

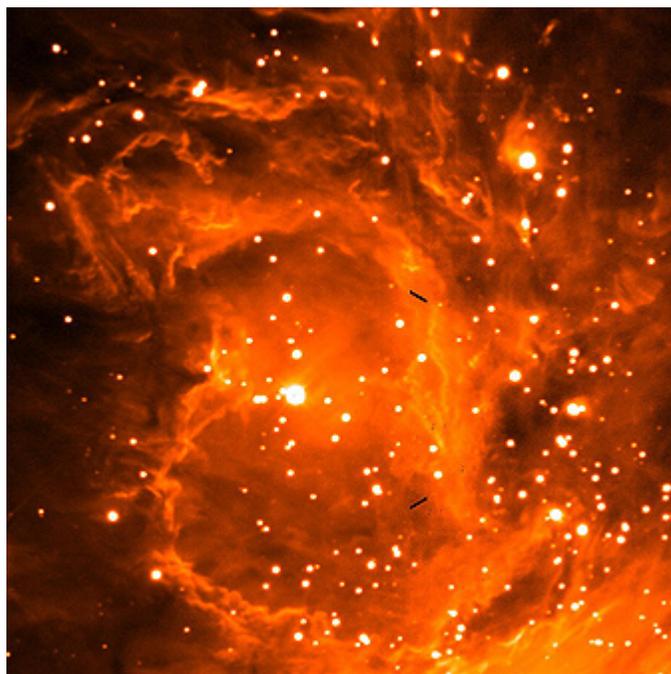


## NEWFIRM Achieves First Light!

*Ron Probst, Buell Jannuzi & David Sprayberry*

The NOAO Extremely Wide-Field Infrared Imager (NEWFIRM) saw first light on the KPNO Mayall 4-meter telescope on 2 February 2007. After several days of delay due to a winter storm front, the scheduled first commissioning run concluded with four successful nights of testing and observing.

NEWFIRM is NOAO's newest instrument, providing both broadband and narrowband imaging capabilities over a square field of view 28 arcmins on a side, at a resolution of 0.4 arcsecs/pixel. It covers the wavelength range of 1.0 – 2.5 microns. The initial filter complement includes standard J, H and K-short (2.0-2.3 microns) as well as 1.3% narrow-band filters centered on Brackett- $\gamma$  (2.16 microns), H<sub>2</sub> (2.12 microns) and [Fe II] (1.64 microns), all at zero redshift.

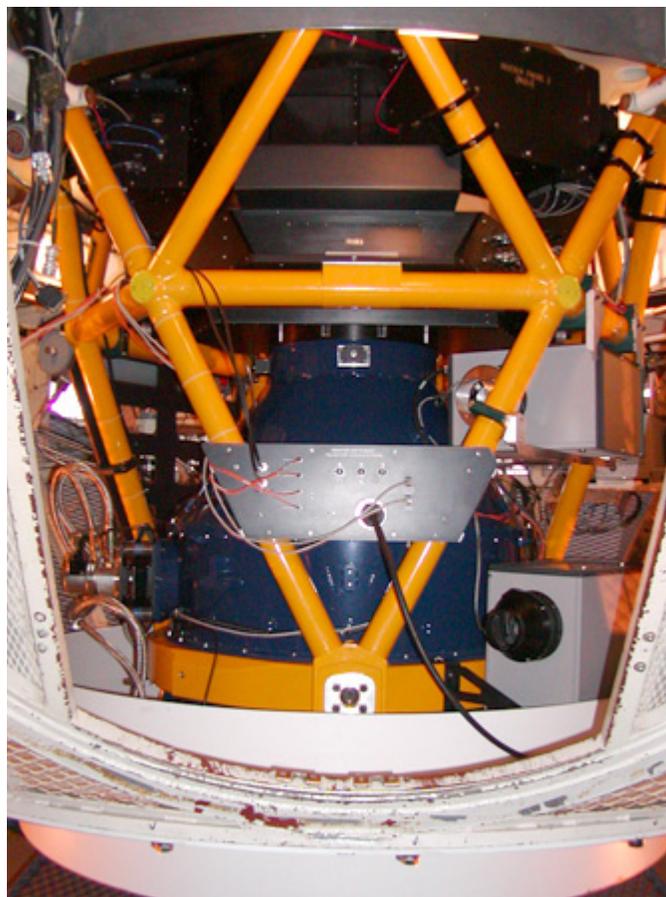


This NEWFIRM image is a portion of the 2.12 micron H<sub>2</sub> image on the cover. This enlargement of the region around the optical nebula M43 illustrates the fine structure captured with 0.4-arcsec pixels in seeing of  $\sim 1$  arcsec.

Image credit: Ron Probst, Frank Valdes, the NEWFIRM team and NOAO/AURA/NSF

The successful commissioning run was the culmination of a great deal of hard work by many people. The KPNO engineering staff did an outstanding job of preparing the telescope and its support services, including the design and installation of the compressed helium system that runs the NEWFIRM cryo-coolers, and a modified bottom section for the Cassegrain cage. They also produced the handling cart,

and actually installed the instrument on the telescope for the first time. Everything was completed on schedule and worked properly the first time. The NOAO Major Instrumentation group staff brought NEWFIRM seamlessly from its third cold test cycle (described in the December 2006 *NOAO/NSO Newsletter*) through the shipment, to restarting on the mountain. The science software group—composed of people from the University of Maryland and the NOAO Data Products Program—also worked hard to get the data handling system, quick-look observer tools, and offline data reduction pipeline to a state of readiness sufficient for first light.



NEWFIRM mounted at the Kitt Peak 4-meter telescope.

Observing targets on the first four nights included standard star and blank-sky flat fields to characterize image quality, throughput, and background sky levels, as well as astrometric fields to determine distortion across the field of view. Tests were also carried out for scattered light and “ghost” images, and for the effects of grazing illumination by very bright sources. In addition to this important work of characterizing the instrument, about half of each night was devoted to narrowband

*continued*

## *NEWFIRM Achieves First Light continued*

imaging of the Orion Nebula (M42) as part of the science verification program (see [www.noao.edu/ets/newfirm/sv.htm](http://www.noao.edu/ets/newfirm/sv.htm)). John Bally (University of Colorado) and Josh Walawender (University of Hawaii/IfA) carried out these observations as part of the science verification team.

The success of this run confirms that NEWFIRM will be made available for Principal Investigator (PI) science proposals in semester 2007B on a shared-risk basis. Also, the “back end” software, including the quicklook observer tools and the data reduction pipeline, may not be in their final state by the beginning of 2007B. Some or all of the data processing tools may not be available, which is why the availability is considered “shared-risk.” Please note that this availability extends to short-term PI proposals only—no survey program proposals for NEWFIRM will be accepted in this first semester.

Information about the instrument will be posted as soon as possible under a prominent banner heading on the NEWFIRM Web page at

[www.noao.edu/ets/newfirm](http://www.noao.edu/ets/newfirm). Posting will be done in time to provide the information needed to support proposal writing. Please check this Web page often for updates about NEWFIRM.

The remaining commissioning and science verification runs are scheduled for April and June 2007. Much remains to be done in the interim, including replacement of the field flattener lens with an updated version to improve image uniformity across the field of view; replacement of the last engineering-grade detector in the focal plane mosaic to complete the focal plane with science-grade devices; completion of the quick-look observing tools for reliable nighttime use; first trial implementation of the science data reduction pipeline; and resolution of the many small problems identified during the first real use on the telescope. On the return to the Mayall telescope in April, we expect that the remaining runs will see a transition from instrument characterization and problem-solving to science verification. 

## New Senior Electrical Engineer Joins Kitt Peak National Observatory

*Tony Abraham & Buell Jannuzi*



We are pleased to welcome Maureen Ellis to the staff of KPNO as a Senior Electrical Engineer. Maureen joins us after working for many years at the UK Astronomy Technology Centre (ATC) in Edinburgh. At ATC, Maureen led the design and development of the electronic system for the Submillimeter Common User Bolometer Array (SCUBA-2)—a second-generation camera that utilizes recent advances in technology to build a “CCD-style” detector using Transition Edge Sensors.

Maureen also led the design and development of the electronic system for UIST, a near-infrared imager/spectrometer for United Kingdom Infrared Telescope. Maureen is experienced in the characterization and optimization of detectors, and has already joined the team commissioning the new infrared imager NEWFIRM. She will also be assisting with the MONSOON controller program, as well as supporting KPNO general operations. We are very happy to have her join our team of skilled engineers, and anticipate that she will be involved in bringing many new instruments to Kitt Peak in the years ahead.

# FLAMINGOS Imaging Update

*Lucas Macri & Dick Joyce*

The photometric quality of the FLAMINGOS instrument at the KPNO Mayall 4-meter telescope was recently characterized after removal of the anti-reflective coating in its field lens. This coating had deteriorated and, as a result, images from the instrument exhibited significant variations in the zero-point across the field of view.

We observed a calibration field during a Testing & Engineering night in October 2006 in the JHK<sub>s</sub> bands under good seeing conditions (FWHM~2.5 pixels or 0.7 arcsec). Point-spread-function (PSF) photometry was carried out, adopting a constant PSF over the entire field of view. The photometry was matched to the 2MASS Point Source Catalog. About 1,500 stars in the magnitude range of 9-15 were used in the analysis.

We found that the PSF is constant over 80 percent of the array. Within this area, the zero-point exhibits a very mild quadratic variation (see figure 1) at the < 0.05 mag level. The coefficients of this relation changed slightly from band to band, most likely due to slight differences in the telescope focus as a function of time.

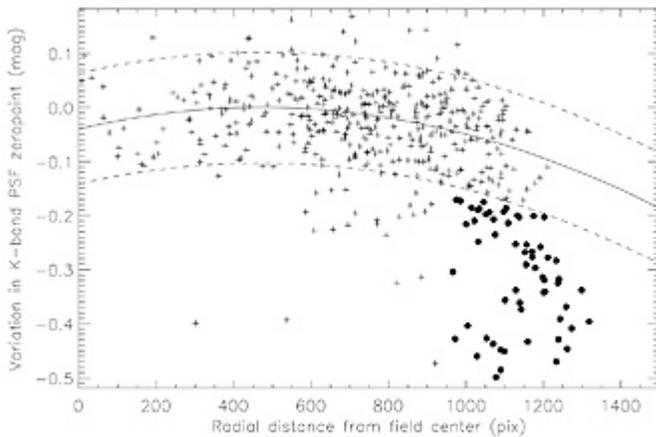


Figure 1. Variation in the zero-point of FLAMINGOS as a function of radial distance from the center. There is a very mild quadratic variation over most of the field. The variation increases drastically at radii greater than 1,000 pixels (filled circles).

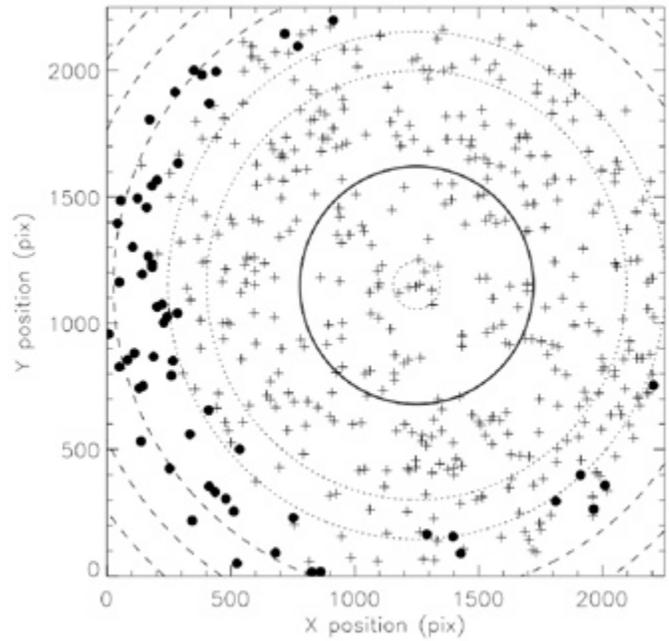


Figure 2. Variation in the zero-point of FLAMINGOS as a function of position within the array. The symbols represent the stars plotted in figure 1. The solid line indicates the annulus where the zero-point reaches its highest value. Dotted lines indicate changes in the zero-point in steps of 0.025 mag, up to 0.05 mag. Dashed lines denote variations in the zero-point in steps of 0.05 mag, up to 0.2 mag.

We found that the image quality degrades significantly at larger radii, especially in the left and bottom edges of the array (see figure 2). Users should expect significant degradation in the PSF at  $X < 300$  pixels or  $Y < 200$  pixels, and plan additional observations with a substantial offset in both directions if they desire accurate photometry of objects located in this section of the array.

Updated information on FLAMINGOS can be found in the “Performance Reports” section of the Kitt Peak instrument manual at [www.noao.edu/kpno/manuals/flmn/flmn.html](http://www.noao.edu/kpno/manuals/flmn/flmn.html).