

System Workshop III
NOAO and Gemini instruments
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NOAO Facility Strengths

- Mayall and Blanco = Wide Field, Natural Seeing, Broad λ : Mosaic's, NEWFIRM, DEC (coming
- WIYN = Wide field, with tip-tilt correction: WTTM+WHIRC, QUOTA \Rightarrow ODI
- SOAR = Narrower field, good-to-enhanced image quality: Single object spectroscopy, optical & IR; GLAO (coming)
- SNe, Galaxy evolution, Stellar populations, Star & planet formation

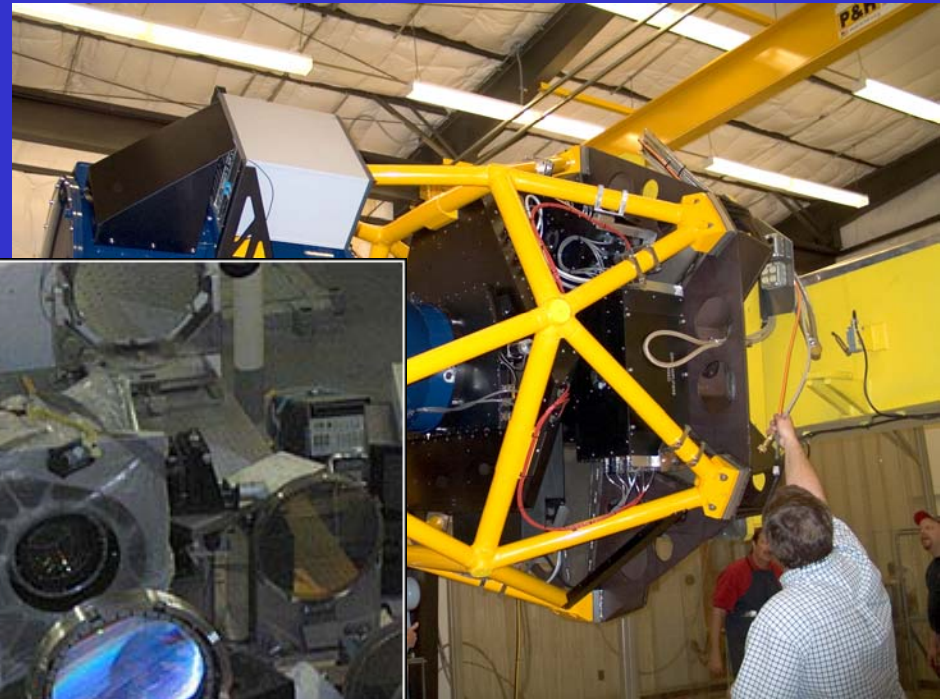
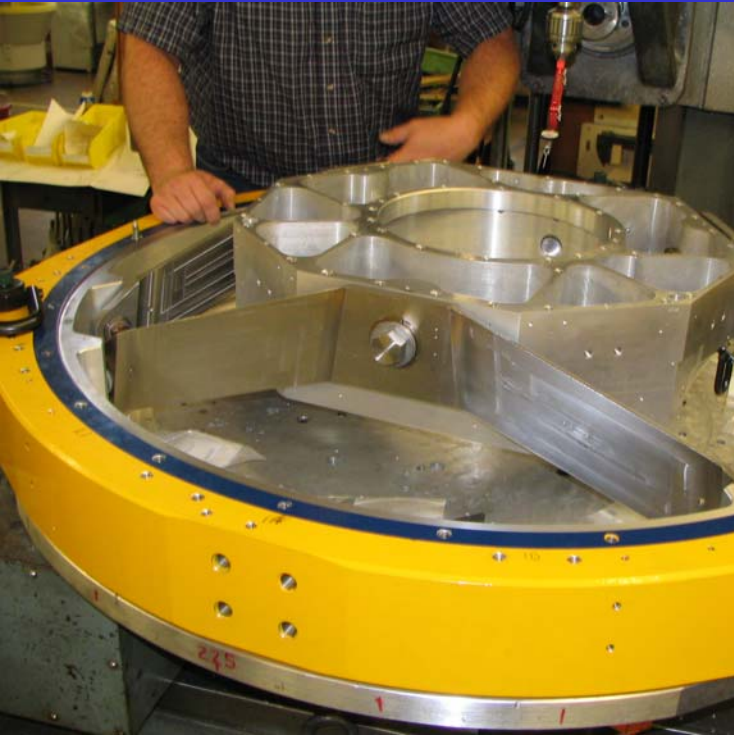
Gemini Facility Strengths

- IR Sensitivity: NIFS, NICI, GNIRS
- High Spatial Resolution: Altair, NIFS, NICI, MCAO (coming), GPI (started)
- Faint Object, multiplexed spectroscopy: GMOS
- Exoplanets, Star & Planet formation, Brown dwarfs, Galaxy evolution

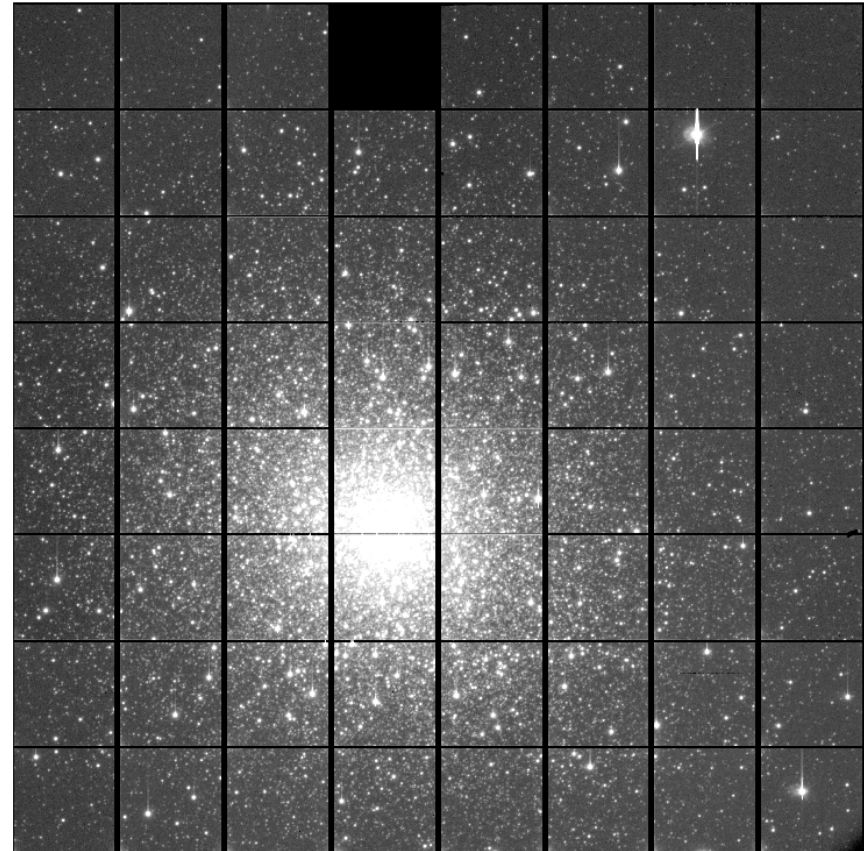
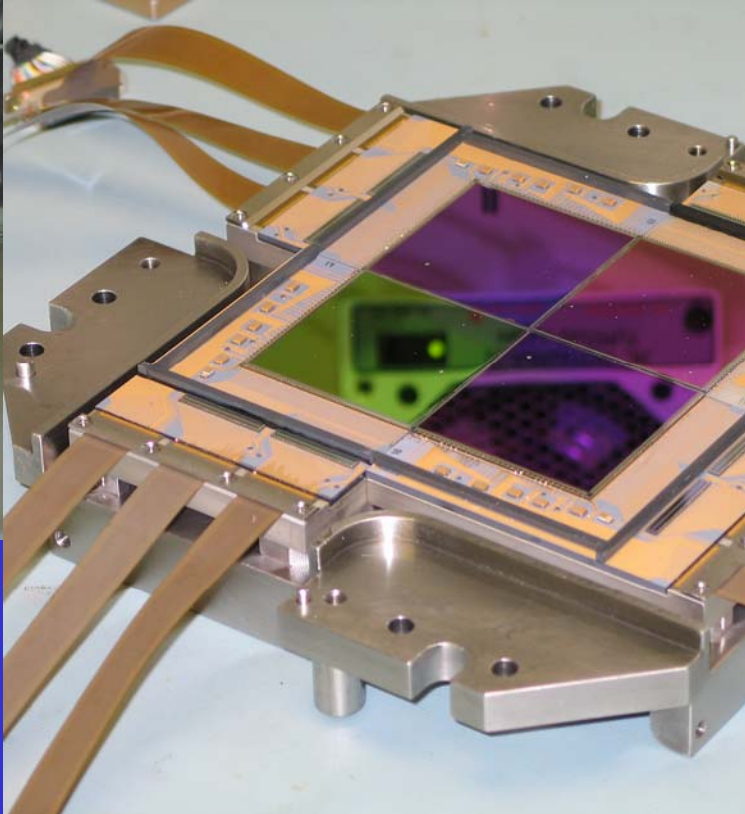
Selection Processes

- Gemini: Workshops (e.g., Aspen) lead to studies, which lead to RFP's and bids
 - Gen-1 both solo and partnership
 - Gen-2 proposals all by partnerships
 - Strengths: all those of entire community
- NOAO:
 - System Workshop(s) identify priorities
 - Partners contribute resources + ideas: SAM, NEWFIRM, ODI (NB: Mosaic's were last “on our own”)
 - Strengths ...
 - Internal discussions begun re: “what next?” ...

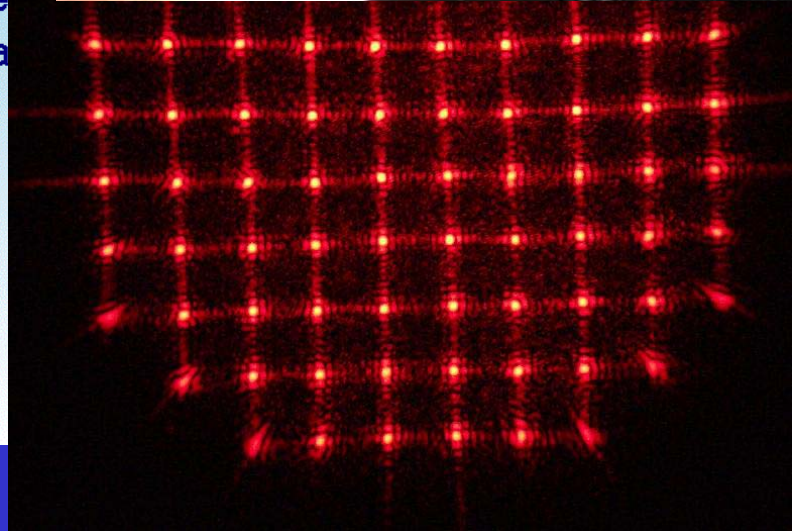
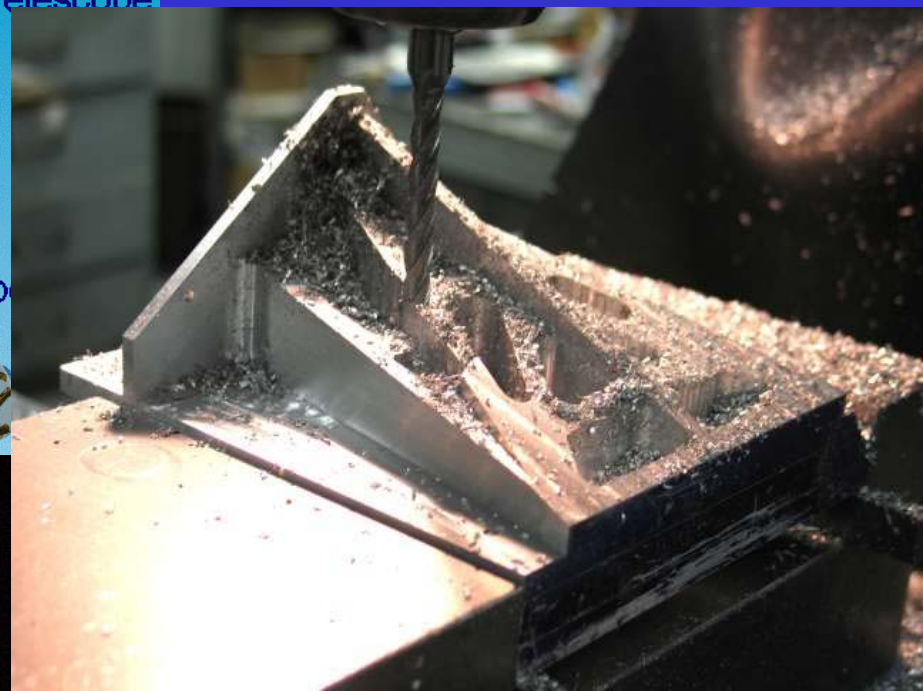
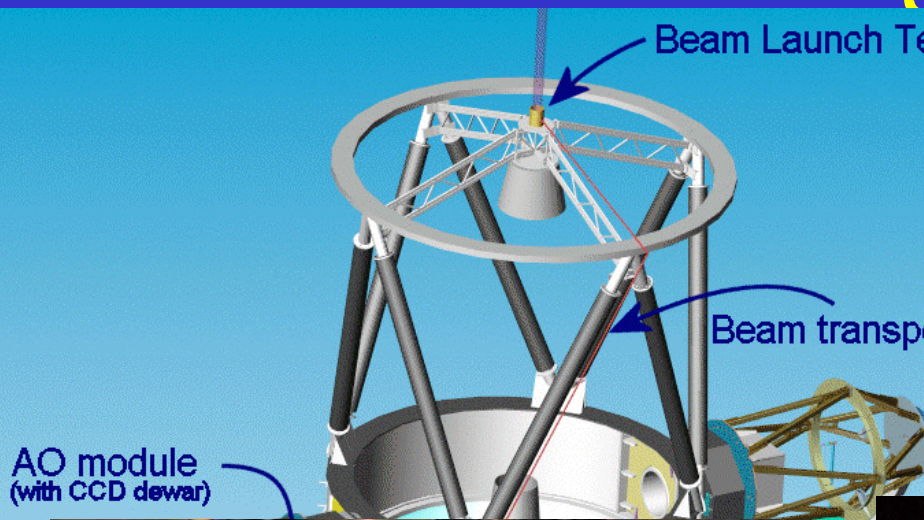
NOAO strengths: Opto-Mechanical Design, Fab, Testing



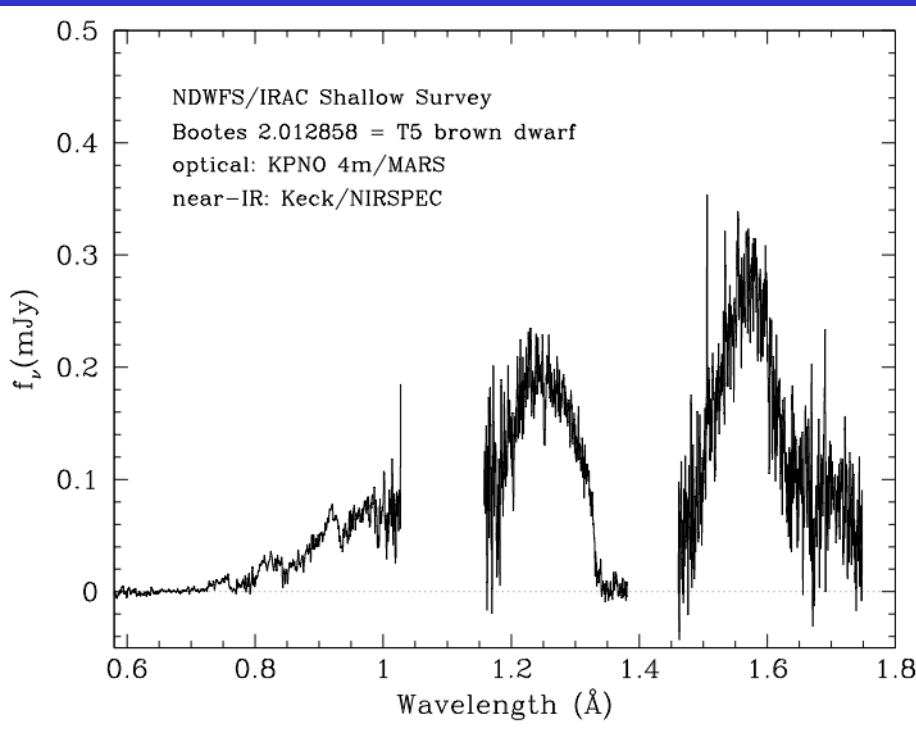
NOAO Strengths: Controllers and Detectors



NOAO Strengths: GLAO



SOIREE: Single Object O/IR Extremely Efficient spectrograph



Efficiency gains from:

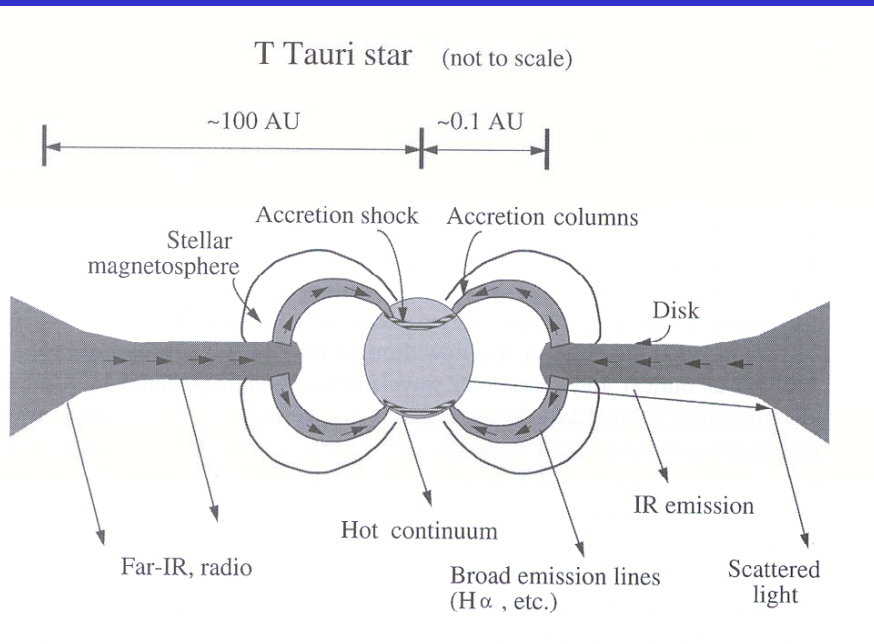
- VPH gratings
- Modern dichroics
- Optimized coatings, detectors

- $0.35 < \lambda < 1.6 \mu\text{m}$
 - K more costly but possible
 - Cool how much for λ range?
- $R \sim 3000$
- Throughput $> 30\%$
- Rapid faint-object acquisition (slit-viewing guider? New TCS?)
- Use O & IR modes together or separately; 3+ channels
- Slit length $\sim 1'$
 - ADC? Need trade study
 - N&S? 'scope or internal?

SOIREE Science highlights

- Redshifts of rare/variable targets where wide wavelength coverage is required
 - GRBs, high z QSOs, core collapse SNe
- Reverberation mapping of QSOs
 - continuum and broad lines
- Redshifts where spectrum breaks $\sim 1\mu$
- SN and CV spectrum monitoring
- Spectra of L,T,Y brown dwarfs

4CES: 4-meter Cryogenic Echelle Spectrograph



Schematic of an accretion disk around a T Tauri pre-main sequence object

- $1 < \lambda < 5 \mu\text{m}$
- $R \sim 50,000$
- Slit 0.8" x 15"
- High Throughput
 - Si immersion grating
 - Single 2k x 2k array
- IR slit-viewer for acquisition & guiding
- Minimize modes, parts = minimize cost

High Spectral Resolution near- IR Science

- Origin of elements of life
- Physics of star formation regions
- Accretion disks
- Chemistry of the ISM, especially H_3^+
- Masses for very low mass stars
- Astrochemistry of elementary life molecules, C_2H_2 , HCN , ...
- Flows in circumstellar envelopes
- Unique ISM, PN diagnostics: H_2 , forbidden lines,...
- Magnetic fields, rotation, Doppler imaging,...

The Yin and Yang of 3-8 meter instruments



Instruments offering an order of magnitude gain rank well.	Expensive instruments have enormous inertia.
New technologies spawn new instruments.	New technologies increase risk.
Niche instruments may have “killer app” but still attract limited support.	General purpose capabilities attract universal support but lack “killer app”.
No guaranteed funds for new instruments in a flat budget.	Good ideas attract funding.