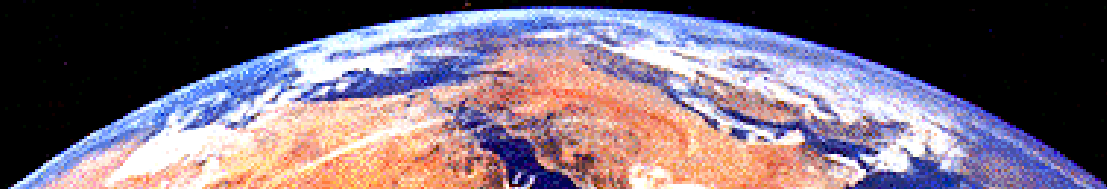


---

# Status Report On US SKA Consortium

Jill Tarter  
SETI Institute  
August 4, 2000



# 10 Member Institutions

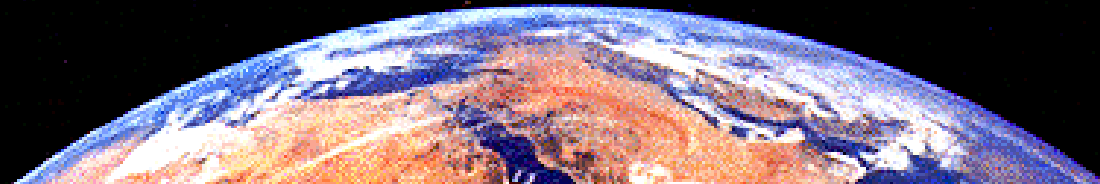
---

- MIT/ Haystack
- UC Berkeley
- SETI Institute
- Cal Tech/JPL
- Harvard CfA
- Georgia Tech
- U. Minnesota
- NRAO/AUI
- Cornell/Arecibo
- Ohio State Univ.
- At-Large Members

Chair: Jill Tarter

Vice Chair: Yervant Terzian

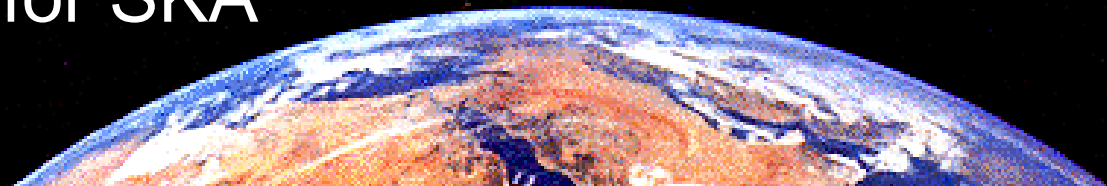
Sec/Treas: Frank Drake



# Consortium Activities 1999-2000

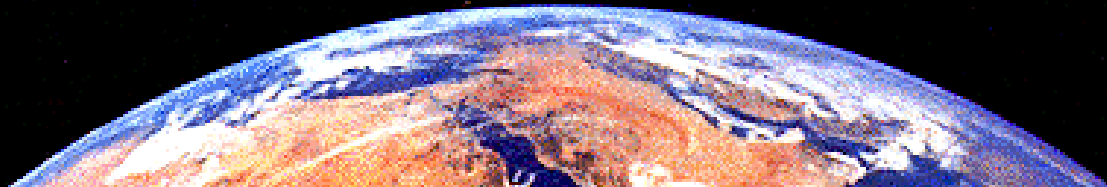
---

- Meetings
  - 2/99 - SETI Institute
  - 5/99 - MIT
  - 9/99 - O'Hare Airport
  - 3/00 - Arecibo with a US Technical Mtg
  - 9/00 - Washington DC
- Consortium members will submit individual grants, rather than block grant
- Role of Consortium is to help NSF prioritize funds for SKA



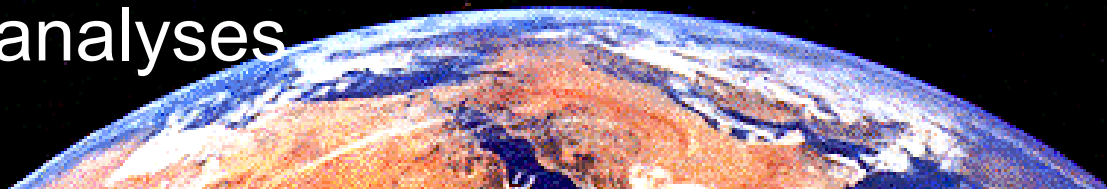
# Success With NAS/NRC Decadal Review Panel

- Establish \$20 million development fund within NSF for SKA R&D
- 5 year duration
- Proposals by individual consortium members - in addition to existing MRI, MRE, and IT proposals



# NSF SKA Fund To Support:

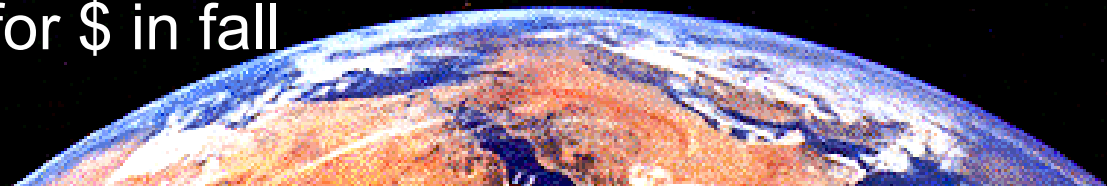
- Development of collectors
- Development of broadband front-ends
- H/W & S/W design for mega-baseline correlator
- Technology for connectivity
- Configuration analyses to match science goals
- Development of high dynamic range imaging
- New post-processing and imaging techniques for Large-N arrays
- New data mining techniques for transients
- Development of RFI excision techniques
- System analyses



# Institutional Reports: MIT

---

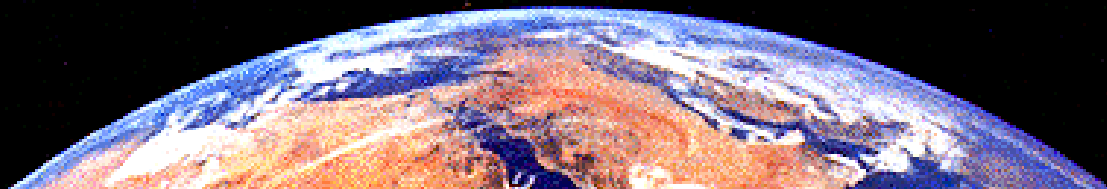
- Studies:
  - Deconvolution algorithms for high dynamic range Large-N imaging
  - Analysis of redundant data for SKA calibration
  - Large-N correlator architecture
- LOFAR as a test-bed for Large-N arrays:
  - Configuration studies
  - Participation in establishment of baseline design
  - Division of tasks among 3 participating groups
  - Preliminary design of high-frequency (120-140 MHz) extension to enable studies of epoch of reionization
  - Start of site evaluation work
- Proposal for \$ in fall



# Institutional Reports: Cornell

---

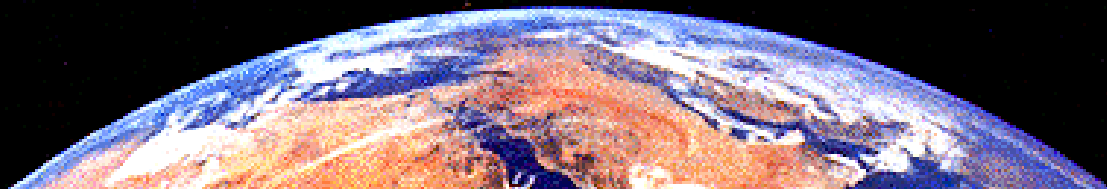
- Hosted Technical and Scientific Meeting for US SKA community at Arecibo Observatory in March 2000
- Presentation materials from meeting can be found at  
<http://www.naic.edu/~ska/usskameeting.htm>
- Dr. Bao-Yan Duan from Xidian University has begun 2-month visit at Arecibo and Cornell



# Institutional Reports: OSU

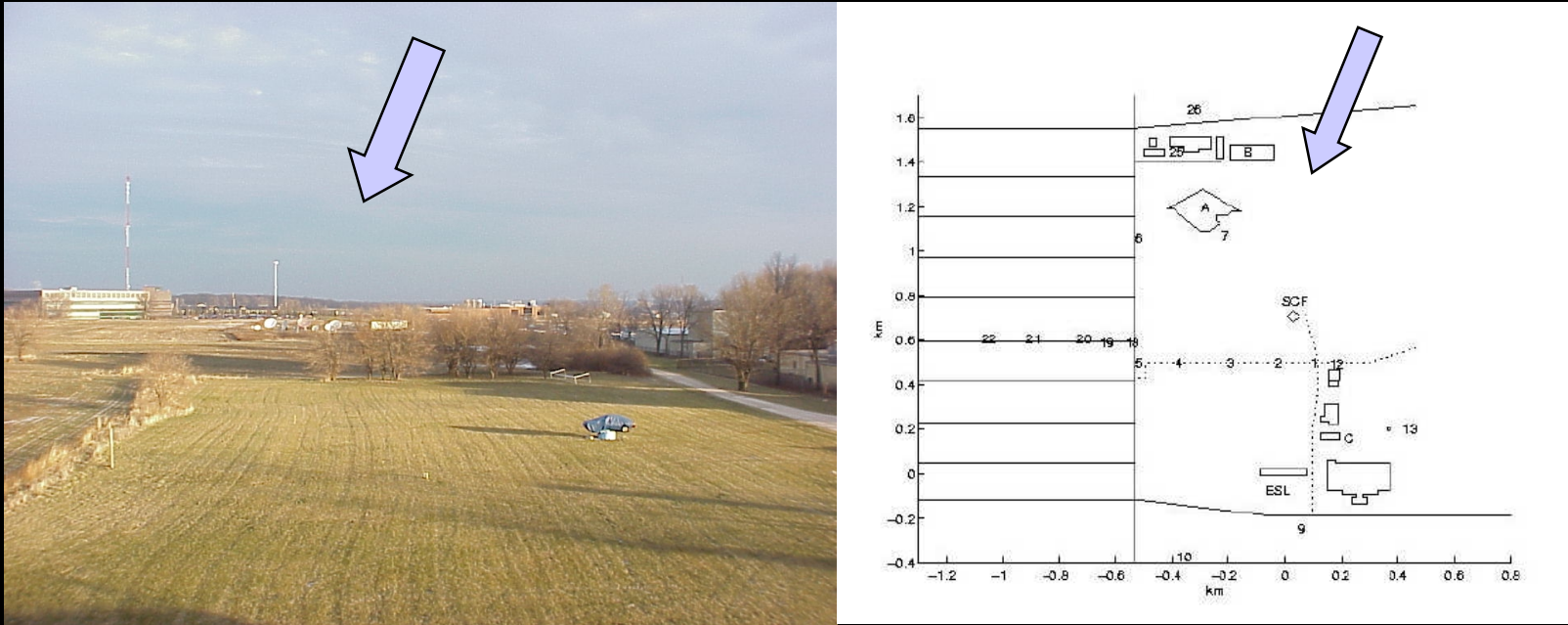
---

- Project Argus work on RFI mitigation





# Site



- Located at the Satellite Communication Facility (SCF), on OSU land in a suburb of Columbus, OH (83 °W 40 °N)
- 64 element array will fill roof of SCF
- May be possible to expand into surrounding corn field

# SCF Roof With First 8 Spirals

---



# Applicable RFI Work from ESL-Astron Collaboration

---

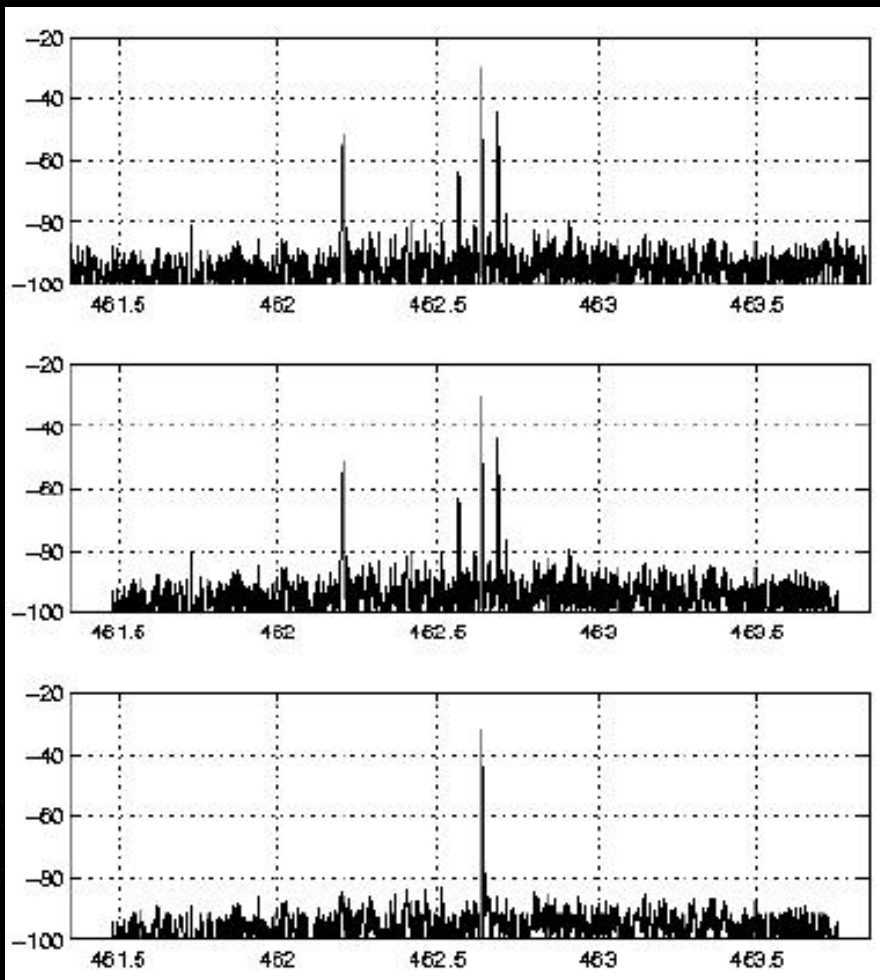
- *S.W. Ellingson and G.A. Hampson, "A Subspace-Tracking Approach to Interference Nulling for Phased Array-Based Radio Telescopes", IEEE Trans. Antennas and Propagation, Submitted November 1999.*
  - Alternative to "minimum variance" algorithm, involving decoupled interference estimation and suppression steps
  - Forces deep nulls and "editing" of suppression
  - Very low computational cost
- *S.W. Ellingson and W. Cazemier, "Efficient Multibeam Synthesis with Interference Nulling for Large Radio Telescope Arrays", IEEE Trans. Antennas and Propagation, Submitted May 2000.*
  - Method for simultaneous FFT multibeaming and interference nulling
  - Computational cost is only slightly higher than FFT alone
  - Allows flexible control over distortion of beam patterns

# Applicable RFI Work from ESL-ATNF Collaboration

---

- *S.W. Ellingson, J. Bunton, and J.F. Bell, “Cancellation of GLONASS Signals from Radio Astronomy Data”, Astronomical Telescopes and Instrumentation 2000 - Radio Telescopes, SPIE Conf. 4015, Munich, March 2000. (see also see [www.atnf.csiro.au/ska/intmit/test\\_data.html](http://www.atnf.csiro.au/ska/intmit/test_data.html))*
  - Method for removing GLONASS interference from telescope data by exploiting known properties of the modulation
  - Strictly a time domain technique; only one antenna is required
  - Negligible distortion or processing noise introduced
  - Demonstrated in OH Maser observations at the ATCA (Narrabri, NSW)
  - Probably applies to GPS as well, but has not yet been demonstrated

# UAX: Suppression of Narrowband Signals



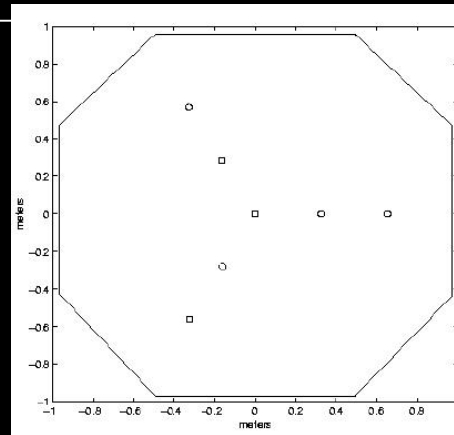
*Digital IF output*  
20 MSPS (bandpass)  
16K samples

*Filtered and decimated*  
5 MSPS (lowpass)  
4K samples

*After removing all but signal-  
of-interest using a time-domain*



# 460 MHz Radio Source Localization



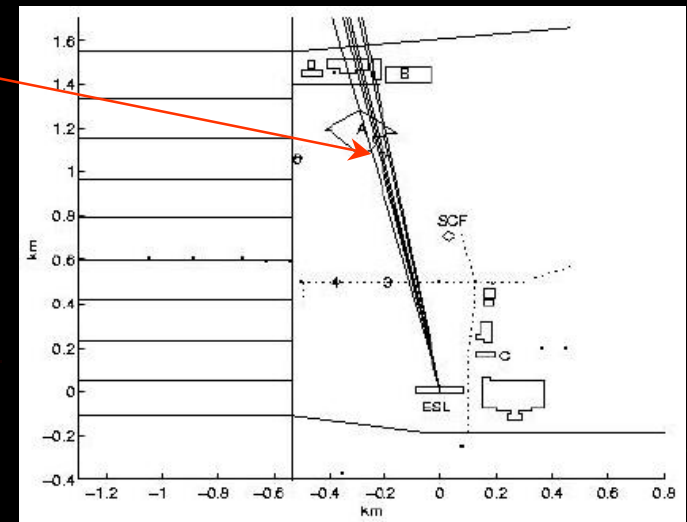
Y-shaped  
array of 7  
monopoles on  
roof of ESL

Location  
of source

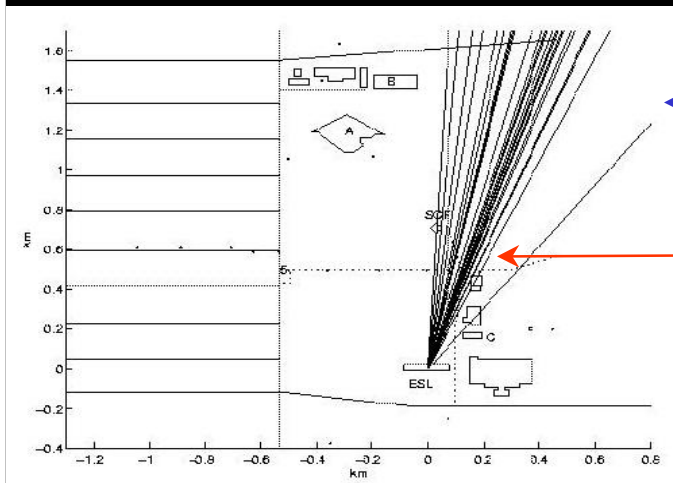
*10 dB S/N @ antenna terminals*

Lines of bearing  
estimated using  
statistically-optimum  
AOA estimation

*Each estimate obtained from about 0.5 ms sample of signal*



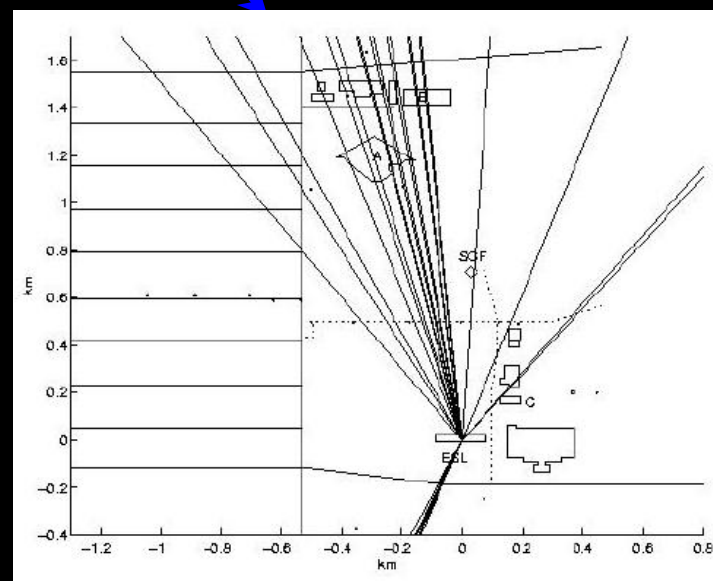
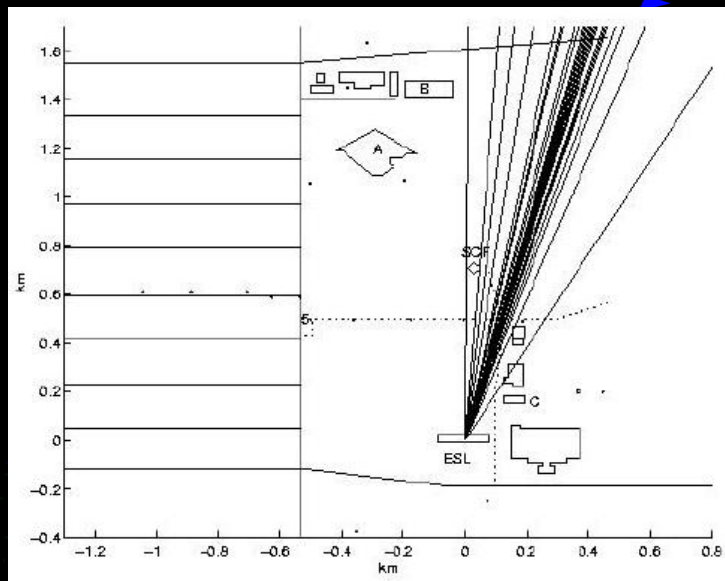
# 460 MHz: Identification of Multipath



Estimation assuming 1 path

Location of source

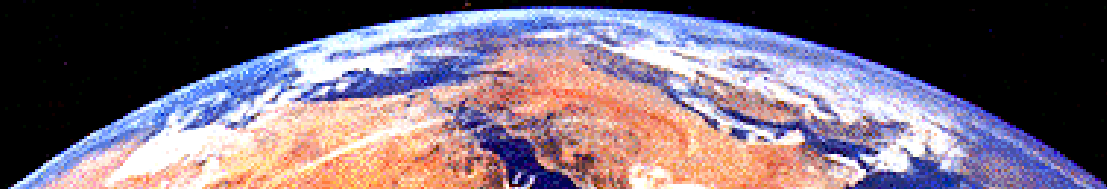
Estimation assuming 2 paths



# Institutional Reports: CfA

---

- Looking for ways to transfer software experience from SMA over to the SKA

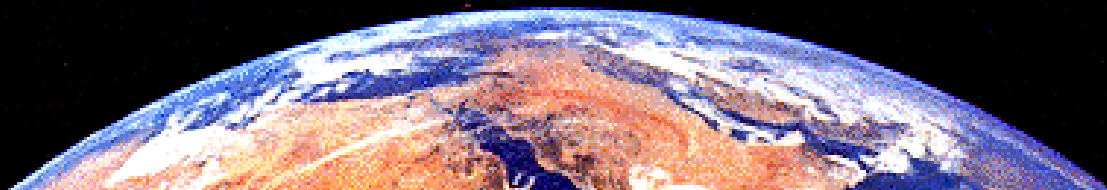




# Institutional Reports: GA Tech

---

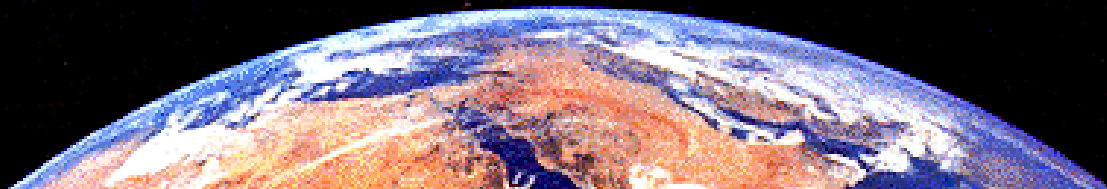
- Support of work at SETI/UCB - primarily on the RPA
- Prof. Dave DeBoer joined the SETI Institute staff
- Continued participation by GA Tech under discussion



# Institutional Reports: Cal Tech/JPL

---

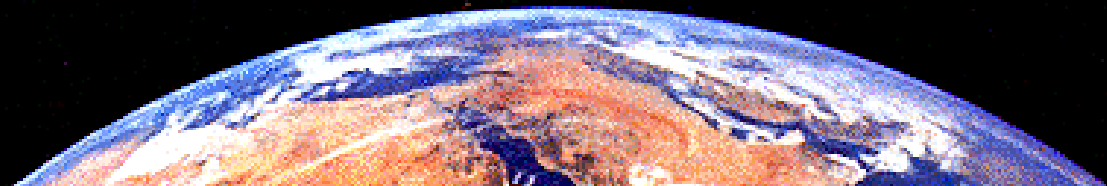
- Technical report on LNAs and large arrays by Sandy Weinreb - after lunch



# Institutional Reports: NRAO

---

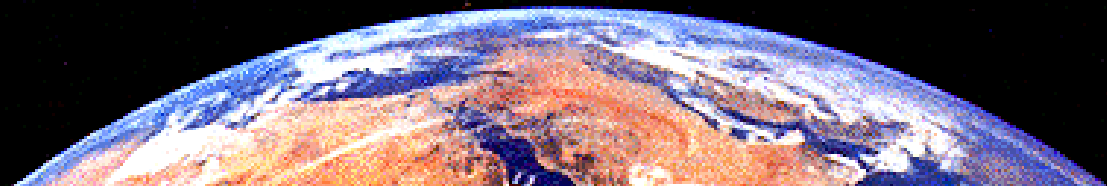
- Hosted LOFAR meeting at Green Bank in February 2000
  - possibility of VLA siting
- Organized program for International Technical and Scientific SKA meeting in Jodrell Bank --- thanks, Rick!!
- Technical Developments
  - RFI mitigation
  - Optical fiber transmission
  - Correlator design
- NSF MRI proposal on RFI mitigation was funded  
PI's: Rick fisher and Richard Bradley



# Institutional Reports: SETI/UCB

---

- Technical report by John Dreher - after lunch
- **GOOD NEWS!**



# NYTimes Science Tuesday 8/1/00

## **SETI GETS \$12 MILLION TO LISTEN FOR FAR-AWAY LIFE** by John Noble Wilford

Two gifts totaling \$12.5 million have cleared the way for the development of what is being described as the world's most powerful radio telescope designed specifically to listen for signals that may be coming from civilizations elsewhere in the galaxy.

The SETI Institute of Mountain View, Calif., a private organization conducting research to determine whether intelligent life exists beyond Earth, announced yesterday that the money would be used to begin work on a proof-of-concept version of the telescope. Under current plans, the telescope, a cluster of many 12-foot dish receivers, would be ready for full operation in 2005.

The principal gift, of \$11.5 million, came from Paul G. Allen, a Seattle investor, one of the founders of Microsoft and a philanthropist of scientific research. The project is being renamed the Allen Telescope Array.

A \$1 million donation by Dr. Nathan P. Myhrvold, former chief technology officer of Microsoft, is to be used to build an electronics laboratory for analyzing data gathered by the telescope.

<http://www.nytimes.com/library/national/science/080100sci-seti-telescope.html>

## **UK DAILY EXPRESS**

**£8m quest to see if  
anyone is out there**

**(Paul Allen plays guitar,  
BIMA is a mock-up for  
the ATA, and Mr. Gates  
got his photo in the  
paper for free!**