

Alt-Az Initiative

Development of portable and
affordable 1-meter class
telescopes

Russ Genet and Bruce Holenstein

2010 ANNUAL IOTA MEETING

Agenda

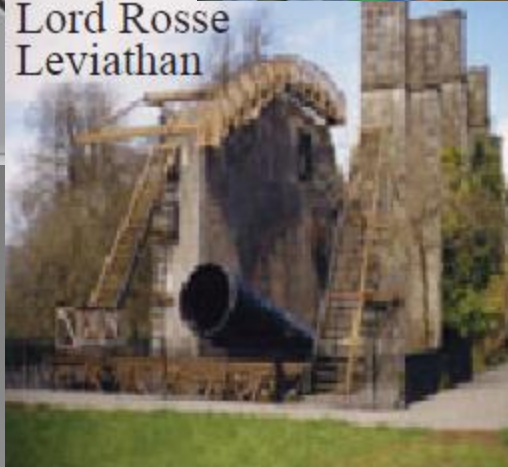
- ◉ Alt-Az Initiative Introduction
- ◉ What does Affordable and Portable Mean?
- ◉ 1-Meter Slumped Meniscus Mirror Scope
- ◉ New Technologies
 - > Meter-Class Mirrors
 - > Mounts, Cells, and Controllers

The Alt-Az Initiative

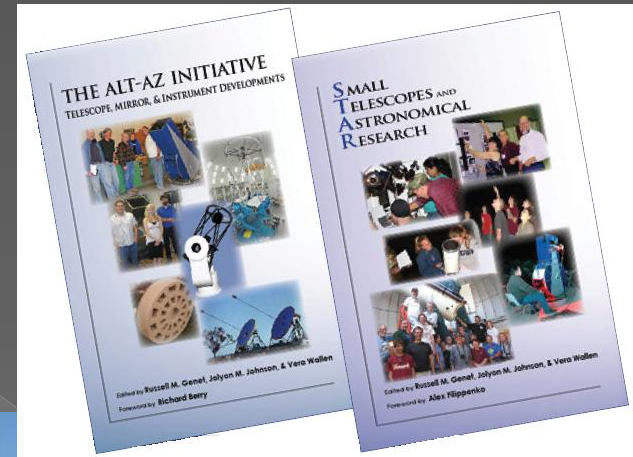
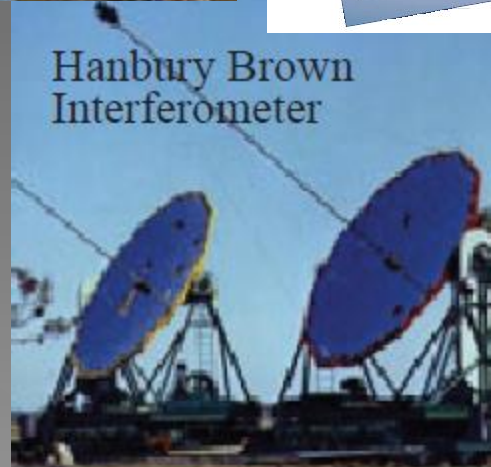
- Mirrors, Telescopes, Instruments, & Research Programs



Lord Rosse
Leviathan



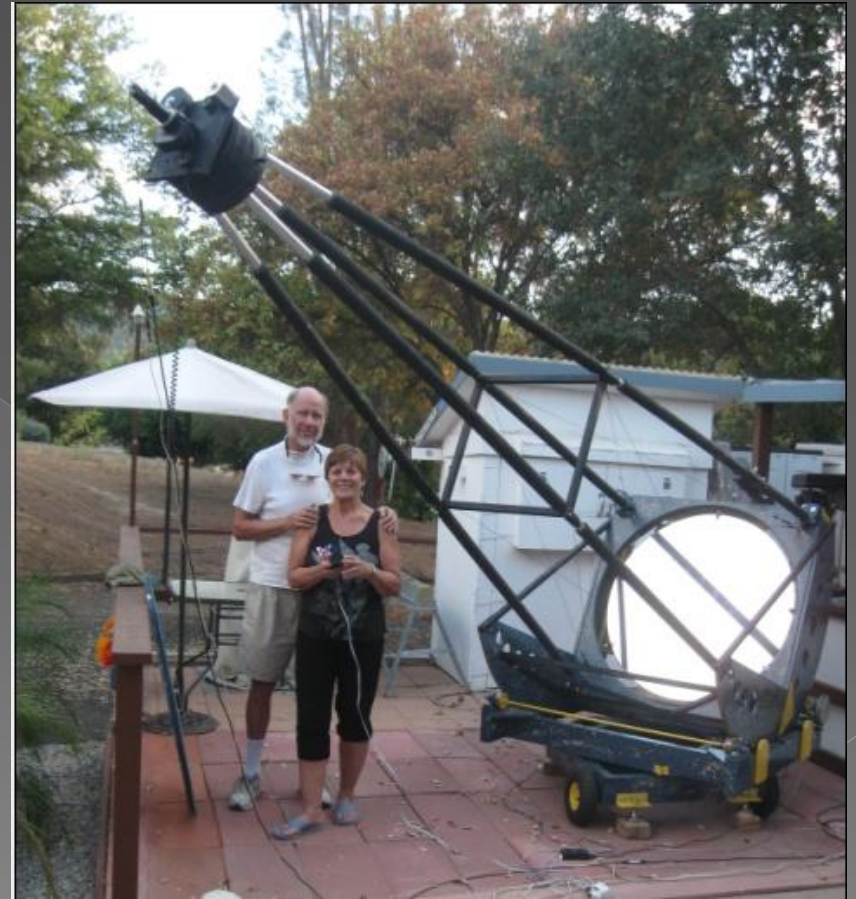
Hanbury Brown
Interferometer



Affordable and Portable?

- ◉ Reduce cost per photon x10 to x100
 - > 1-Meter portable scope for cost of C14
 - > Work ~ 2.5 magnitudes fainter
 - > Each magnitude fainter worked is about 300% more targets (2.5 mag. is ~30x more!)
- ◉ Banich Bylaw – 30 minute setup max.
- ◉ Somewhat purpose-built
 - > Visual observers vs. science mission
- ◉ Light Bucket Classes

1-M Meniscus Mirror Telescope Prototype



From this \$1.8M 1-M EOS scope ... TO ... This \$20k 1-M f/4 Prototype

1-M Scope Setup



1-M Scope Portability



1-M Meniscus Mirror Mount



Different ways to transport a 1-m telescope

Slide courtesy of Howard Banich



Everything but the truss tubes stacked and rolled on wheels – Dan Bakken's 41.2 inch String Alt-Az



Fully assembled –
Steve Swayze 40 inch Dobsonian with custom trailer



Everything but the truss tubes stacked as a wheel barrow - Howard Banich 28 inch alt-az



Tommy Gate lift 1000 pound lift capacity –
greatly eases getting the scope in and out of a vehicle.

Banich Bylaw – Full Statement

“Banich Bylaw” – for a telescope to be enjoyably and repeatedly used it must be happily set up by no more than two people of ordinary strength and dexterity in 30 minutes or less.

Even better if only one person is needed. This “rule” has been formulated through personal experience and observing “large” amateur telescope enthusiasts since 1991.

Important note – the useful life span of the scope will be short if it takes grudging effort to set up and take down.

All attachments must be robust to stand up to repeated set up and take down, which also aids in repeatable collimation.

Moving the scope as a stacked unit as shown in the previous slide greatly streamlines the set up and take down process, keeps the optics in a safe, horizontal position during transport and reduces the set up process to leveling the base, inserting the truss tubes and attaching the secondary cage. This only takes about 20 minutes with a little practice.

View “[howardscopeardown_0002.wmv](#) movie!



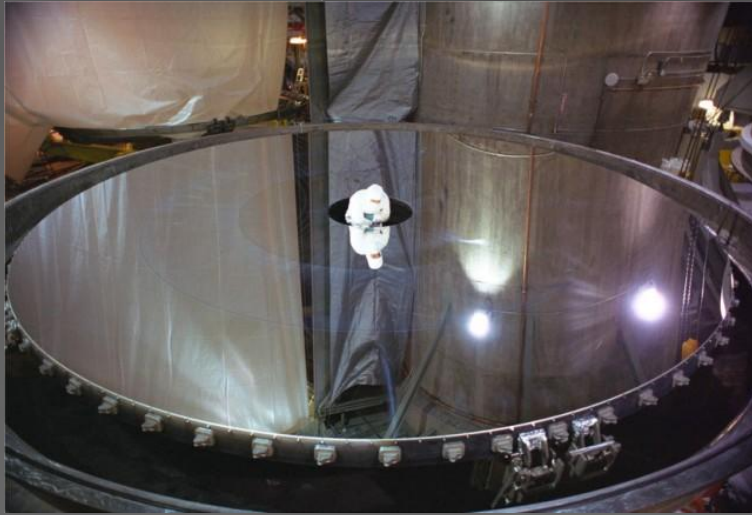
New Technologies

- ◉ Mirror Technologies
 - > Slumped Meniscus
 - > Foam Glass
 - > Sandwich
 - > Spin-Cast Epoxy
 - > Multiple Spherical Mirrors
 - > Non-Vacuum Coating
- ◉ Mounts, Cells, and Controllers



David Davis's 1.5-M Tessellated Prototype

Slumped Meniscus Mirrors



Gemini 8-m meniscus mirror



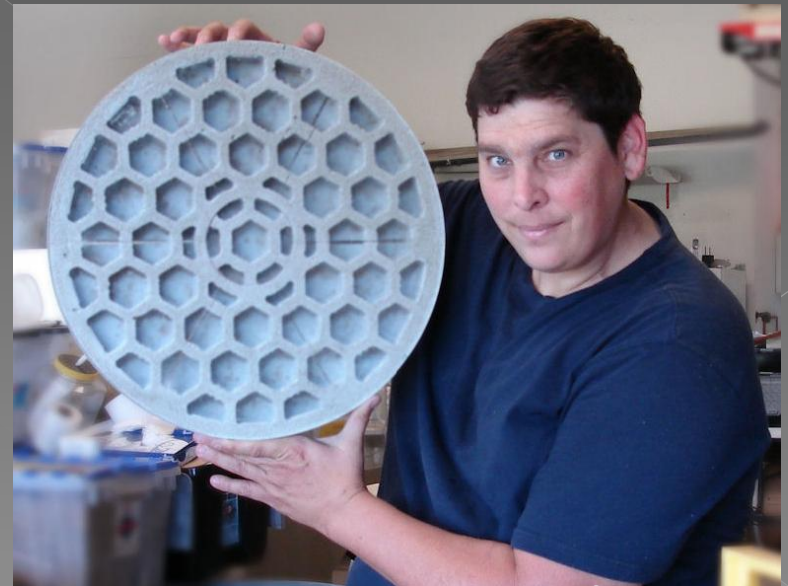
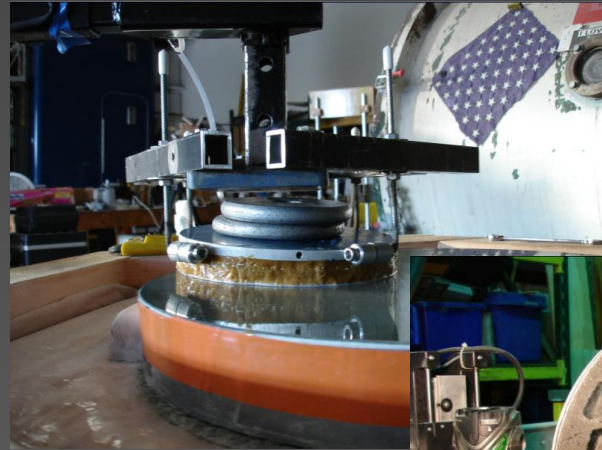
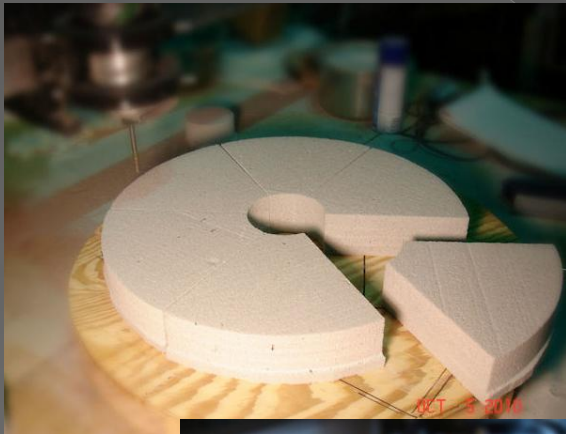
Mel Bartle's 13" soda lime slumped meniscus mirror



French ATM with 1-m meniscus mirror and astatic support system

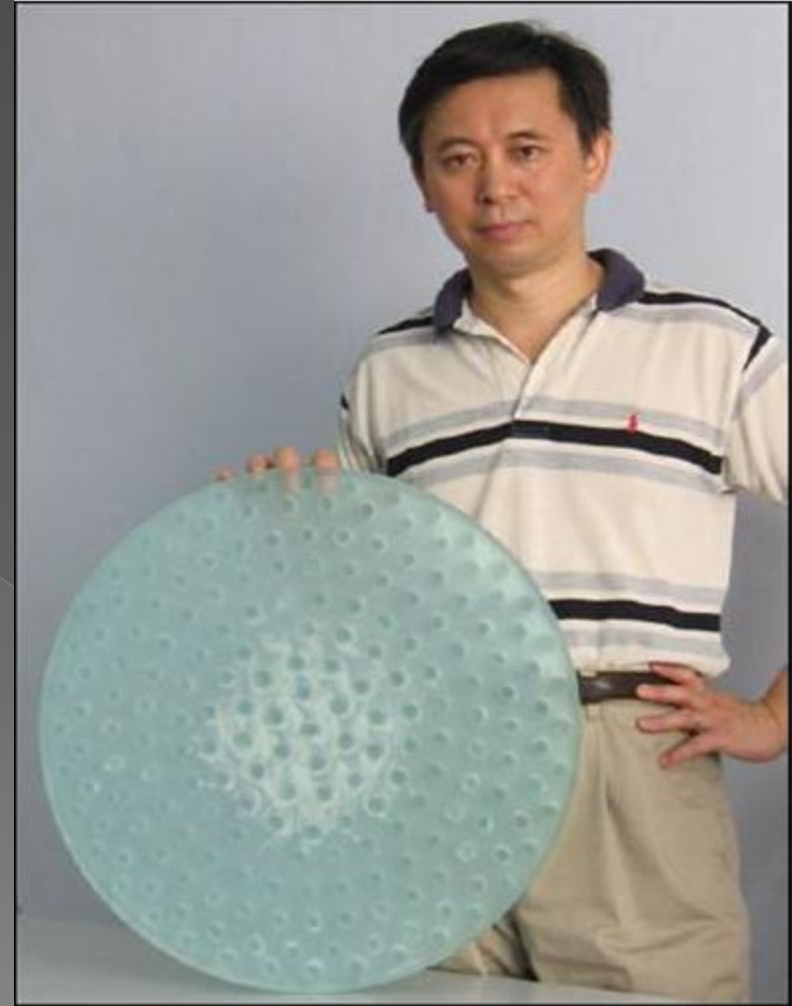
Foam Glass

- Andrew Aurigema from OTF Designs



Sandwich

- Tong Liu from Hubble Optics



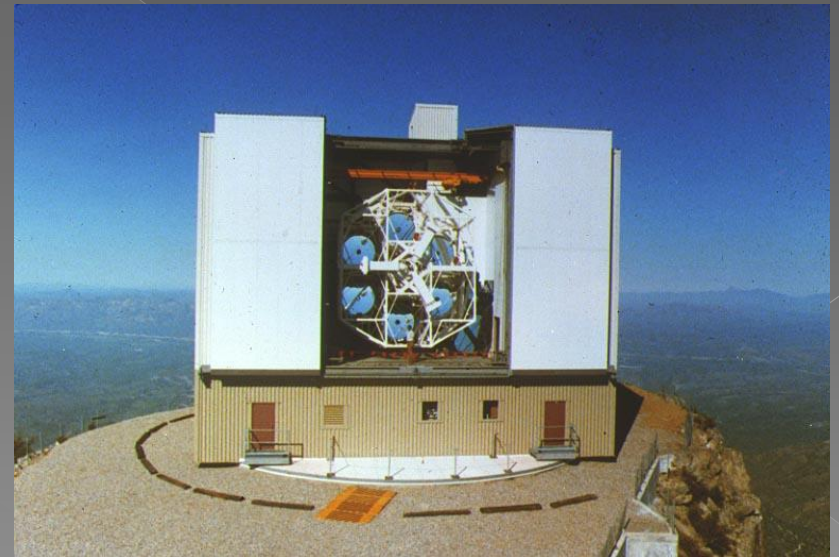
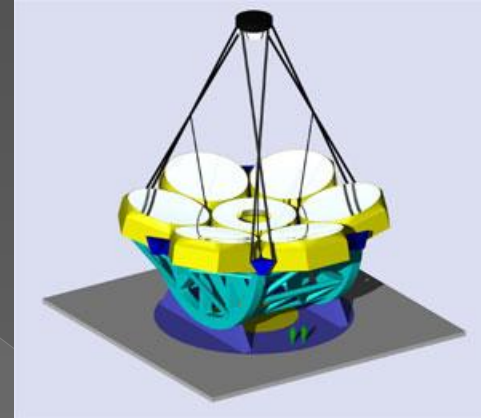
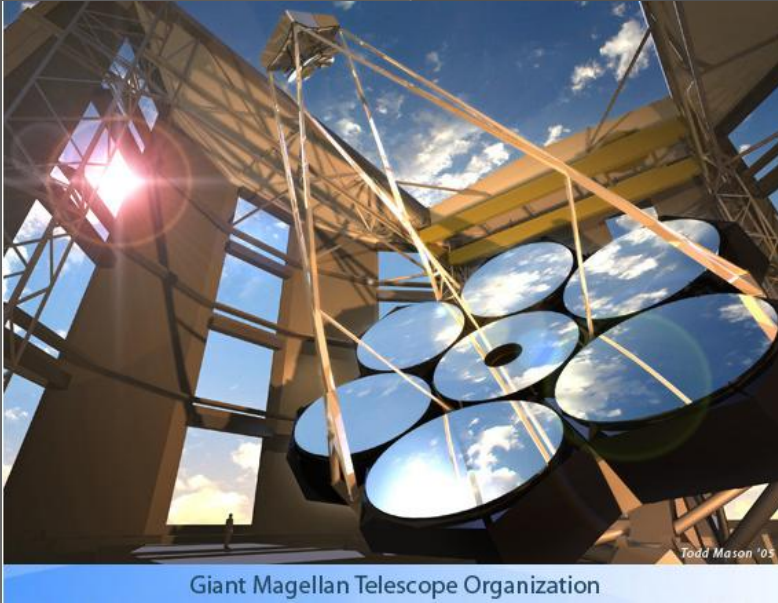
Spin-Cast Epoxy

● Lisa Broadhacker at Lander University



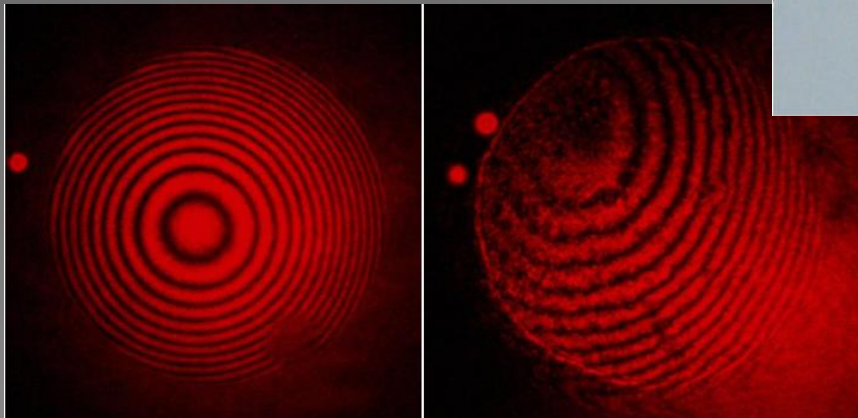
Multiple Spherical Mirrors

- Model as a “Mini” MMT or Giant Magellan



Non-Vacuum Coating

- Sagar Venkateswaran
at Peacock Labs



Uncoated

With Permalac

Cold silvered, optional
Permalac overcoat

Testing at Gravic Labs

Mounts and Controllers

- CalPoly 18
- Direct Drive
- Sidereal Tech Controller

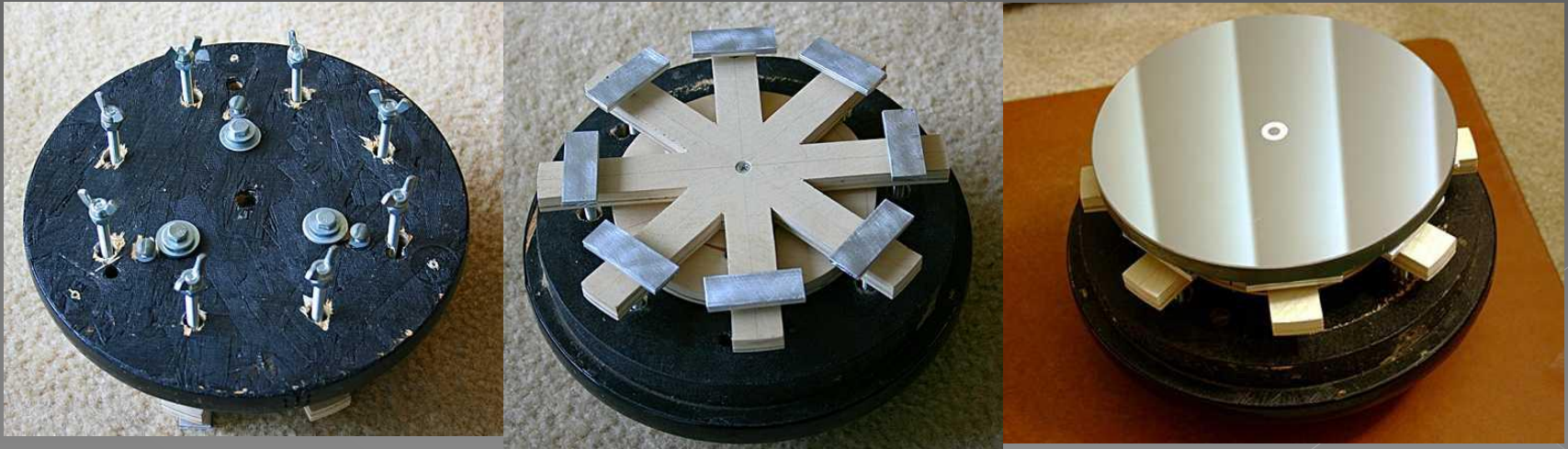


Mirror Cells

- ◉ Deformable mirror cell

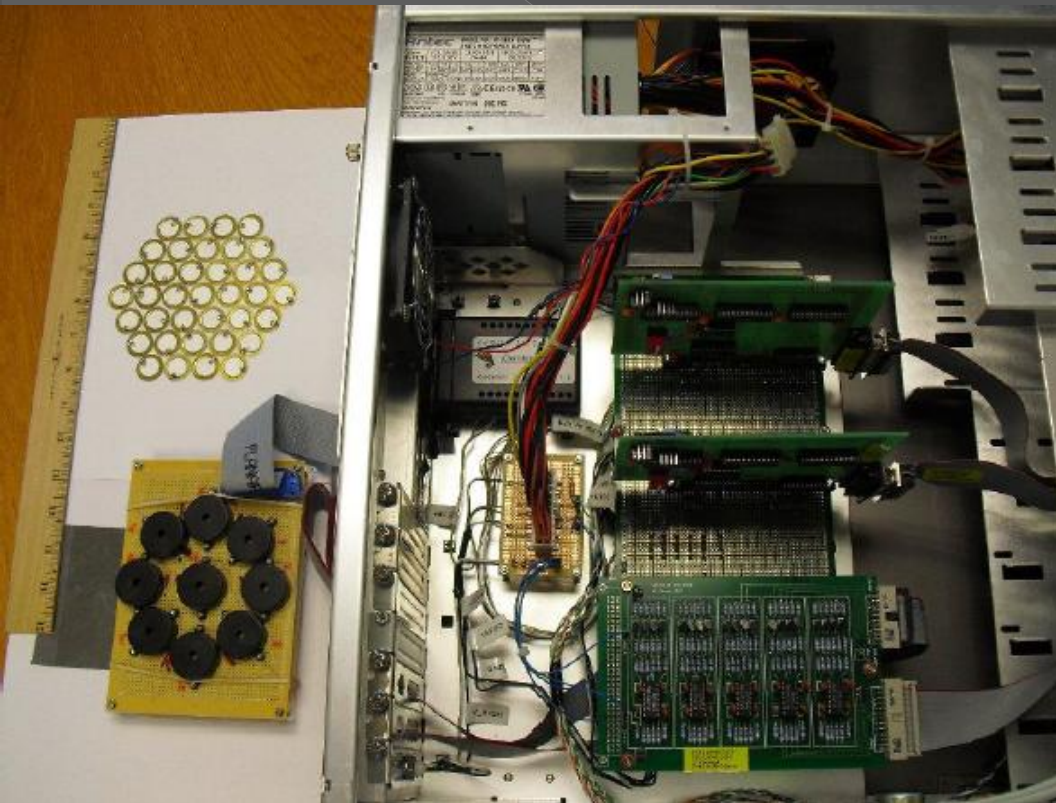


One of the 120 Gemini voice coil actuators



Mike Connelly's deformable 8" cell

Deformable Secondary Project



40-actuator high voltage controller
at Gravic Labs



Prototype piezo transducer cell:
elements deflect ± 35 microns

Light Bucket Astronomy Conference

- Mirrors, Telescopes, Instruments, & Research Programs
- Canada France Hawaii Telescope Headquarters
 - Waimea (near Kona), the Big Island of Hawaii
 - Tours of select Mauna Kea and Mauna Loa giant scopes
- December 31, 2010 – January 2, 2011



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- Yahoo Discussion Group -
<http://groups.yahoo.com/group/AltAzInitiative>