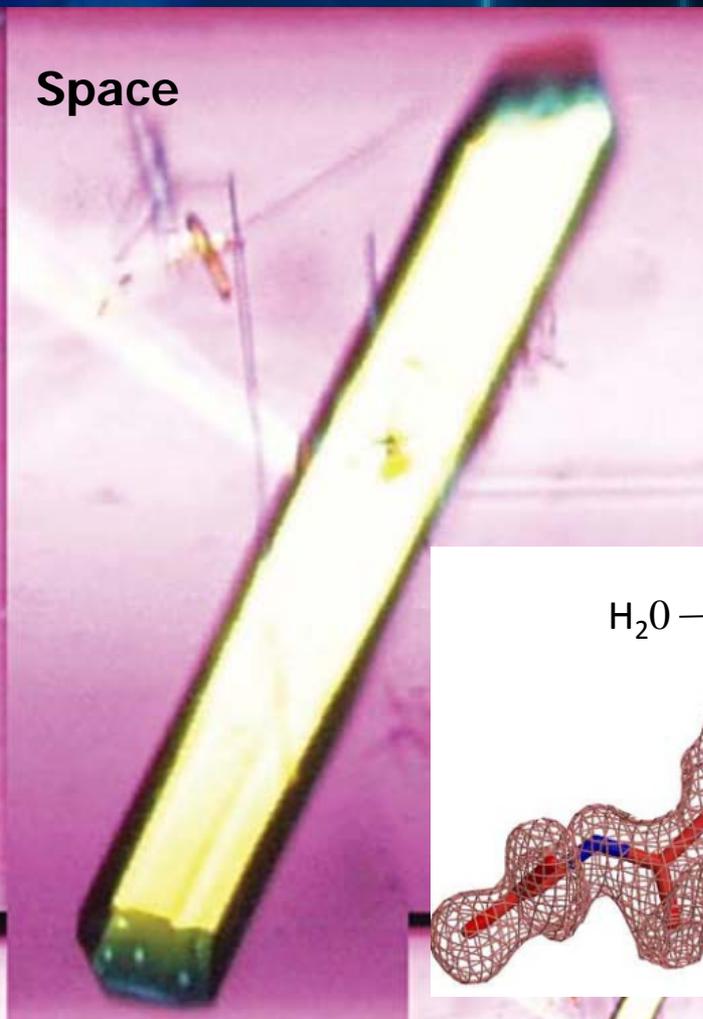
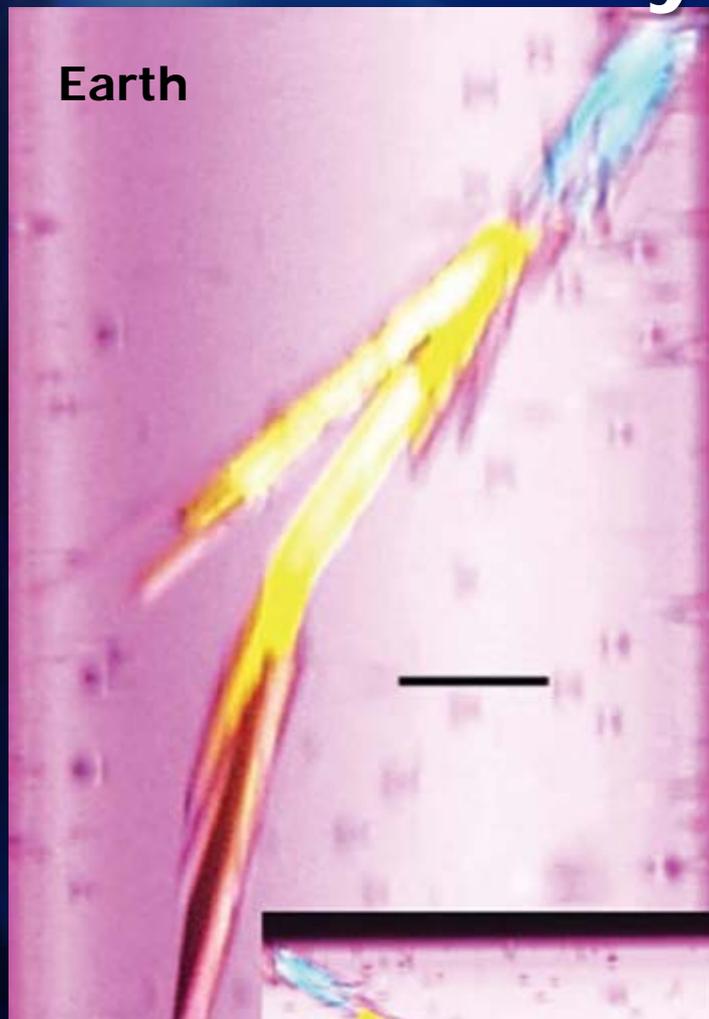
Bottom image credit: Rocky Mountain Laboratories

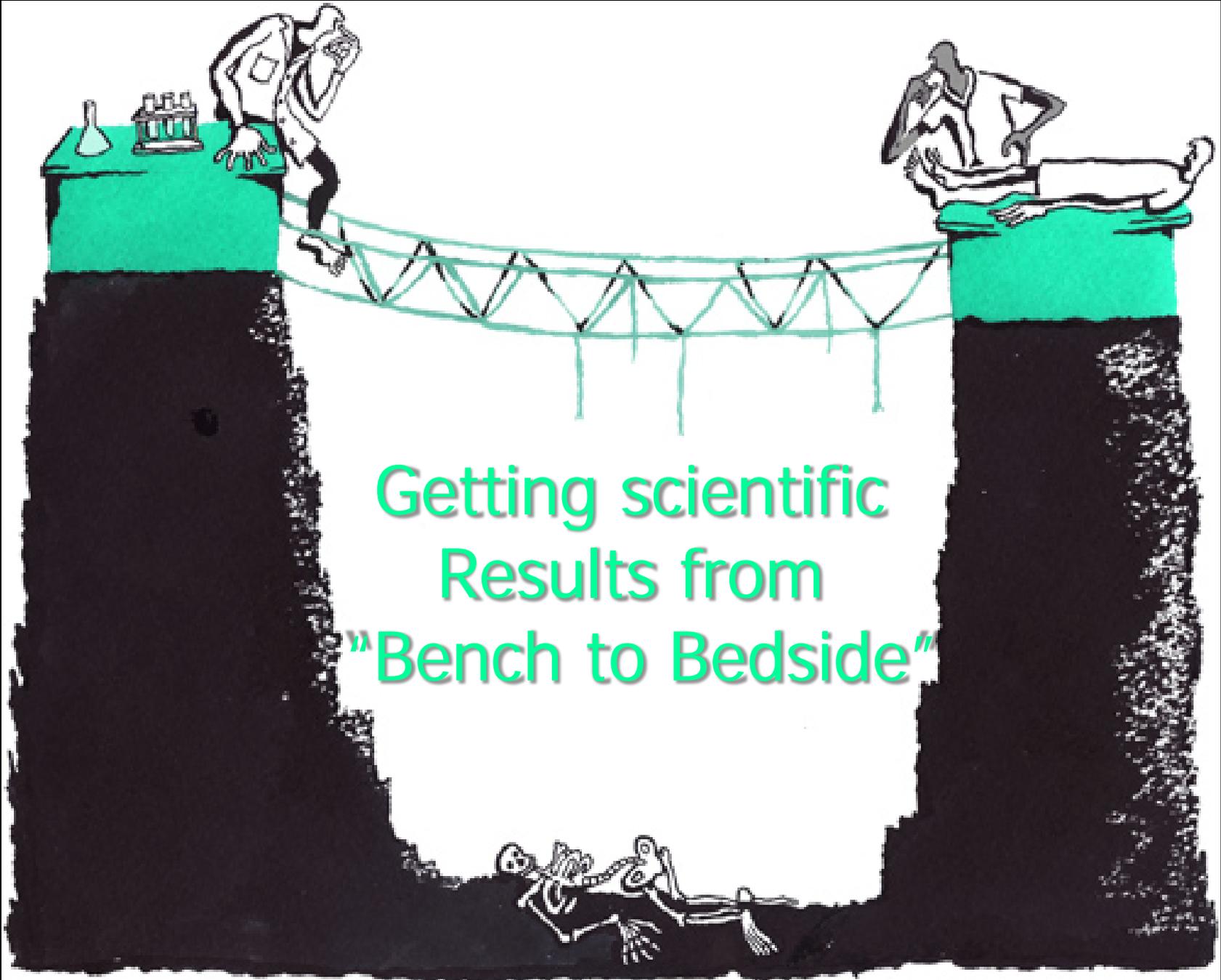
Source: ISS Chief Scientist, NASA

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

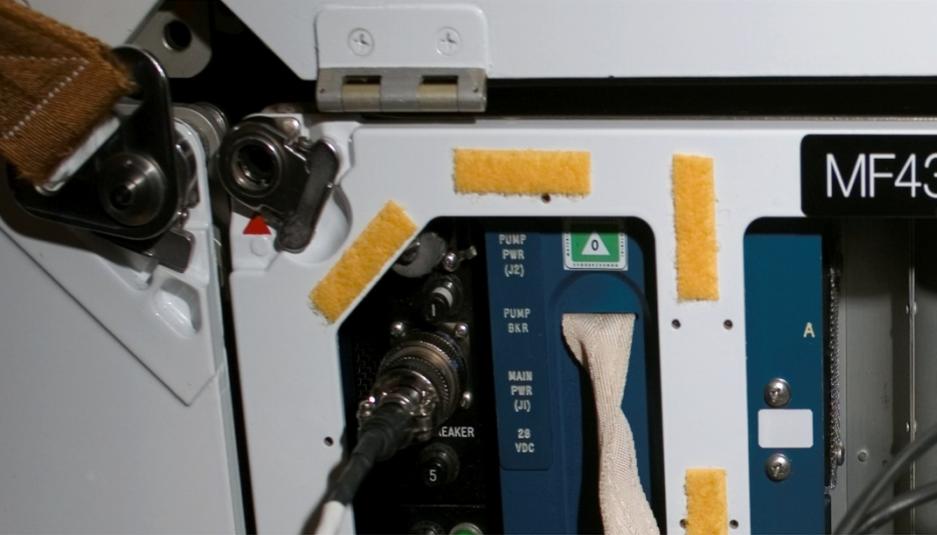
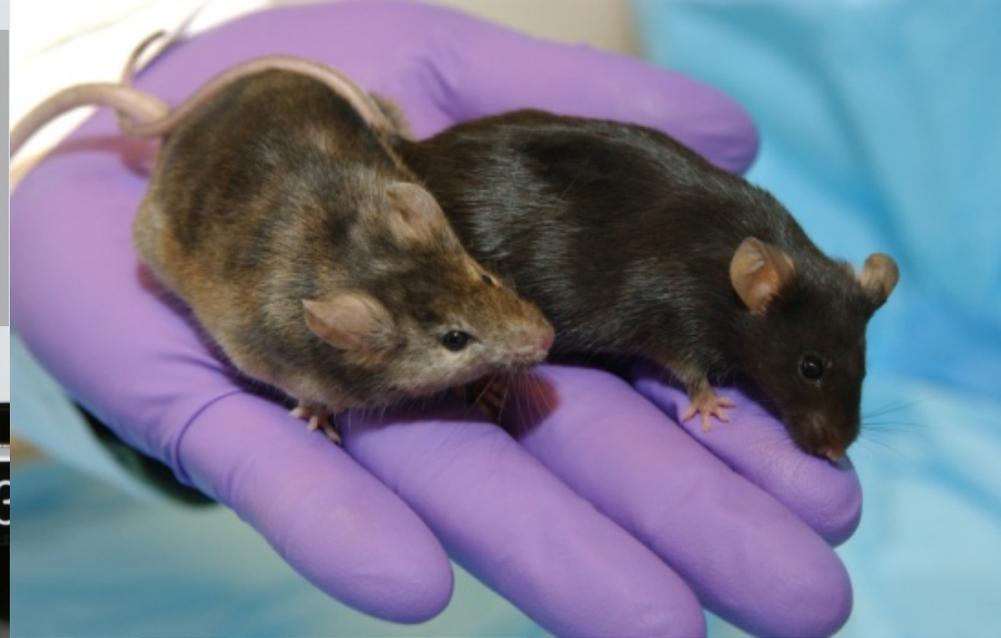
Candidate Treatment for Duchenne's Muscular Dystrophy from Protein Crystallization

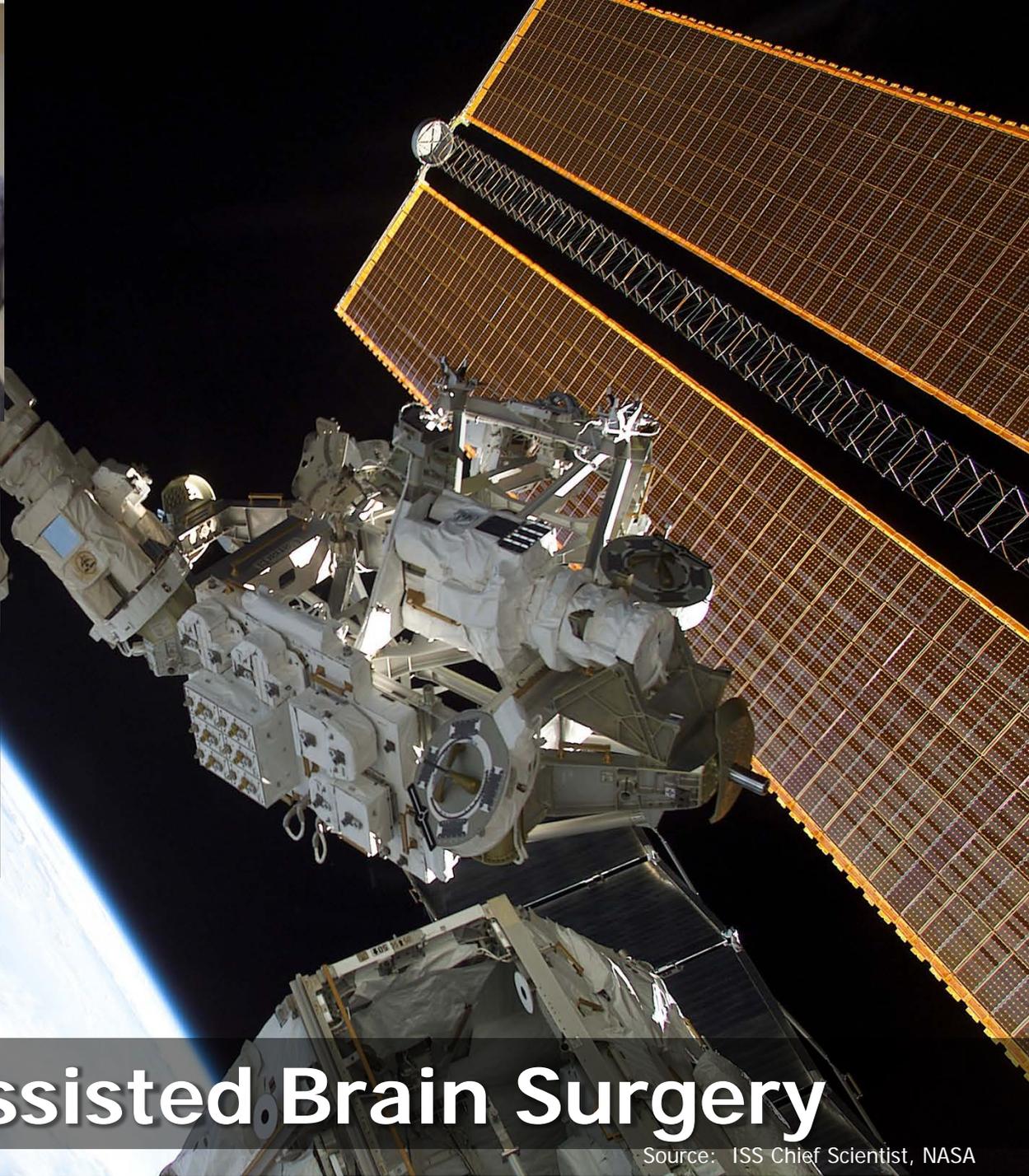




Getting scientific
Results from
"Bench to Bedside"

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



ROSCOSMOS

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

(direct link to document:) 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***

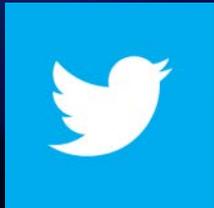
ISS benefits for Humanity Document

[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/>

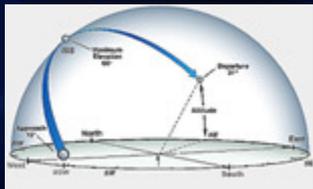


@ISS_Research [\(link\)](#)



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

http://blogs.nasa.gov/ISS_Science_Blog/



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

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