



WIYN Observatory

Wisconsin Indiana Yale NOAO

Newsletter

January 2007

Director's News

With the major holiday season behind us, it's time to look forward to highlights in the coming year. Here are some milestones that we are looking forward to achieving by the end of 2007.

Complete the QUOTA camera. When the ODI project began and we proposed QUOTA as a test bed camera, there was a lot of excitement about having a new advanced technology camera before ODI became available. The partners have donated some of their valuable observing time toward testing and science verification, and offered some people-power to help bring QUOTA on-line sooner. We thank everyone for doing so. Barring unforeseen problems, QUOTA should be completed this summer.

Complete the Bench collimator and CCD upgrade projects. Historically, spectroscopy is the chief use of WIYN, and so, any throughput gains effectively translate directly into more available nights. We hope to have a new CCD in the Bench in August and the new collimator later in the Fall, improving throughput for everyone and by as much as a factor of 2 for some configurations.

Complete the WIYN External Review. The WIYN partnership is required to convene an external panel every 5 years to review the scientific effectiveness of the facility, and there is considerable progress to report since the review in mid-2000. Now that the NSF Senior Review is public, and the Astronomy Division is openly discussing its implementation plans, WIYN can begin its review process within this landscape. The external review provides the foundation upon which the partners can build a new agreement for the decade after 2010. Unlike QUOTA and the Bench projects, this is a "people" job – no technical breakthroughs are needed. We have excellent people within WIYN – at the universities, at NOAO, and on the staff. Even though we are all busy, I ask that you please help prepare for the review if asked, for the long-term success of WIYN.

~George Jacoby

Science News

Steve Howell & Patricia Knezek

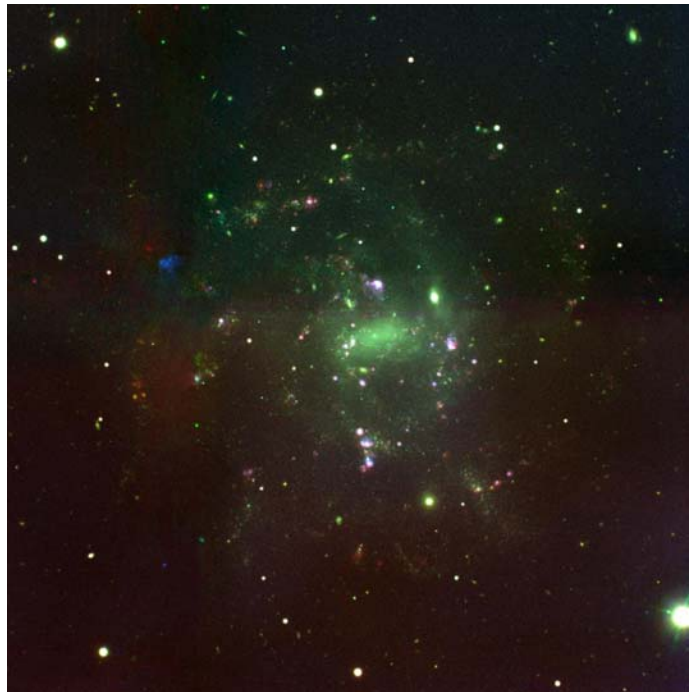


Figure 1: Shown is a composite image (V in green, H- α in red, and [O III] in blue) of the galaxy UGC 2302. The data were taken at the WIYN 3.5m telescope with OPTIC in OT (tip-tilt) mode. Credit: H. Christopher/P. Marenfeld/P. Knezek

WIYN Tip/Tilt Helps to Get the Low Down on Galaxies. UGC 2302 is a low surface brightness galaxy that is similar to M33 in size and gas mass, but it's five times less luminous. Imaging at WIYN using OPTIC in orthogonal transfer (OT) tip/tilt mode was performed in V, H- α , and [O III] (see Figure 1). Clearly visible are a likely small nucleus or central star cluster, a bar-like structure in the central region, and numerous areas of ongoing star formation, mostly along the spiral arms. Also visible (but harder to discern in the small image) are many background galaxies. The disk appears to be nearly transparent except in the very central regions (less than 1 mag A_V out to ~ 5 kpc, Holwerda et al. 2003).

These WIYN data are being combined with HST imaging to determine the star formation history of this system, and thus to better understand how star formation proceeds in "quiescent" galaxies where there's plenty of fuel (HI) but not much fire (stars).

New LBV Candidates Discovered in M31 and M33. Using WIYN and HYDRA, Phil Massey (Lowell Observatory) and

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Science News, *continued*

undergraduate student Reagin McNeill (Smith College) have been attempting to discover additional members of an interesting class of poorly studied variable star.

In 1953, Edwin Hubble and Alan Sandage identified five irregular variables in M31 and M33 that were (at times) among the brightest stars in these galaxies. Photographs from the Mt. Wilson collection provided photometry extending back to 1916, which revealed that these same stars showed episodic outbursts of several magnitudes.

Today, we recognize that the Large Magellanic Cloud star S Doradus and the Milky Way stars Eta Carina and P Cygni are members of this same bizarre class of object. Such objects are known as “luminous blue variables” (LBVs), and they are generally recognized to be extremely massive and luminous objects near the Eddington Limit where radiation pressure exceeds the force of gravity.

However, our knowledge of the LBV phenomenon is very limited. Discoveries have traditionally relied upon fortuitous observations of their extreme, but apparently rare, photometric outbursts. For example, the last major outburst of Eta Carina was in the late 1800’s, and P Cygni last “did its thing” in 1600.

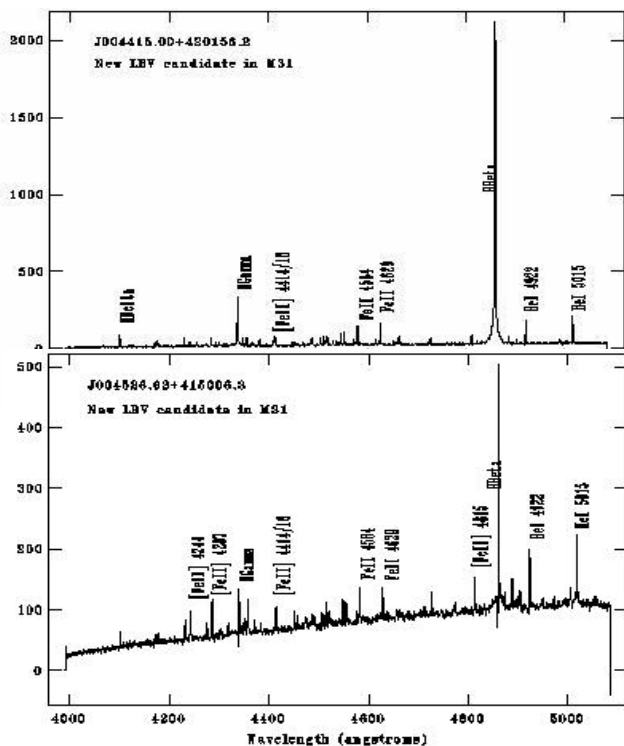
they found a large number of new candidates.

Using HYDRA on WIYN in September 2006, they obtained spectra of 51 stars in M31 and 81 stars in M33. Close to 80% of these are identified as possible LBVs or Wolf-Rayet stars. Figures 1 & 2 show spectra of two of their discoveries. If most of their candidates turn out to be LBVs, this one WIYN run will have increased the number of known LBV’s by roughly a factor of 10.~

IU Guest Night at WIYN

Caty Pilachowski

On a clear night in November, Indiana University (IU) astronomer Con Deliyannis hosted an evening of stargazing for a lucky group of seventeen guests at the WIYN Observatory. The evening began with a supper catered by El Charro restaurant. After a lingering view of sunset, it was time to look at the stars. The group got to view the Ring Nebula through an eyepiece on the WIYN telescope. Deliyannis particularly noted spectacular blues and greens in the "Blue Snowball" planetary nebula, and the reds, yellows, and greens of the Ring.



Massey and McNeill used the NOAO Local Group Galaxies Survey images to identify stellar objects in M31 and M33 that were likely to have H- α emission but not [OIII], eliminating compact HII regions and planetary nebulae. Their philosophy was if it looks like a duck and you wait long enough, it will probably quack and their selection criterion seemed robust; they recovered all but one (it was too faint) of the known LBVs. In addition,



Con Deliyannis (front row at left) and IU guests at WIYN.

The IU Astronomy Department, coordinating with the IU College of Arts and Sciences Development Office, hosts a guest night at the observatory about every 18 months. It's a way of saying "thanks" to those special friends of the Department and the College, including IU alumna Katy Garmany, who was able to join the group.

One delighted guest said “Thanks again for a wonderful experience, matching wonderful people, sharing an incredible adventure.” It was definitely a night to remember.~

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Bench Upgrade Project

Patricia Knezek (WIYN), Project Manager & Matt Bershady (U. Wisconsin), Project Scientist

The highlights during this time include: Board approval of funding for the completion of the off-axis collimator (OAC), VPH grating effort, and new Bench CCD; an external review of opto-mechanical error budget for the off-axis collimator (OAC); and the successful lab testing of the MONSOON electronics intended for the new CCD detector.

Opto-Mechanical design. As noted in the highlights section, mechanical engineer Gary Muller and optical engineer Ming Liang completed an external review to evaluate the current optical and mechanical tolerancing of the OAC design. Overall, they concluded that the error budget was distributed realistically, and recommended a “quasi build to print” approach where the optics and mechanical components are built to meet requirements stated on the drawings, but the final machining of the locating features of the mechanical components is delayed until after the optical components have been manufactured, measured, and the as-built measurements of the optics are entered into the optical design program for optimizing. This recommendation was in accord with our current plan, so we are proceeding forward

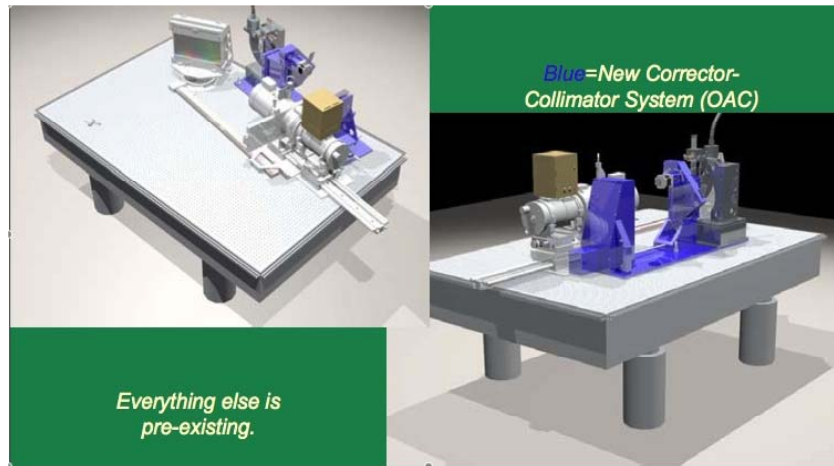


Figure 1: Solid model rendering of the new OAC on the existing bench. (J. Keyes)

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towards a final opto-mechanical design for the OAC. The figure below shows a rendering of the new OAC (in blue) on the existing bench.

In addition to the OAC opto-mechanical design, work has also begun on the redesign of the ATV, and a bid package for the Off-Axis Paraboloid (OAP) is nearly completed.

VPH gratings. A coatings requirement document for the 3300 l/mm grating has been drafted, and we're moving forward with the coating procurement. We aim to complete the coating in the coming months, with commissioning in late 07A or 07B.

A draft requirements document has been written by Gene McDougall for the final 3300 l/mm grating cell and mount. This should be finalized within the next two weeks, and then Joe Keyes will begin work on a design.

New Detector/Controller/Dewar for the Bench Spectrograph. Mark Hunten of NOAO has been able to successfully read a test CCD in the lab with MONSOON with the expected noise performance. The plan is to progress from this first test CCD to a lower noise CCD, and then on to the low noise ($\sim 2.5 e^-$) devices that we may use in the Bench.~

Telescope News

Heidi Schweiker & Andy Layden

WIYN Web site Redesign/Update. The WIYN web site (www.wiyn.org) has a new look. Check it out! Please send comments to heidis@noao.edu.

0.9-m Operations. The past several months have been busy at the 0.9-m. As noted in the July 2006 WIYN newsletter, the PCI card that controls the shutter and filter wheel with the S2KB system became unreliable. The need to upgrade the control of these systems led to a complete upgrade of the telescope control system, both in hardware and software. Changes due to the upgrade are mostly transparent to the user but will make it easier to service and maintain in the future.

New guide cameras were also installed. Both FLI guide cameras suffered damage during the summer shutdown period. In October they were replaced with SBIG ST-402ME Class 1 guide cameras. The new SBIG cameras perform similarly to the old FLI cameras with only a small

change in operational control. The original guide cameras were sent back to the manufacturer (FLI) for repair. These will serve as backup guide cameras in the event that they are repairable.

We are pleased to announce a new mode of observing at the 0.9-m telescope. The Opportunity Queue (OQ) is a web-based communications service designed to connect observers who find themselves with free time at the telescope with consortium partners (PIs) who request specific observations. The intended purpose of the OQ is to increase the scientific productivity of the telescope while fostering collaborations between consortium members.

Participation in the OQ is completely voluntary for the observer, and is encouraged by academic rewards (e.g., acknowledgment in a paper, co-authorship, reciprocal observation, etc.) from the PI for the time and effort expended. Go to www.noao.edu/0.9m/oq/ for more information about the Opportunity Queue. ~

WHIRC

Patricia Knezek (WIYN, Co-I) & Margaret Meixner (STScI, PI)

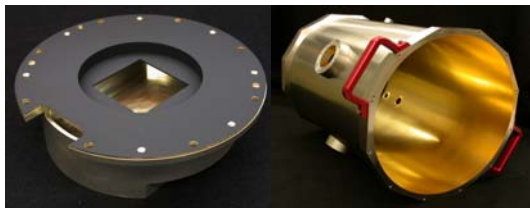


Figure 1: The WHIRC detector housing and baffle can be seen on the left, and the vacuum vessel on the right. (Gregg Scharfstein, IDG/JHU)

Work on the WIYN High Resolution Near-Infrared Camera (WHIRC) continues with full instrument testing in spring 2007, delivery to WIYN in mid-June 2007, and the first commissioning runs in late June and July 2007. Recent progress includes receipt of the cryostat from Precision Cryo, acceptance of the optics, receipt of the final IR Acquisition board from NOAO, updating the MOP observation planning and control software to accept high level scripting, and continued work on using MONSOON with the MUX.

Hardware. WHIRC is nearing completion of its fabrication phase (see Figure 1 for example, which shows the detector housing and vacuum vessel components of the

cryostat). Over 90% of the parts have been fabricated. The cryostat passed its first vacuum test and was gold plated. The filter wheels are done and were sent out for iridizing and plating. Initial warm bench testing is underway. Figure 2 shows the filter wheel assembly. The lens cell holder drawings have been released for fabrication.

Optics. All of the optics have passed inspection and are waiting for the lens cell holders for final assembly.

Controller Electronics. Testing is now being done with the final power supply and the final IR Acquisition



Figure 2: The WHIRC filter wheel assembly. (Gregg Scharfstein, IDG/JHU)

board. Progress continues with implementing MONSOON to correctly control the MUX.

Software. The WHIRC software team has updated the easy-to-use operational interface for the astronomer with software tools so that it will accept high level scripts. Figure 3 shows a snapshot of the prototype GUI

interface. The updates will allow it to process the scripts created in advance of the observing run by the observer using a GUI-based observation planner also developed by the software team.~

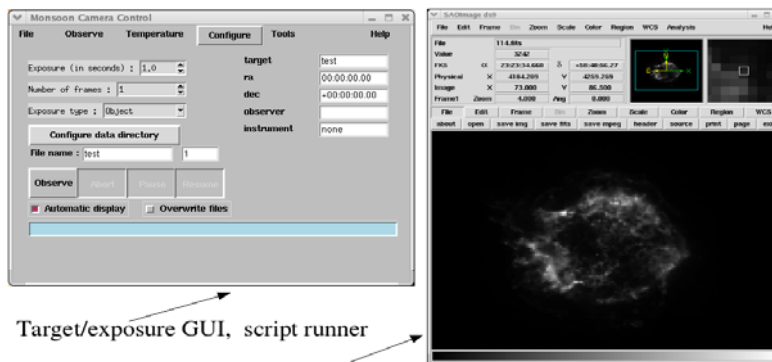


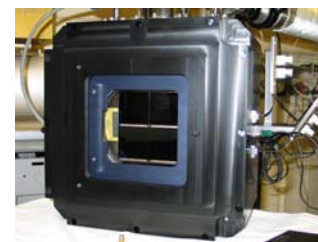
Figure 3: Snapshot of the prototype operation interface MOP-2 GUI that will be used by observers during their runs. (D. Mills)

QUOTA and ODI News by Daniel Harbeck

The new year started with preparations for QUOTA's second light mission at the end of January. The goals for this on-sky test at the WIYN telescope are to operate a fully populated focal plane (i.e., four OTA detectors, as a static imager), and to read out a guide star video stream as the next step towards fast tip/tilt corrections. During the preparations, we encountered some obstacles: e.g., two leaking cold heads, bad components on a controller board, getting the timing right for the data acquisition loop. Ultimately, we are confident that we will have a fruitful testing campaign.

A dedicated QUOTA U-band filter was ordered from Barr Associates after a good blue performance of QUOTA was demonstrated during the first light campaign last October. This new filter will eliminate scheduling conflicts with the Mosaic U-band filter, which we hesitate to use in QUOTA since it is a liquid CuSO_4 design – bubbles can form in the liquid or the filter may leak. The new filter will be made of conventional layered glass, but an additional thin film layer will correct for a

red leak. This novel hybrid design should allow a high peak transmission of the new filter. Expected delivery is in March 2007.



STA started the work on the third lot of OTA detectors. A number of changes were applied to the mask design in order to improve the power consumption and noise performance. The first batch of new detectors is expected in April.

Parallel to the efforts of getting QUOTA operational we are now preparing for the ODI Critical Design Review. While no date is set at this point, we are planning to hold the CDR this spring. As intermediate steps, we will have internal reviews of components and the high-level requirements.~