

# NEWSLETTER

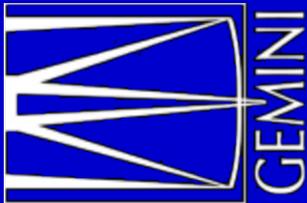
Issue 17

December 1998

## **GEMINI** 8-Meter Telescopes Project



## ***Hilo Headquarters Completed Gemini North First Tilt!***



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The first primary mirror being transported up Mauna Kea in June 1998.

The acceptance tests for the first primary mirror at Gemini North, October 1998.



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# GEMINI OBSERVATORY NORTHERN OPERATIONS CENTER OPENS!

*WATCH THIS SPACE...*

In August 1998, most of the Gemini staff relocated to the new Northern Operations Center in Hilo, Hawai'i. This new 17,300+ square foot facility is home to the Gemini administrative offices, remote access control center, instrument labs, and meeting/conference facilities and will serve as a hub for the Gemini communications networks. The facility was formally dedicated on November 18<sup>th</sup> and was attended by the Gemini Board, the local astronomical community, local business and political leaders and staff.

The image below shows the new lobby that will greet visitors at the Hilo facility, seen on the front cover. Behind the temporary Gemini display panel is the remote-access viewing windows where visitors will be able to see how the Gemini telescopes are controlled. Also included in the lobby will be exhibits that will interpret Gemini and ultimately even provide a virtual tour of the observatory. In addition, changing displays will highlight the science obtained by Gemini once commissioning and scientific operations begin.

Gemini Director Dr. Matt Mountain said, "It is wonderful to be in our new offices after spending so much time in temporary facilities. I'm extremely pleased with the new building and confident that it will be a great asset as we continue forward and accomplish the ambitious goals that have been set for Gemini."

*- Peter Michaud  
Manager, Public Information and Outreach*



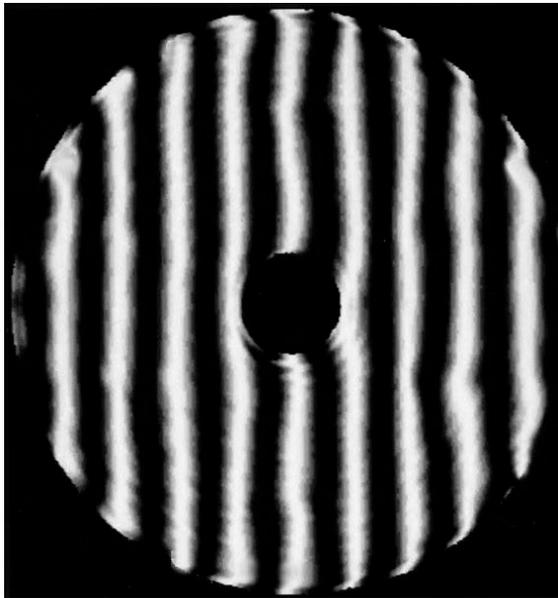
**Figure 1.** The Gemini Northern Operations Center lobby.

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## PROJECT STATUS REPORT

The project is well into the system integration efforts on Mauna Kea, and projected to lead to first light near the end of this year or by early 1999. In addition to filling most of our planned operational staff positions, we have hired a large number of temporary employees with the skills necessary to keep the project moving rapidly. The remainder of the project construction staff that were expected to move to Hawai'i have now relocated, leaving a small administration staff in Tucson to support construction, contracting, and a variety of other activities. Several software and optics staff are also commuting from Tucson to support the integration efforts in Hawai'i. Other staff are beginning to support the ramp-up of our activities in Chile.

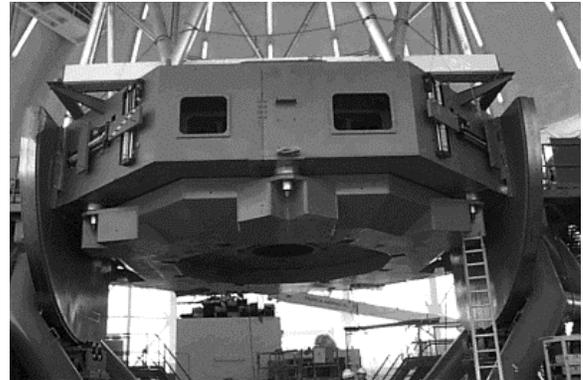


**Figure 2.** Test results on M2

The first completed primary mirror has been successfully transported to the summit and is currently in our coating area, where it is being prepared for installation into the telescope. The first secondary mirror has been accepted from Zeiss and is being integrated with the rest of the M2 assembly in Hilo. One of the test results from the secondary is shown in Figure 2 and shows a surface map and simulated fringes after

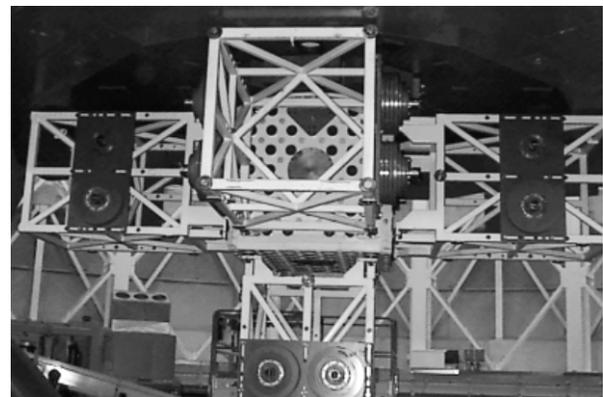
active optics correction. The residual figure after active optics will be about 17 nm rms.

While several critical activities have progressed slower than anticipated, we continue to rapidly approach first light for Gemini North. At the time of this writing, we anticipate that first light will occur within a few weeks of the new year.



**Figure 3.** The first primary mirror cell with steel dummy mirror in place in the telescope.

An example of our progress is shown in Figure 3, which shows the telescope structure with the primary mirror cell assembly integrated within the enclosure on Mauna Kea. The mirror cell is holding a steel dummy mirror that (as of early November) has allowed initial pointing tests and calibrations of the telescope mount. The instrument support structure and instrument dummy mass is shown in Figure 4.



**Figure 4.** Telescope structure with M1 assembly installed, along with the ISS and dummy mass.

Thanks to the cooperation of our employees, partners and subcontractors, we have been able to reorder and/or perform several activities in parallel to mitigate most delays on Mauna Kea. In addition to telescope integration, other major progress includes: work on the enclosure, building fitout work, optics group work on primary mirror equipment, and the completion of the system cables and services installation on the telescope to connect the primary mirror and telescope systems. There are also a few remaining cleanup items to finish on the enclosure, but they are not directly affecting our progress towards first light.

The acquisition and guiding system, from RGO and Zeiss Jena, were delivered to the summit this past summer, and integration to our overall control system is well underway. These systems will be installed in the telescope concurrently with the primary mirror.

The Mauna Kea coating chamber has presented some major problems over the last six months, but most of them have been resolved. It is now ready to coat the primary, but some cleanup work will be required after first light. All handling equipment for the primary mirror is ready and has been fully tested with the steel dummy mirror in preparation for the real primary. The primary mirror itself was unloaded from the shipping container on October 13<sup>th</sup> and accepted from REOSC shortly thereafter, as can be seen on the inside front cover.

The first primary mirror cell assembly, with its support systems, has been installed in the telescope and tested on MK with the dummy mirror.

The top end of the telescope, shown on the inside back cover, was transported and assembled in the enclosure in October. Also during October, the telescope was successfully tilted for the first time on the summit to allow for top end installation and mount drive tests. The first Gemini North tilt tests are shown on the front cover.

Other notable accomplishments in Hawai'i include the recent completion of our high speed DS3 link between the Hilo Base Facility and the summit. This not only supports our control system work, but provides phone and video links to the summit as well. The Hilo Base Facility was also occupied in August of this year (see the article on Page 1).

On Cerro Pachón in Chile, the enclosure erection work is complete and is shown on the outside back cover. The work to fitout the support building and interior is also well underway.

On secondary mirror systems, the Project has cancelled efforts to produce silicon carbide secondary mirrors and contracted with Zeiss Optical for two lightweighted zerodur mirrors. The first of these mirrors has been delivered and as mentioned earlier, the test results are shown in Figure 2. The second one is currently being produced at Zeiss and is on schedule.

The first secondary assembly, including the positioning system, M2 baffles, and fast tilt/focus system, has been integrated in Hilo, and the M2 mirror is being installed at this time. Lockheed has delivered the second tilt system to Tucson.

In the area of facility instrumentation, both of the Instrument Support Structures have been completed by AMOS in Belgium. AMOS has also completed the Cassegrain rotator and cable wrap for the MK system. (A picture of this can be seen on the inside back cover.) The wavefront sensors and acquisition cameras from RGO and HIA have also been integrated with the Zeiss systems on Mauna Kea.

Software for the wavefront sensing functions of the acquisition and guiding systems is incomplete at this time. We are working to get the minimal required processing software complete and tested for first light. The prime focus wavefront sensor has been integrated on the top end and is awaiting integration of the primary mirror. The Calibration Unit had its

critical design review in September and is proceeding well. All facility instrumentation handling equipment has been fabricated, tested and delivered to Hawai'i, with the exception of a flexure rig being fabricated for use in the Hilo Base Facility Lab.

The ALTAIR system (Gemini North natural guide star adaptive optics (AO) system) is progressing towards its Critical Design Review next January. We have begun detailed planning for upgrading this system for use with a sodium laser guide star (LGS) and have added the detail design phase for the ALTAIR modifications to the Canadian Workscope. Adaptive optics for Cerro Pachón has moved forward with the completion of site characterization testing. Analysis of this data has begun along with a review of its impact on the AO system for Gemini South.

The science instruments in fabrication include the Near Infrared Imager (NIRI), Near Infrared Spectrograph (NIRS), Gemini Multi-Object Spectrograph (GMOS), and the shared UK/Gemini instrument, Michelle. Though NIRI will not be available for first light, the University of Hawai'i has offered the use of an existing near-IR instrument for first light and initial commissioning purposes. NIRI is scheduled for completion in March of 1999. In addition, we have reached an agreement with UH on use of their adaptive optics system on Gemini North during commissioning. This system will also serve as a visitor instrument once we enter into science operations. This will

allow for both high resolution imaging early in commissioning and serve as a key diagnostic tool for engineering commissioning activities.

In the Software and Controls area, the list of delivered software includes: the Telescope Control System, Enclosure Control System, Secondary Control System, Primary Control System, Data Handling System (critical functions complete – not final), the Engineering Archive, most of the Acquisition and Guiding software, and the networking system mentioned previously.

The next few of months will be exciting and difficult for the Gemini project team and partners as we work toward first light on Mauna Kea. Activities are being ramped up in Chile, so expect to see even more activity on Cerro Pachón in the next newsletter. Updates on our progress can always be found on our web site, which has recently undergone renovation to bring in more operational features and a public outreach area.

About six months from now, we will be dedicating the Gemini Northern Telescope, which will be followed by scientific handover in the year 2000. There is still much to be done between now and then, but the team is working hard and cooperating to make it happen. In the meantime, we anxiously await first light!

*-Jim Oschmann  
Gemini Project Manager*

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## GEMINI PUBLIC INFORMATION AND OUTREACH

Having recently joined Gemini from the "outside world," it seems that my first few months have been a blur of names, faces, countries and acronyms! I'm happy to report that things are beginning to look a lot clearer now as I settle in and focus on the tasks ahead for the Gemini Public Information and Outreach Office at the new Hilo base facility.

For those on the project who I haven't met, I look forward to meeting you in the near future and exploring how the Public Information and Outreach Office can best serve the projects needs. We have recently established Public Information and Outreach liaisons for each of the partner countries and I expect that we will be working closely together, especially as we approach the Gemini North first-light and dedication events.

First-light plans are progressing well and by the time this is published the first-light/commissioning PR plan will be completely developed and tested. Especially challenging has been the fact that the ESO's VLT first-light event(s) have redefined first-light as an "all-systems" event and ours has always been planned as an engineering event. This will require that we emphasize Gemini's first-light and commissioning as a process, culminating in an "all-systems" first-light several months after the first starlight is reflected off the primary mirror. During this period we will release many images to the partnership and media that highlight the progress, technology and success of Gemini's systems.

In the most probable scenario, our best images will be produced as we approach the Gemini North dedication event in late June. This should serve as an ideal venue for the public release of our most spectacular images.

Planning for the dedication of the Gemini North Telescope is developing quickly (as it must at this point), and several initiatives are underway that include: possible corporate sponsorships, a commemorative commissioned artwork mural, selection of key-note speakers, and the selection of venues for dedication functions. With lots of work still ahead, several meetings have been held with AURA staff and as of this writing, we are still awaiting confirmation on the attendance of several top political officials from partner countries. It is anticipated that many of these issues will be resolved by the end of this year and more details will be available soon on the Gemini North dedication event.

While first light and the dedication have been critical issues during my first few months at Gemini, a number of other projects have been progressing in the background. Many of these are laying the foundations for future Gemini outreach efforts and range from the development of the Gemini public WWW page, to a new non-technical Gemini Project brochure.

In all instances these materials are being developed so that partner countries can use them as templates and adapt them for their own purposes as they see fit. With the current staff and physical resources of the Gemini Public Information and Outreach Office, implementing this template approach will be essential to the dissemination efforts of all media and outreach materials in the future.

Other highlights include:

- Development of a successful prototype for a Gemini WWW & CD-ROM virtual tour (prototype QuicktimeVR movies will soon be linked on the new Gemini public WWW site)
- Completion of the first Gemini Public Information and Outreach Summer internship
- Development of displays for the Winter AAS and the Hilo base facility lobby (these will be provided to partner countries for adaptation)
- Installation of a non-technical interpretive plaque for the entrance of the Gemini North telescope
- Development of the Public Information and Outreach Office Vision and Operational Statements
- Initiation of informal, non-technical "Brown-Bag" lunch series for Hilo staff.

Finally, I will be assuming editorship of this newsletter starting with the next issue. I'll look forward to working even more closely with the entire Gemini partnership in this capacity.

- Peter Michaud

*Public Information and Outreach Manager*

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## A SCIENTIFIC CASE FOR THE GEMINI DATA ARCHIVE

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## MISSION STATEMENT

*The Gemini Science Archive should provide the scientific community of the partner countries with online access to all Gemini observations to ensure full scientific exploitation of those data. The Gemini Science Archive should be considered an integral part of the planning, observation, calibration, data reduction, and data distribution processes that occur at Gemini. The Gemini Science Archive should guarantee that the valuable datasets obtained with the Gemini Telescopes are preserved for use by future generations for research and education.*

## 1 INTRODUCTION

Space-based observatories have produced scientifically effective archives for over two decades. Data from IUE, IRAS, Einstein and other missions have made enormous contributions to the progress of astronomy. Hubble Space Telescope (HST) has broken new ground in the development of optical data archives. Its archive has only recently become heavily exploited and will be a valuable resource for decades to come. Hanisch (1998, SPIE, vol. 3349) recently reported that the data retrieval rate from the HST archive is now higher than the rate at which new data is being ingested; he also pointed out that, up to present, ten times more International Ultraviolet Explorer (IUE) data have been extracted from the IUE archive than was originally put in it.

Some large astronomical projects like the Palomar Sky Surveys, the Sloan Digital Sky Survey, or the 2Mass Survey are inherently archival projects. For example, The Sloan Digital Sky Survey (SDSS), (which uses a telescope and instruments dedicated to the project) will contain photometric, spectroscopic, and morphological parameters for several hundred million objects. Archiving is quickly becoming one of the most important resources serving the astronomical research community.

### 1.1 Archive Research Opportunities

There are at least 3 classes of effective archival

research projects. The first consists of cases where the data are used for an entirely different scientific project than they were obtained for. The second is the case where new, improved, or otherwise different and more effective methods of analysis are brought to bear on the data. The third, and perhaps most important class exploits the collective effect of the archive. In this case, a larger and more comprehensive dataset consists of all of the archive observations taken to date, and spans a wider range in some important parameter. When this archive is made available to the researcher, it provides a resource that would otherwise never have been available to an individual proposer. **The whole of the archive dataset is worth far more than the sum of the parts.** Also, the linkages across archives and wavelength regimes adds still more value to archive data.

An excellent illustration of the effective use of archive resources is "The Demography of Massive Dark Objects in Galaxy Centres" (Magorrian et. al 1997, astro-ph/9708072). Here, leading workers in this field have collaborated in the analysis of data from at least 6 HST programs and 10 ground-based observing projects. Clearly, combining many years worth of observational effort into a large homogeneous dataset is a very effective approach. The existence of good archive facilities makes this type of substantial scientific progress possible.

Another illustration that demonstrates the power of archives is the CFHT archive that was used to search for observations of NGC 1068 - an AGN that displays spectroscopic and photometric variability. The search took only a few minutes of effort and returned 189 exposures from 8 separate programs spanning 7 years. Spectra and images in the optical were obtained in 6 programs and infrared observations were made in 2 additional programs. The long time baseline makes this a very valuable archival dataset. A search of the JCMT archive revealed 613 observations of this object in the sub-millimeter regime from numerous programs. These could be combined with the 283 HST observations taken over a period of 6 years with 6 different

instruments in 22 separate programs. All of these data are available from a single archive site at CADC. Over 50 observations are available from 6 different X-ray and gamma ray missions through the HESARC archive. This is a very well-observed object, but many sources have been observed at multiple wavelengths at different observatories over long time baselines. Archiving preserves the value of these data for future research.

The range of published archival research is extremely impressive and includes papers using data from all wavelengths from X-rays to radio and from extragalactic studies to protostars and planetary work. It is evident from these examples - many involving space-based instrumentation in a key role - that extremely valuable science over a wide range of subject areas can be done with a properly implemented Science Data Archive. It is also clear that much of this science would not be possible in the absence of these archives.

### 1.2 Ground-based astronomy archives

Archives of ground-based astronomical data have lagged those populated by space-based data in terms of research effectiveness. Historically, there have been differences between space and ground-based observatory design that is motivated by the fact that a higher level of planning and automation is required to operate an observatory in space. **The process of archiving Gemini data will be made enormously easier because of the progressive observing strategies (which, in many cases, parallel space observatory design) adopted by Gemini and motivated by the quest for optimum observatory performance.** Queue-mode observing is only one of those strategies, but *the operational requirements for queue-mode observing are identical to those for effective data archiving.* For those involved in archiving this is a happy state of affairs.

Data archiving experience from the Canada-France-Hawai'i telescope has identified a number of pitfalls that must be avoided to assure

an effective data archive. The Gemini observatories are capable of overcoming these key problems by requiring weather monitoring, electronic logging of the observing process, adequate calibration for all observations (queue-mode or classical), and well-designed and populated FITS headers. In short, Gemini will collect all of the necessary accompanying information (metadata) that is needed to understand those data and use them for scientific research.

### 1.3 Motivation for a Gemini Science Archive

The fundamental argument in favor of a Science Data Archive is that it would increase the quality and the quantity of the science that is produced by the Gemini observatories. Simply put; we can get more good science out of Gemini if we have an effective archive in place. An archive of science data would also play an important role in the characterizing, monitoring, and optimizing of instrument performance. Comparison of newly obtained data with those in the archive is the most reliable way to monitor performance.

A successful Gemini Science Data Archive would ensure that all scientists, in all countries of the partnership, would have access (following an appropriate proprietary period) to all of the data produced by the observatory. This would distribute scientific opportunity and thus represent added value to the Gemini partnership. An archive would also be extremely valuable both for educational purposes and for public outreach activities (where HST has excelled).

## 2 SCIENCE WITH THE GEMINI ARCHIVE

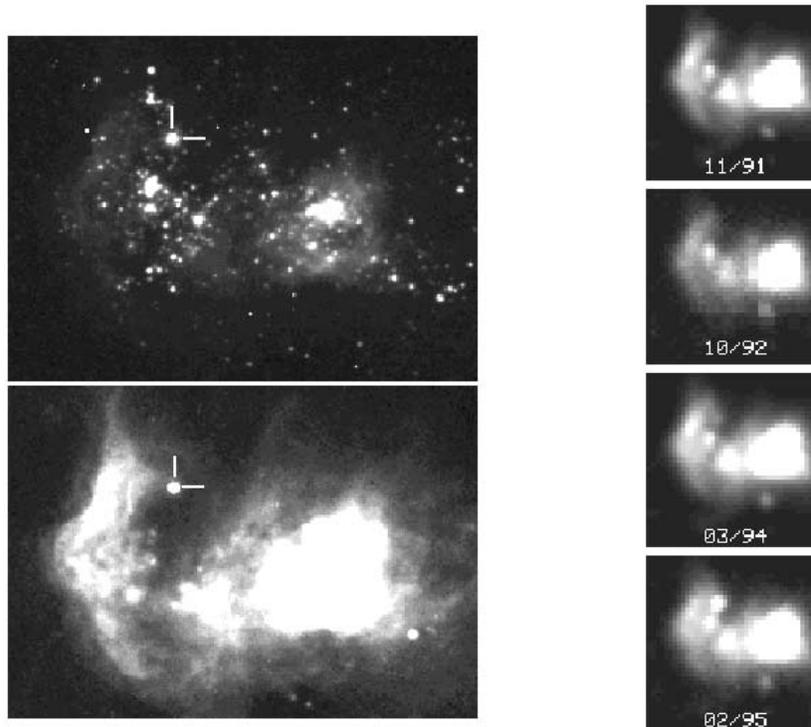
Gemini's first and subsequent generations of instrumentation will provide unprecedented observational capabilities and will open up new opportunities for study in fields as diverse as planetary searches and high-redshift clusters of galaxies. Here we present three specific cases of archival research to illustrate the potential of Gemini's data archive. Of course there are many more.

- *The fate of very massive stars.*

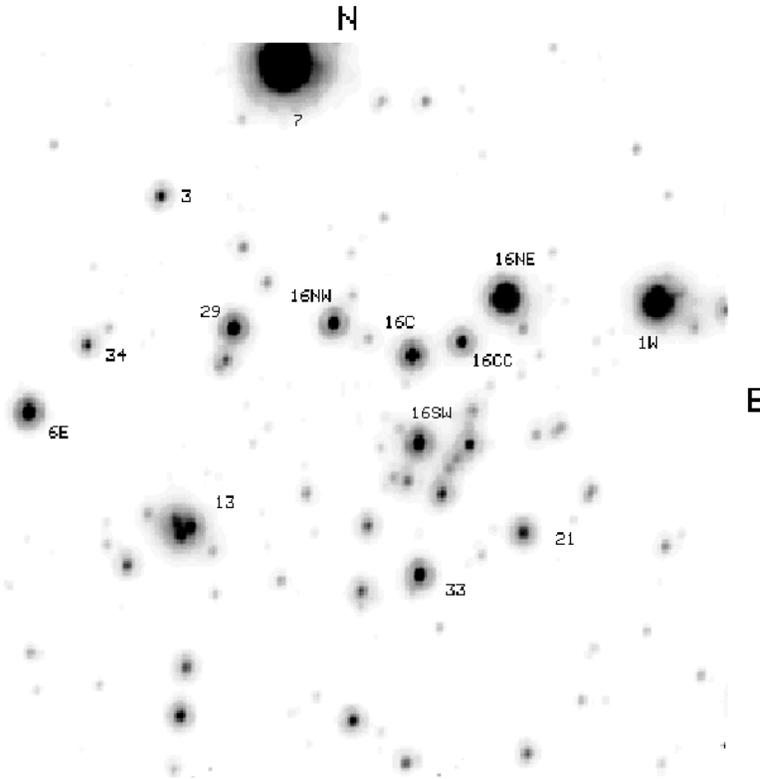
Massive stars evolve through the Wolf-Rayet phase to explode as supernovae. It is believed that the most massive ( $M \geq 40 M_{\text{sun}}$ ) go through a relatively short  $\leq 10^5$  yr) but active phase of instability after leaving the main sequence. Stars in this stage - known as luminous blue variables (LBVs) - are very rare (Figure 5); the most luminous infrared source in the Galaxy,  $\eta$  Carina, for example erupted between 1837 and 1860. Such events are probably more frequent in starbursting galaxies, where many very massive stars are formed in super stellar clusters. Because of insufficient image resolution and because these events are most conspicuous in the infrared, very few LBV events have been studied. With Gemini's excellent imaging capability in the infrared, an archive would easily allow the search for, and subsequent study of, erupting LBV stars in massive star forming regions within  $D \leq 10$  Mpc.

- *The Galactic Center*

The Galactic Center provides an un-precedented laboratory for investigating the central regions of a late-type spiral galaxy. Early studies with single-element infrared detectors revealed a number of bright point sources, hinting that the stellar content near the Galactic Center may be different from the surrounding bulge. Using state-of-the-art instrumentation, such as the CFHT Adaptive Optics system, it has been possible to obtain near-diffraction limited images of the central parsec of the Galaxy, as shown in Figure 6. It is now recognized that there is a population of young stars near the Galactic Center that are centered around a supermassive object corresponding to the radio source SgrA\*. Efforts to study the region around SgrA\* are confounded by: (1) crowding, which limits efforts to resolve stars fainter than  $K_s 14$ , even with angular resolutions corresponding to the diffraction limit of 4-metre class facilities (Davidge et al. 1997, AJ, 114, 2686), (2) the



**Figure 5:** A new LBV in the giant HII region NGC 2363 located at the SW of the Magellanic irregular NGC 2366 ( $D = 3.7$  Mpc). a) HST WFPC2 B(F439W) and  $H\alpha$  (F656N) images of NGC 2363 in 1996 January 8. The Luminous Blue Variable star is identified. The field of view is  $13'' \times 9''$ . b) Time sequence of archival R-Band ground-based images of NGC 2363. The LBV appeared in early 1994, and it is now the most luminous object in the galaxy NGC 2366. (Drissen, L., Roy, J.-R., & Robert, C. 1998, ApJ, 474, L35)



**Figure 6:** The central 12.4 x 11.9 arcsec field of the Galaxy, as observed in K with the CFHT AOB. The Airy pattern can be seen around the brightest sources. SgrA\* is at the approximate center of the image. Various IRS sources are labelled.

potentially complicated kinematics of stars in this region, which introduces uncertainties in dynamical studies using only radial velocities, and (3) contamination from foreground (and possibly even background) disk objects, which become progressively more significant at fainter magnitudes.

The second and third problems can be overcome by measuring proper motions. Archival data from Gemini, (as well as other 8 metre telescopes) will provide a way to obtain homogeneous stellar positions over moderately long time scales. When combined with radial velocities, proper motions can be used to deduce true space velocities, allowing the orbits of stars about SgrA\* to be constructed, and their mass determined accurately. Data of this nature will permit an extension of the pioneering work of Eckart & Genzel (1996, *Nature*, 383, 415). Proper motion measurements can also be used to distinguish between bulge and disk stars. This would establish whether or not the faint

blue objects detected by Davidge (et al. 1997) are bona fide main sequence turn-off stars associated with SgrA, or just foreground interlopers.

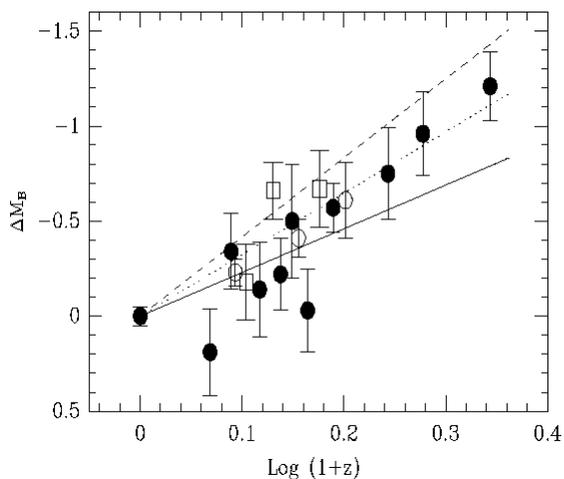
- *Luminosity evolution of elliptical galaxies*

Another example of archive science is illustrated by the aggregate effect of accumulated archive observations. This effect provides greater opportunities for discoveries than would be available to the original proposers of the observations. Figure 7 shows the evolution in luminosity ( $\Delta M_B$ ) of elliptical galaxies in clusters as a function of redshift (Schade et al. 1997 *ApJ* 477, L17). A collection of nine clusters (from seven distinct observational programs), spanning the redshift range  $0:17 < z < 1:21$ , was extracted from the HST archive. A uniform analysis technique was applied to trace the shift in luminosity of the sequence of giant elliptical galaxies with increasing look-back time. Each point on this diagram represents not a single galaxy, but a

sequence of galaxies in a single cluster (ranging from 4 to 28 individual galaxies each). The results indicate that elliptical galaxies undergo luminosity evolution consistent with models of the passive aging of a single-burst stellar population formed at  $z > 3$ .

These are just three examples of research in astronomy that can be done using archival data. There are many other instances. In some cases the main benefit might be derived from the larger and more comprehensive database represented by the Gemini observations accumulated over a period of time. Time resolution or baseline might be important. Some observations may be used for completely different purposes than they were originally obtained and sometimes they will be used for the same purposes. However, new results will be due to fresh viewpoints and more effective methods of analysis.

In addition to research and educational applications, an archive contributes to the efficient and effective operation of a state-of-the-art observatory. The ability to quickly



**Figure 7:** Luminosity evolution of elliptical galaxies from archival HST data (Schade et al. 1997 ApJ 477, L17).  $\Delta M_B$  is the shift in luminosity at a given size as measured from the sequence of giant elliptical galaxies. Each point represents not a single galaxy but the shift of a sequence of galaxies at a given redshift or in a given cluster. Solid symbols are for cluster elliptical galaxies using HST imaging and open symbols are from CFHT fields. Open circles are cluster E's and open squares field E's.

access raw and calibrated observational material from current or previous runs, examination of calibration data, and quick-look processing pipelines all assist the staff astronomer to quickly evaluate the observatory and instrument performance. Proposers will find the archive invaluable for checking feasibility, proposal planning, and program optimization. The availability of calibration material from the archive will also help to minimize the amount of time spent calibrating the Gemini instruments. In summary, an archive is an integral component of an efficient planning and observing environment that will greatly benefit all observers, whether queue-mode or classical.

### 3 CONCLUSIONS

A Science Data Archive would represent a major contribution to the scientific productivity of the Gemini observatories in a number of ways. First, we have given a number of examples where it would enable first-rate scientific research that would never be attempted in the absence of an archive. Second, a data archive carries benefits for proposal preparation, instrument performance verification and optimization, queue-mode observing, and overall Gemini operations. Finally, the Gemini Science Archive would: distribute scientific opportunities among astronomers in the partner countries, help to inform the public about the excitement and importance of astrophysical research, and demonstrate to the taxpayers who support Gemini that these valuable data are being handled with the greatest care to ensure that they are fully exploited and that their value is being preserved for future generations.

### Acknowledgements

We are grateful to Andy Woodsworth, Jim Hesser, Séverin Gaudet, David Bohlender, Tim Davidge, Laurent Drissen, Phil Puxley and Gordon Walker for their comments and help in preparing this material. We are also indebted to Fred Gillett, Ted von Hippel, and to all of the participants at the Gemini Science Archive Workshop held in Hilo in September 1998 for their many insights.

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## REPORTS FROM THE NATIONAL PROJECT OFFICES

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### *US GEMINI PROJECT OFFICE*

Now that the first Gemini telescope is nearing first light, the activity connected with instrumentation has accelerated and become more real. The foundry run for 1K X 1K InSb detector arrays at SBRC has produced some extremely promising devices. These are still in the final stages of testing, but it is believed that sufficient science-grade arrays will have been produced in this effort to equip the initial complement of near-IR instruments. The development and fabrication of controllers for these arrays has been completed, and NOAO is in the process of delivering these controllers to the instrument teams. The Near-IR Imager, being built at the Institute for Astronomy at the University of Hawai'i, is well along in its fabrication stage, and current estimates have it being delivered early next year. The Near-IR Spectrograph, under construction at NOAO, has run into some unforeseen delays that are being addressed through reviews by Gemini and by AURA.

The Mid-IR Imager, now known as the Thermal-REgion Camera System (T-RECS) is in the design stage at the University of Florida. This instrument recently had its preliminary design review. The optical detector and controller work is proceeding satisfactorily with controllers from San Diego State University and CCDs (only engineering-grade so far) from EEV.

In addition, the USGP has organized U.S. efforts to participate in the ongoing Gemini instrumentation program. The U.S. proposal to undertake a conceptual design study for the Near-IR Coronagraph/Imager was recommended for funding by the Gemini instrument forum. The study proposed will be led by Douglas Toomey of Mauna Kea Infrared, and

will include participation by Christ Ftaclas from Michigan Technological University and Maria Teresa Ruiz from the University of Chile. A development study to explore the use of micro-mirror arrays for the Gemini IR Multi-Object Spectrograph, led by Richard Green of NOAO, was also recommended for funding.

During the last six months, the US Gemini Program has organized or been involved in a number of meetings related to different aspects of Gemini operations. In July, a working group met in Tucson to develop an implementation plan for a NOAO survey program. The capability to carry out surveys over significant areas of the sky came out of a workshop that USGP held last year as the most important necessity for effective use of very large telescopes. It is hoped that this program will begin in March 1999, and will allow astronomers to get telescope time to carry out such surveys.

In August, NOAO organized a workshop to address the process by which observing proposals are processed. Representatives of several observatories met to discuss common issues and goals related to telescope proposals for astronomical telescopes. The goal of the Proposal Process Workshop was to develop a shared understanding among observatories, including the National Gemini Offices and the Gemini Project, of the requirements and procedures for telescope proposals, and to encourage cooperation among the national observatories of the partner countries, STScI, and other institutions faced with similar issues and concerns related to the telescope proposal process. A description of the workshop and a summary report can be found at [http://www.noao.edu/scope/tpp\\_workshop/](http://www.noao.edu/scope/tpp_workshop/).

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### **UK GEMINI PROJECT OFFICE**

As we approach the end of 1998, Gemini First Light and the testing and operations phases are almost upon us, and the UK Gemini team is gearing up toward Operations support, resulting in new appointments and staff changes.

The UK Senior Support Scientist, Colin Aspin, is now in post in Oxford and is rapidly coming up to speed on Gemini. Colin has extensive experience in telescope operations and instrumentation. He moved to Oxford from the NOT in La Palma where he was the senior staff astronomer, and prior to that, spent 9 years in Hawai'i at UKIRT where he was the staff astronomer with responsibility for IRCAM.

The second UK Support Scientist, who joined the team in November 1998, is Isobel Hook, based at the Institute for Astronomy at Edinburgh University. From 1994 to 1996 she held a NATO postdoctoral fellowship at the Astronomy Department of U. C. Berkeley where she worked on high-redshift quasars. While

there, she also joined the Supernova Cosmology Project, based at the Lawrence Berkeley National Laboratory. Since October 1996 she has had a fellowship at ESO in Garching, Germany. Isobel will spend much of her time here working on GMOS integration with the teams from the UK ATC, Durham University, and DAO before going out to Hilo with the first GMOS.

And finally, Simon Craig, the UK Deputy Project Manager has moved to the UK ATC - he will continue to support the UK Programme from there.

We are looking forward to working with our colleagues in the partner countries to develop the Gemini support program.

-Pat Roche, UK Project Scientist

-Alison Tonì, UK Project Office

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### **CANADIAN GEMINI PROJECT OFFICE**

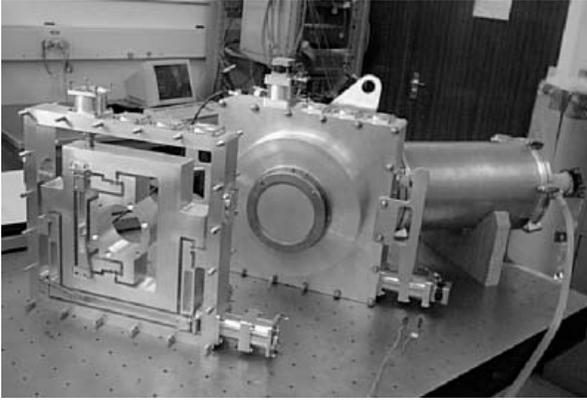
#### **Canadian Gemini work packages**

The Gemini Multi-Object Spectrograph (GMOS) construction is well underway, in partnership with the UK, with integration scheduled to commence at ATC in a few months. The components are being designed and built by HIA in Victoria, by ATC in Edinburgh, and by Durham University. The work is generally going well, however we have had some difficulties with the main optics: delivery of the largest CaF<sub>2</sub> boules has been very late, and there has been some breakage of components during polishing. The broken components are now being replaced.

These are the first Gemini instruments to have been built collaboratively, an arrangement that is expected to be common during the operations era. Coordination and management of an international project is much more complicated

than building an instrument in a single laboratory. However, this is more than compensated for by our access to a much larger base of engineering and scientific expertise, and by the many working-level contacts we have made with our UK Gemini partners. We hope these contacts will continue after GMOS has been completed.

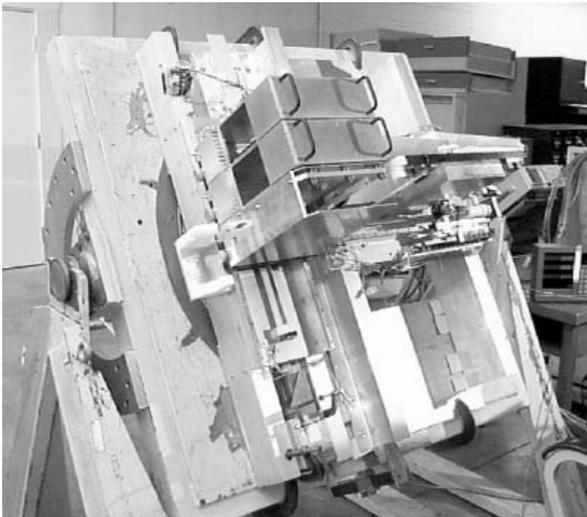
The Gemini adaptive optics system, Altair, will have its critical design review in January. This system will be able to feed a corrected beam to any other instrument on Gemini. It was designed as a natural guide star system, however IGPO recently asked HIA to design an additional wavefront sensor path to track a laser guide star. The implementation of the laser guide star launch system for Mauna Kea will be the responsibility of the IGPO. The Altair design has some unusual features: the output beam



**Figure 8** - Dewar Assembly at ATC



**Figure 9** - Filter wheels undergoing flexure testing at Durham



**Figure 10** - Focal plane Assembly undergoing flexure testing at HIA

must have the same f/ratio and focal position as the input beam, so that observers can easily take Altair out of the beam if it is not desired (for instance, when the full telescope field of view is required). Additionally, the deformable mirror

is conjugated to the mean height of the atmospheric turbulence, rather than to the primary mirror. René Racine has demonstrated that this should increase the size of the corrected field of view and the probability of finding a suitable guide star.

The Enclosure Control System has been installed on Mauna Kea and accepted by IGPO, so this work is now complete. Most components of the Data Handling System have also been delivered, but we still must complete some upgrades to the Quick Look track, and develop the Data Processing track. Work also continues on the Wavefront Sensors, in collaboration with the UK.

### **Preparations for commencement of Gemini operations**

The Canadian Gemini user community will be supported primarily by the Canadian Gemini Office. This will be a successor to the current Canadian Gemini Project Office, and will have much the same structure. It will be a separate unit within NRC's Herzberg Institute of Astrophysics (HIA), based at the Dominion Astrophysical Observatory (DAO) in Victoria. It will have a manager plus two scientists directly involved in user support. We will also have a university-based Gemini scientist until at least 2001, by which time we hope to find funding to continue this position in the longer term. In addition, a number of other members of HIA's Optical Astronomy Program will provide support as instrument specialists, archive experts, and so on.

Over the coming year we will be quite busy working with NOAO and others on a Canadian proposal tool, developing Canada specific Web pages, visiting Canadian universities, and generally ensuring that the information and systems Canadian researchers will need are in place by the time of the first call for proposals. At least some of this information will be made available in French. We also plan to send our staff for visits to Gemini to gain operational experience.

Finally, Canada and Chile jointly developed a scientific justification for a science archive (see the summary by David Schade elsewhere in this issue). In a parallel exercise, the Canada-Chile collaboration also submitted an unsolicited proposal to Gemini to develop the science

archive. If Gemini accepts this proposal, we will start work soon on a conceptual design and a prototype.

*-Andy Woodsworth, Canadian Project Manager*

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### ***AUSTRALIAN GEMINI PROJECT OFFICE***

- A Gemini special session was held at the Annual General Meeting of the Astronomical Society of Australia in Adelaide in July. Phil Puxley attended from Gemini.
- Approval has been received from the Australian Research Council to form an Australian Gemini Steering Committee, chaired by our new IGP Board member, Professor Lawrence Cram of the University of Sydney. Approval has also been received to

set up a Science Advisory Committee as a forum for the Project Scientist.

- Following the recent instrument forum in Hilo, the Australian project is preparing to enter into discussions with Gemini about the concept design study for the Near Infrared Coronagraphic Imager and aspects of the infrared multiobject spectrograph study.

*-Jeremy Mould*

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### ***CHILEAN GEMINI PROJECT OFFICE***

- Cerro Pachón site characterization is almost finished. The students from the Universidad de Chile involved in the work are very happy with this practical experience, which is being led by Jean Vernin.
- We are looking for a mechanical engineer to work in a collaboration with the UK. This will mean that the candidate will spend 18 months working in a highly experienced and top

quality mechanical engineering environment, helping to build part of a Gemini instrument.

- Chile and Canada will be collaborating in the Gemini Archives. This was agreed at the last meeting in September in Hilo, Hawai'i.

*-Oscar Riveros, Chilean Project Manager*

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### ***ARGENTINE GEMINI PROJECT OFFICE***

- On September 24, during the annual meeting of the Argentine Astronomical Association, Emilio Lapasset, Hugo Levato and the undersigned updated the audience on the status and forthcoming events in the Gemini Project. Dr. Levato who had attended the meeting in Hilo the week before, dealt with the operative plan that had been discussed for carrying out observations with the telescopes. At the business meeting the membership unanimously endorsed a declaration expressing their strong support to the Argentine participation in the Gemini Project

and requesting the relevant Government agency to provide the economic means to make full participation possible.

- We are having preliminary discussions on the question of the NTAC and the procedure for the reception and considerations of the proposals. Further discussions will take place at the next meeting of the Argentine National Committee for Gemini.

*-Jorge Sahade, Argentine Project Coordinator*

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### ***BRASILIAN GEMINI PROJECT OFFICE***

The National Project Office in Brasil is located at LNA - Laboratorio Nacional de Astrofisica, our national astronomical facility, in the city of Itajuba, state of Minas Gerais. A Gemini homepage is kept there, at the URL address <http://www.lna.br/gemini/gemini.html>. A homepage for the SOAR Project is also kept at [www.lna.br](http://www.lna.br).

Last August we had the meeting of SAB (Sociedade Astronomica Brasileira), with approximately 200 participants, where Beatriz

Barbuy made a presentation about the status of the Gemini Project.

The Brazilian Gemini Support Committee is having TELECON's to discuss the composition of the Gemini TAC, as well as the support for proposals within Brazil. Our goal is to initiate a TAC process a few months before the deadline of September 1999.

*-Thaisa Storchi Bergmann, Brazilian Project Manager*

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## RELEASED DOCUMENTATION

The following documents have been released by the Gemini Project since the last edition of the Gemini Newsletter (June 1998). Copies of these and other publications are available either via Gemini's Documentation page on the Web site at <http://www.gemini.edu/documentation/>; or by request through the Gemini Project systems librarian at the project address; or by emailing me at [rkneale@gemini.edu](mailto:rkneale@gemini.edu). Document numbers are listed in parentheses. **Please note:** This list does not include any Interface Control Documents. For current ICDs, please see the Gemini Interface Control database tool at [http://www.gemini.edu/systems/icd\\_main.html](http://www.gemini.edu/systems/icd_main.html).

- Gemini South Safety Program (English). P. Gillett, May 98 (PG-PM-G0017)
- Gemini South Safety Program (Spanish). P. Gillett, May 98 (PG-PM-G0018)
- Support Capability Workshop Report. Puxley et al, May 98 (RPT-PS-G0081)
- Baseline DHS interface (update). Hill/Gaudet/Kotturi, Jun 98 (ICD-01c)
- Bulk Data Transfer (update). Hill/Gaudet Jun 98 (ICD-03)
- An Engineering Backdoor for Gemini Instruments. Wampler, Jun 98 (PG-C-G0019)
- Integration Time Calculator. Puxley, Jun 98 (SPE-C-G0076)

- Weather Server Software Specification. Jensen, Aug 98 (SPE-C-G0077)
- The Infrared Surface Brightness Fluctuation Distances to the Hydra and Coma Clusters. Jensen et al, Jul 98 (Preprint #38)
- High Resolution Infrared Spectroscopy and Nuclear Clusters in the Starburst Galaxy NGC1614. Puxley/Brand, Jul 98 (Preprint #39)
- Primary Mirror Covers Assembly Procedure. Pentland, Aug 98 (SPE-TE-G0078)
- WIYN Open Cluster Study 1: Deep Photometry of NGC188. von Hippel et al, Sep 98 (Preprint #40)
- Azimuth Cable Wrap Assembly Procedures. Pentland, Sep 98 (SPE-TE-G0079)
- Primary mirror cell cart assembly procedures. Pentland, Sep 98 (SPE-TE-G0080)
- Altitude Cable Wrap Assembly Procedure. Pentland, Sep 98 (SPE-TE-G0082)
- T-ReCS (MIRI) Preliminary Design Review. Univ. of Florida, Sep 98 (REV-I-G0132)
- The Revolution in Telescope Aperture. Mountain/Gillett, Oct 98 (Preprint #41)
- Gemini Science Archive Workshop Report. Von Hippel et al, Oct 98 (RPT-PS-G0082)

*-Ruth Kneale, Project Librarian*

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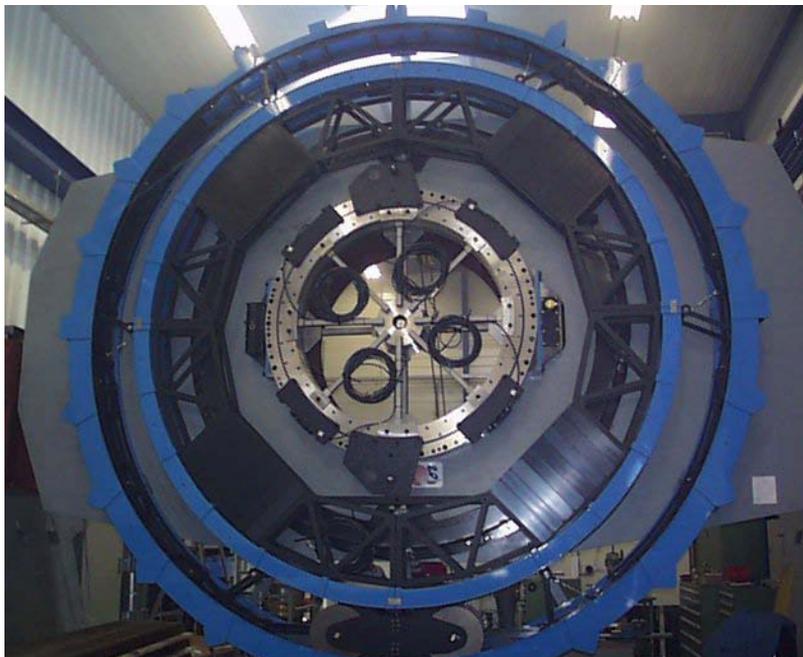
## CURRENT STAFF STRUCTURE AT GEMINI



The telescope top end  
at Gemini North,  
October 1998.

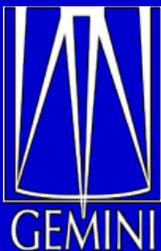


Gemini North Cassegrain rotator in final testing.





The completed Cerro Pachon enclosure, September 1998.



# GEMINI

## 8-Meter Telescope Project



*THE GEMINI 8-METER TELESCOPES PROJECT is an international partnership managed by the Association of Universities in Research in Astronomy under a cooperative agreement with the National Science Foundation.*

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*Edited by Ruth Kneale and Peter Michaud*

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