

National Aeronautics & Space Administration  
Johnson Space Center



# Space and Life Sciences Directorate Overview

Presented by  
Dave R. Williams, M.D.  
Director, Space and Life Sciences

# The Big Picture



**The mission of the Johnson Space Center is**  
*the expansion of a human presence in space*  
*through exploration and utilization for the*  
*benefit of all:*

- **Lead Center for the Human Exploration and Development of Space Enterprise in**
  - ✓ Space Medicine
  - ✓ Space Biomedical Research and Countermeasures
  - ✓ Advanced Human Support Technology
- **Lead in Astromaterials**
  - ✓ Galactic and solar wind
  - ✓ Interplanetary dust
  - ✓ Materials from comets, asteroids and other planetary bodies

# SLSD Personnel



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		Civil Servants	Contractors
SA	Directorate Office	18	0
SD	Medical Sciences Division	53	452
SF	Flight Projects Division	54	300
SL	Program Integration Office	13	41
SN	Earth Science & Solar System Exploration Division	44	108
<b>Total</b>		<b>182</b>	<b>901</b>

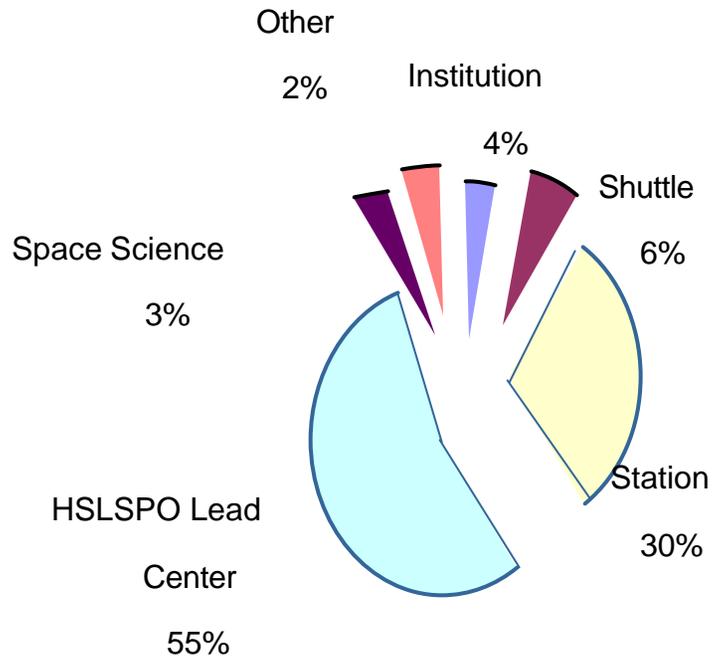
As of 3/00

# SLSD Budgets

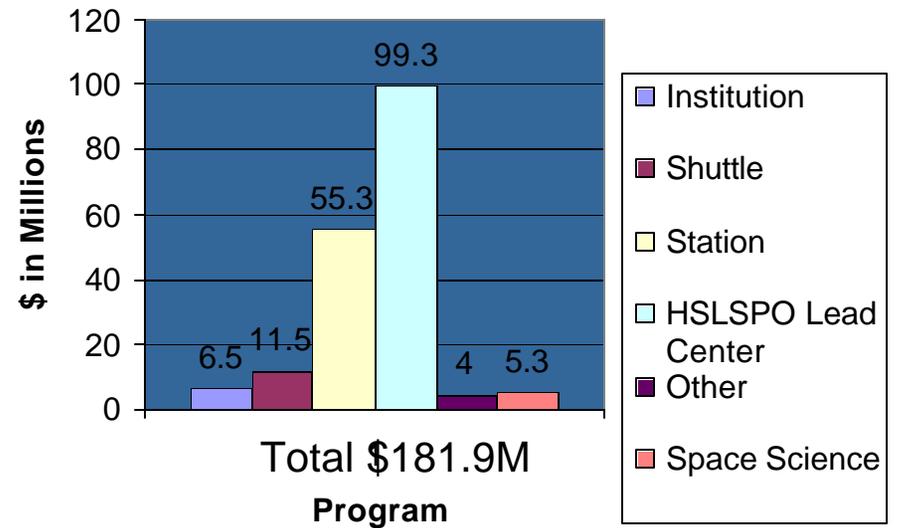


SLSD

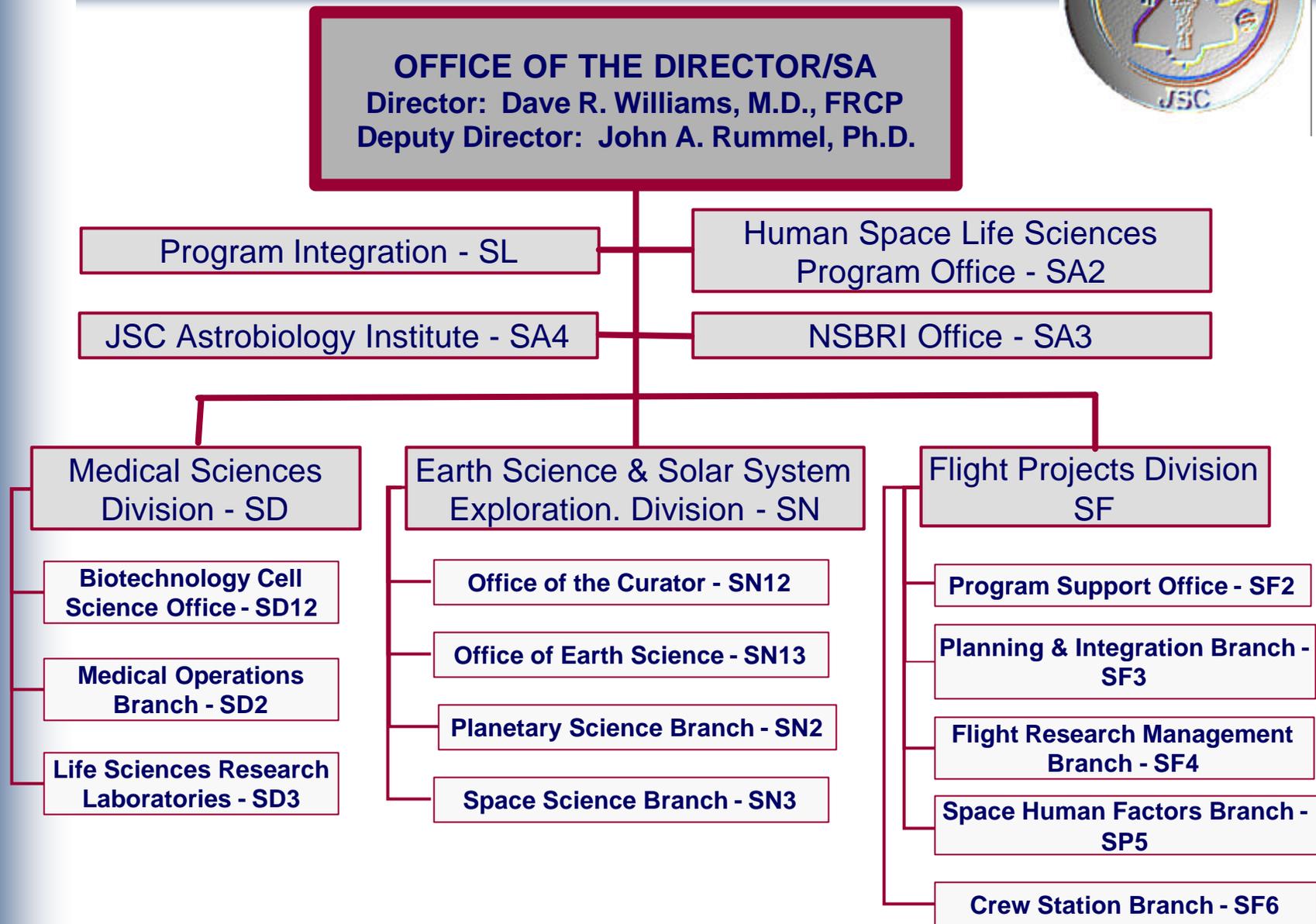
SLSD FY2000 Budget by Program



SLSD FY 2000 Budget by Program \$



# The Organization



# Facilities & Labs

## Medical Sciences Division

- ✓ Cardiovascular Lab
- ✓ Clinical Operations Lab
- ✓ Muscle Research Lab
- ✓ Bone Lab
- ✓ Exercise Physiology Lab
- ✓ Microbiology Lab
- ✓ Cellular Molecular Lab
- ✓ Environmental Physiology Lab
- ✓ Neuroscience Labs
- ✓ Nutritional Biochemistry Lab
- ✓ Water Lab
- ✓ Pharmacology Lab
- ✓ Radiation Biophysics Lab
- ✓ Toxicology Lab
- ✓ Human Test Subject Facility

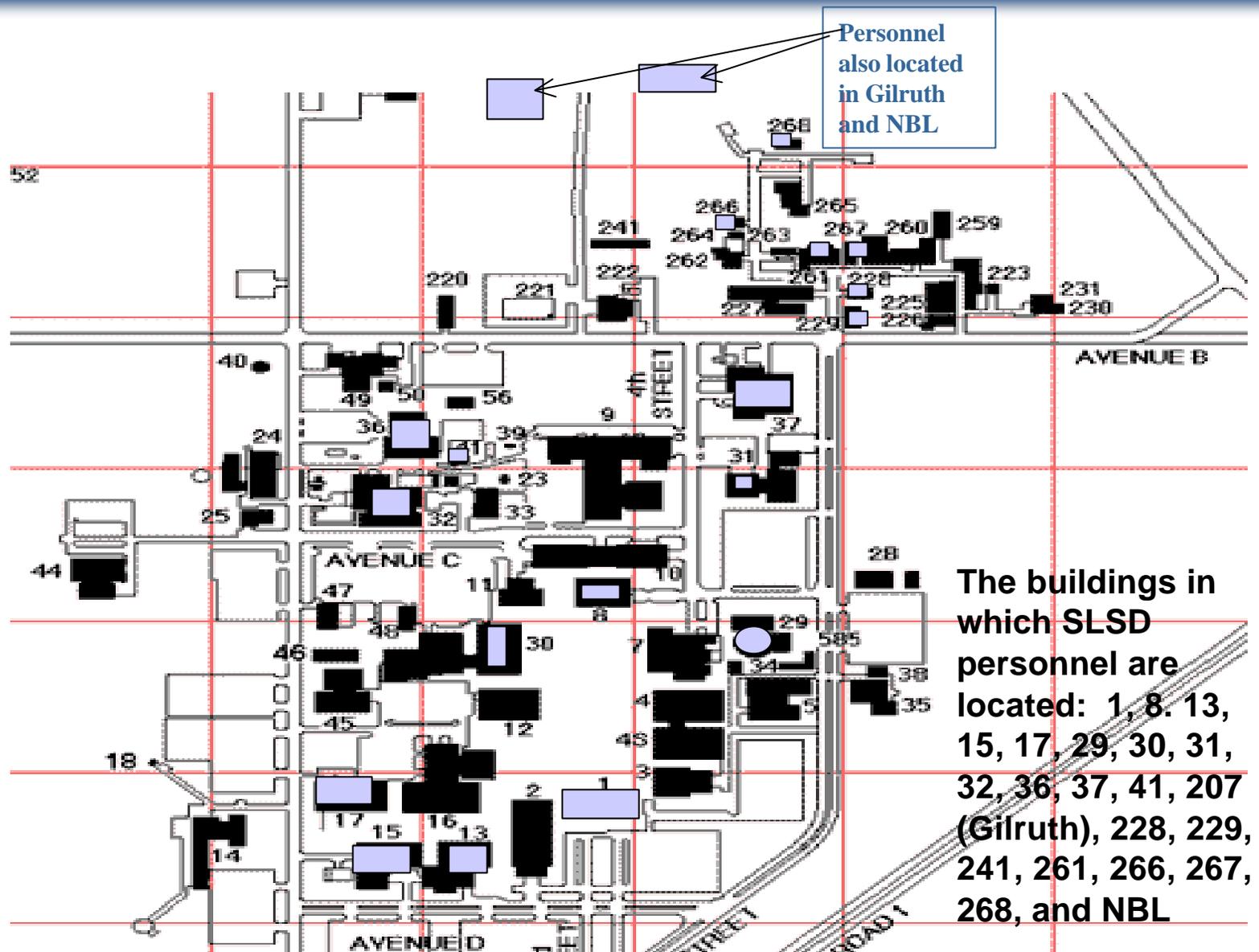
## Flight Crew Support Division

- ✓ Human Factors Labs
- ✓ Food Lab

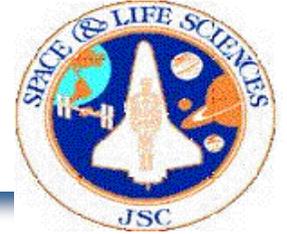
## Earth Science/Solar Explor Division

- ✓ Astromaterials Lab
- ✓ Earth Sciences Lab
- ✓ Photo Analysis Lab
- ✓ Orbital Debris Lab
- ✓ Radiation Lab

# JSC Site Map



# The Challenge



- ✓ **NASA management challenged JSC/Space and Life Sciences Directorate to develop a new paradigm for NASA human life sciences**
  - **A new thrust - Bioastronautics - has been formulated**
  - **Led to a budget augmentation request from NASA**
  
- ✓ **Expanded extramural community participation through the National Space Biomedical Research Institute (NSBRI) is an important component of this overall concept**
  
- ✓ **We have initiated the detailed planning and implementation of Bioastronautics within NASA**

# National Space Biomedical Research Institute



**Mission:** Combine the basic research capabilities of the nation's leading biomedical research laboratories with the operational & applied research of NASA to understand & remove the impediments to safe & effective human exploration & development of space

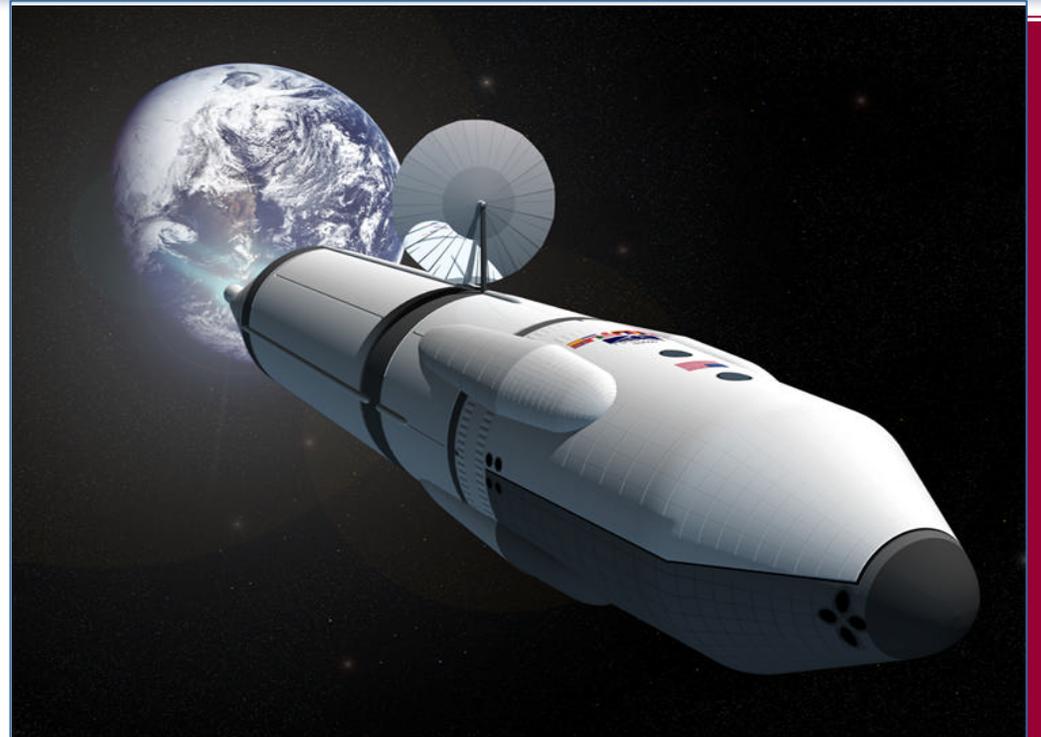
- ✓ design, implement & validate effective countermeasures
- ✓ define molecular, cellular, and organ-level responses to foster development of countermeasures
- ✓ establish biomedical support technologies
- ✓ transfer and disseminate biomedical advances in knowledge & technology
- ✓ ensure open involvement by the scientific community, industry, and the public

## Consortium Institutions

- Baylor College of Medicine (NSBRI Headquarters)
- Harvard Medical School
- The Johns Hopkins University School of Medicine
- Massachusetts Institute of Technology
- Morehouse School of Medicine
- Rice University
- Texas A&M University
- Brookhaven National Laboratory
- Mount Sinai School of Medicine
- University of Arkansas for Medical Sciences
- University of Pennsylvania Health System
- University of Washington

# The Response . . . Bioastronautics

- ✓ ***An integrated approach to ensure healthy and safe human space travel while assisting in the solution of Earth-based problems***



Bioastronautics

# Bioastronautics Defined

- ✓ Builds upon previous and ongoing work
  - A significant amount of fundamental knowledge has been created during previous ground and flight biomedical research
  - It is now appropriate to apply this knowledge base to applications and solutions which will provide safer human operations in space
- ✓ New research resources are coming on line
  - ISS research opportunities
  - Ground analogs
- ✓ Leverage new and unique capabilities
  - NSBRI is established and is capable of fulfilling NASA's original vision for science institutes
  - Leverage the scientific community, focus on NASA issues, transfer knowledge to Earth based problems
  - Cooperation with other Federal Agencies
  - New Technologies - smart medical systems, biologically-inspired technologies

# Increase in Resources

- ✓ **Base Program**
  - Additional \$4M applied to NSBRI in FY00
  - Additional \$6M applied to NSBRI in FY01 (\$20M total)
  
- ✓ **Augmentation**
  - Additional increase in NSBRI activities and manpower
  - Support overall Bioastronautics activities
  - Support complementary work at other NASA centers
  
- ✓ **Re-alignment of civil servant skill mix**
  - Identification of critical hires to maintain and adequately support flight safety readiness responsibilities and to maintain “smart buyer” responsibilities

# Bioastronautics Laboratory

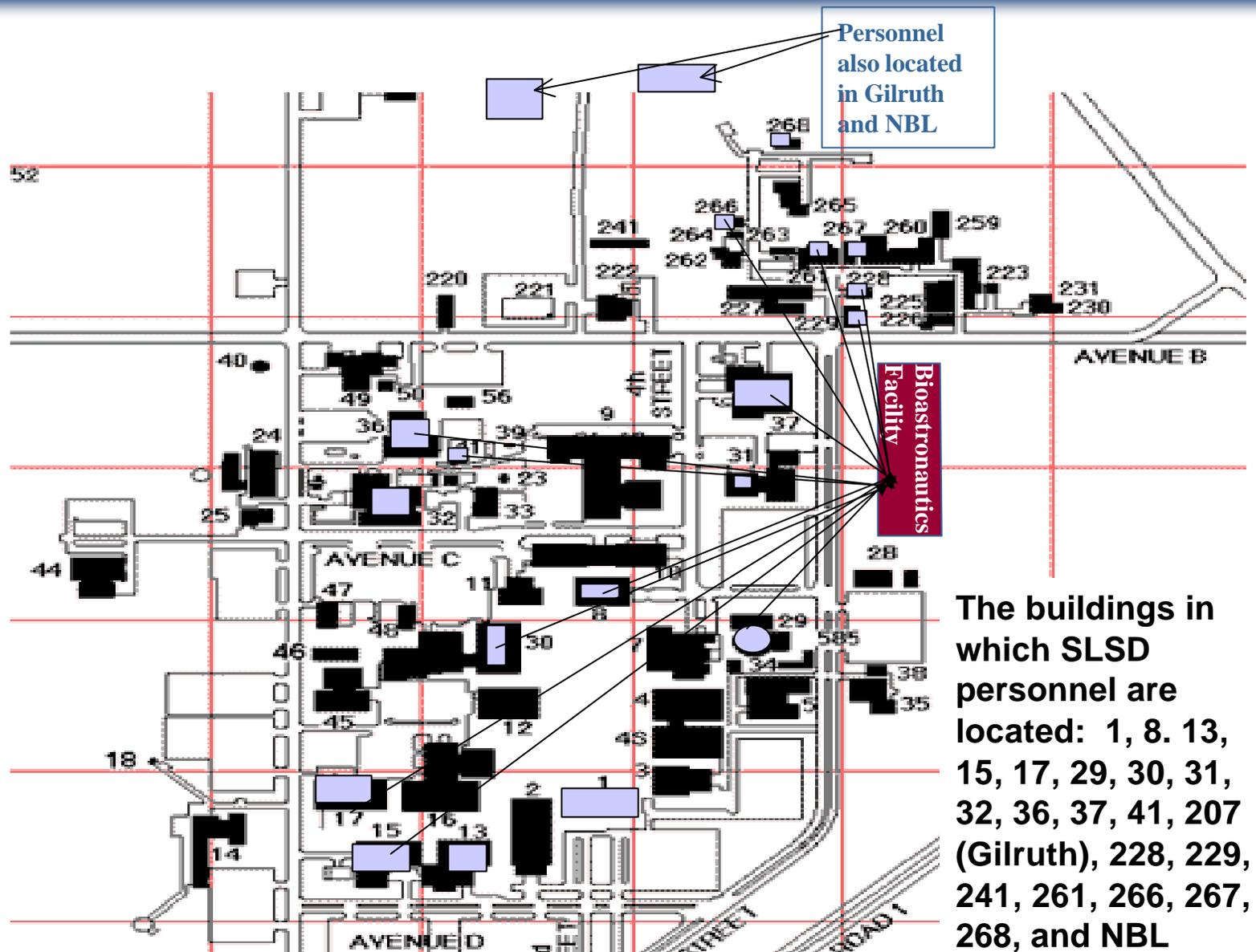
**Single, integrated facility that supports the human elements of space flight**

- ✓ Space medicine
- ✓ Biomedical research laboratories/baseline data
- ✓ Ground/flight research and operations integration
- ✓ Human factors/bioengineering
- ✓ Baseline data collection
- ✓ Astronaut medical training
- ✓ Advanced medical care systems/informatics research
- ✓ Re-habilitation, isolation, autonomous health care
- ✓ Education and outreach

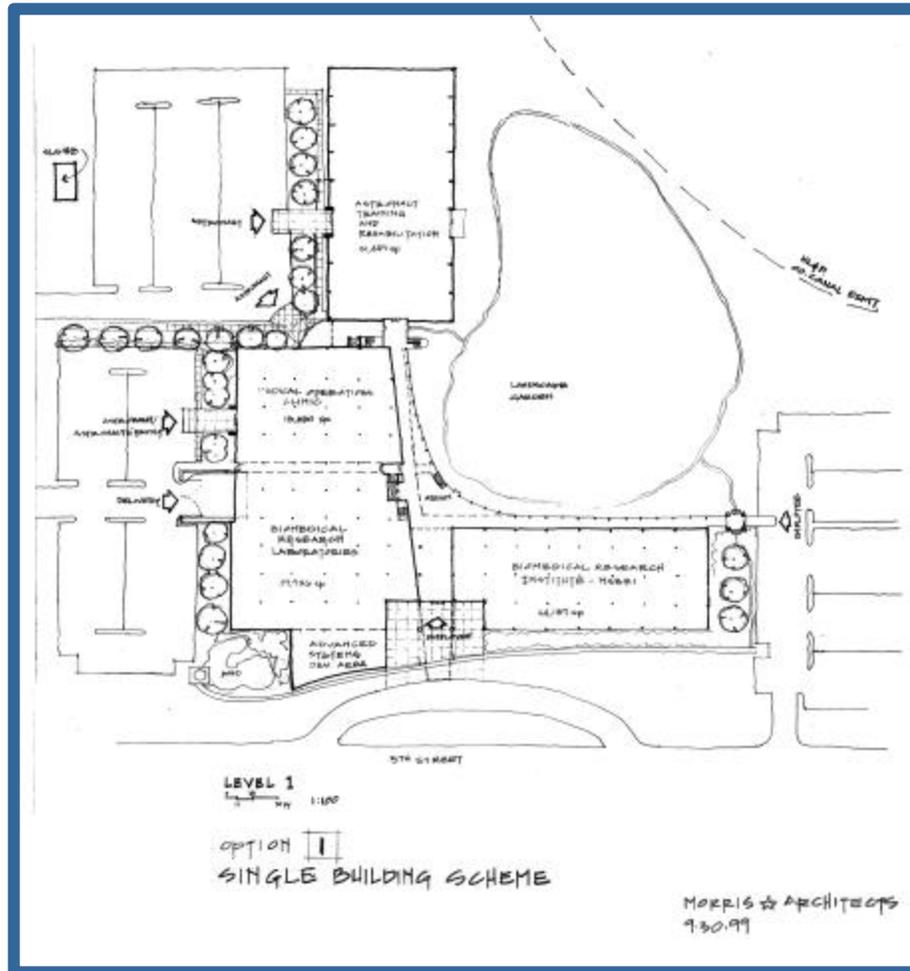
**Fifth Street Elevation Option 1**



# JSC Site Map



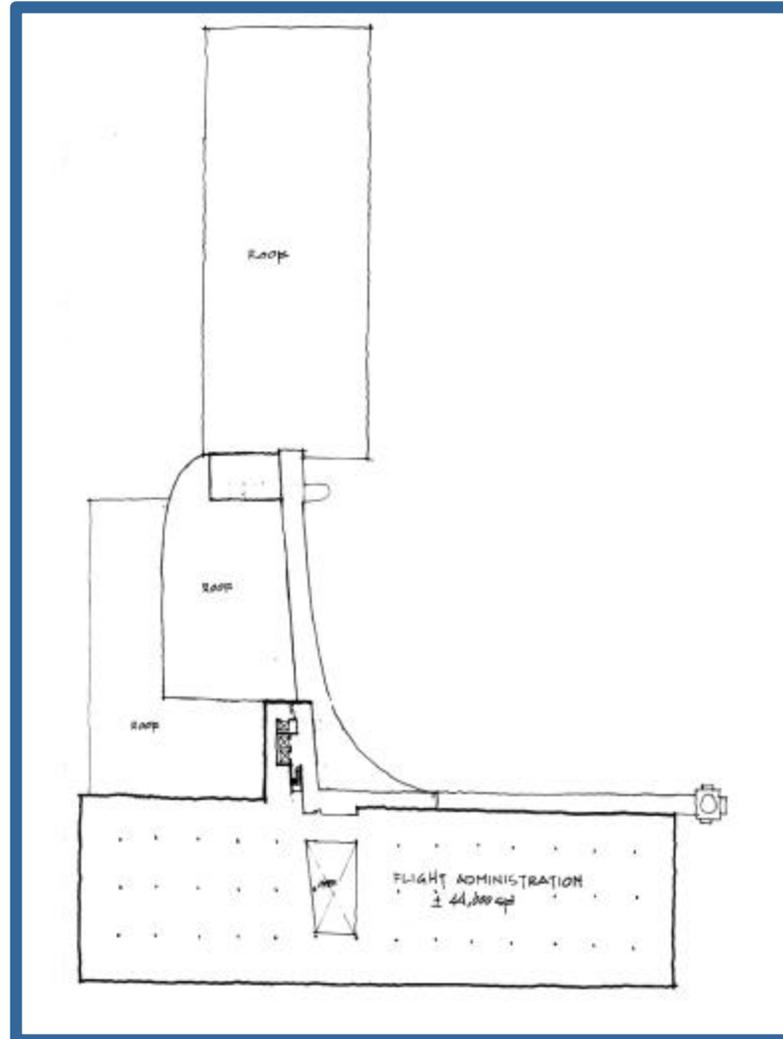
# Bioastronautics Laboratory



**Ground floor**



# Bioastronautics Laboratory



**Third floor**

# Facility - Status

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- ✓ **Initial requirements developed in order to do a preliminary feasibility/cost study**
- ✓ **15% design nearing completion, final design in FY00**
- ✓ **Responding to A. Nicogossian/J. Rothenberg letter to develop benefit/cost analysis**

# Conclusion

## S L S D

*Bioastronautics provides an integrated approach with measurable deliverables leading to safer and more productive human space operations, with benefits for the health and well-being of people on Earth.*

- Capitalizes on NASA's infrastructure base
- Will break through the medical and technological barriers to safe, productive, & autonomous human activity beyond low-Earth orbit
- Integrates a total program leading to safe human space operations

