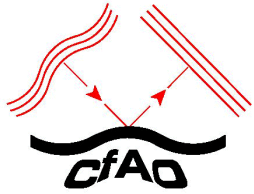


The Current State of AO Galaxy Observations

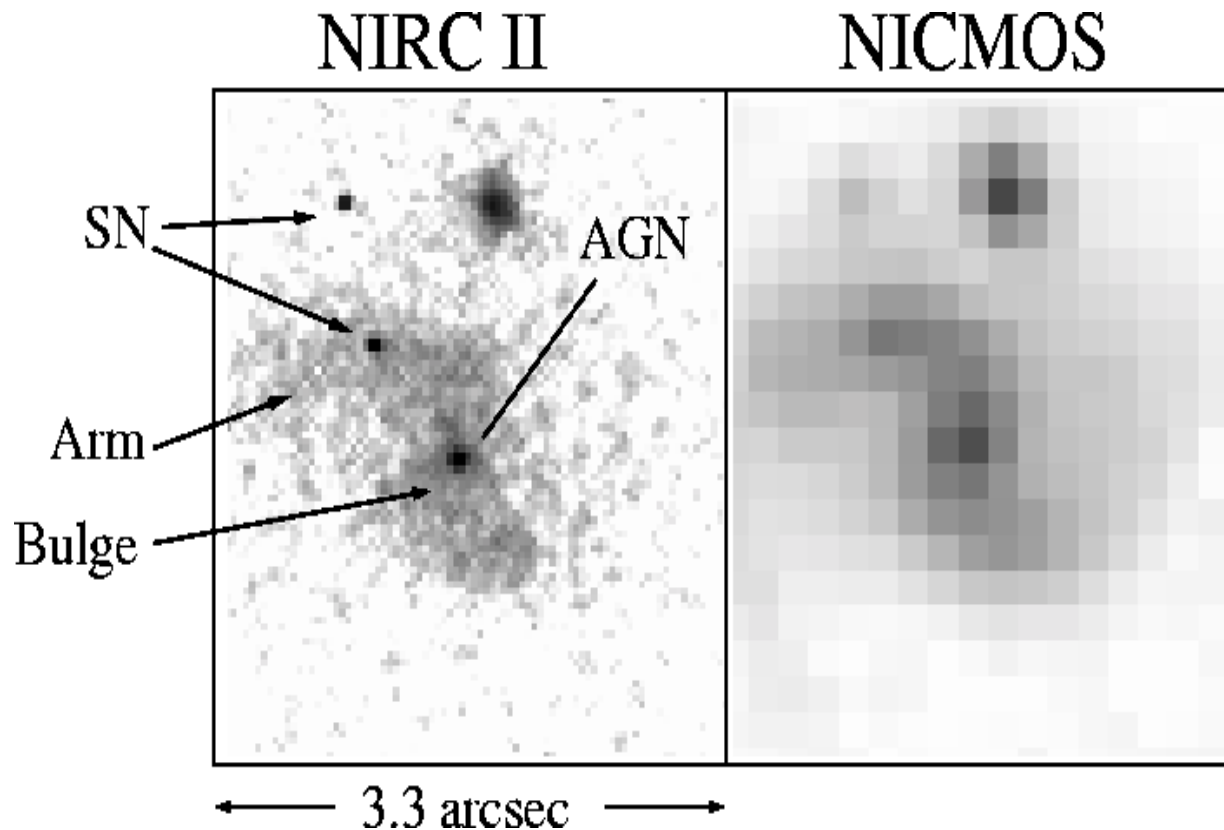
Matthew Barczys, UCLA

CfAO Fall Retreat 2002 - Nov. 7-10, 2002

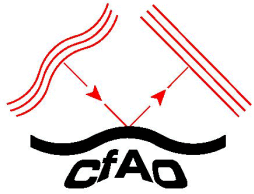


Near-Infrared AO Imaging of Galaxies

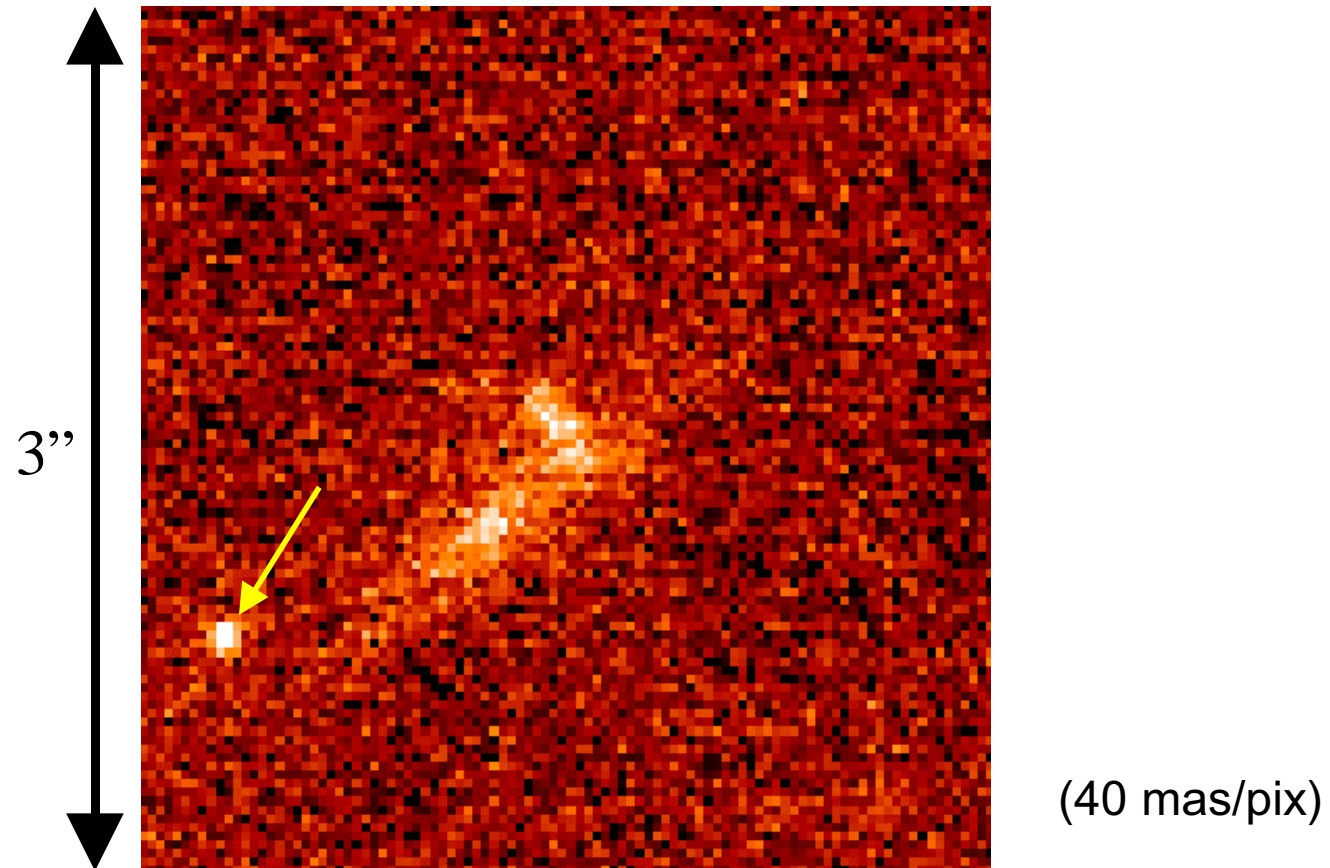
What was thought to be possible...



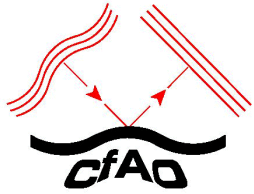
- Simulated galaxy ($H \sim 20$) image from NIRC2 (15 mas/pix) and HST/NICMOS (200 mas/pix). The SN and AGN are each $H \sim 25$. (R. Bouwens)



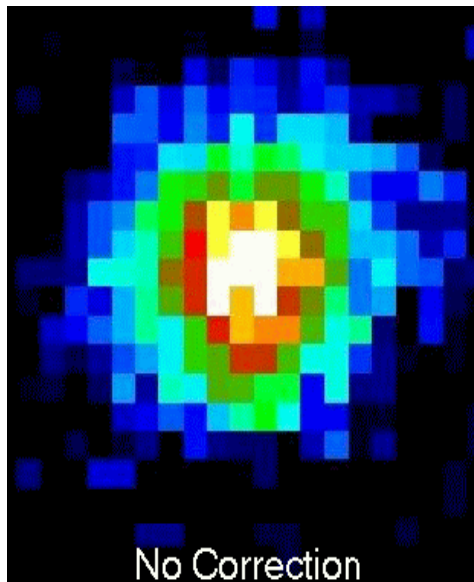
Near-Infrared AO Imaging of Galaxies *IS Possible!*



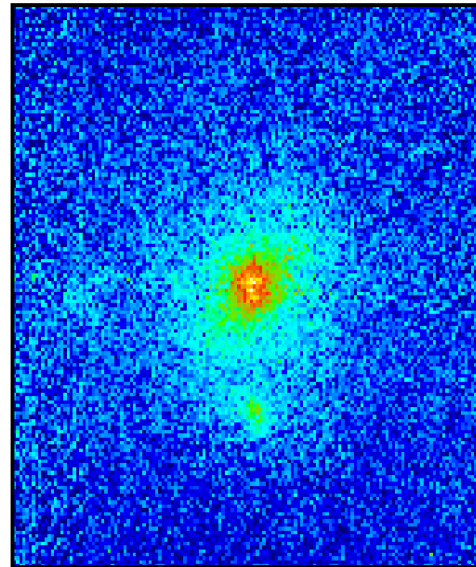
- Real galaxy imaged with Keck AO and NIRC2. Galaxy is $H\sim 20.5$, and point source is $H\sim 23$.



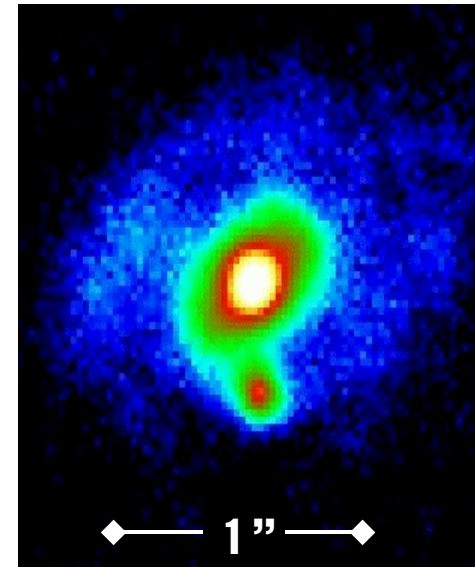
Near-Infrared Galaxy Imaging Capabilities



No Correction
Non-AO NIRC
(150 mas/pix)

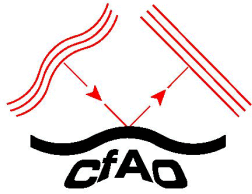


NIRSPEC/SCAM
(18 mas/pix)



1"
NIRC2
(40 mas/pix)

- Galaxy (PPM114182+6+27) imaged by three generations of Keck cameras.
- *These capabilities have enabled surveys of faint field galaxies...*



Keck AO Imaging Survey of Faint Field Galaxies

- **Motivation:**

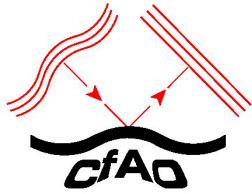
- Image distant field galaxies around bright NGS at high angular resolution to measure the morphologies of disks and bulges, and to study evolution of these galaxy sub-components.

- **Initial Survey:**

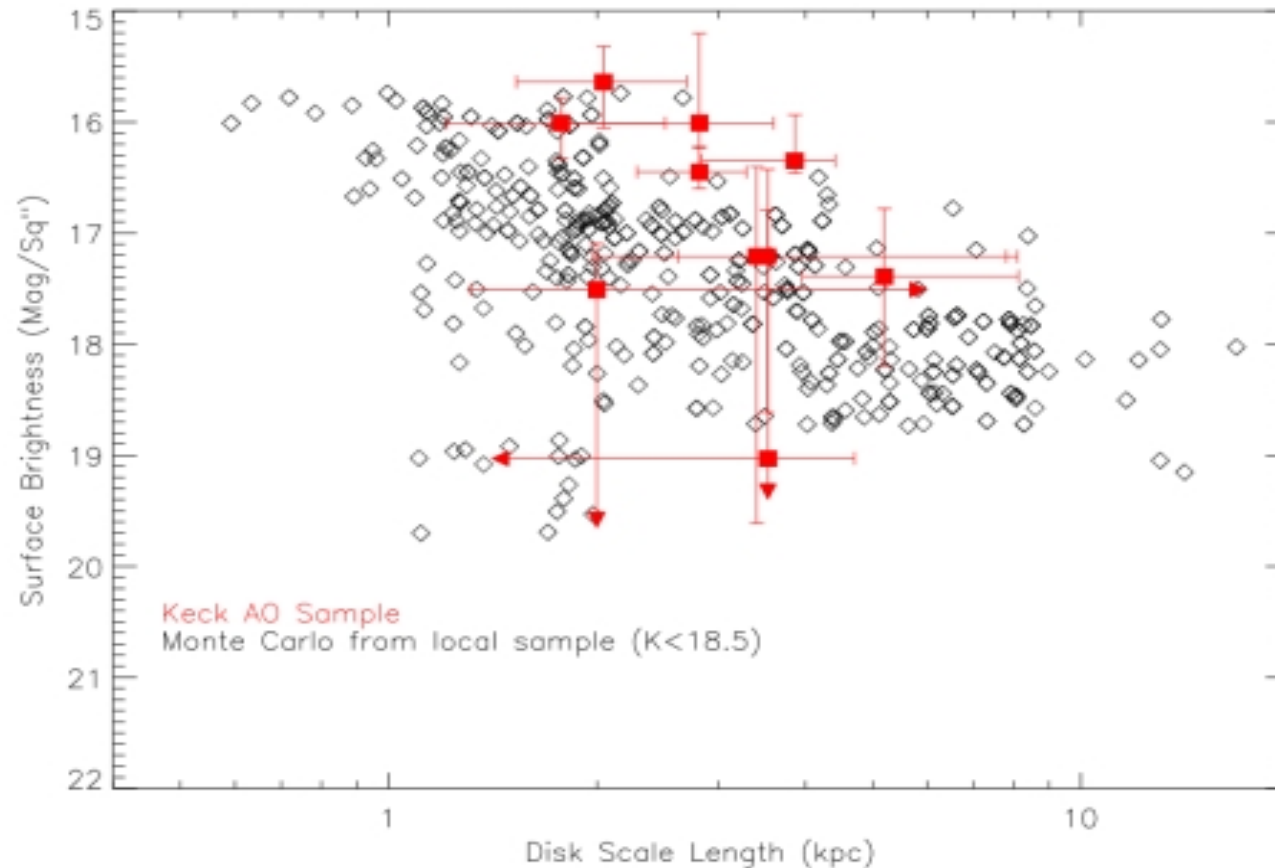
- Began in 1999
- 12 galaxies with $H < 18.5$ imaged with KCAM and SCAM ($\sim 4''$ fields of view)
- Average redshift is $z \sim 0.55$
- Thesis - Tiffany Glassman (UCLA)

- **NIRC2 Survey:**

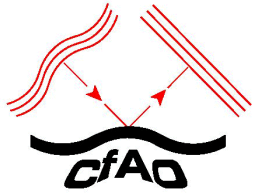
- Began in 2001.
- > 200 galaxies to $H \sim 23$ in 17 NIRC2 fields ($40''$ field of view)
- See poster and talk “Galaxy Evolution at the Keck Diffraction Limit”



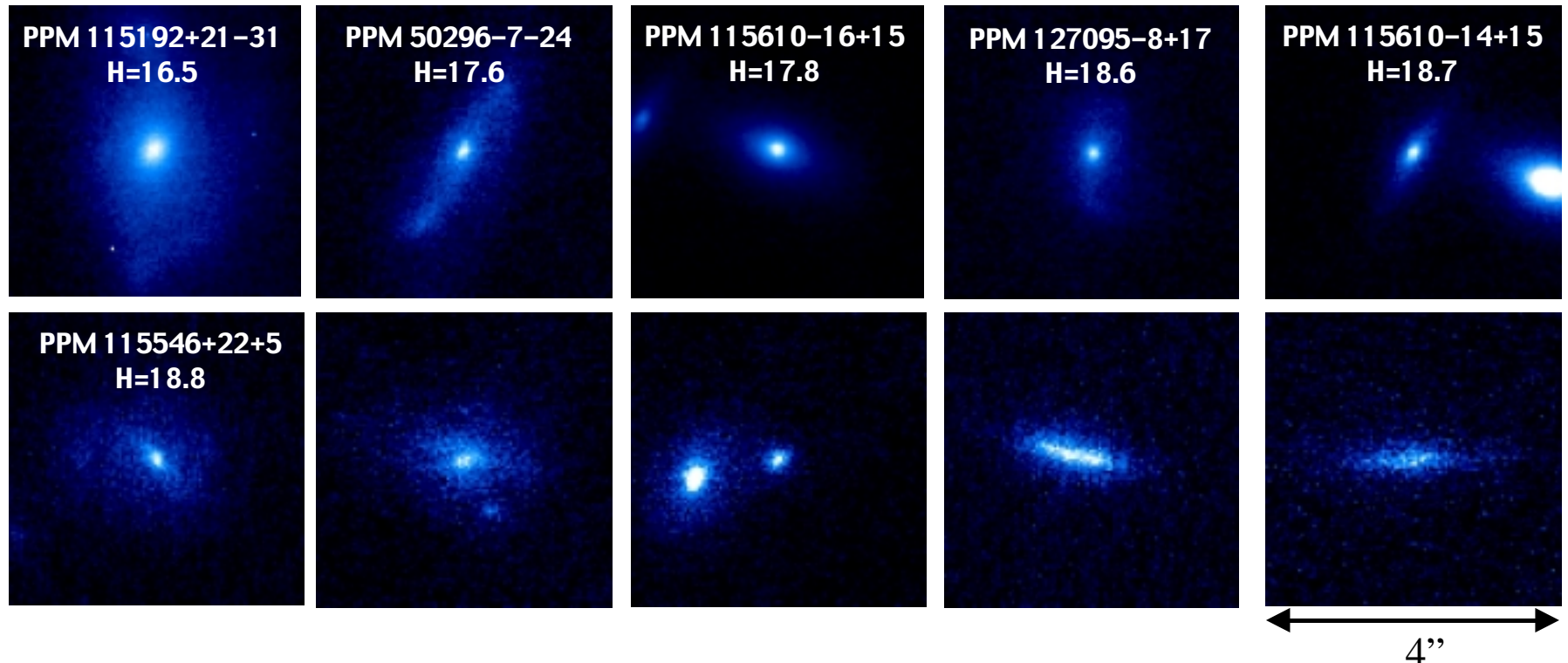
Initial Imaging Survey Demonstrates Scientific Possibilities



- Initial Keck AO survey shows that disks at $z \sim 0.55$ are $\sim 0.6 \text{ mag}/\square''$ brighter than local disks in DeJong's sample.



Individual Galaxies from NIRC2 Sample and Early Indications



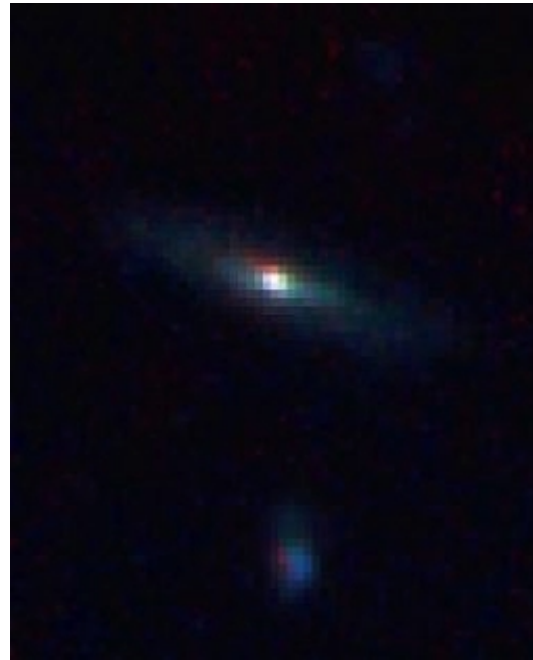
- 10 galaxies with $H < 20$ out of more than 200 galaxies with $H < 23$ in 17 fields (~ 8 sq. arcmin)
- Lots of Bars and Close Companions, Some Point Sources (possibly embedded)
- *Existing surveys show possibilities with single-band imaging data...*



Benefits of Multi-wavelength Data

GSS 294 3364
 $z=0.651$

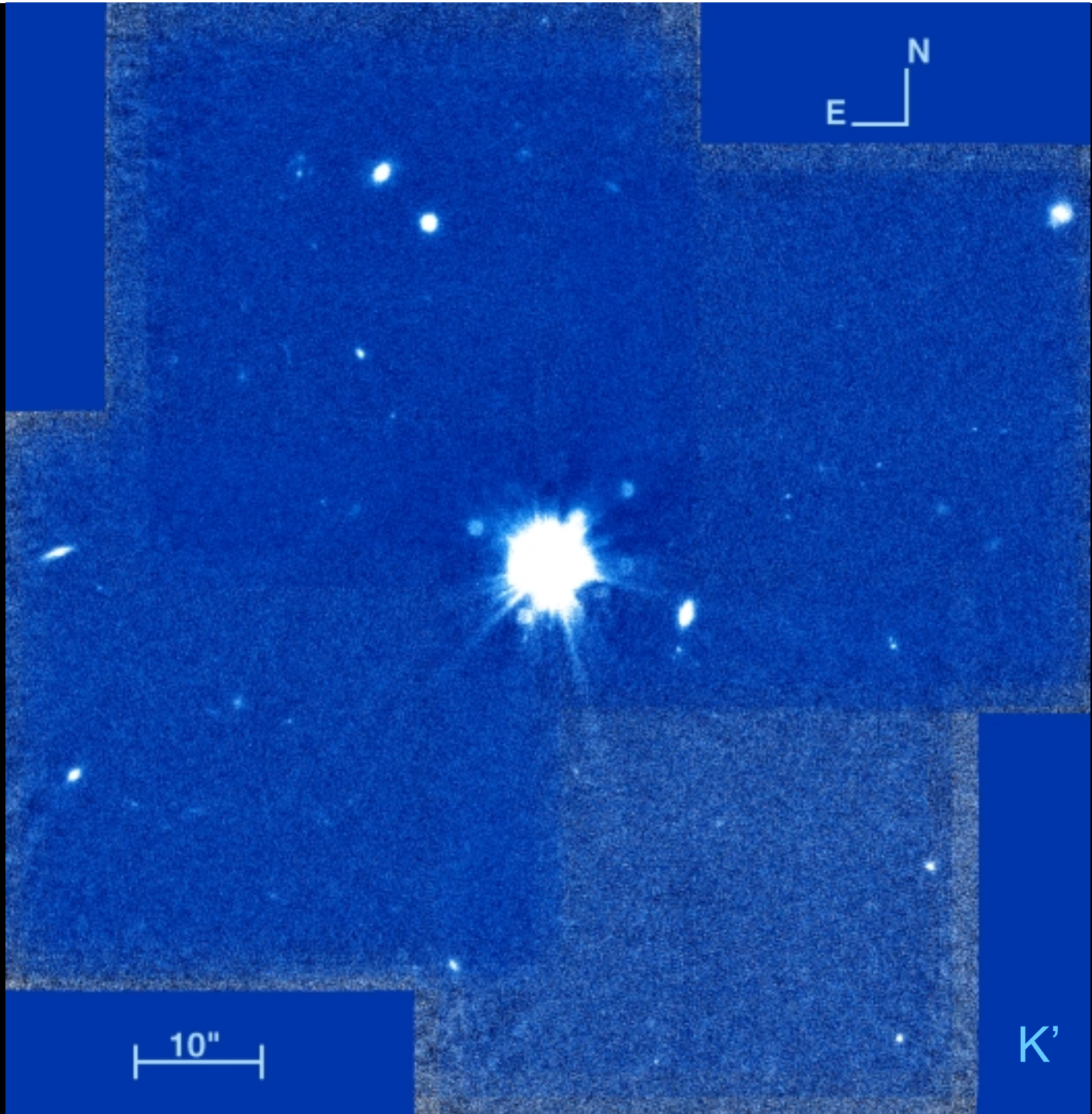
GSS 294 3367
 $z=0.928$



JHU 2375 $z=0.531$

- **Optical/NIR Three Color Images enable colors and color gradients to be measured**
 - Blue = HST V-band, Yellow = HST I-band, Red = Keck AO K'-band
- **At UCSC: Galaxy decomposition and stellar population synthesis modelling.**

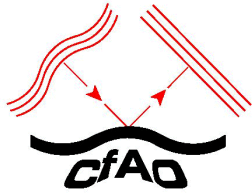
GOODS-North



(see poster
for more)

10"

K'



Pilot NGS Observations of GOODS-North

- **Observations: Keck AO and NIRC2, May 30-31, June 1, 2002 with Matthews and Soifer (Caltech)**
- **Natural Guide Star: USNO-A2.0 1500-05579958**
 $RA_{2000}=12^h 37^m 38.11^s$, $DEC=62^\circ 16' 32.0''$
- **Image Quality: $0''.15 - 0''.20$ FWHM**
- **AO WFS Rate: ~ 70 Hz**
- **Airmass: ~ 1.5**
- **Integration Time:**
 - NE: 90 min
 - NW & SE: 54 min
 - SW: 18 min

