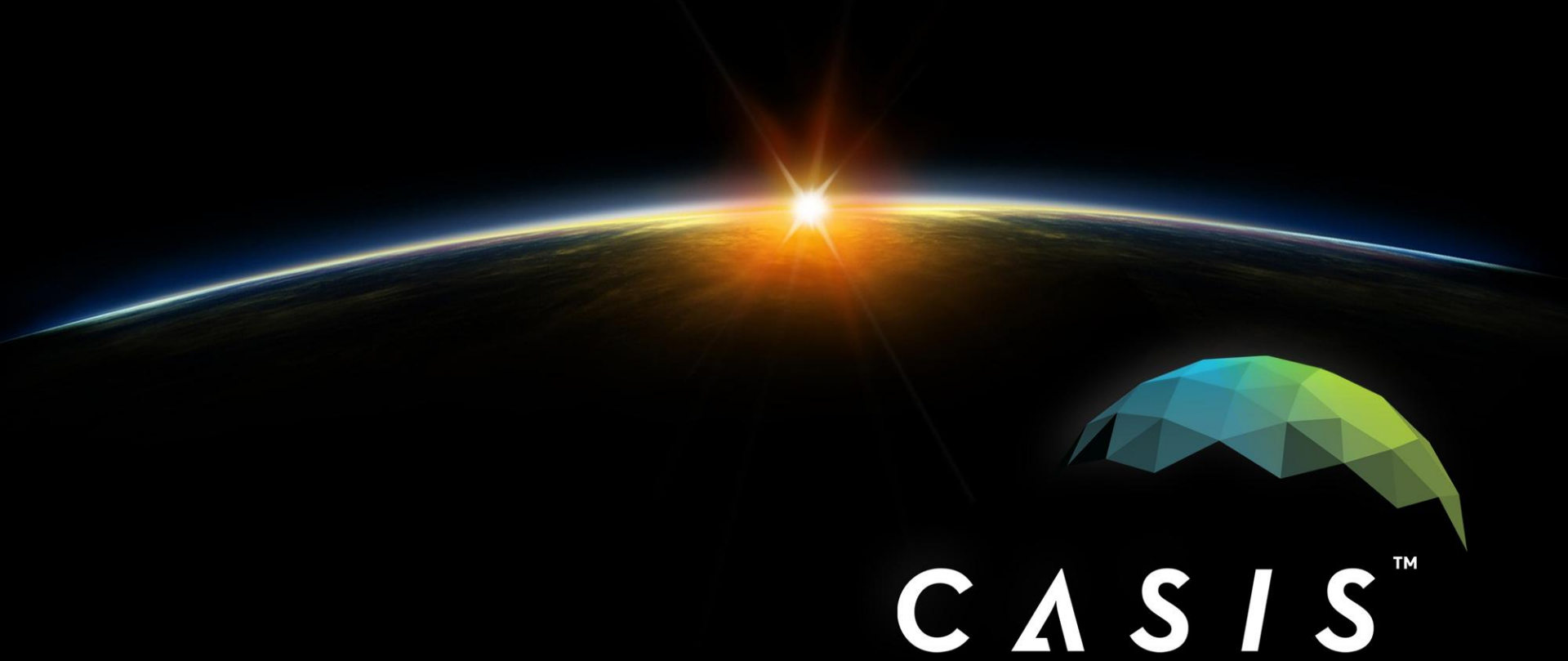
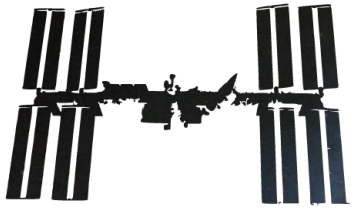


CASIS™

Science in Space for Life on Earth:
CASIS opportunities for research onboard ISS

A NEW ERA OF SPACE RESEARCH

APPOINTED BY CONGRESS



MANAGER
NATIONAL LAB ISS

IDENTIFY
OPPORTUNITY

COST

INCREASE
ACCESS

ROI

CONNECTING

HARDWARE

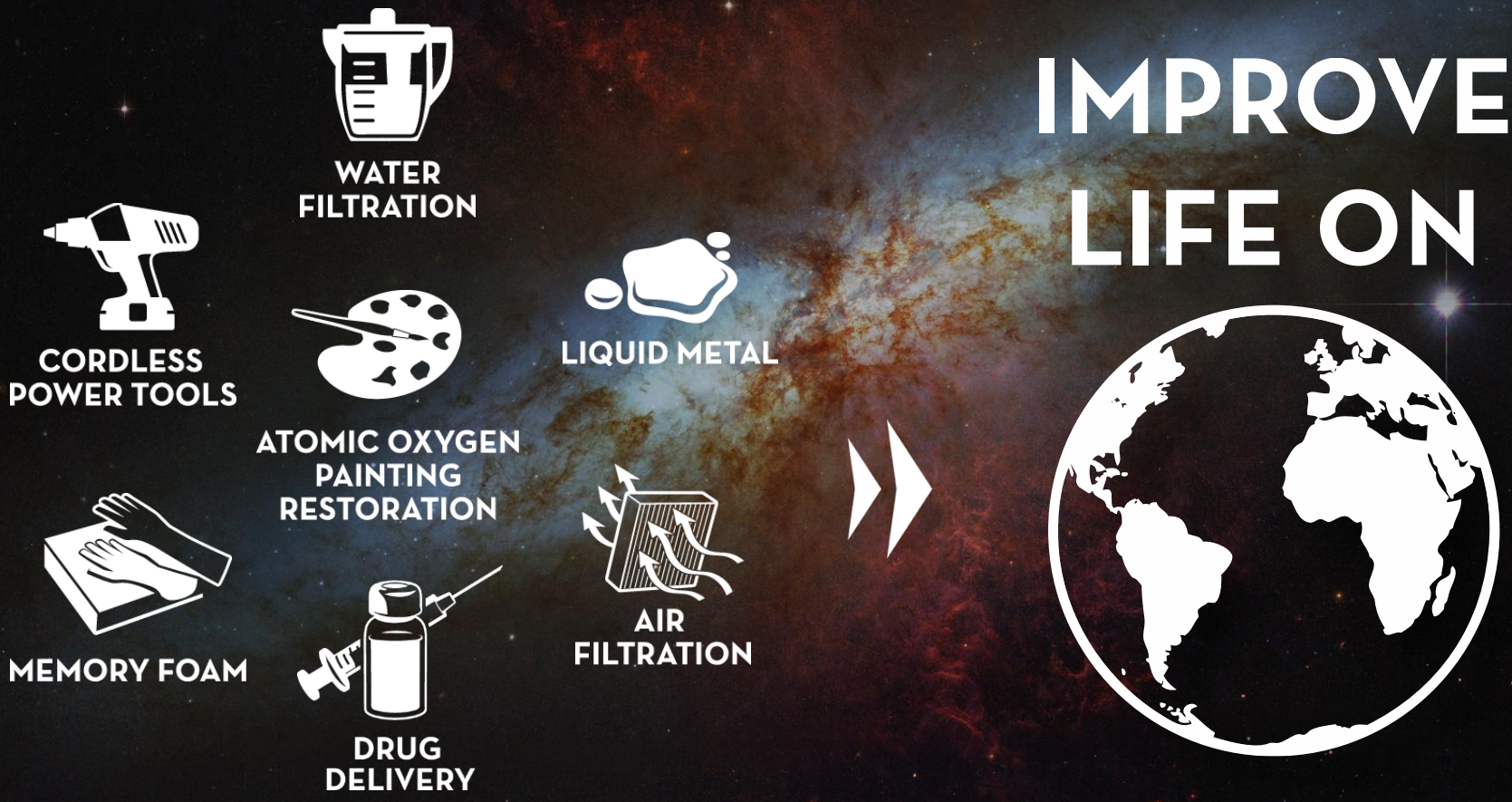
RESEARCH

FUNDING

OPPORTUNITY

IMPROVE
LIFE ON

HOW DO WE KNOW? BECAUSE IT ALREADY HAS.



SUCCESS STORIES:
PROTEIN CRYSTAL GROWTH

HEALTH SCIENCES

Protein crystallization in space produces larger, more ordered structures, supporting structure-based drug design

Notable Example: A candidate treatment for Duchenne muscular dystrophy, developed based on crystallization of inhibitor complexes in space, is now in human clinical trials

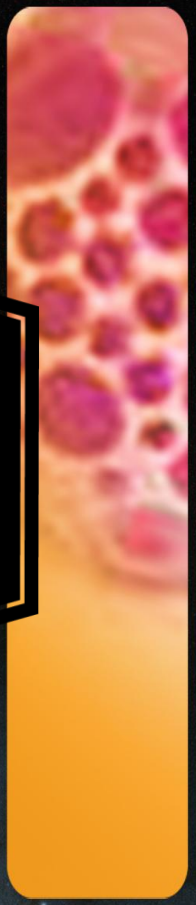
BREAKTHROUGH IN DRUG DEVELOPMENT

SUCCESS STORIES: DENOSUMAB

HEALTH SCIENCES

Space-based testing of Denosumab (Prolia®), an anti-fracture drug now used in osteoporotic patients, provided evidence of the drug's effectiveness in preventing bone loss

SALES EXCEEDED $1.2 BILLION IN 2012



SUCCESS STORIES: MICROENCAPSULATION

HEALTH SCIENCES

Drug-delivery microcapsules optimized in microgravity were reproduced on Earth and are in human clinical trials for cancer treatment

May be useful in treating not only tumors but also diabetes, resistant infections, and clotting disorders

DRUG DELIVERY SYSTEM HAS YIELDED AT LEAST FIVE PATENTS

SUCCESS STORIES: LIQUIDMETAL

MATERIAL SCIENCES

LIQUIDMETAL TECHNOLOGIES IS A $46 MILLION MARKET CAP MATERIALS COMPANY

Space-based experiments on undercooled liquids led to improved alloys of high-strength glassy metal materials

The company Liquidmetal uses these flexible yet strong alloys for consumer products on Earth: jewelry, sporting equipment, cell phones, coatings for Industry and orthopedic inserts

SPINOFFS v EARTH BENEFITS

EXPLORATION & INDIRECT EARTH BENEFITS

CASIS & DIRECT EARTH BENEFITS

WATER FILTRATION

CORDLESS POWER TOOLS

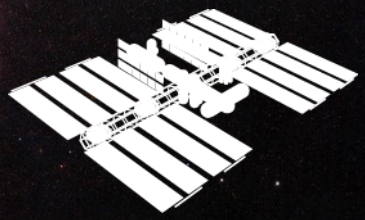
ATOMIC OXYGEN PAINTING RESTORATION

IMPROVED LIFE ON

MEMORY FOAM

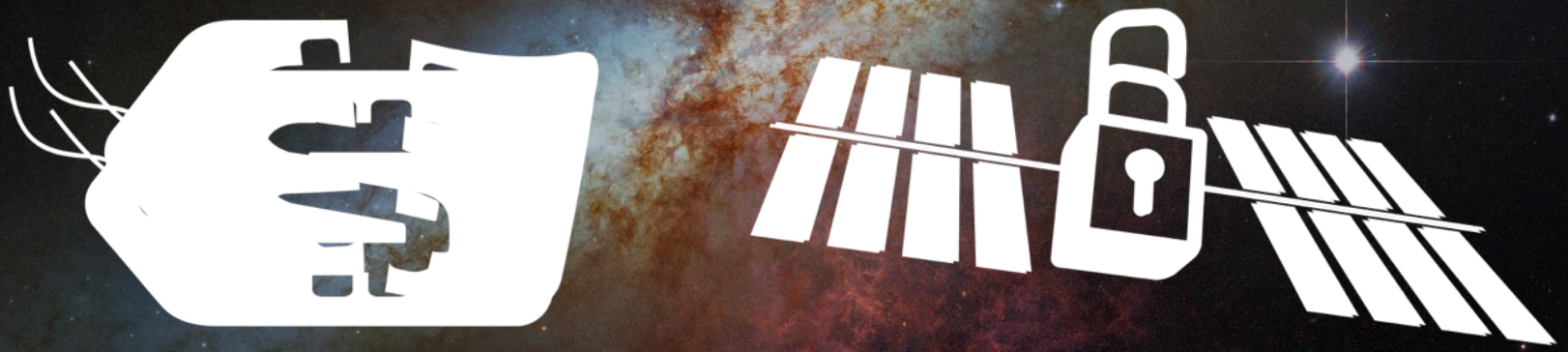
AIR FILTRATION

DRUG DELIVERY



SETTING NEW EXPECTATIONS

ACCESSIBLITY + AFFORDABLITY = OPPORTUNITY:



ADVOCATES FOR DISCOVERY

IDEA	ISS ENVIRONMENT	BREAKTHROUGHS

MICROGRAVITY

UNIQUE VANTAGE POINT

EXTREME CONDITIONS

PHARMACEUTICALS
BIOTECHNOLOGY
ENERGY
NANOTECHNOLOGY
MATERIALS SCIENCE
AEROSPACE
NANOMATERIALS
ANALYTICAL DEVICES
TISSUE ENGINEERING
DRUG DISCOVERY
SENSORS DEVELOPMENT
ELECTRONICS
ATMOSPHERIC RESEARCH
PHYSICAL SCIENCES
EARTH OBSERVATION
AGRICULTURE
PROPULSION
TECHNOLOGY READINESS LEVELS
ETC...

SCIENCE IN SPACE:
Environmental highlights

LIFE SCIENCES | MATERIALS SCIENCES | PHYSICAL SCIENCES | TECHNOLOGY DEVELOPMENT | EARTH OBSERVATIONS

Microgravity
A broad range of benefits

Microgravity influences many phenomena: cell behavior, organism health, fluid physics, combustion, and various processes across the physical and life sciences

MICROGRAVITY

Extreme Conditions
The extreme environment of space

Exposure to extreme heat and cold cycling, ultra-vacuum, atomic oxygen, high-energy radiation, and debris impact

EXTERNAL PLATFORMS

Remote Sensing
A unique vantage point

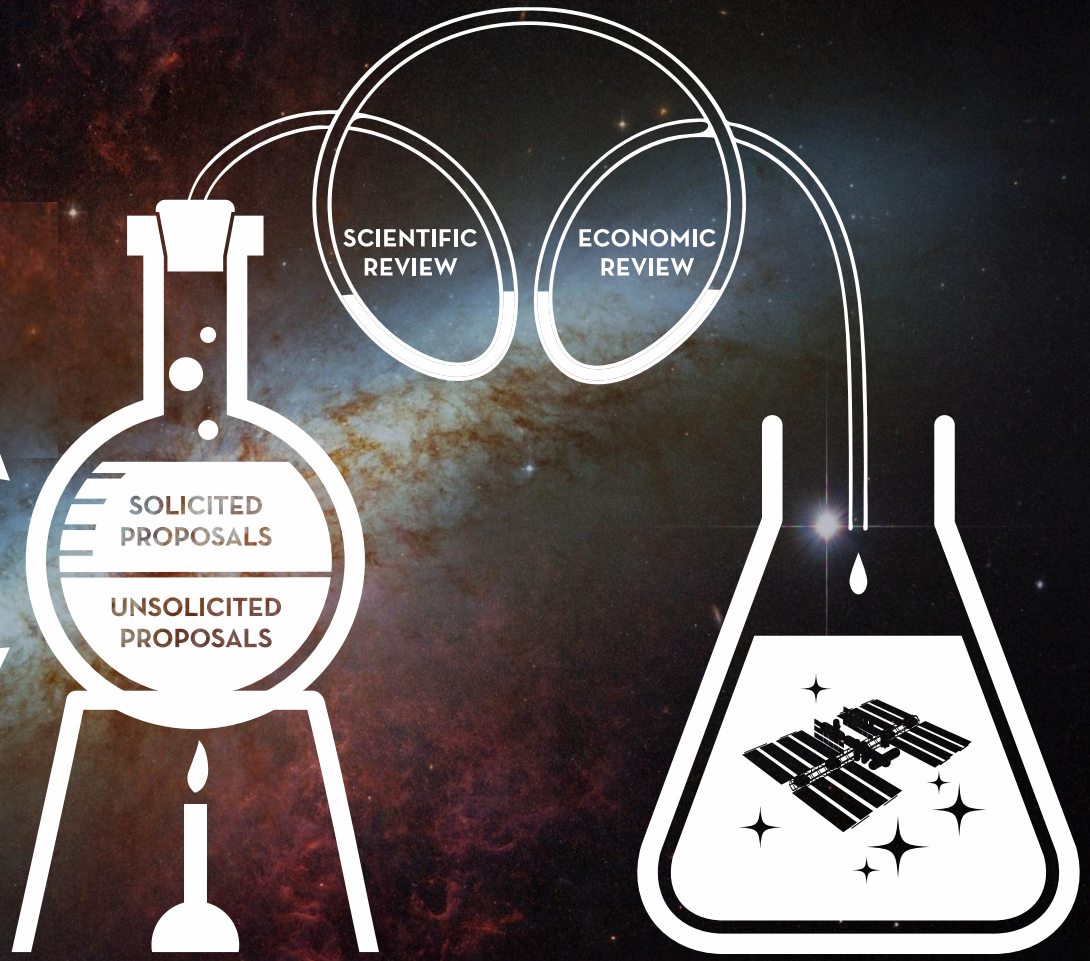
With an altitude of ~240 miles and an orbital path over 90% of Earth's population, the ISS provides improved spatial resolution and variable lighting conditions

EARTH/SPACE OBSERVATION

Putting Powerful Research in Space

"Solicited" = Responses to Formal Requests For Proposals
(Several issued each year)

"Unsolicited" Submissions Online
(Can be done at any time)



Pipeline:
Example Projects

Projects across the physical and life sciences, as well as tech demo/development, come from academic institutions, commercial entities, nonprofits, and OGAs

Advanced Materials Applications
Baylor College of Medicine
Broad Institute
CalTech
Cobra Puma Golf
Dept. of Veterans Affairs
Emory
Georgia Institute of Technology
Houston Methodist Research Institute
iXpress Genes
Kentucky Space
Mayo Clinic
Merck
Nano3D Biosciences
Naval Research Lab
NIH
Novartis
Procter & Gamble
Quad Technologies
RasLabs
Stanford

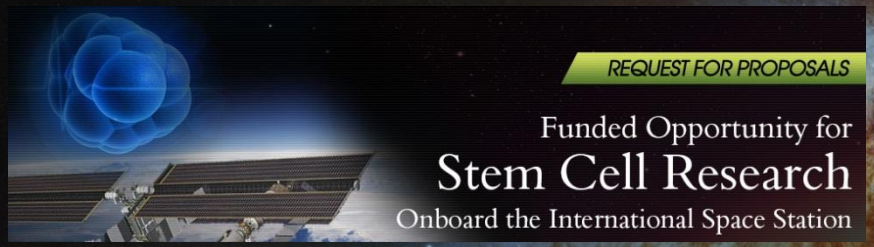
PIPELINE:
Homerun Potential

- *Many of these projects are applied in nature or closer to product. Near-term impacts may include:*
  - *Drug development*
    - *Cancer, Huntington's, Cystic Fibrosis, Parkinson's, heart disease, diabetes…*
  - *Increased shelf life of commercial products*
  - *Better performance of sports equipment*
  - *More efficient solar cells*
  - *Improved satellite capabilities*
  - *And many more…*

Previous Funding Opportunities

August 2012

December 2012



July 2013

January 2014

February 2014

April 2014

Current Funding Opportunities

Disease Modeling (human, rodent, and non-rodent models)

- Neurodegenerative diseases
- Musculoskeletal diseases
- Wound healing/tissue regeneration
- Immunosuppression
- Aging

Remote Sensing for Energy Applications

- Capture
- Generation
- Storage
- Sustainability
- Efficiency

Partnerships

Beyond Project Development

United Nations: A collaboration to build a next-gen imager will improve humanitarian efforts and disaster relief worldwide

CASIS Academy
WHERE GRAVITY WON'T HOLD YOU BACK

National Geographic: A partnership for science education

NanoRacks: Support of projects enabled installation of their External Platform a year ahead of schedule

EXTERNAL PLATFORMS

NANORACKS

ENGAGING OUR YOUTH:
CASIS Education Outreach

- *Objectives*
  - *Provide educators with resources to complement current curricula*
  - *Support STEM education by leveraging space station assets/credibility*

- *Two major resources:*
  - *CASIS Education webpage: resources for educators*
  - *CASIS Academy: a website designed to engage students (middle school focus)*

The Era of ISS Utilization

CASIS

All the exposure without the high cost & infrastructure

-Provides infrastructure
-Power to approve payloads & sponsorships
-All in the context of the m exposure of space allure

An Emerging Commercial Market

ACCESS TO SPACE

EQUAL ACCESS

FUNDING SOURCES AND LOGISTICS

CASIS™

- COMMERCIAL ENTERPRISE
- SCIENTIFIC & EDUCATIONAL INSTITUTIONS
- OTHER GOVERNMENT AGENCIES


CASIS™

THANK YOU. QUESTIONS?

@iss_casis iss-casis.org