

# *International Research Results and Accomplishments From the International Space Station*

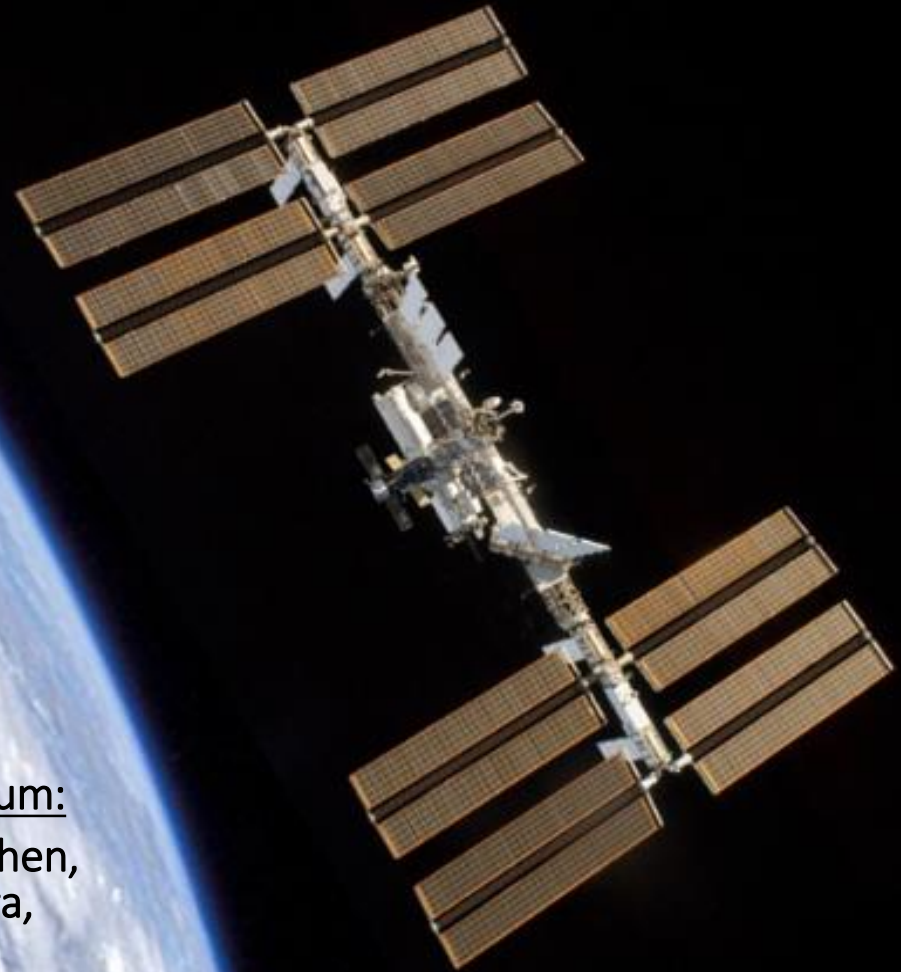
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**ISS Associate Program Scientist**

Publication by the ISS Program Science Forum:

Robinson, Ruttle, Tate-Brown, Perkins, Cohen,  
Marcil, Heppener, Hatton, Tasaki, Umemura,  
Karabadzak, Sorokin, Cotronei, Sabbagh.

September 2016.

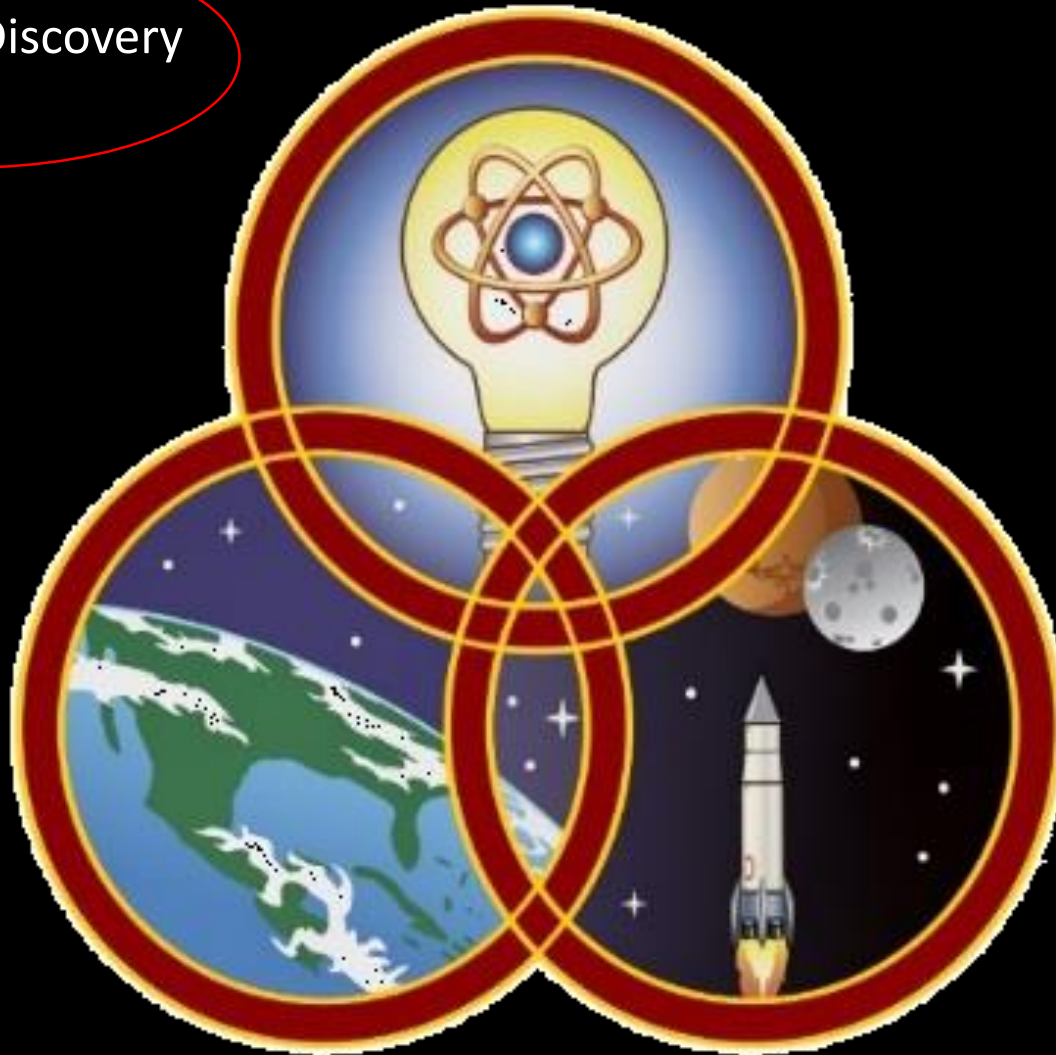


# How Do We Show the Impacts of ISS Utilization?

Scientific Discovery

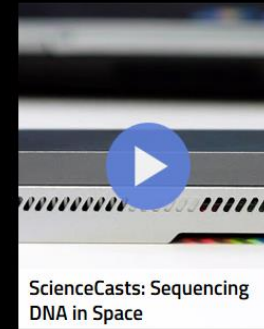
Benefits for  
Humanity

Enabling Future  
Exploration



# Ways We Communicate the Impacts of ISS Utilization

Blogs  
 Stories  
 Multi-Media  
 Social Media  
 Media Briefings  
 Scientific Presentations



Videos Media Resources

## Research & Technology Media Resources

**Applications**  
 Space Station Research Explorer  
 Apple  
 Google Play

**Reference Guide to the International Space Station - Utilization Edition (2015)**  
 Reference Guide to the International Space Station (PDF, 37.1 MB)

**Explanatory Videos**  
 Microbiomics: The Living World In and On You (7/28/16)  
 Astronaut Vision Changes in Microgravity (9/11/14)  
 Benefits for Humanity: In Their Own Words (11/26/13)  
 Bone Remodeling in Microgravity (5/12/14)  
 Capillary Flow Experiments on Space Station (9/10/14)  
 From Skylab to Station: Out of This World Science (7/30/13)  
 International Space Station Protein Crystal Growth (3/4/14)  
 International Space Station: We're Working Off the Earth For the Earth (10/27/14)  
 NASA's OPALS Beams Video from Space (6/5/14)

Source: Station Research Explorer



## A Lab Aloft (International Space Station Research)

International Space Station research and technology topics

HOME PHOTOS

**Science in Short: Station Offers Diverse Research Opportunities**  
 Posted on August 10, 2016 at 7:44 pm by rthobson

Leave a reply

**Archives**

- August 2016
- June 2016
- May 2016
- April 2016
- March 2016
- February 2016
- January 2016
- September 2015
- June 2015
- May 2015
- April 2015
- March 2015
- February 2015

# The ISS International Archive of Research and Results

[www.nasa.gov/iss-science](http://www.nasa.gov/iss-science)



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## Space Station Research & Technology

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INTERNATIONAL  
**SPACE  
STATION**  
OFF THE EARTH, FOR THE EARTH

### Research & Technology on the Space Station

The International Space Station is an unprecedented achievement in global human endeavors to conceive, plan, build, operate, and utilize a research platform in space. With assembly of station at completion, continuity of visiting vehicles, and support of a full-time crew of six, the era of utilization for research advances.



### Research & Technology Latest News



### Space Station Research & Technology Organization



### International Space Station Benefits For Humanity



### Space Station Research Goals

NASA Research

Space Life and Physical Sciences Research and Applications

Human Research Program

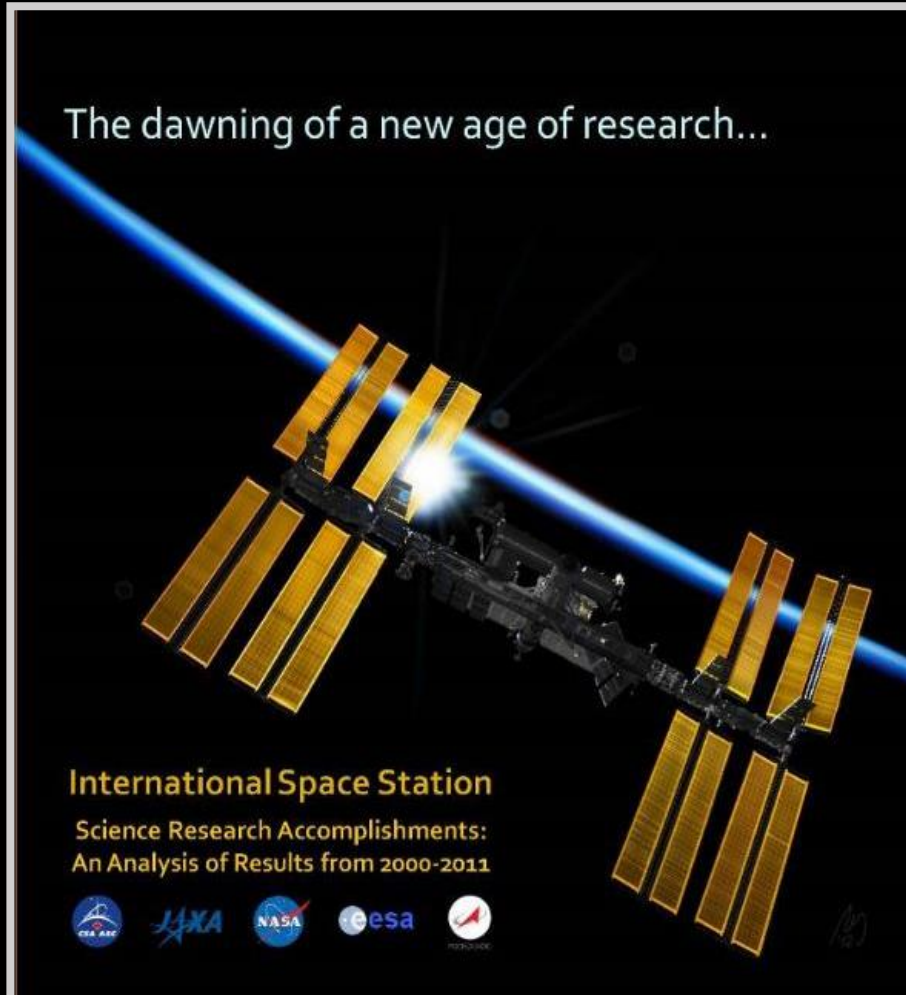
Science Mission Directorate

Advanced Exploration Systems

Space Technology Mission Directorate

# ISS Science Research Accomplishments: 2000-2011

The ISS Program Science Forum has published the first-ever compilation of international ISS Results for investigations published through the year 2011.

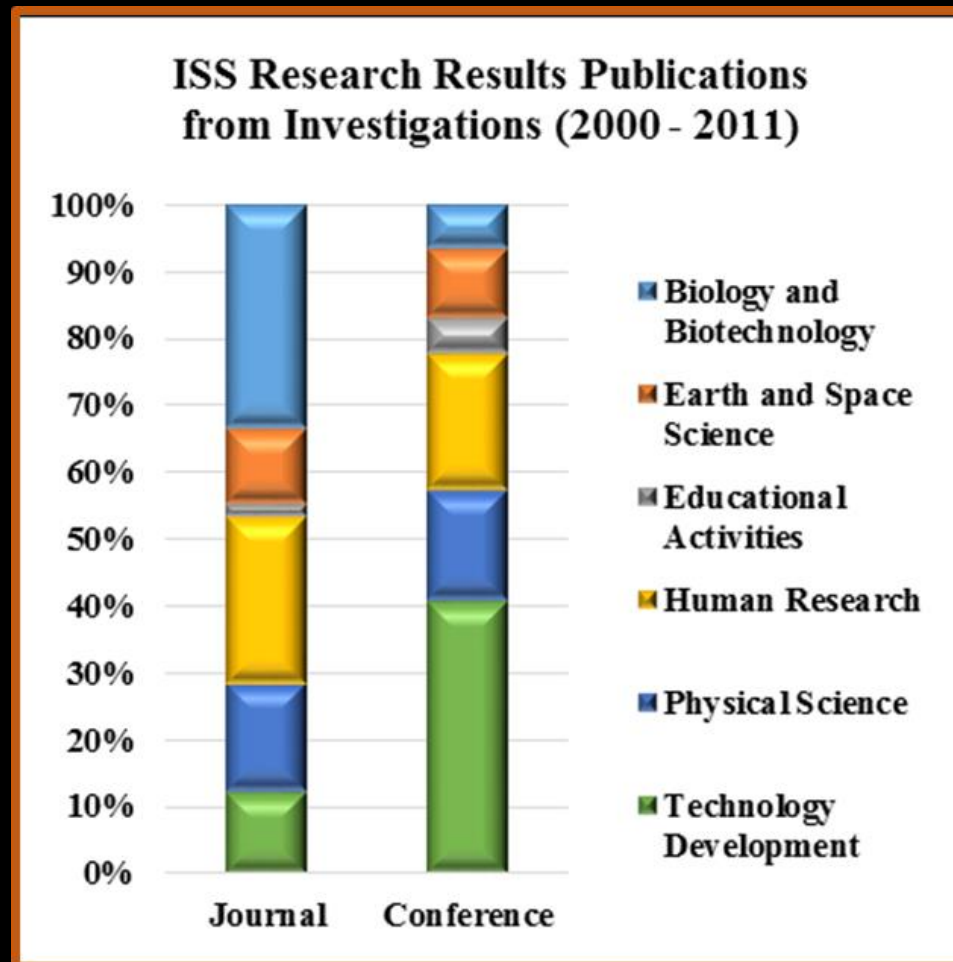


# Tracking Results from ISS Utilization

- A team of professionals in NASA's ISS Program Science Office mine for publications from ISS research and technology development through many ways, including:
  - keyword searches with various tools and search engines
  - databases such as AIAA, IEEE, IngentaConnect, JSTOR, J-STAGE, ScienceDirect, Wiley
  - Web of Science
  - conference proceedings
  - science networks such as ResearchGate
  - email alerts from systems such as Pubmed, Google Scholar, Nature Partner Journal-Microgravity
  - NASA Taskbook, and others
  - ISS investigator and international partner websites
  - personal email exchanges with ISS investigators and international partners

# ISS Science Research Accomplishments: 2000-2011

At the time of publication, over 1200 journal publications, 59 patents and over 400 conference proceedings were collected from ISS research.



# How Do We Show How ISS Knowledge Impacts Science?

- **ESA** scientists published Genara-A molecular evidence of plant seedling stress response to the microgravity environment in PLoS One [*Mazars et al. 2014*].
- **Roscosmos** scientists published in PLoS One that long-duration data has led to new tools for immunological testing in space and in remote and resource-restricted areas on Earth [*Pastushkova et al. 2013*].
- **CSA** scientists from the CCISS investigation published in the Journal of Applied Physiology that the current countermeasures on ISS are sufficient to maintain cardiovascular health, and can provide insight into cardiovascular maintenance on Earth [*Hughson et al. 2012*].
- **JAXA** investigators published MAXI observations in Nature of a “first-ever”: the instant that a massive black hole swallowed a star, which had before been only a theory [*Burrows et al. 2011*].
- The global team of scientists in the **NASA**-sponsored AMS-02 investigation challenged theoretical models of cosmic predications for evidence of elusive dark matter in Physical Review Letters, as the instrument was the first to sift through galactic cosmic rays in energy ranges beyond 200Gev [*Aguilar-Benitez et al. 2014*].
- One of the earliest ISS investigations was also highly collaborative: the ICE-First investigation included investigators from France, Canada, Japan, and the United States to study the effects of the spaceflight environment on living systems, using the *Caenorhabditis elegans* the model organism of study radiobiology, muscle protein changes, ageing, radiation effects on living organisms, apoptosis, and DNA damage and repair.





# How Do We Show How ISS Knowledge Impacts Science?

Top 20 Journals with ISS Results (Number of Publications)	Times Cited
PLOS ONE (36)	303
Nature (1)	165
Proceedings of the National Academy of Sciences of the United States of America (3)	139
Science (3)	31
Physical Review Letters (23)	839
Journal of Biological Chemistry (2)	52
Chemical Communications (1)	72
Journal of Neuroscience (1)	76
Advanced Materials (1)	72
Journal of Geophysical Research (5)	179
Physical Review D - Particles, Fields, Gravitation and Cosmology (1)	2
Optics Express (2)	35
Scientific Reports (6)	41
Chemistry - A European Journal (1)	73
Geophysical Research Letters (1)	22
NeuroImage (1)	23
Journal of Chemical Physics (4)	41
Langmuir (2)	18
Physical Review E, Statistical, Nonlinear, and Soft Matter (11)	212
The Astrophysical Journal (1)	9

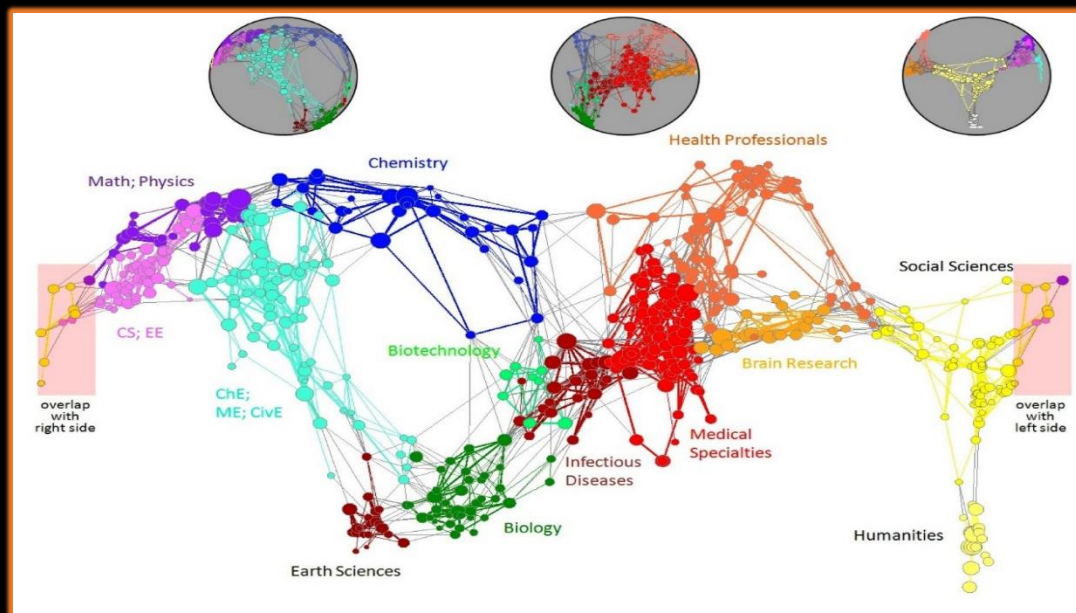
Percentage of ISS publications in Top 20 Journals- By Discipline



■ Biology and Biotechnology    ■ Earth and Space Science  
■ Educational Activities    ■ Human Research  
■ Physical Science    ■ Technology Development

*By Eigenfactor, which is the rating of the total importance of a scientific journal.*

# The Future: How Do We Show How ISS Knowledge Impacts Science?



The University of California San Diego  
(UCSD) Map Of Science  
<http://sci.cns.iu.edu/ucsdmap/>

Figure: Broner et al. 2012. *PLoS One* July 7(7):e39464



National Academies of Science  
"AcademyScope"  
<https://www.nap.edu/academy-scope>

# NASA ISS Research & Technology Resources



ISS Research & Technology  
<http://www.nasa.gov/iss-science/>



@ISS\_Research



ISS Research Blog "A Lab Aloft"  
<http://go.usa.gov/atI>



ISS Research Explorer App  
(Apple App Store and Google Play)

## ISS Benefits for Humanity

A collage of four images related to ISS benefits. Top left: A photograph of the International Space Station in space. Top right: A book cover titled "INTERNATIONAL SPACE STATION Benefits for Humanity ISS Benefits For Humanity - 2nd Edition (2015)". Middle right: A photograph of the ISS with the text "Benefits of ISS Research". Bottom right: A graphic titled "Areas of Benefits" with a list: Economic Development of Space, Innovative Technology, Human Health, Global Education, and Earth Observation and Disaster Response. Bottom left: A graphic titled "15 Ways the International Space Station is Benefiting Earth" with a photograph of the station and a globe.

Benefits: [www.nasa.gov/stationbenefits](http://www.nasa.gov/stationbenefits)