The Perfect Decade

Jeremy Mould

From the outset, we have all recognized that the current Decadal Survey, *Astronomy and Astrophysics in the New Millennium*, is ambitious. The survey committee saw revolutionary astronomy opportunities in diffraction-limited ground-based telescopes and the digital sky. There was a parallel movement to double the National Science Foundation (NSF) budget. Astronomy was also the beneficiary of some of the biggest philanthropic gifts to science. These were the conditions, perhaps, for a decade long astrophysics boom, the inverse of the perfect storm!

In response to the opportunity, we have seen an armada of new projects emerge from port: two candidates for the Giant Segmented Mirror Telescope (GSMT) and a flotilla of survey projects, including PanStarrs, the Dark Energy Survey, and the Large Synoptic Survey Telescope (LSST), complementing the spaceborne Joint Dark Energy Mission.

Members of the Long Range Planning Committee during their November 11 meeting in Tucson.

The Decadal Survey also entrusted to NOAO the task of leading community strategic planning for the US System of optical/infrared (O/IR) observing facilities, including the nurturing of public-private partnerships, and scaling up WIYN and SOAR by an order of magnitude. In response to an NSF request, and recognizing the size of the challenge, we have recently established a Long Range Planning Committee to develop a road map that can guide us to success with the decadal goals. The committee has the benefit of a chair who knows the community well, Caty Pilachowski, and membership that includes the chairs of the GSMT and LSST Science Working Groups. I'm grateful to Caty and to Roger Blandford, Julianne Dalcanton, Alan Dressler, Garth Illingworth, Rolf Kudritzki, Pat Osmer, Sara Seager, Chris Sneden, Michael Strauss, and Alex Szalay (see photo) for their willingness to help with this important activity.

The NSF briefing at the committee's first meeting in September identified two special challenges that face us. First, we are working in a larger context than the astronomy decadal survey. In the future, priority for public funding of facilities of the scale of GSMT and LSST will be assessed by the NSF over all scientific disciplines and national priorities, in an international context. A project that has a fundamental impact on high-energy physics, or on the life sciences in an astrobiological context, may thus command a higher priority than a pure astronomy project. The committee will be mustering our arguments to present the intriguing connections between astronomy and these other disciplines.

Second, the committee was told to plan for a flat operational budget. That means the resources to operate the new facilities will be derived from our existing workforce levels. We therefore foresee the need to retire some current facilities or devolve them to other groups able to continue their operation. The committee's road map will need to include those decision points too.

A third challenge became clear during the committee's deliberations. The nature of the opportunities that make the current Decadal Survey goals so attractive is to involve disciplines that carry out large projects in different ways. High-energy physics and space science are opposite poles when it comes to selecting between competing concepts. Computer science is different again. Physics experiments are finite and are more readily sequenced in order of tighter and tighter measurements. We need to absorb the best from this diversity of approaches to the tasks of planning and working together. More details of the first meeting are on the Web at *www.noao.edu/dir/lrplan/lrp-committee.html*.

The Long Range Planning Committee is currently in its input phase, receiving presentations and data from interested parties. Its goal is to produce a scientifically interesting and consensus-based road map; it is not a selection committee of any kind. The committee will seek feedback from the community before finalizing its report. The report is anticipated in Spring 2005, and it is expected to inform the Committee on Astronomy and Astrophysics (CAA) and the NSF astronomy division on a fully integrated road map that will include radio astronomy and solar physics.

New Guidelines for TSIP in FY 2005

Todd Boroson

Following the "Building the System from the Ground Up" workshop (*www.noao.edu/meetings/system2/system2_report.pdf*), the Telescope System Instrumentation Program (TSIP) guidelines have undergone major revision for the FY 2005 cycle. TSIP is the National Science Foundation (NSF) program, administered by NOAO, that awards funds to independent observatories to build instruments or upgrade capabilities, and returns observing time on those facilities to the broader astronomical community.

There are now two types of TSIP proposal—System Improvement proposals and System Access proposals. System Improvement proposals are aimed at providing instruments or upgrades that result in enhanced scientific capability, effectiveness, or efficiency. They may range from complete facility instruments to instrument improvements (including data reduction pipelines and data archives) to infrastructure upgrades. System Improvement proposals require telescope time equal in value to 50 percent of the funds awarded to be provided to the community through the NOAO telescope allocation process.

System Access proposals are a simple mechanism for independent observatories to sell telescope time. The time provided will be equal in value to 100 percent of the funds awarded.

The funding in FY 2005 is expected to include the annual allocation of $4 million, plus approximately $1.75 million being carried forward from previous cycles. In FY 2005, this funding will be divided into two portions, with up to one-fourth available for telescopes between 3 and 6.5 meters, and the remainder for telescopes of aperture 6.5 meters and larger.

FY 2005 TSIP proposals are due at the end of February, and new awards will be announced in May 2005.

LSST Update

Sidney Wolff

A major milestone for the Large Synoptic Survey Telescope (LSST) project is currently being finalized—a commitment to purchase the primary mirror with funds generously made available by a private donor. Private donations are key to purchasing long lead time items early in the project and achieving our goal of first light in 2012.

Over the past several months, the members of the LSST consortium (under the leadership of Tony Tyson, project director; Don Sweeney, project manager; and John Schaefer, president) have focused their efforts on establishing the science requirements, selecting a baseline optical design, letting the mirror contract, developing the design for the camera (via work being done at Department of Energy laboratories), initiating work on data management, and narrowing the list of possible sites.

A Science Working Group, chaired by Michael Strauss, has completed its report on the kinds of scientific programs that will be enabled by a survey capability with a figure of merit of

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LSST Update continued

AΩ > 250, where A is the aperture of the telescope and Ω is the field of view. That report, which is independent of the particular design that is adopted to achieve AΩ > 250, can be found on the NOAO Web site.

The LSST consortium has developed a set of requirements for the telescope and camera that would meet the goals set forth by the SWG as well as the three NRC studies that have recommended it, and these requirements are posted at *lsst.org*. Requirements for data management also will be posted as soon as they are completed. Community comment and input is invited; again, see *lsst.org* for how to contribute to LSST.

The baseline optical design provides a field of view with a diameter of 3.5 degrees. The tertiary is now flush with the primary, and the camera will be mounted between the secondary and tertiary. A drawing can be seen on the LSST Web page image gallery. The committee to advise the LSST Board on site selection has narrowed the choice to four sites: La Palma, San Pedro Martir, Las Campanas, and Cerro Pachón.

A series of poster papers at the January meeting of the AAS will provide updates on the project. Stop by, and we will be happy to answer your questions!

Regional Workshop on Public Facilities and the System at Yale

Todd Boroson

On October 9, about 60 astronomers from Yale University and a number of nearby institutions spent most of a day at a workshop on "Ground-based Optical Astronomy in the 21st Century." This meeting was organized by Charles Bailyn, who took advantage of the visits of a number of NOAO staff for the WIYN Board meeting on the previous day. Presentations focused on both current and future facilities, primarily those that are publicly funded and offer open access. A panel discussion in the final hour of the workshop raised concerns about availability of time on telescopes from small to large, the relationship between grant funding and telescope time, and the balance between education and research in the use of available facilities. The program of the workshop can be viewed at *www.astro.yale.edu/bailyn/workshopagenda.html*.

As a participant in this workshop, and as the organizer of previous national-level workshops (as well as AAS town meetings) that covered similar ground, I found this meeting to be an extremely effective forum for communication with a segment of the community that is often difficult to reach. Many of the participants were graduate students, postdocs, and junior faculty. Most of those attending were from small colleges, and their perspectives were somewhat different from what I hear at national meetings. The way the meeting was organized—running from 10 A.M. until 5 P.M., box lunches, and student assistance—made it relatively easy for people to participate, and it was inexpensive to stage.

The NOAO System Project Office (syspo@noao.edu) would be happy to assist anyone who wants to put on a regional workshop by arranging for speakers from NOAO to attend and participate.

While there are probably not that many places in the country where a regional meeting such as this one would attract as many attendees, I believe that there are a few, and that it would be worthwhile to organize more regional workshops, both to convey the federal optical astronomy program to an important segment of the community and to communicate their concerns to the staff of the national observatory. The NOAO System Project Office (*syspo@noao.edu*) would be happy to assist anyone who wants to put on a regional workshop by arranging for speakers from NOAO to attend and participate.

Letizia Stanghellini
Associate Astronomer

Letizia Stanghellini joined the NOAO scientific staff in April 2004, along with her spouse, Mark Dickinson. Letizia came to NOAO from a European Space Agency staff position at the Space Telescope Science Institute (STScI). Before moving to Baltimore, she was an assistant astronomer at the Bologna Observatory in Italy. Letizia earned her master's degree and PhD from the University of Illinois in Urbana-Champaign, advised by Professor James Kaler; her thesis included observations with the Kitt Peak 2.1-meter telescope. Letizia previously taught physics and math in Italy, after receiving her undergraduate degree from the University of Bologna, where her adviser was Professor Alvio Renzini.

Letizia's research specialty is planetary nebulae, which she has been studying in an extensive campaign using the Hubble Space Telescope (HST) with collaborators Dick Shaw and postdoc Ting-Hui Lee (NOAO); Eva Villaver, Max Mutchler, Diane Karakla, and Chris Blades (STScI); Bruce Balick (University of Washington); and Anabel Arrieta (UIA, Mexico).

Q. What is the current focus of your research on planetary nebulae?
For the past eight years, my main focus has been on observations of planetary nebulae in the Magellanic Clouds. We have acquired several hundred orbits of data from the HST, including the current cycle. We are trying to understand the formation and evolution of planetary nebula in an environment where their distance is known.

The distances of planetary nebulae in our own galaxy are not known very accurately, even though they are much closer to us—perhaps a dozen in the Milky Way are known with an accuracy of 20 percent, and many others could be 50 percent off or more. We don't know the absolute brightness of their central star or their true size, so we wanted to obtain an "absolute probe." The only way to do it with current technology is in the Large Magellanic Cloud (LMC) and Small Magellanic Cloud (SMC).

With Hubble, you can resolve them spatially, and we know their distance with sufficient accuracy. We have observed about 100 objects to date, and we use an innovative technique of spectroscopy without a slit that gives us an image of the nebula in each spectral line, as well as the morphology in each line. Ground-based optical spectroscopy is extremely useful to complete the observations—with a 4-meter class telescope, they are point sources.

Q. What are the big questions in the field right now?
We don't have a good understanding of the lower limit for the mass of a Type Ia supernova; below that limit, [the death of a star] produces a planetary nebula.

There are also issues related to theories of single-star star formation. How much carbon and nitrogen are contributed into the interstellar medium for the next generation of stars from planetary nebula? They are probably a major source, but we need more precise measurements and distances to know.

Another major question is "how do bipolar planetary nebulae form?"—is it from a binary star, or magnetic fields, or is it from stellar rotation associated with higher-mass stars?

All these questions are completely open, and they require absolute measurements of the central star.

Q. There has been some recent research using the WIYN telescope and other facilities suggesting that binary stars are required progenitors of bipolar planetary nebula. Does your work support this trend?
We are finding some interesting variability in the shapes of planetary nebulae. In the LMC, about half of planetary nebulae have aspherical features; others are almost round or elliptical.

One of our results that was not a surprise, but is good to know, is that the shapes of planetary nebulae in the LMC are the same as those we have seen in our galaxy. The distribution is different, but that may be partly because the plane of the Milky Way obscures a large fraction of the population, many of which are probably bipolar.

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Q&A continued

There are several hints that the bipolar planetary nebulae are associated with a more massive population, but having a binary progenitor is not a necessity. Neither current observations nor theories give a full answer.

Q. What was attractive to you about a job on the scientific staff at NOAO?
It was clear to me when I visited here that NOAO is an organization that is looking forward, both in my science area and with ground-based astronomy in general, and it presented many possibilities. Very interesting new things are being discussed, and I could tell that NOAO is reinventing itself, both with current projects and new ones.

In addition, Dick Shaw is one of my closest collaborators. We had the same academic advisor and have worked together on the LMC planetary nebulae project for the past ten years—we are like professional brother-and-sister! So that was another strong motivation for moving here, along with people like George Jacoby and, now, John Feldmeier. We have initiated a "Planetary Nebula Forum" with our neighbors at Steward Observatory that meets on the first Friday afternoon of the month. It has been very charming, there are 10 or 12 people here who are really in love with the subject.

I still hold my staff position at the University of Bologna—it is very hard to get tenure in Italy and, in general, it is easy to keep the position in absentia. I could go back easily, which is why I continue to include that affiliation on my papers.

Q. What are your NOAO staff service duties?
My functional work is very interesting. It includes tasks for the New Initiatives Office and science operations.

In addition, I will be serving as chair of the galactic panel at the next telescope Time Allocation Committee (TAC) meeting. It's a lot of work, you can see the piles of proposals covering my desk! It is similar to the process at STScI, but the difference is that you can actually participate in scientific discussions—it is much more scientific than bureaucratic.

Very recently, I was asked to chair the NOAO Goldberg Fellowship search committee, and we are preparing to review applications.

Q. What could the Thirty Meter Telescope (TMT) and the Large Synoptic Survey Telescope (LSST) do for observations of planetary nebulae?
The TMT offers even better spatial resolution than the Hubble Space Telescope for infrared observations. This will enhance our study of the planetary nebulae in the Magellanic Clouds and beyond. The large collecting area of the telescope will allow spectroscopy of the nebulae at the faint end of the luminosity function for planetary nebulae in our Local Group of galaxies.

With the LSST, it will be interesting to look at stellar pulsations. Many current observations cross the instability strip, and it is not easy to determine their variations.

Q. How do you find life in Tucson?
I had only visited here once before moving. In June, I thought I would never get used to the heat…and now I am cold all the time, so I guess I have adjusted! The sky is beautiful and the sunsets are spectacular, just like I had been told.

I am an amateur artist in my spare time, and I have found a nice artist community, including a school at the Tucson Museum of Art. I can see it will be very interesting. We certainly have the "right light" here in the southwest.