

The image shows the International Space Station (ISS) in orbit above Earth. The station's complex structure, including its large solar panel arrays, is illuminated from the side, creating a bright glow. The Earth's horizon is visible in the background, showing a thin blue line against the blackness of space. The text is overlaid on this image.

# ***ISS Opportunities for University Students***

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# Expanding the Mission: Enabling University Students' Experience with ISS

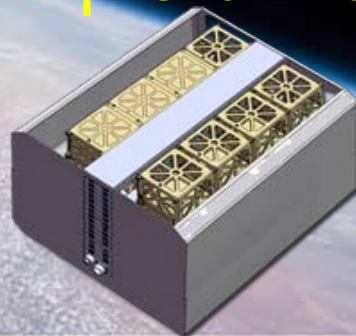
- University students have been engaged in the development of several major ISS Payloads
  - CubeLabs
  - SPHERES
  - Space DRUMS
  - CGBA/CSI
  - EarthKAM
  - AgCam
  - Cubesats
- *With more ISS payloads becoming operational university students can utilize these on-orbit assets*

# Bridging Flight Opportunities

- Some payloads can offer a bridge from sounding rocket or reduced gravity aircraft experiments to ISS
- Other payloads provide a platform for the long term Low Earth Orbit environment
- Additional university level student opportunities will emerge for payload development/operations and educational product development

# NanoRacks/CubeLabs

- An operational ISS National Lab payload
  - Regularly available resupply
- A “blank sheet of paper” venue based on the Cubesat form factor
  - 10 cm cube (1U) with power and USB data interface
  - Available in multiple units



## NanoRacks/CubeLabs

- Standard scientific instruments for use inside the CubeLab soon to be made available by the vendor
- ICD data available
- Adaptable for flights on sound rockets and reduced gravity aircraft
- Details: <http://www.nanorackslc.com/> or <http://ssl.engr.uky.edu/cubelab>
- Search: “NanoRacks” or “CubeLab”

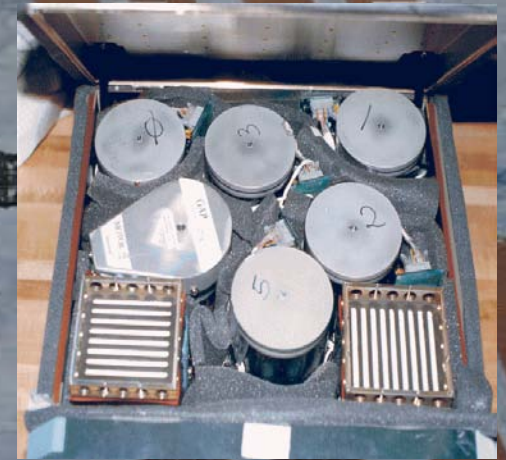
# BioServe CGBA

The background of the slide is a photograph of the International Space Station (ISS) in orbit above the Earth's blue and white clouds. The station's complex structure, including its central truss and multiple large solar panel arrays, is clearly visible against the dark space.

- The Commercial Generic Bioprocessing Apparatus (CGBA) is a temperature controlled multi-use reconfigurable device for life science and physical science research applications  
Extensive flight history on Shuttle and Mir in various configurations
- Two CGBAs currently operational as ISS National Lab payloads
  - Regularly available resupply
- Host to the highly successful CGBA Science Insert (CSI) educational program

# BioServe CGBA

- Previously flown configurations have included temperature controlled cell cultures, small habitats and customized temperature control experiment inserts



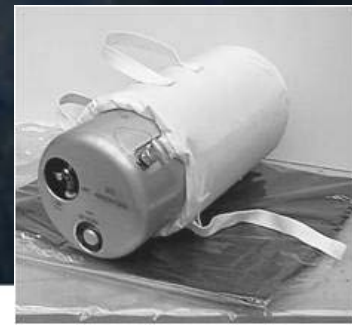
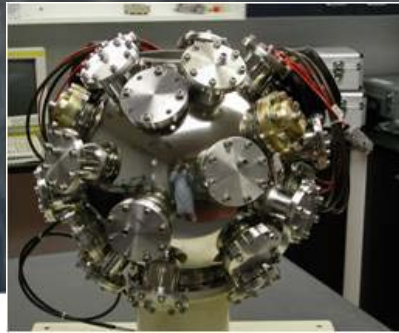
- **Details:**

<http://www.colorado.edu/engineering/BioServe/>

- **Search: “BioServe Space Technologies”**

# SpaceDRUMS

- The Space Dynamically Responding Ultrasonic Matrix System (SpaceDRUMS) is a suite of hardware that enables containerless processing
- 20 acoustic beam emitters suspend a baseball-sized solid or liquid sample during combustion or heat-based synthesis
  - Lack of contact with container walls result in microgravity samples being produced with unparalleled quality of shape and composition

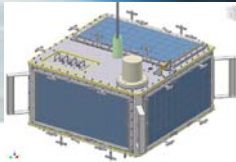


# Space DRUMS

- One SpaceDRUMS rack is currently operating as an ISS National Lab payload
  - Regularly available resupply
- Flight History of the combustion chamber and other modules on the NASA KC-135 and Zero-g Corp reduced gravity aircraft (COSYN)
- Reconfigurable modules allow for investigations in metal-ceramics and glass-ceramics materials processing, fluid physics, chemical and biological mixtures, as well as basic micro-g physics
- NASA Payload, based in Canada, looking for a new US home
- Search: “SpaceDRUMS”

# ARISSat Student Experiments

- ARISSat can host 4-6 student developed experiments with low rate experiment data telemetered down via amateur radio
  - Commercial VHF amateur radio equipment can be used for experiment data acquisition from the satellite
- The first of a the ARISSat series will contain a pressure sensor from Kursk University in Russia to obtain in-situ atmospheric density measurements
  - 2-6 month satellite life time predicted
- 4 more ARISSats currently planned in a collaboration between AMSAT, ISS National Lab Education and RSC-Energia
- Details: [www.amsat.org](http://www.amsat.org), Search: “ARISSat”



# Cubesats

- Poly Picosatellite Orbital Deployer (P-POD) will be incorporated into Space X Commercial Resupply Service launches to ISS
- Additional P-POD/Cubesat launch opportunities will be available on NASA ELV launches as part of NASA's Cubesat Launch Initiative
- Search:  
“Cubesat Launch Initiative”

# More to Come!

- The fully operational phase of ISS is just beginning and will run through at least 2020
- New educational opportunities at the K-12 through University levels will be forthcoming
- Keep Looking Up!

