Update on VISION at NPOI
And Completely Unrelated Collaboration Opportunities

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VISION: Visible Imaging System for Interferometric Observations at NPOI

- Construction: NSF MRI – R$^2$ (American Reinvestment and Recovery Act) Funded
- Improve NPOI Data Product Precisions by 10×
- Improved System Visibilities: Low Visibility Targets
- Avoid Systematic Effects: Delay Nonlinearities, APD Afterpulsing
- Monitor all baselines
- Spectral Resolution Flexibility
- Modernize Equipment
VISION Design

MIRC, With Modifications
Lab Fringes
VISION Design

[Image of laboratory equipment]
Science Programs

- Imaging Stellar Surfaces
- Emission Line Studies: High Spectral Resolution
- Baseline Bootstrapping: Beyond the first visibility zero
- Defending Democracy, Deterring Aggression, and Maintaining Freedom of the Seas (Imaging Satellites)
- Triple Star Systems
Complementarity and Divergence With MIRC

- Combined IR-Visible Studies
- VISION: Photon Counting, Baseline Bootstrapping, baseline flexibility
- MIRC: Sensitivity Advantage—IR/Telescope Size (until 1.8m....)
- High-Contrast Objects
  - Separated Objects: Want Lower Contrast
    - Faint is redder than Bright: IR (BD’s, Planets)
    - Faint is bluer than Bright: Visible (CVs, Thanks Fabien)
  - Embedded Objects: Want Higher Contrast (Star Spots, Visible)
Fairborn Observatory:
Fully Robotic Photometry and Spectroscopy
Robotic Photometry

Automatic Photometric Telescopes (APTs)

- **Operations:**
  - 6 Telescopes (0.4, 0.75, 4 × 0.8 m)
  - Single Pixel (PMT), 2-channel (b-y), photometers
  - Sequential observations of calibration/check stars

- **Benefits:**
  - Nearly Maintenance Free (this year, OS updates during monsoon season, and a few mouse-chewed cables replaced).
  - Precision: 1 milli-mag/obs; 0.1 milli-mag seasonal repeatability
  - Long-term stability: 0.4m APT in operation since 1987
  - Cost-efficient: Under $30k/year/telescope

- **Tradeoff**
  - *Not* versatile

- **Also:** Red-sensitive 14” Imaging (CCD) Telescope
Robotic Spectroscopy

Automatic Spectroscopic Telescope

- 1 Telescope, $D = 2\text{ m}$
- Fiber-optic fed instruments (recent upgrades)
- Primary Instrument: R$\sim$30,000 Optical Echelle, 3800–8200 Å
- Also: Ca H/K spectrograph, Mini-Echelle
- Future Instruments: UF’s FIRST, EXPERT. NSF-Funded “EDI-Testbed”
- Nearly Maintenance Free (2-3 trips/year)
- Partially Versatile (multiple instruments)
VISION at NPOI

AST Complex, September 2012
Future: FIRST

- \( R = 68,000 \, (1.4-1.8 \, \mu m) \), \( R = 56,000 \, (0.8-1.35 \, \mu m) \),
- M Dwarf Planet Survey
- Young Star Planet Survey
- SB1 \( \rightarrow \) SB2
- Cold Stellar Atmospheres
- Young Stars
Contact Information

Observations by TSU’s Fairborn Telescopes are generally available on a collaborative basis.

- For photometric measurements with the Fairborn APT’s and new Imaging Telescope, contact:
  Greg Henry, gregory.w.henry@gmail.com

- For spectroscopic measurements from the Fairborn AST, contact:
  Matthew Muterspaugh, matthew1@coe.tsuniv.edu

- For technical questions, please contact:
  Michael H. Williamson, michael.h.williamson@gmail.com