# Challenges of Operating a Small "Big Science" Facility

Robert L. Brown, NAIC Director

# NAIC Thumbnail Sketch

NAIC is a national research center, FFRDC, entirely funded by NSF, 80% AST, 20% ATM.

- Research facilities for upper atmospheric research (430 MHz transmitter and optical LIDAR), and for radio astronomy (passive reception and a planetary radar)
- 120 employees (90 AST; 20 ATM; 10 Self Supported at the Angel Ramos Foundation Visitor Center on the Arecibo Observatory site).
- Managed under cooperative agreement by Cornell University

# Challenges of Operating a Small "Big Science" Facility

1. Building the Community of Users
2. Maintaining a Technological Edge
3. Managing Risk in a Declining Funding Environment
4. Coping with Single-Point Failure Situations

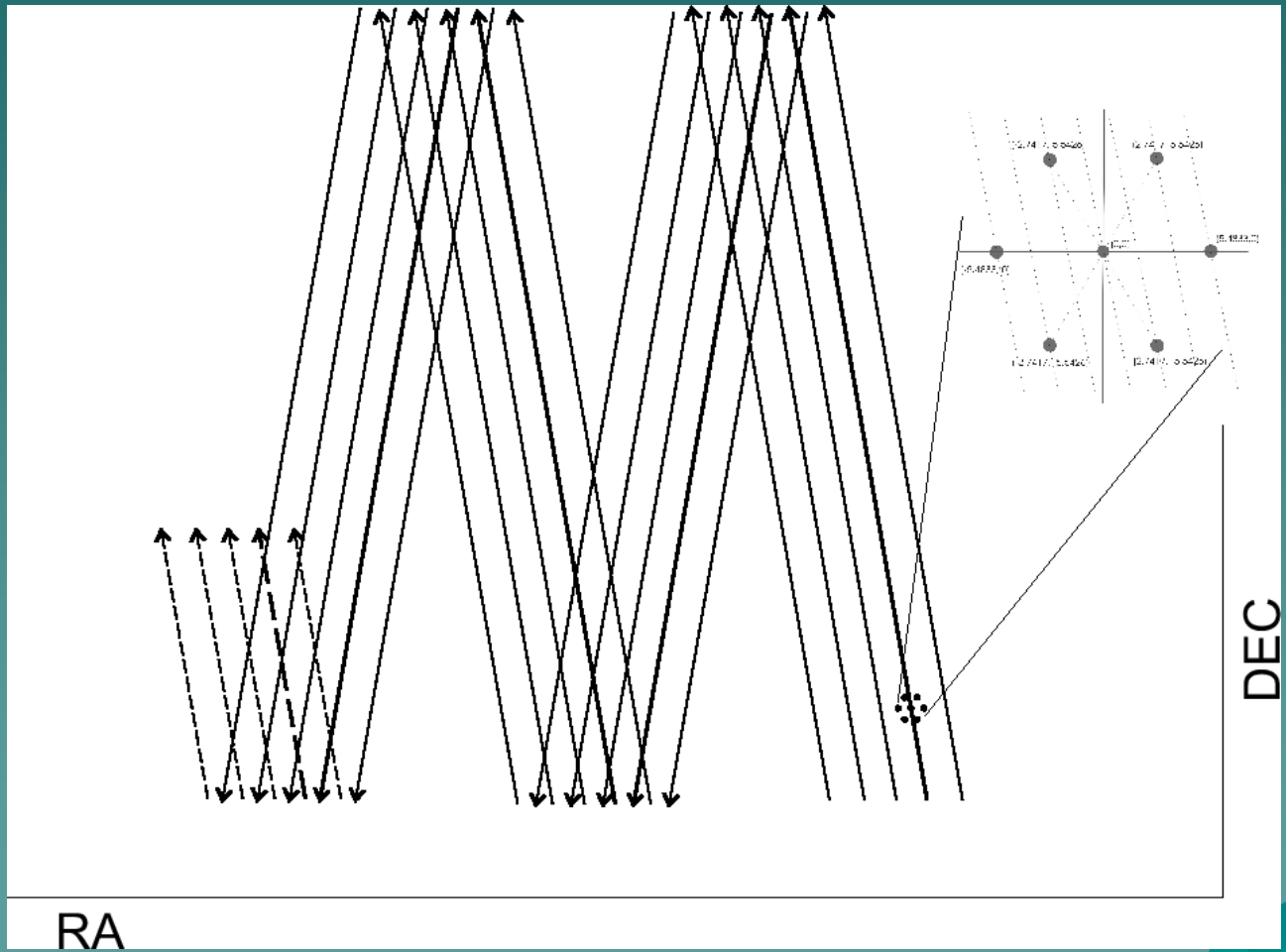
# Building the Community of Users
# → New Research Capabilities <u>and</u> Leadership

# ALFA: Arecibo L-Band Feed Array

# ALFA: Arecibo L-Band Feed Array

# ALFA: Arecibo L-Band Feed Array

# ALFA Enables Large-Area Sky Surveys



# NAIC Organized the Three ALFA Legacy Survey Consortia

1. Pulsar Survey
2. Survey of Neutral Atomic Hydrogen in the Galaxy
3. “Blind” Survey of Hydrogen in Objects Beyond the Milky Way

# NAIC Organization of the ALFA Legacy Survey Consortia: Guidelines

## NAIC Responsibilities:

- Schedule the required telescope time
- Maintain/operate the required instruments
- Permanently archive data products w/VAO
- Oversee the work of the consortia

## Consortia Responsibilities:

- Build a team of researchers and students
- Plan and execute the observing program
- Produce survey data products of value to the research community in a timely way
- Insure data quality

# Astronomical Research Sociology 2008

## THE ASTROPHYSICAL JOURNAL May 10, 2007

- CONSTRAINTS ON REIONIZATION AND SOURCE PROPERTIES FROM THE ABSORPTION SPECTRA OF $z > 6.2$ QUASARS *@Andrei Mesinger & Zoltan Haiman*
- *THE KINETIC SUNYAEV-ZEVDOVICH EFFECT FROM RADIATIVE TRANSFER SIMULATIONS OF PATCHY REIONIZATION @Ilian T Iliev, Ue-Li Pen, J Richard Bond, Garrelt Mellema, & Paul R. Shapiro*
- *DISTRIBUTION OF DAMPED Lya ABSORBERS IN A II. COLD DARK MATTER UNIVERSE @ Kentaro Nagamine, Arthur M. Wolfe, Lars Hernquist, & Volker Springel*
- *CLEANED 3 YEAR WILKINSON MICROWAVE ANISTROPY PROBE COSMIC MICROWAVE BACKGROUND MAP: MAGNITUDE OF THE QUADRUPOLE AND ALIGNMENT OF LARGE-SCALE MODES @Chan-Gyung Park, Changbom ~ar~ & .f: ~~chard Gott III*
- *IMPLICATIONS OF THE COSMIC BACKGROUND IMAGER POLARIZATION DATA @J L. Sievers, C. Achermann, J R. Bond, L. Bronfman, R. Bustos: C. R. Contaldi, C. Dickinson, P. G. Ferreira,M. E. Jones, A. M. Lewis, B. S. Mason, J May, S. T. Myers, N. Oyarce, S. Padin, T J Pearson,M. Pospieszal!f.ki, A. C. S. Readhead, R. Reeves, A. C. Taylor, & S. Torres*
- *ON THE CONTRIBUTION OF ACTIVE GALACTIC NUCLEI TO THE COSMIC BACKGROUND RADIATION D. R. Ballantyne & c. PapovicH*

# Astronomical Research Sociology 1998

## THE ASTROPHYSICAL JOURNAL April 10, 1998

1. SEARCH FOR INTRASUPERCLUSTER GAS IN THE SHAPLEY SUPERCLUSTER S. M. *Molnar* & M. *Birkinshaw*
2. SCREENING OF GRAVITATIONAL INTERACTIONS AND ITS ASTROPHYSICAL MANIFESTATIONS *Andrei* G. *Bashkirov* & *Andrei V. Vityazev*
3. A NEW METHOD FOR CALCULATING COUNTS IN CELLS *Istvan Szapudi*
4. SEARCHING FOR THE EARLIEST GALAXIES USING THE GUNN-PETERSON TROUGH AND THE Lycx EMISSION LINE*Jordi Mira/da-Escude* & *Martin J. Rees*
5. TRANSITION FROM CLUMPY TO SMOOTH ANGULAR DIAMETER DISTANCES *Eric V. Linder*
6. CLUSTER-GALAXY CORRELA'fIONS-rN COLD DARK MATTER MODELS *Manuel* E. *Merchizn, Mario* G. *Abtldi, Diego* G. *Lambas,* & *Car/os Va/otto*

# Astronomical Research Sociology 1988

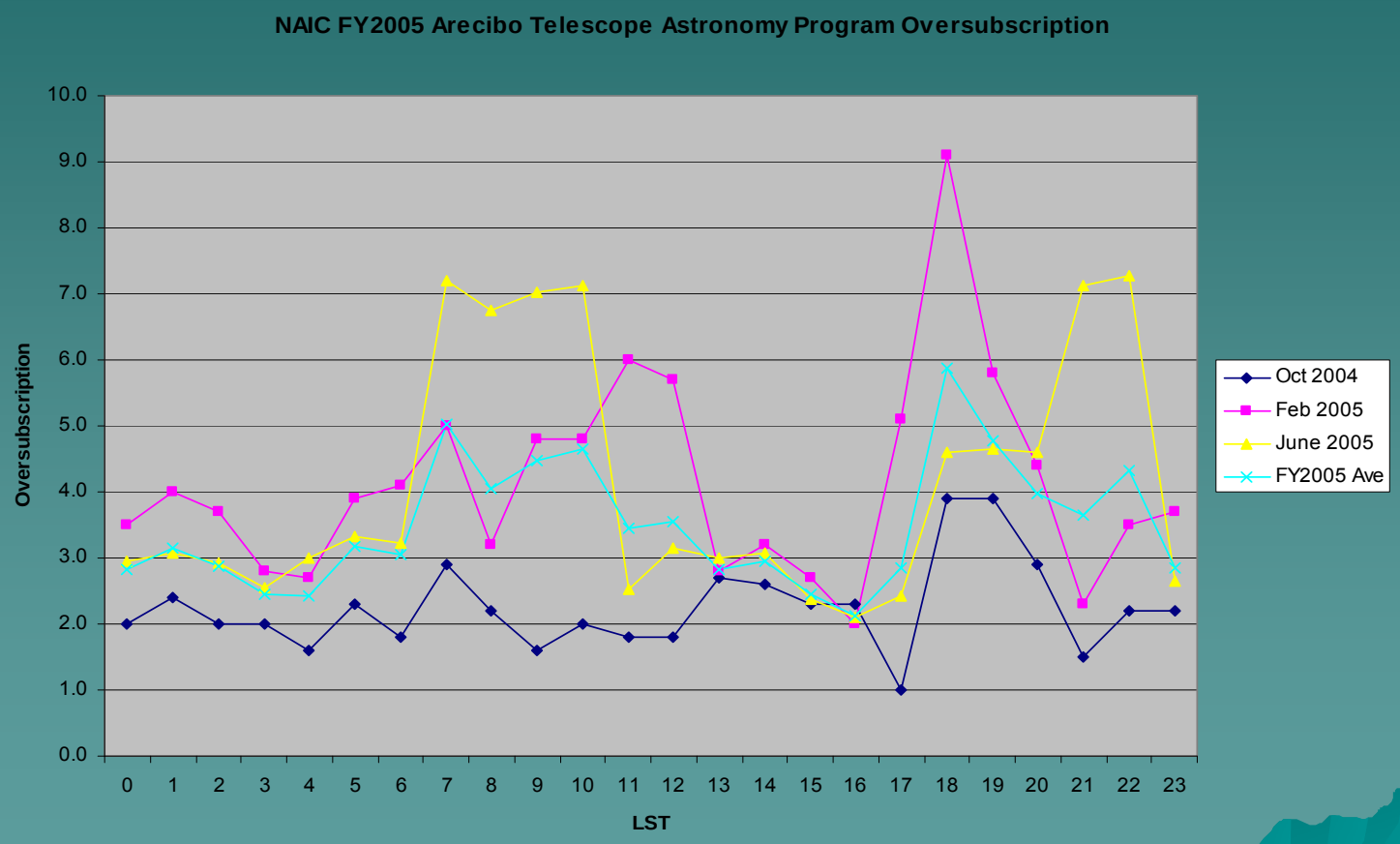
**THE ASTROPHYSICAL JOURNAL April 1, 1988**

1. SUBCLUSTERING IN RICH CLUSTERS OF GALAXIES AND THEIR ENVIRONS *Michael1. West, Augustus Oemler, Jr., and Avishai Dekel*
2. LARGE-SCALE STRUCTURE OF THE UNIVERSE: CONSTRAINTS FROM THE X-RAY BACKGROUND *A. Meszaros and P. Meszaros*
3. *AN EXPLOSIVE ORIGIN OF BUBBLES IN THE DISTRIBUTION OF GALAXIES? G. F. R. Ellis and A. P. Fairall*
4. CONSERVATION LAWS AND RADIATION IN THE SCALE COVARIANT THEORY OF GRAVITATION. . . . . *A. Beesham*
5. *KINEMATICAL QUANTITIES IN THE SCALE COVARIANT THEORY OF GRAVITATION. . . . . .. A. Beesham*
6. *PLANE, RELATIVISTIC, OBLIQUE SHOCK FRONTS R. N. Henriksen and Catherine F. Westbury*
7. *FLAT-SPECTRUM, VARIABLE RADIO SOURCES . . . . . S. L. O'Dell*

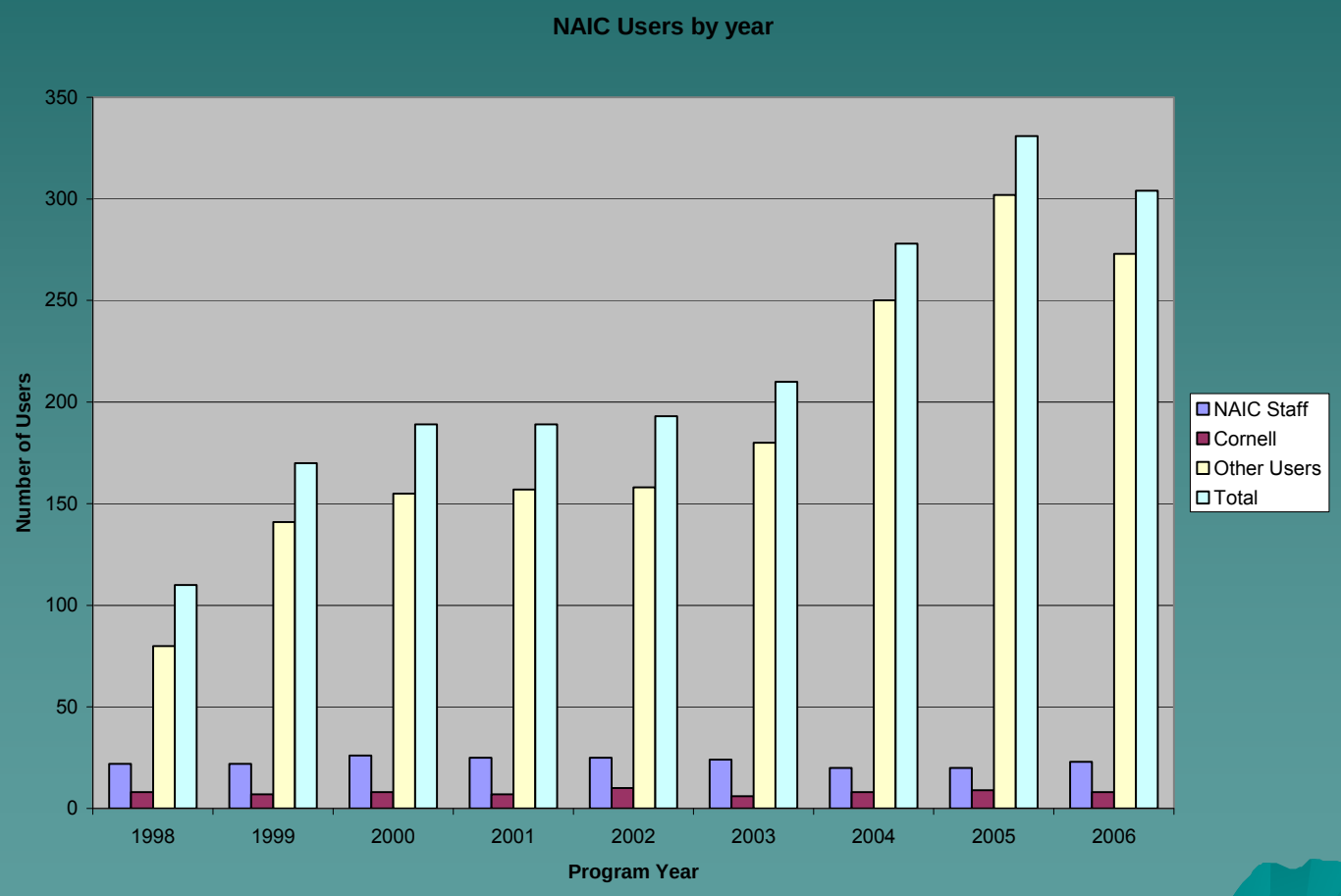
# NAIC Organization of the ALFA Legacy Survey Consortia: Members

1. Pulsar Survey (48)
2. Survey of Neutral Atomic Hydrogen in the Galaxy (~72)
3. "Blind" Survey of Hydrogen in Objects Beyond the Milky Way (>100)

# Telescope Oversubscription at the NAIC Arecibo Observatory (observing hours requested/hours available) is greater than that for any other telescope supported by NSF



# The Number of Scientific Users of the NAIC Arecibo Observatory has Nearly Doubled in 4-Years.

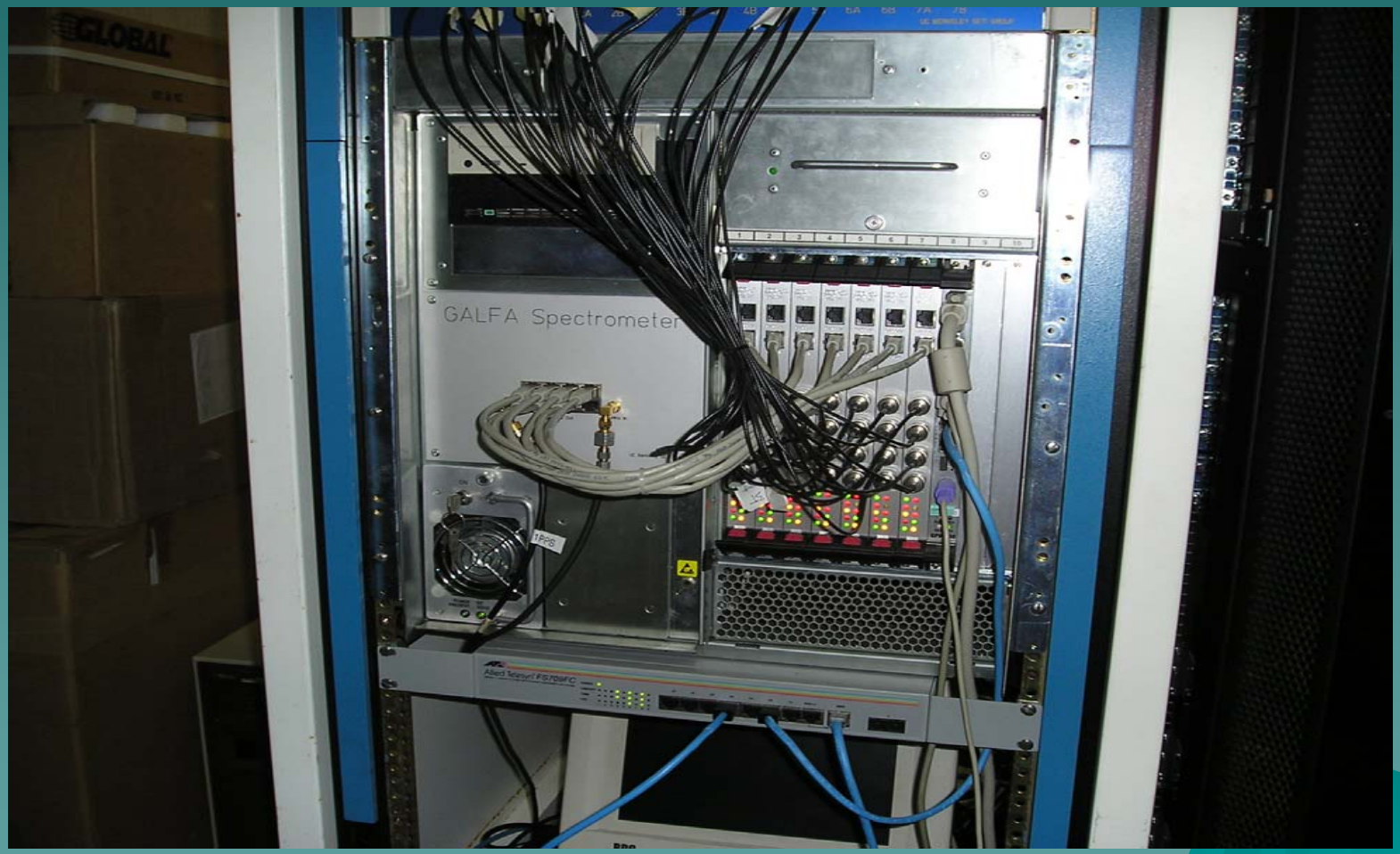


# Challenges of Operating a Small "Big Science" Facility

1. Building the Community of Users
2. Maintaining a Technological Edge
3. Managing Risk in a Declining Funding Environment
4. Coping with Single-Point Failure Situations

# 2. Maintaining a Technological Edge

# Instrumental Innovations Through Partnerships→ "Contracts for Creativity"



# Instrumental Innovations Through Partnerships→ "Contracts for Creativity"

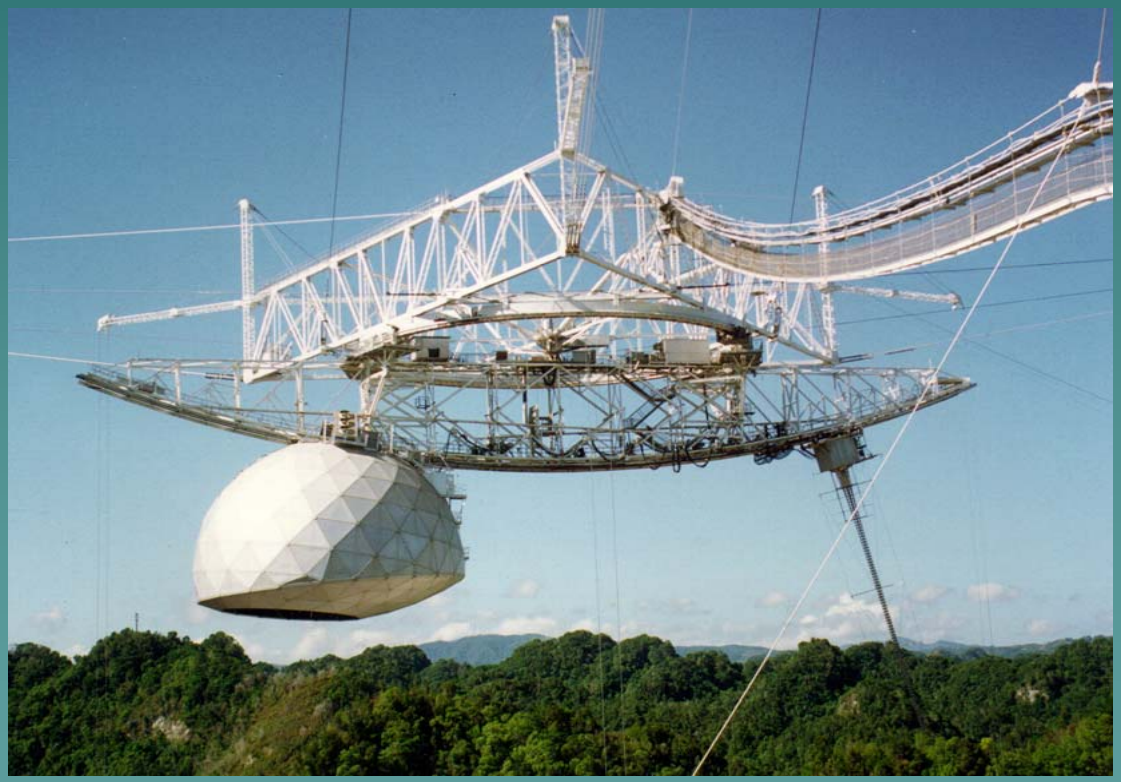
# Instrumental Innovations to Cope with the Oversubscription→ Commensal Observing

# Challenges of Operating a Small "Big Science" Facility

1. Building the Community of Users
2. Maintaining a Technological Edge
3. Managing Risk in a Declining Funding Environment
4. Coping with Single-Point Failure Situations

# 3. Managing Risk in a Declining Funding Environment

Example: Arecibo Telescope Platform Painting Project



# Telescope Platform Painting Risk Areas

- Removal of the corrosion (adequate “cleaning”)
- Likelihood that the existing primer on the steel was lead based
- Adequate adhesion of the new coating (relates to the “profile” of the cleaned steel) in a tropical environment
- Safety of the workers and the Observatory staff while the project was in progress
- Compliance with local EQB (EPA) regulations regarding lead contamination
- Engaging a competent painting contractor at an affordable cost

# Managing the Risk of the Platform Painting Project

- Contracted for the services of a painting consultant to draft the technical specifications of the job [David Leyland of KTA-Tator, Pittsburgh]
- Leyland thoroughly analyzed the chemical composition of the existing surface pointing out both the areas of lead-based primers and highlighting the ubiquitous millscale on the structure.
- Leyland stubbornly insisted on abrasive blast cleaning and encouraged the use of a new coating product, polysiloxine for our tropical conditions.
- Leyland wrote the first draft tech specs, assisted in the selection of the contractor, and constructively criticized the contractors containment and safety planning, and provided project technical oversight throughout the project.

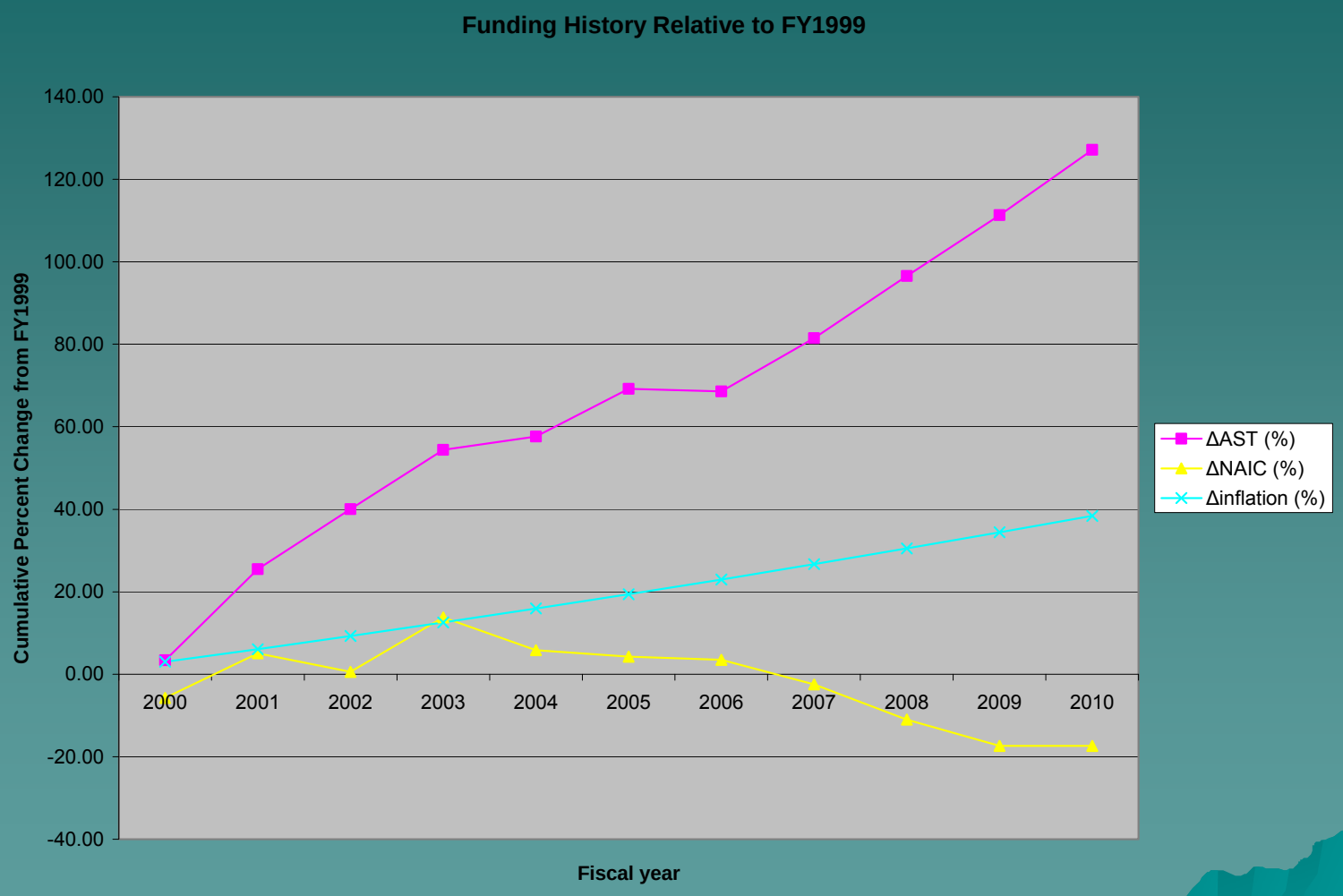
# Platform Painting Result

# Another Platform Painting Result

# Challenges of Operating a Small "Big Science" Facility

1. Building the Community of Users
2. Maintaining a Technological Edge
3. Managing Risk in a Declining Funding Environment
4. Coping with Single-Point Failure Situations

# Coping with Single Point Failure Situations



# Coping with Single Point Failure Situations

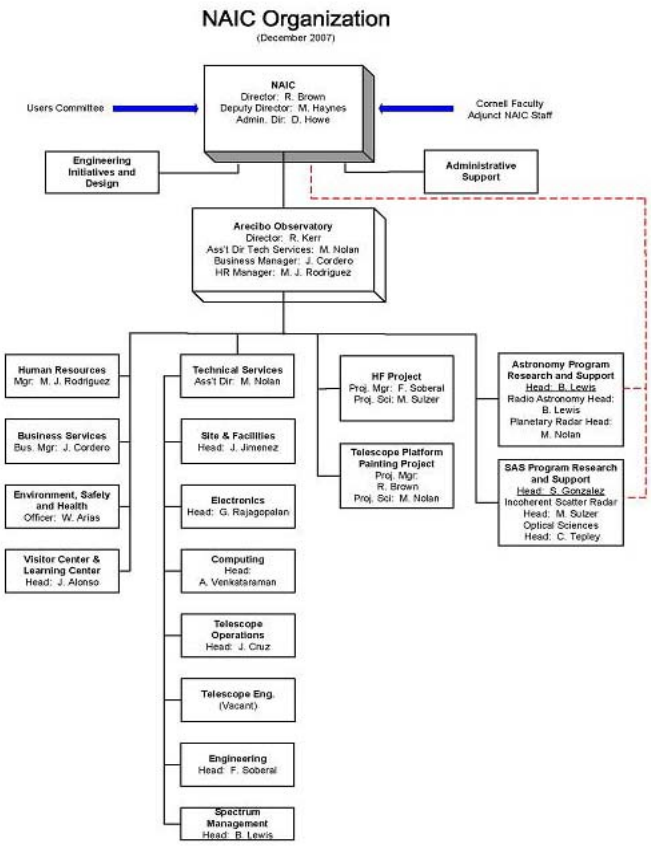
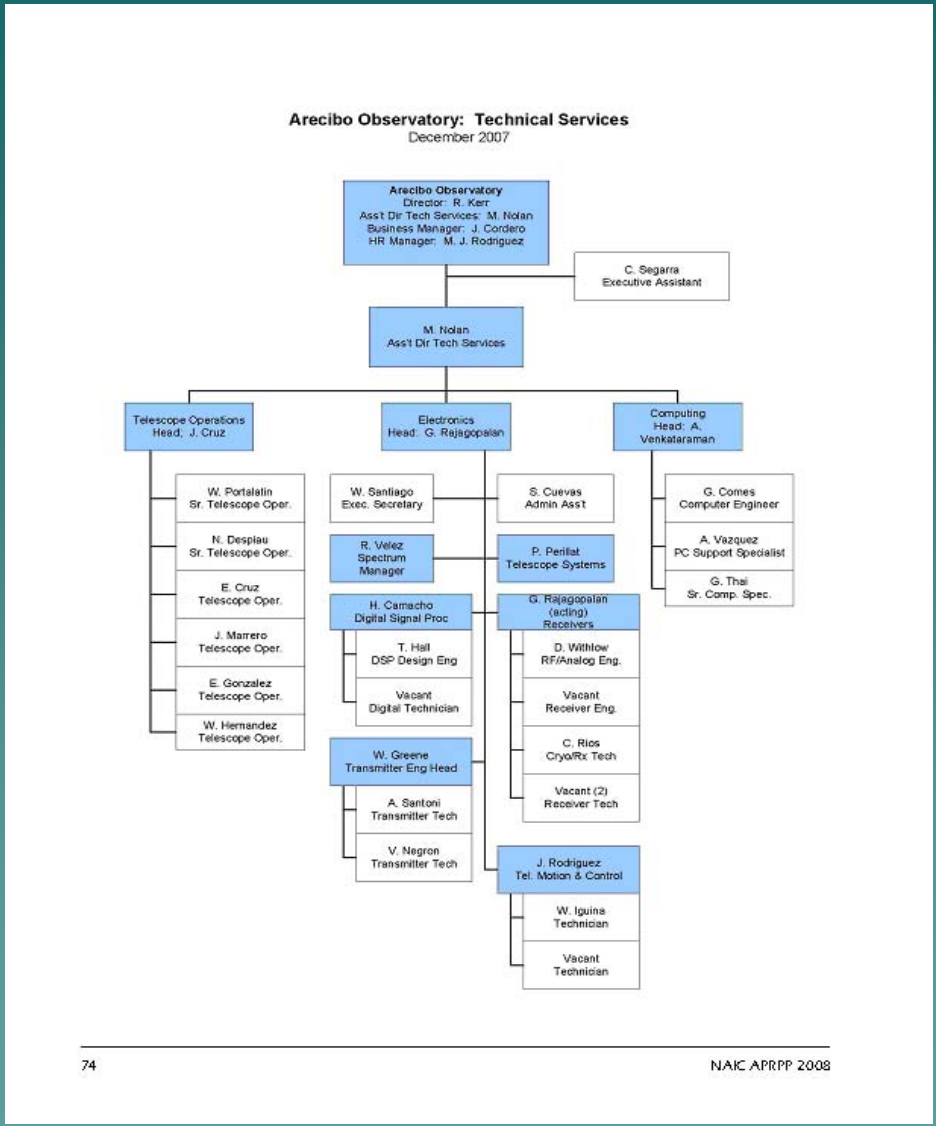



*Figure 9.1.2: NAIC/Arecibo Observatory Organizational Structure*

NAIC APRPP 2008 S9

# Coping with Single Point Failure Situations



## Coping with Single Point Failure Situations

This is a real, unsolved, management problem for NAIC

Your suggestions are greatly appreciated.

# Challenges of Operating a Small "Big Science" Facility: Lessons Learned

## "There's Always Something"

Gilda Radner as Emily Latella, *Saturday Night Live*

## "Never Mind"

R. L. Brown
NAIC

NSF Facilities Meeting 2008
Boulder, Colorado