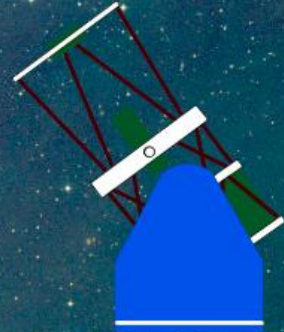


# Alt-Az Telescope Initiative

[www.altazinitiative.com](http://www.altazinitiative.com)



## Overview of 0.75-m Telescope Project and Requirements

**Bruce Holenstein and Russ Genet**

Conference on Meter-Class Astronomy

January 20-22, 2012

Waimea, Hawaii

# Overview

- **Observational Programs**
  - Visual
  - Astro-Imaging
  - Scientific Research
- **0.75m Project**
  - Requirements
  - Panel topics
  - Some Concepts



Inspiration from Big Blue 1-m<sub>2</sub>

# Visual Recreational, Outreach, and Educational Programs

- Planetary detail in color.
- Hints of color in the brighter emission nebulae.
- Spiral arms in 17<sup>th</sup> magnitude and brighter galaxies.
- H-II regions and star clusters in 16<sup>th</sup> magnitude and brighter galaxies.
- Exotic new discoveries such as Hanny's Voorwerp.
- Tidal distortions in Arp peculiar galaxies.
- Seeing colors in the stars that make up the brighter globular clusters.
- Seeing the complex internal structure of planetary nebulae, their central stars, and extended halos.
- 19<sup>th</sup> magnitude and brighter supernovae in distant galaxies.
- Digging out small scale, faint details in brighter objects such as the Herbig-Haro objects in M20.
- Soaking in the glorious, exquisite details of brighter objects such as M51, M42, Saturn, etc...



Chris Erickson at MK-HP Viz

# Astro-Imaging

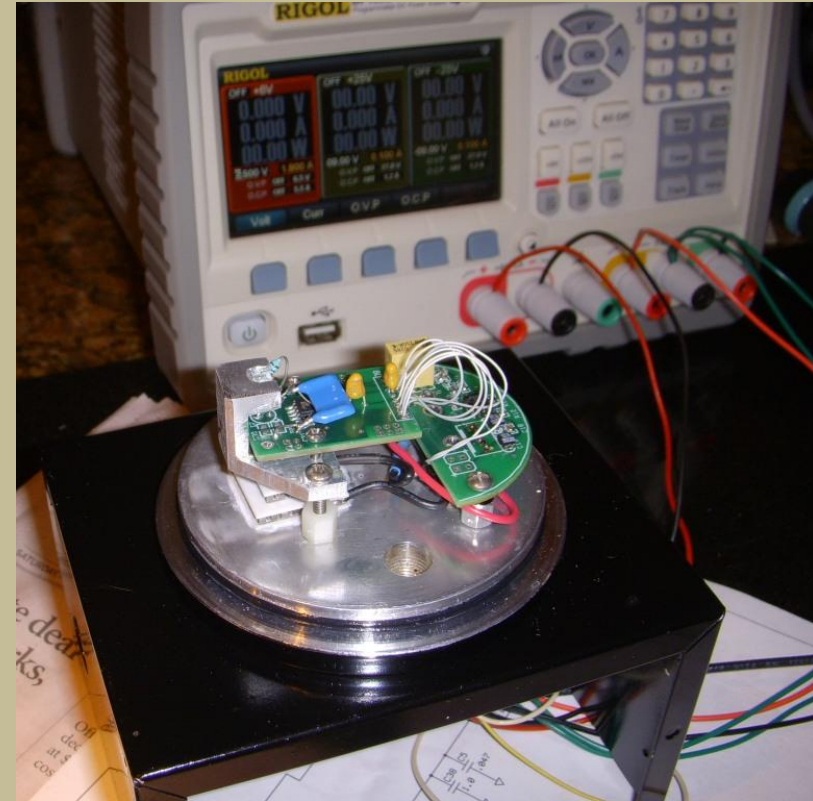
- Astrophotography
- The focal length of a 0.75-m, f/4 to 1-m, f/3 is perfectly matched to pixel size and average seeing
- Wide field allows for the greatest possible (affordable) etendue, for spectacular wide-field imaging



Eagle Nebula, M16, CDK20, SciTech, Roweville, Pinto Valley Obs.

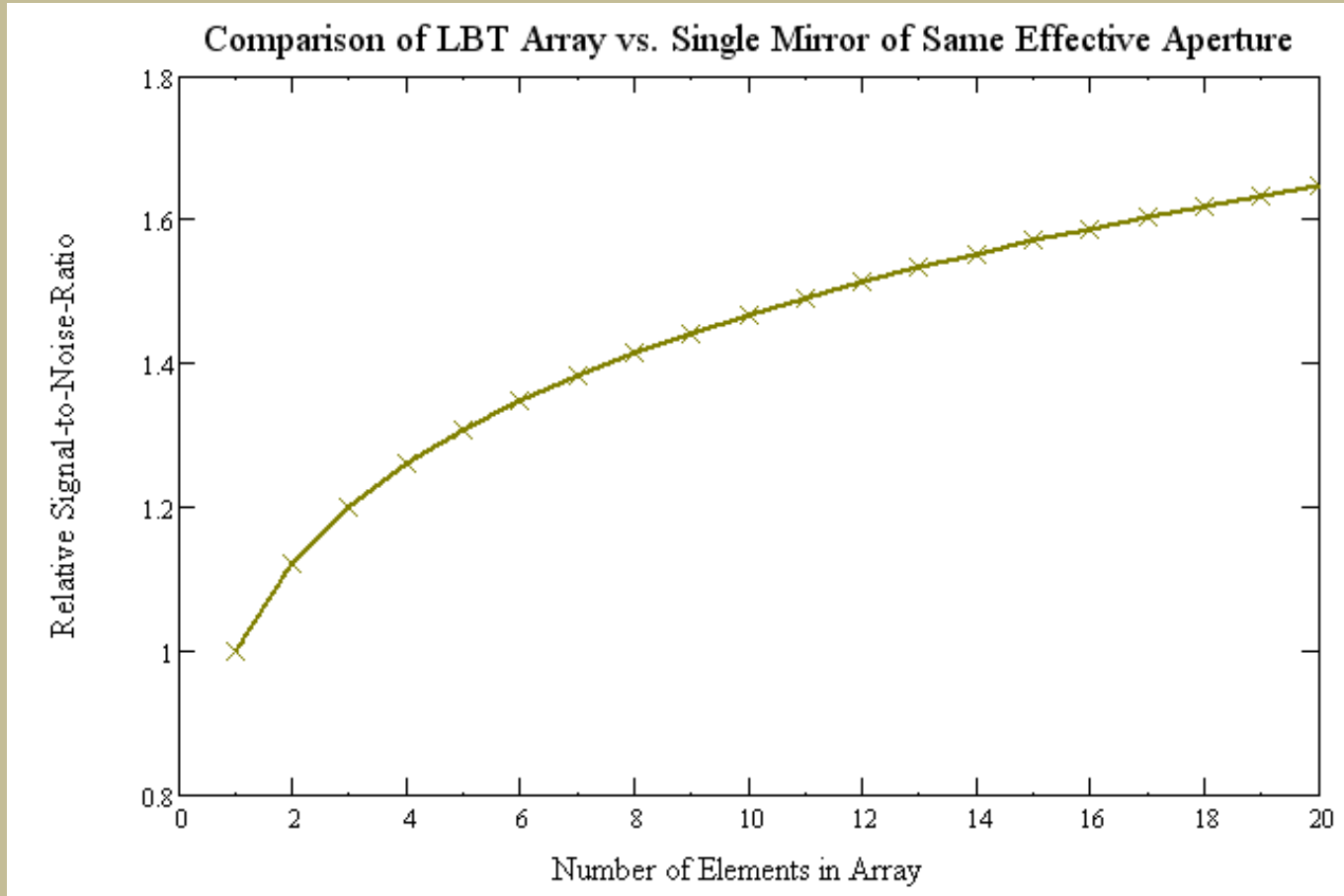
# Some Science Uses

- Discovery searches for supernovae in not-too-faint galaxies
- Visual photometric observations of fainter variable stars such as Miras
- Visual inspections of dwarf novae to see which stars are up
- Visual astrometric measurements with laser-etched astrometric eyepieces of fainter double stars.
- Size and shape (and hence albedos) of smaller diameter trans-Neptunian objects (TNOs)
- Lunar occultations for determining stellar diameters and duplicity
- Various projects at dark sky sites
- Near IR photometry (especially Ks band), which can benefit from high altitudes and dry skies.
- Spectroscopy
- Polarimetry



Greg Jones's K' NIR photometer

# Array Scintillation Reduction



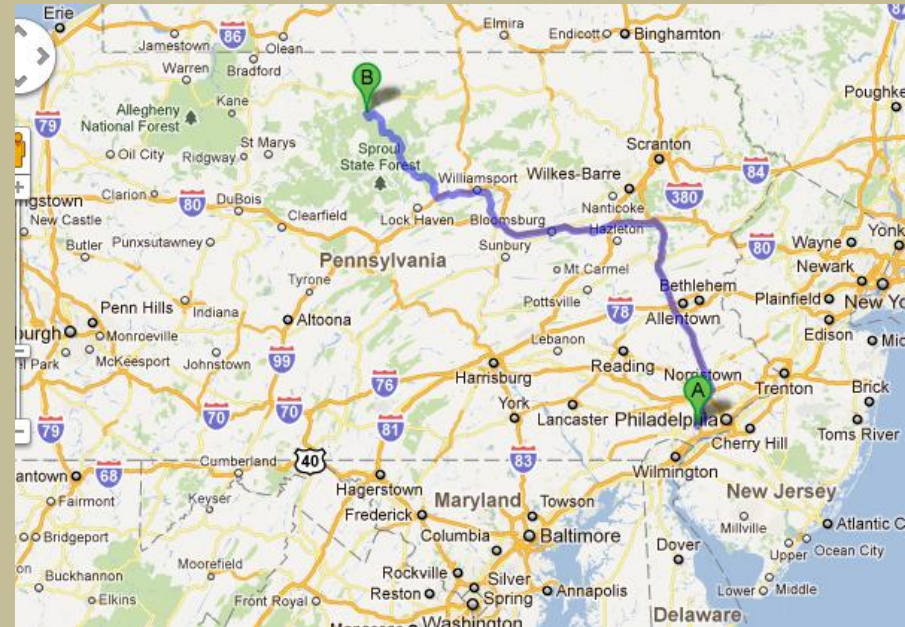
Only Scintillation per Young (1967) counted in noise.

# Other Array Benefits

- *Reliability.* Immediate and independent confirmation of rare, transient events
- *Availability.* Graceful failure rather than all at once
- *Independence.* Geographic area avoids clouding out the array
- *Transportability.* Moveable elements to avoid bad weather or seek advantageous observing locations
- *Expandability.* Add more array elements later as funds allow.

# Gravic's Array Plans

- 7 to 10 elements 0.75 to 1.25-m aperture
- Configurable
  - Minimize scintillation
  - Maximize coverage
- East Coast location
  - <2500 ft. elevation typical
  - 1-2 arc second seeing
- Automated, Queue Scheduling
- Minimum 3 astronomers, 1 technician



- Cloudersport, PA (5 hrs.)
- International Dark Sky Park



# 0.75-m Project Requirements

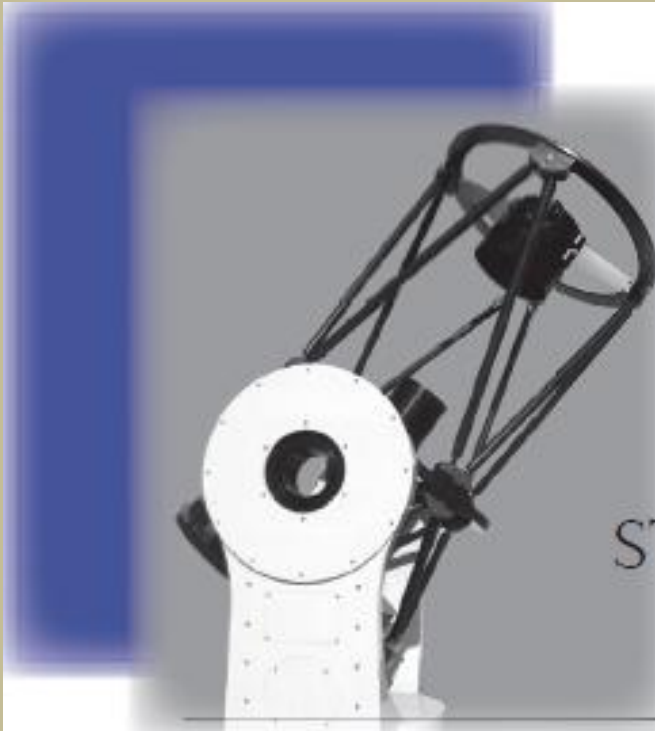
- Goldilocks – not too big/fast, not too small/slow
- Uses - visual, imaging, science projects
- Portability requirements - movability, assembly time < 30min., airline transportability a plus
- Weight <150 lbs, no crate >70lbs
- Cost [several classes: \$8-20+k], volume discounts, ATM “kit”
- Arrayable and remotely operable
- Good tracking & slewing speeds
- Field of View & etendue ( $\text{m}^2\text{deg}^2$ ) for imaging
- Spot size – 3 Classes: 1mm, 0.1mm, 0.01mm



Wikipedia: Arthur Rackham

# Some Concepts to Consider

Bigger version of the  
CalPoly 18 or  
PlaneWave CDK series



# Mini-Me

- Half-scale version of the 1.5-m “Big Woddy”



# Hubble Optics UL30?

- Scaled up UL20



# 0.75-m Panel Topics

## Primary Mirror

- Material/construction, weight, environmental ruggedness
- Conic
- Strehl or other quality metric/waves of aberration
- Aperture
- Thickness
- F/#
- Cell – whiffle, active support
- Coatings – AL, Silver, overcoat

## Secondary mirrors & optics

- Conic
- Active vs. passive
- Back focus
- Paracor type correctors [Optimized speed, diameter, back focus, magnification]

## OTA

- Materials
- Design – Newtonian, CDK, hexapod
- Wind cross section
- Balance issues,
- Payload weight

## Mount

- Alt-Az
- Rocker design
- Materials (wood, aluminum, steel, carbon fiber)
- Paints and coatings
- Resonant frequency
- Base bearing or wheels
- Trunions
- Ring construction
- Encoders – absolute vs. relative, on-axis or on-motors, Renishaw encoder tape
- Controller & drive – servo or stepper, coordinated array control
- Field rotation

# 0.75-m Panel Members

- Moderator: Bruce Holenstein, Gravic
- Howard Banitch, Rose City Astronomers
- Mel Bartles, BB AstroDesigns
- Donny Mott
- Dave Rowe

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<http://groups.yahoo.com/group/AltAzInitiative>