

NASA Hi-Resolution Imaging Program Speckle Imaging on Large Telescopes



WIYN 3.5m



Gemini-N 8m



Gemini-S 8m

- Full frame readout at 1MHz
 - 1024 X 1024 EMCCDs
- Dual plate scale
 - 0.01" or 0.07" / pixel

- High-resolution (20mas)
- High-contrast (~12mag)
- Wide Field – up to 56"

Filters and data:

- u, g, r, 467, 562, H α
- i, z, 716, 832
- Provide fully reduced data

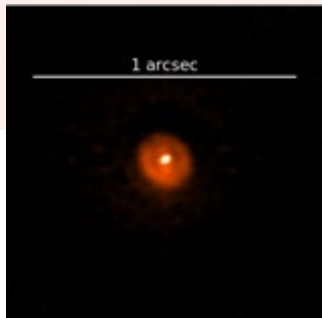
Fast ms imaging

Diffraction-limited

Optical dual-channel

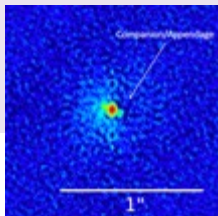
Program and Instruments Funded by the NASA Exoplanet Program Office

Nova Shell



Nova V906 Car imaged at 832nm
978 days after explosion

Asteroids

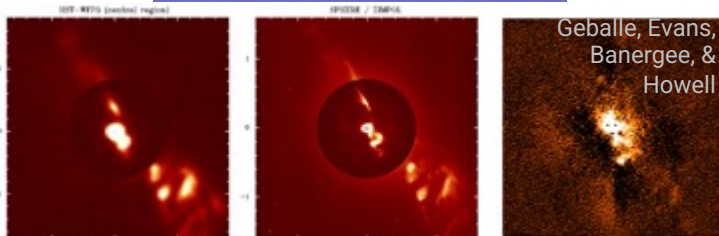


Asteroid light curves,
shapes, and binarity

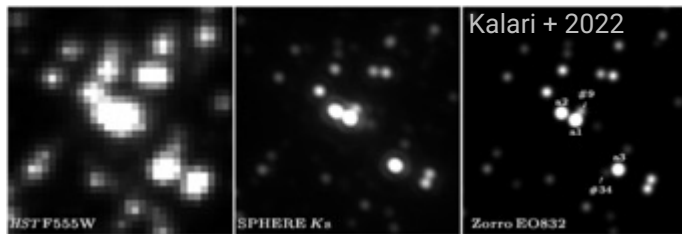
Imaging Capabilities

Provides the highest angular
resolution of any telescope

Wide-Field

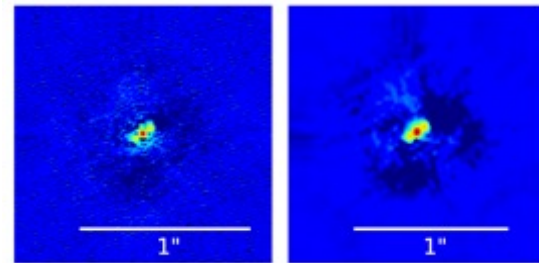


H α imaging of central 0.5'' region of R Aqr



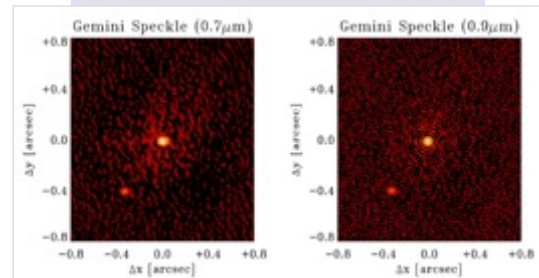
Imaging center of R136 (0.8'' x 0.8'')
(Tarantula Nebula)

Transient Follow-up



Follow-up imaging detected
lens and source:
sep = 0.058'', contrast = 3.7

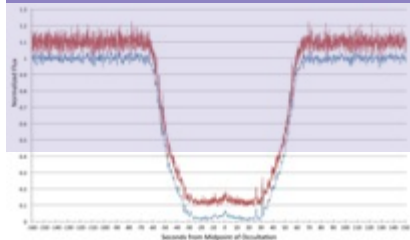
Binary Stars



Exoplanet validation, formation, and
evolution; stellar multiplicity, orbits

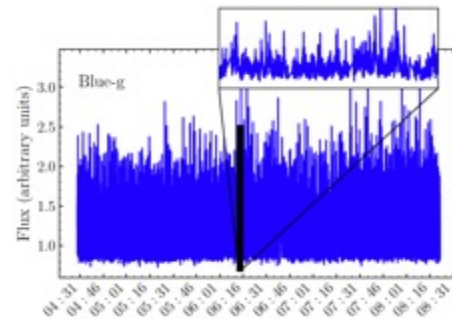
Time Domain Capabilities

Occultations



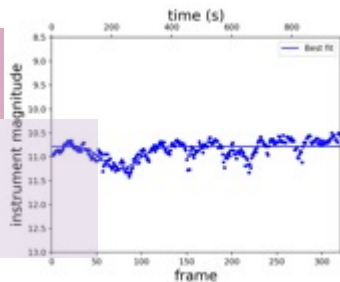
Pluto
occultation
2018

High speed and
accurate timing:
0.001s min. exp time
70nsec internal precision



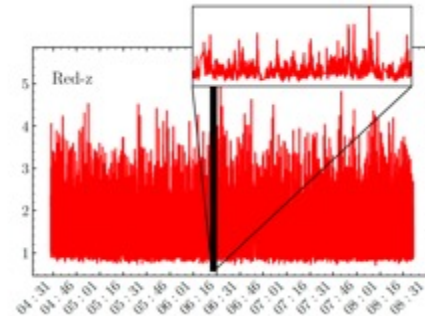
Variable Stars

Faint cataclysmic
variable NZ Boo
showing 4min eclipse



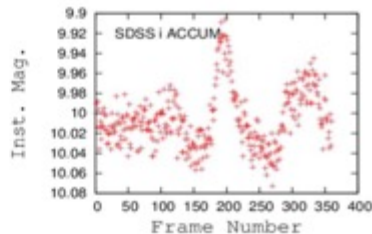
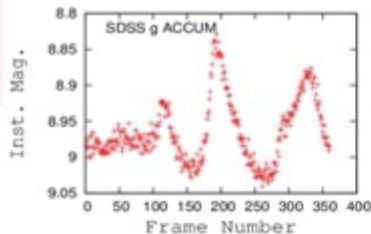
BH X-ray Binaries

4-hr simultaneous
30 sec sampled light curve
(Tetarenko, A.+ 2021)

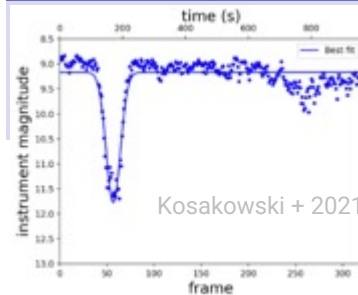


White Dwarf Pulsations

Simultaneous g
+ i light curves:
20min, 0.5s
exposures



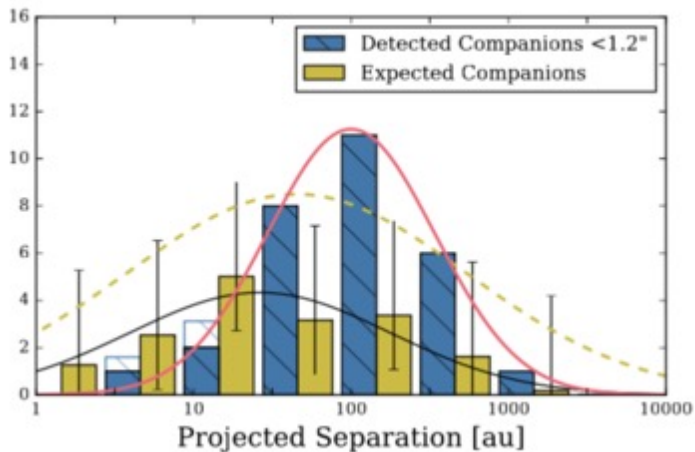
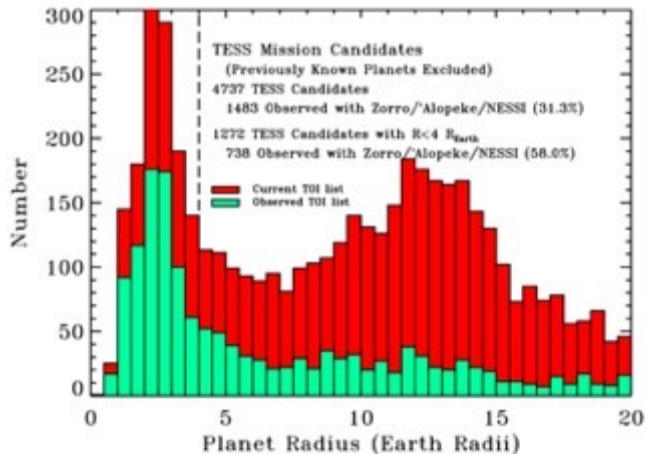
Degenerate Eclipsing Binaries



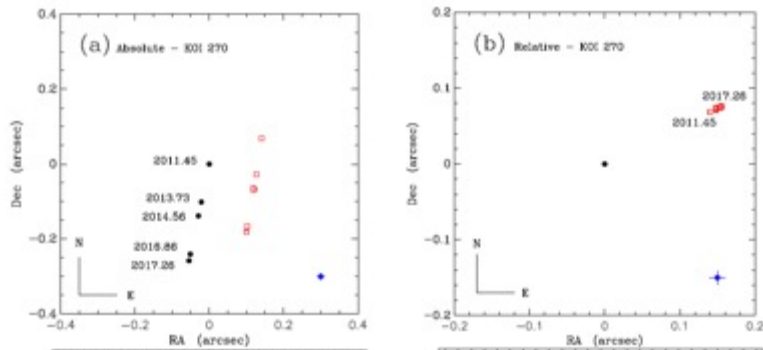
Eclipsing Double
WD
ZTFJ0220+2141
R = 19, 3.5hr,
10s exposures

Kosakowski + 2021

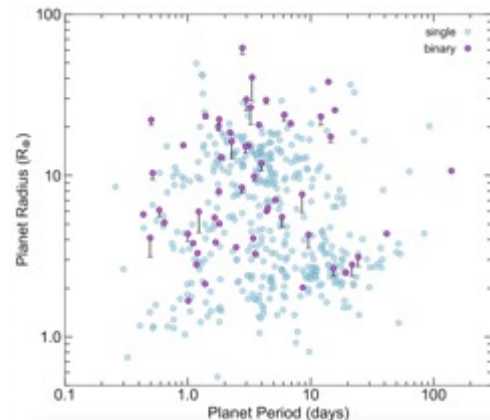
NASA Hi-Resolution Imaging Program: Emphasis on Exoplanets



Binary stars
which host exoplanets
have wider orbits.
Howell+, Lester+ 2022



Highlight bias
Against small planet
detection
in binary systems
Lester+ 2021



Perform absolute +/- 1 mas astrometry (Colten+ 2021)

NASA Hi-Resolution Imaging Program - Speckle Imaging on Large Telescopes



WIYN 3.5m



Gemini-N 8m



Gemini-S 8m

**Available to
the Community,
Two ways**

Propose thru NOIRLAB

- <https://www.wiyn.org/Instruments/wynnessi.html>
- <https://www.gemini.edu/instrumentation/alopeke-zorro>

All raw and reduced data are publicly available with no exclusive use period at NASA Exoplanet Archive

Contact Information

Few target pilot programs, Time critical, JWST observation, etc.

Contact Instrument PI:

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