SARA OBSERVATORY DIRECTOR'S REPORT

September 22, 2006

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I. Introduction.

The SARA consortium is not just growing, its inflating! After adding two new members last year, Ball State and Agnes Scott, we are now adding University of Alabama and are considering a proposal from Valparaiso University to include them in SARA as well. The addition of these new members will place us squarely in position to go forward with Sara South. We are currently working on a memorandum of understanding with Lowell observatory for access to their 24-inch telescope at CTIO. Although much has yet to be done, Peter Mack's evaluation run in the summer led to a proposal from ACE for the cost of automating the 24-inch that seemed well within our capabilities. The major challenge yet to be faced is ratification of the MOU with Lowell and CTIO to ensure our investment leads to a research quality instrument that is accessible to SARA members in the southern hemisphere. In addition to welcoming the new Agnes Scott members, Chris De Pree, Amy Lovell, and Arthur Bowling, I would also like to welcome the University of Alabama astronomers: Ron Buta, Gene Byrd, Phil Hardee, Bill Keel, Jack Sulentic and Ray White. The Alabama proposal was voted on by e-mail and was unanimously approved after the board meeting in the spring. The formal induction will take place at the September 2006 board meeting. In addition, the Valparaiso proposal will likely be voted on at the September board meeting and I do not foresee any obstacles for their admission into SARA. I would also like to welcome Bruce Hirvnak and Todd Hillwig to the board meeting.

In addition to all of the good things, I feel it is my obligation to point out a few of the more troublesome things as well. One is participation of board members in running the SARA observatory and preparing for SARA south. In the early days, before we had a working telescope and observatory, the board members played key roles in getting projects started and finished, without exception. Since a few of the "old timers" have rotated off the board, the newer board members must take up the slack. Weeks have gone by without SARA board correspondence and therefore months doing tasks that should have been accomplished in a week have taken months. One or two board members cannot do everything alone. This consortium has in the past hung its hat on the contributions of its faculty across the board. Each of us has our own local duties: teaching, our own research, family life, university committees. But if you accept the responsibility of being a board member, it is more than just showing up to a bi-annual meeting. You have the responsibility of running the consortium, making timely decisions to protect our investment and improve the observatory for all of SARA. There have been several occasions in the past where the response of board members has been less than

timely for our collective cause. If we are to proceed with SARA south, this issue needs to be seriously addressed at this board meeting.

II. Research at SARA.

We continue to use the SARA telescope every clear night for research and teaching. SARA research consists of projects ranging from binary stars to Blazars. The list below is indicative of the research done at SARA by the member institutions.

- White dwarf stars (Oswalt FIT)
- Cool variable stars are also monitored (Henson ETSU).
- Cataclysmic variables, white dwarf and delta Scuti variables (Wood FIT)
- Binary star light curves are observed (Van Hamme FIU and Shaw UGA)
- Structure of Galaxies (Smith ETSU)
- Asteroids studies (Leake VSU).
- The search for and monitoring of gamma-ray bursts (Hartmann CU)
- Micro-variability observations of Blazars (Webb FIU)
- Photometric observations Seyfert galaxies (Rumstay VSU)
- red dwarf stars (Jordan and Robertson BSU)
- CV Binaries (Kaitchuck BSU)
- Massive Star formation in the Milky Way (Chris De Pree ASU)
- Asteroids and comets (Amy Lovell ASU)

Please continue to submit your publications to Bev Smith at ETSU. Cooperative projects highlight the remotely accessible abilities of SARA and most of all the "extended astronomy department" feeling of the consortium. For the new members, the collegial interaction of observers has allowed projects like Blazar outbursts and Gamma-ray bursts to be observed with great success. Hopefully this "TOO" practice will continue in the future. We feel that the addition of the University of Alabama and the Agnes Scott researchers will further enhance our research projects and the reputation of the SARA observatory.

III. Telescope Usage.

I once again encourage everyone to fill one out for their night whether they open the dome or not. Scott and I depend on these to keep abreast of usage, problems, and weather. Most observers have been much better about this recently, but would like to I ask everyone to include more detail as to why they didn't open. It makes it easier when we go back and look at the reports to figure out what the problems actually were.

Operating without an ROA! We would like to remind remote observers that without an ROA the weather must be exceptional and that they must be properlyy qualified to operate in that mode. We recently had a misunderstanding about this issue and it appears prudent that a recap of the important rules here is in order. Note our definition of "Faculty" applies ONLY to Ph. D. astronomers who are faculty at a SARA member institution.

1. New faculty must train either in person or on-line with a qualified SARA faculty member for a minimum of 3 nights, and with an experienced observer on call for another 3 nights.
2. Post Docs must train in person with a qualified SARA faculty member for a minimum of 3 nights and always have an experienced faculty on call. Must be "Board approved" to observe without faculty on call.
3. Graduate students must train in person with a qualified faculty member for a minimum of 3 nights. Their faculty advisor may then petition the Board to have them approved as a "qualified observer" who may only observe with an experienced faculty observer always on call.

4 An undergraduate student may NEVER operate SARA alone without a qualified SARA faculty member or other qualified observer present in person.

5 Non - ROA observing – Experienced Faculty (Those having met the training criteria under point 1 above) may observe without an ROA after an additional 3 nights of remote observing (total 6). Non-Sara faculty, Post Docs and Graduate students may NEVER observe without an ROA unless they are Board approved. Essentially their faculty advisor must make a strong case for allowing them non-ROA clearance..

For new members, these rules were created over a period of years of operation and seem to work well. Earlier in SARA history, there were absolutely no operations without an ROA, but as we grew more comfortable with the system, we have systematically relaxed our requirements to their current status.

If there is a problem while you are observing the following is the "Chain of command" to follow:

1. Consult ROA for weather problems, computer reboots etc. ROAs cannot perform complicated repairs or diagnostic functions.
2. If you are an eligible grad student operating alone, call faculty advisor to report any problem before continuing.
3. If the problem is too severe for the ROA, call the observatory director for a recommendation. I do answer the phone at night, but I do screen calls to if you get the machine, keep talking! If it is before 11:00 MST Peter and Josie Mack have been excellent about responding to a phone call in case of evening-threatening problems. Don't call for minor problems! If you are unsure as to whether to call Peter, call the observatory director first. We can decide together whether to involve ACE.
4. If you can't get in contact with anyone, shut down!

The telescope is fully subscribed and ROA coverage is adequate, although not as comprehensive as we would like. Every night when there was ROA coverage was allocated for research and nearly all clear nights were used by a SARAn. The policy of

allowing "seasoned observers to stay open after the ROA has left the mountain" has been used with great success. Only four of the 330 available nights were unclaimed by observers and these nights were holidays.

Last semester, out of the possible 153 days (excluding August), 69 nights were used to gather observations. Weather was the primary cause for losing nights. There were two periods of technical problems, one in early spring when both the U55 and the Ap7 were not working properly for about 5 days, and another time in the summer when we reserved engineering time for ACE to do the focal point tests. It turns out most of the nights used to perform these tests were cloudy anyway (~6 days)! Some usable nights were lost due to the rules of "experienced observers only" on non-ROA nights, but most were traded off.

Due to the addition of Ball State University and the Agnes Scott, as well as figuring in the additional nights for University of Alabama and Valprasio, the current algorithm gives the member universities the following number of nights for the upcoming semester: CU – 23 nights, ETSU – 18 nights, FIT – 14 nights, FIU – 12 nights, UGA – 19 nights, VSU – 19 nights, BSU – 16, ASC – 25 nights, UA – 18 and VU - 18.

IV. Telescope Problems.

Although there are no major telescope problems to report, the SARA south investigation by Peter Mack drove home the fact the SARA North is not performing optically up to its theoretical limits. Whether this is a problem with cooling, or the optical light path is still a question. What is clear is that the Lowell 24" goes deeper and gets smaller FWHM than the SARA 0.9-meter with the same camera. We knew we did not achieve the kind of resolution we would like, and we have discussed various options over the years like:

a) fabricating a new secondary
b) doing away with the tertiary mirror
c) installing cooling fans in the tube

It is not clear which option is the one that will get us the most improvement with the least effort and expense. Peter has an option to replace the current 'backend" of the telescope with a straight-through stage that will move the detectors to the focal plane, not use a tertiary to move the focal point to the detector. Peter and Adam Block ran tests to this effect, but due to lousy weather, the tests were inconclusive. We need to run further tests to determine if this is an option we would want to pursue. Replacement of the telescope "back end" would require an expensive purchase, but might be our best shot at achieving better images. We should have a cost proposal from Peter for the board meeting budget discussion.

I spoke with Mike Palermiti of ITE astronomy, an optics expert who gave a public lecture on telescope optics for Southern Cross. From my discussion with him over dinner, he would be a good choice if we decided to have the optics analyzed by a professional. There are several local optical companies in Tucson as well we could hire for consultation. Unfortunately, due to lack of discussion on the SARA board, we have not made significant contact with Mike or any other company about this issue so I have

nothing solid to report to the board as far as cost. This is an option we might want to consider after we access the gains due to the deletion of the tertiary.

Dome cooling is another option we should explore. Peter Mack has proposed (and I should have a formal quote by the board meeting) to air condition the dome. He estimates the initial cost would be less than $10,000.00 and the monthly cost in electricity and upkeep would be on the order of $200.00. Several observatories have realized substantial gains from doing this.

V. Instrumentation.

- **Cameras**

1. Apogee has sent us a new U42 CCD camera to replace the U55 camera. This camera seems to be significantly more sensitive (although I have yet to use it). This fair trade was a nice gesture by Apogee since we were constantly bellyaching about the low sensitivity of the U55. I am optimistic this will become our workhorse camera at SARA North. The new camera has just been returned to SARA following a moisture problem.

2. Finger Lakes camera with SITe chip. This camera has not turned out to be as good as I had hoped. The cosmetic feature does not flat field out and the bias level is very high, but in the final analysis, it was necessary. The urgency of purchasing it was based on the limited availability, the reasonable price, and the fact that SARA would have been without a camera for more than a week while Peter was in Chile. As it turns out, it will now be our only back up at SARA north due to the expiration of the AP7 (see below). We might consider asking FLI about the bias level, whether it is permanent or can be tweaked.

3. The Ap7 was sent Fedex to Apogee (Tucson-California) at the beginning of August for shutter problems again. This CCD has been very problematic due to the shutter freezing for about a year now. I was one of the primary users of the camera due to its better sensitivity over the U55. Apparently, during transit, the box was dropped and the chip was fractured, destroying the camera. The Apogee people, upon receipt, failed to open it immediately to check the contents. When it was opened, they discovered the chip was broken. Since they delayed in opening, Fedex refused to pay for it (It was insured, but after a period of time if a claim is not made, the insurance expires). Apogee is nominally responsible since they failed to open it in a timely fashion and discover the problem. Our decision is this: how do we proceed from here.

    - The camera was on its way out anyway due to shutter problems and the chip constantly fogging up.
    - Apogee was very generous in giving us the new camera to replace the heavily used, but not well liked, U55. The new Princeton cameras with

the same chip as the new U42 is $50k, whereas we paid only ~$24k for the U55.
- We have the FLI camera as a backup to the U42 and it is a newer camera than the Ap7 and a much wider field.

Question to the Board: - Do we proceed against Apogee because they are officially liable, possibly disrupting our currently good relationship with them, or not pursue damages?

4. The apogee Ap4 is still serviceable and usable but will not be on the telescope during normal operations.

- **Computing facilities**

Computers continue to work well. The saraccd computer is set up to run both the Ap7 and the U42 cameras, while saratel remains the telescope computer. There is a very large problem with the Cryocam computer. Martha's low resolution spectrograph operates off of a windows 98 computer. NOAO and KP have said they will no longer allow windows 98 computers on the local net due to security issues. Thus, either the cryocam computer needs to be upgraded, or it can only be used on site.

- **Weather Station**

The weather station is up and running and appears to be accurate. We have had some problems with it, but apparently it is currently working. We would still like to buy "fish-eye lens" camera to aid in determining whether the night is photometric or not. I believe we had allocated funds for one, but no one has acted upon it and actually purchased one. Peter will provide us with an updated quote for the board meeting.

- **Autoguider**

The autoguider is on the telescope and is in regular use by observers. The autoguider is connected through the saraccd computer. The caveat is that the autoguider cannot be focused if the telescope is focused for the Ap7p. This is a problem since the only reason one would use the Ap7p is for faint objects due to its better sensitivity. Yet the exposure times are necessarily limited without autoguider use, so we need to correct this problem. When (if) we get the new back end for the telescope, the autoguider will be replaced and the problem will disappear.

- **ISTeC** – There is no new news to report on ISTEC. After a short discussion at the Spring board meeting, no one from SARA has stepped up to take over ISTEC. Gary Henson sent the some of the ISTeC information for inclusion on the WGPAC (Working group of Professional/Amateur Collaboration) web site, but I checked it and it hasn't been updated since the summer of 2004. Thus, we would like to once again ask if someone from SARA was willing to work on the ISTeC web site.

- **REU Program -**

  New interns, new projects, great success! Thanks to Matt for another successful year.

- **ROA's** - Our current group of ROA's are exceptional. I would like to formally thank Elaine, Chuck and Roy for their excellent work. It is always a pleasure to work with them, even though the telescope is operating so efficiently only rarely does there need to be much interaction. Due to the departure of Adam Block, there was a rather severe hole in the ROA coverage. A combination of the new more lenient rules and ACE stepping up and providing ROA services has really lessened the impact of losing Adam. Thanks ACE!

VI. Future.

The future is here! These are some of the challenges we face starting this week and in the near future.

1. ***Possible SARA expansion.*** The Valparaiso group, led by Bruce Hirvnak and Todd Hillwig, has submitted a proposal for consideration at the board meeting. We are excited about the prospect of adding their University to our consortium and look forward to working with our new colleagues at Alabama. The addition of the money (buy-in of $50,000) will allow follow-through with plans for a southern hemisphere telescope. In addition to the cash inflow, as usual the most important addition will be the talents and expertise these astronomers bring.

2. ***SARA South ?=? CTIO 24-in.*** The evaluation trip yielded some rather nice surprises, and some unwelcome ones. The telescope itself is in good condition and the subsequent automation should be reasonably easy. The bad news was the condition of the dome which houses the telescope. The dome must be replaced before we can refurbish the telescope. This is expensive I think it will undoubtedly cause a serious delay.

3. ***Image quality improvements.*** We are entertaining a proposal to refurbish the "light path" of the SARA 0.9-meter telescope at Kitt Peak and replace the current tertiary mirror and instrument selector with a "straight through" instrument selector. Although the tests are inconclusive, this may improve our image quality by a large amount. There are other advantages to this arrangement that are also important.

   Air conditioning the dome is a possible way to substantially improve the image quality and is reasonably inexpensive, but will be an increase in the operating costs.

   No one has investigated alternative funding for secondary mirror fabrication. This

is a major project and someone who is interested needs to be the driving force behind this project if we really expect developments. The board should consider hiring an optical expert the evaluate the current SARA 0.9 after the back end replacement and the air conditioning are in place,.

VII. Summary.

The SARA observatory remains a fully functional research and teaching observatory, operating nearly every clear night! The ACE control system is effective and Peter has implemented improvements promised in a timely fashion. The most exciting new developments are the new members and the possible addition of a Southern Hemisphere telescope. The only less than positive issue has been the less than timely response of board members to vital issues.

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