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## Why *Currents*?

*Currents* is intended as a sparkplug for communication between NOAO and our community. It provides updates—and solicits community input—on NOAO observing opportunities and NOAO programs and policies on a more rapid timescale than is possible with the quarterly NOAO Newsletter. The incentive for *Currents* comes from the NOAO Cooperative Agreement Renewal Proposal, which describes the new 5-year program for NOAO. The proposal, [now available on the NOAO homepage](#), elaborates on the description of the new NOAO program that was given in the [December 2007 NOAO Newsletter](#).

In a nutshell, the Renewal proposal reaffirms our mission of providing broad community access, based on peer review, to a complete and balanced System of state-of-the-art facilities, including telescopes of all apertures, and the data from these facilities. The proposal describes how NOAO is altering its program in order to better accomplish this mission. The proposal also describes the principles by which the System will evolve and the importance of maintaining an active dialogue with the community in setting the appropriate balance of capabilities. *Currents* is one of the mechanisms by which we aim to maintain that dialogue.



The [NOAO Cooperative Agreement Renewal Proposal](#)

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## In this Issue...

The [Program Update](#) (ReSTAR and Beyond) describes the recommendations of the ReSTAR (Renewing Small Telescopes for Astronomical Research) committee, which created a blueprint for developing a system of 2-m to 6-m aperture telescopes. A similar study, focused on larger aperture telescopes, is on the horizon.

The [Gemini Update](#) (The Gemini Opportunity) summarizes the recent news fluctuations regarding the Gemini partnership. It also raises the issue of how the Gemini partnership might evolve over the long term for the benefit of the US community.

The [Science Spotlight](#) (Constraining the Cosmic Evolution of Type Ia Supernovae) illustrates how spectroscopy on a range of telescope apertures, from 10-m to 1.5-m, can be used to address an important problem at the frontier of astrophysics. In developing the System described in the cooperative agreement proposal, NOAO aims to make a similarly broad range of capabilities accessible to all astronomers in the community.

## Contact Us

Is there a topic that you would like to see covered in a future *Currents*? If you are planning a regional astronomy meeting or department internal symposium, would

you like someone from NOAO to give a presentation on our new program? Please contact us at [currenents@noao.edu](mailto:currenents@noao.edu). We look forward to hearing from you!

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## Program Update: ReSTAR and Beyond

### ReSTAR Reports

The Senior Review report urged NOAO to ensure that community access to facilities remains scientifically balanced over all apertures, and that it do so both in the present, and in the future—into the era of Pan-STARRS, LSST, JWST, ALMA, GSMT, and the NVO. In response to this recommendation, NOAO formed a committee, ReSTAR (Renewing Small Telescopes for



Astronomical Research), charged with developing a prioritized, quantitative, science-justified list of capabilities appropriate to telescopes with apertures less than 6 meters, together with estimates of the number of nights needed. The committee was asked to solicit input from the broad community in order to address current needs and uses of such telescopes and to attempt to predict how these needs will evolve over the next ten years. The ReSTAR committee concluded its work in December, 2007 and issued its recommendations. The full report can be found at [the ReSTAR page on the NOAO website](#).

In summary, the ReSTAR report establishes the scientific importance of telescopes of small and mid-size aperture, and makes the following recommendations about the evolution of access and capabilities in order to make the US system of telescopes in this aperture range more consistent with the needs of the community.

- Renew the infrastructure of the existing federally-funded telescopes.
- Update the instrumentation on these telescopes to provide higher efficiency and effectiveness.
- Emphasize fundamental, “workhorse” instrumental capabilities—these are what the great majority of researchers want access to.
- Raise the amount of time available on 2-4m telescopes to the equivalent of about 8 telescopes; it is currently between 3 and 4, including NOAO facilities and IRTF.
- Create a network of facilities for the exploration of the time-domain; this will be needed for the community to exploit Pan-STARRS and LSST discoveries to the fullest.
- Utilize important capabilities on non-federal telescopes, but in bringing them into the system, maintain a high level of usability.

### Building the ReSTAR System

In response to these recommendations, NOAO is putting together a plan that addresses all of the items above. The mountaintop infrastructure at KPNO and CTIO is already being modernized. To address the amount of access desired, we are looking at a combination of restoring complete access to our own facilities, buying time on other facilities, and building some new telescopes. We will update our existing instrumentation, starting with our spectrographs; modernization of our



The ReSTAR report was a major [focus of the NOAO town hall meeting](#), on

imaging capabilities is already well under way with NEWFIRM, ODI, and DECam. All of these efforts will be supported by our in-house

programs, particularly our Instrumentation program and our Data Products program, and their approaches will emphasize partnerships with community groups. This plan will first be sketched out in a white paper that we will submit to the NSF before the end of February. At that time we will release it for public comment. Our expectation is to package this plan as a proposal to the NSF to be submitted in time to begin ramping up these activities in 2009.

January 10, 2008, at the AAS winter meeting in Austin.

## The Large Telescope System

We regard the ReSTAR committee effort as having been quite successful. It elicited input from 160 astronomers through a Web survey. This input was analyzed and interpreted by the committee into a report that is thoughtful and comprehensive. Obviously, the same approach would benefit discussion of the capabilities needed on telescopes in the 6.5-10 meter aperture range, and so an analogous committee is being formed to begin this study. For the large telescope discussion, Gemini is a special case, both because it already represents the dominant access to large telescopes for the broad community and because of the recent announcement of the UK withdrawal. While the membership of this new committee has not yet been established, we are hopeful that it will complete its report before the end of 2008. Like ReSTAR, it will make the solicitation of community input a high priority. Please be aware of this activity, and when the announcement comes out, make your ideas and interests known.

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## Gemini Update: The Gemini Opportunity

In recent weeks the Gemini partnership has gone through a period of turmoil, during which it was first announced that the UK had withdrawn, and then that statement was reversed. We expect the UK participation in Gemini to be clarified over the next few weeks, and we will keep the US community informed about what is happening and what the implications are. Watch the NOAO web site and future issues of Currents for upcoming details.

## The Revised Partnership

Equally or more important is how the Gemini partnership will change over the longer term. From the US perspective, we believe that it is in our community's interest to acquire as large a fraction of the available time as is possible.

Gemini time is highly oversubscribed (typically 4-6 when calculated as nights requested divided by nights charged); we usually receive as many proposals for Gemini as for Kitt Peak and CTIO telescopes combined; the community is

successfully turning Gemini observations into published papers. We also believe that a larger US share will result in a closer connection between Gemini and the US community, and that might result in different decisions about how to operate Gemini and what capabilities to provide.

These issues are significant ones, and, just as we have argued for the smaller telescopes, we believe that they are best considered in the context of the US system of ground-based O/IR facilities. It seems appropriate to convene a community discussion on exactly this point: what are the capabilities (instruments, observing modes, types of access, numbers of nights) that the community needs on the



Gemini South

current generation of large telescopes, and how can Gemini and the non-federally-funded facilities best address these needs. This becomes the large-telescope version of the ReSTAR committee, and we are in the process of establishing this panel to solicit broad community input and to provide such a report by the end of 2008. Again, watch the NOAO web site and future issues of Currents for upcoming details.

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## Science Spotlight: Constraining the Cosmic Evolution of Type IA Supernovae

### Stranger than Fiction?

In one of the most surprising developments of the past decade, astronomers discovered that the expansion of the Universe appears to be accelerating rather than decelerating. Perhaps stranger yet, explaining this result led to the proposed existence of a new form of energy—a mysterious “dark energy”—that pervades all of space. At the heart of these developments are observations of type Ia supernovae. They provide most direct evidence for dark energy and the accelerating expansion of the universe under the assumption that type Ia’s are unevolving standard candles (apart from corrections based on light curve shape).

### Results from the NOAO Survey Project ESSENCE

A recent paper by Foley et al. (2007; [astro-ph/0710.2338](#)) examines this assumption, by studying the extent to which type Ia’s evolve over cosmological redshifts. In the first large-scale effort of its kind, composite spectra of high-redshift type Ia supernovae were compared with the spectra of low-redshift counterparts. The study made use of the  $\sim 100$  spectra of high-redshift type Ia supernovae obtained as part of the [NOAO survey project ESSENCE](#). These were compared with a compilation of  $\sim 400$  spectra of low-redshift supernovae obtained at the Lick and Keck Observatories and with HST and IUE.

Because the spectra of individual high-redshift supernovae have low signal-to-noise ratios, Foley et al. combined the spectra to create higher signal-to-noise composites. The composite spectra of high-redshift supernovae are very similar to the spectra of low-redshift type Ia’s. Once the ESSENCE spectra have been corrected for the likely contribution from the light of the host galaxy, the low- and high-redshift composites of spectra obtained at maximum light differ by less than  $\sim 10\%$  at rest-frame optical wavelengths. Foley et al. conclude that type Ia supernovae show little spectral evolution, evolving spectrally by less than 10% at redshifts  $< 0.8$ .

### Relation to the NOAO System

The ESSENCE project spectra that were used in the study were obtained with telescopes spanning a wide range in aperture: the Keck I and II 10-m telescopes; the VLT, Gemini North and South 8-m telescopes; the Magellan and MMT 6.5-m telescopes; and the Tillinghast 1.5m telescope. Providing access to a similarly broad range of telescope apertures is a goal of the NOAO System of facilities and resources. To learn more about the governing principles and implementation of the NOAO System, see the NOAO Cooperative Agreement proposal, now [posted on the NOAO home page](#).



The [type Ia supernova 1994D](#) (the bright spot at the lower left) in the outer reaches of the galaxy NGC4526.

Credit: High-Z Supernova Search Team, HST, NASA and V. Rubin/CIW

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NOAO is the national center for ground-based nighttime astronomy in the United States and is operated by the Association of Universities for Research in Astronomy (AURA), Inc. under cooperative agreement with the National Science Foundation.

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