Report to the Gemini Director on the 21st meeting of the Gemini Science Committee, held in Waikoloa, Hawaii 13-14 October 2004

GSC members in attendance were: Lori Allen (US), Taft Armandroff (US), Tim Bedding (AU), Malcolm Bremer (UK), Albert Bruch (BR), Luis Campusano (CH), Laird Close (US), Stéphanie Côté (CA), Warrick Couch (AU, Chair), Jim Dunlop (UK), Karl Glazebrook (US), Isobel Hook (UK), Verne Smith (US), Doug Welch (CA), Charles Woodward (US).

Gemini Observatory staff in attendance were: Matt Mountain (Director), Jean-Rene Roy (Associate Director, Gemini North), Phil Puxley (Associate Director, Gemini South), Doug Simons (Associate Director, Instrumentation), and Peter Gray (Head of Engineering).

The following 'observers' were present for all but the executive sessions: Dennis Crabtree (CA), Paul Francis (AU), Rachel Johnson (UK), Richard Myers (UK, Chair of AOSWG), Richard Wainscoat (UH). David Koo (Chair of the WFMOS-SWG) also participated briefly in the meeting by videocon.

The first day of the meeting was held jointly with the AURA Oversight Committee – Gemini (AOC-G).

The GSC appreciated the comprehensive and accurate note-taking of Dennis Crabtree.

1. Scientific productivity and impact of the Gemini Observatory

The first morning of the meeting was largely devoted to the consideration and discussion of the scientific productivity and impact of the Gemini telescopes, with the GSC receiving a very detailed and thorough presentation prepared by Jean-Rene Roy, Phil Puxley, and Dennis Crabtree, which served to focus the GSC's attention on what were the key issues in this context. The GSC was particularly appreciative of the efforts of Dennis Crabtree in compiling many of the publication and citation statistics within the presentation, the comparisons of which between the major 8-10m telescopes it found to be highly informative. The GSC also received valuable input in this context from the NGO representatives in giving their partner country reports, as well as members of the AOC-G, whose insights gave a broader perspective to the issues at hand.

Presented to the GSC was a detailed evaluation of the scientific output to come from the Gemini telescopes over their first 3-4 years of operation (going back to 2000B). Over this time, a total of 466 science programs have been conducted on the two telescopes, of which 175 (38%) have been completed. This has led to a total of 94 refereed papers being

published, the large majority of which are in high impact journals[1]. However, when these numbers are looked at critically both in terms of productivity as a function of Gemini instrument and productivity relative to other large telescope facilities, a number of areas of concern and future challenges are clearly identified. These can be summarized as follows:

- Although the statistics are small in some cases (and hence should be treated with caution), there is considerable variation between the Gemini instruments in terms of their productivity – as measured by the number of papers per unit time on the telescope – with some showing a disappointingly poor return at this stage.
- Only 16% of programs have so far produced papers.
- The number of papers produced per telescope in the first 3 years of Gemini's operation is similar to that of Keck and Subaru (at the same stage of their operation), but 50-70% below that of the VLT. However, over the next two years the number of papers will have to increase significantly above the present levels, if the Gemini Observatory is to keep up with (let alone outstrip) these other telescopes. Specifically, the number of papers per telescope will have to double in 2005 and triple in 2006 with respect to the ~20 papers per telescope per year average achieved to date, if Gemini is to be competitive.

The primary question for the GSC, therefore, was what actions needed to be taken by the Observatory and the Gemini Partnership to effectively respond to each of these issues?

The GSC was of the view that this question has to be addressed in two ways: (i)to pinpoint and understand what factors are inhibiting the publication of Gemini data and then rectify them, and (ii)to identify strategies that will further enhance the productivity of the Gemini telescopes. Taking this approach, the GSC has the following general remarks to make, followed by some specific recommendations as to actions that need to be taken:

General remarks:

Since the scientific output of the Gemini Observatory is directly dependent on the productivity of its users, much of the GSC's discussions focused on the areas of user behaviour, user accountability, and the 'user experience'. It was noted that there is an important 'feedback loop' here, with users' attitudes and interest (both positive and negative) being very much determined by their experiences in using a facility.

In terms of behavior and accountability, the GSC rejects the notion that the Gemini community is afflicted by a widespread 'slothfulness' amongst its astronomers. By all reports, including quantitative survey results, the large majority of astronomers in the partner communities are genuinely attempting to get results from their Gemini data and publish them. In addition, they face pressures from many quarters to publish telescope data, not just in being accountable to TACs, but also in seeking job advancement and

[1] Although it is too early for a citation analysis to assess the impact of the papers themselves.

grant funding. There was no evidence to suggest that astronomers in any of the partner countries were immune from these pressures, particularly in dealing with their NTACS which all appear, at some level, to monitor productivity and factor it into their decision-making process. *On the basis of this evidence, the GSC would strongly discourage taking coercive measures against astronomers in an attempt to improve productivity, since this is likely to be counter-productive.*

In terms of the 'user experience', a number of key concerns, common to all partner countries, emerged during the GSC's discussions. These all related to queue observing and the way the queue is managed, and can be summarized as follows:

- *Completion rates:* These are far too low, particularly in Science Ranking Bands (SRB) 1 and 2, where the Observatory's statistics show them to have averaged 48% and 19% (of all programs), respectively, over the same 2000B-2004A period that the publication statistics have been compiled. Even though these rates have improved in some recent semesters, they are still well below those achieved on say the VLT, which achieves completion rates of 80-85% and 70-75% in its top two ranking bands.
- *Fragmented observations:* While queue observing involves, by design, switching between programs to make best use of the changing conditions, it would seem this is done excessively when running the Gemini queue. In most cases, the observations for a queue program are 'salamied' into many sub-exposures, spread out in time over many nights, if not months. This fragmentation of programs has numerous deleterious effects: prolonged completion times, reduced chance of completion, heterogeneous datasets and hence compromised data quality, and increased queue observing overheads.
- *Data distribution:* The time taken for Gemini data to be delivered to PIs was seen as still being far too slow, with there being numerous reports that it can be as long as 3 months. This lengthy 'disconnect' between PIs and their data, risks them losing interest and enthusiasm in their programs and putting the reduction, analysis and publication of the data at lower priority to other projects.

Specific recommendations:

(1) The Observatory needs to give urgent priority to finding ways to increase the completion rate of queue programs, with a goal of lifting them to at least 90% in Science Ranking Band 1. In identifying the changes in the management and operation of the queue required to meet this target, very high priority also needs to be given to minimizing: (i)the time interval between starting and finishing a program, and (ii)the number of 'visits' needed for each program.

(2) The Observatory needs to implement as rapidly as possible the electronic delivery of data to PIs via the Gemini Science Archive, so that they have almost immediate access to their observations once they are taken. In the interim, the Observatory should find a way to allow PIs to have quick access to their data through an appropriately secure ftp site.

(3) The NGOs need to take a proactive role in raising the awareness within the partner communities of how important scientific productivity and impact are to the success of Gemini, and facilitating the most effective use of its telescopes in this context. This should include: alerting the NTACs to the relevant issues and soliciting their cooperation; encouraging NTAC use of the SRB=1 rollover mechanism to maximize the completion rate of top-ranked programs; promoting and encouraging programs well matched to Gemini's capabilities; fostering well-organized and productive teams.

(4) The Phase I Tool (PIT) be modified so that it requires much more explicit reporting from PIs on their previous use of Gemini time and how productive it has been. This will further enhance the level of accountability required from Gemini users and give the NTACs a greater sense of Gemini productivity. The NOAO Web proposal form, which has this feature built into it, provides a suitable template for this purpose.

2. Priorities for commissioning of instruments and their modes

The GSC's decisions on instrument/mode commissioning priorities were largely informed by Doug Simon's presentation on the status of current and forthcoming Gemini instruments, a presentation by Francois Rigaut on the Gemini AO Program, and the report from the AO Science Working Group, given by its Chair, Richard Myers. The detailed report written by David Crampton on the merits and issues associated with commissioning the GMOS ADC, was also gratefully received. From this input emerged a number of important issues, which are addressed first, before the final priorities are given. Also included in this section (2.2) are the GSC's recommendations on the suitability of the science programs contained within the 'science campaign' proposal for bHROS, for a demonstration science program with this instrument.

2.1 Hokupa'a-85

The GSC was pleased to hear that this instrument had been delivered to Gemini-South, and that it met the operational/performance requirements for it to have its first run on the telescope in August. However, it was disappointed to learn that Hok-85's DM failed (delaminated) on the first night of this run, and a replacement is still to be found that will allow it to achieve its full Strehl performance. There was also some concern that the Observatory is having to support the ABU camera, exposing it to additional work that had originally not been envisaged.

While the GSC supports the continuation of efforts to commission Hok-85 and get it performing at full potential, it felt that these efforts cannot continue indefinitely. While Hok-85 is an important 'test-bed' for NICI, in particular its DMs, it is fast reaching the point of reaping little science return to the community, given that NICI is due to be delivered in mid-2005. Accordingly, the GSC recommends that Hok-85 be supported and

mounted on Gemini South in 2005, if and only if it is successfully commissioned (with a fully-functioning DM) by the end of 2004B. This is fully consistent with the relevant Board recommendation 2004.A.14.

2.2 bHROS

Commissioning preparations

While the GSC acknowledged the Board's decision that this instrument is to be commissioned in 2005A, it did note with concern that the details of the commissioning plan, in particular the amount of effort that could be contributed by the bHROS team at UCL, were still poorly defined. It also has serious reservations about the effort being devoted to the acquisition and installation of an iodine cell in bHROS, to support science programs that require very high stability. The GSC sees this as serious "mission creep", going well beyond the baseline mode of operation that it had previously recommended be commissioned. Moreover, the GSC was concerned about the additional burden this would place on the Observatory, in providing the resources needed to install and commission the iodine cell.

Although the commissioning of bHROS's baseline mode is set to go ahead in 2005A, it is still included in the table of commissioning priorities below to give an indication of where the GSC ranked it relative to other instruments. Priorities for the 'new CCD' and 'iodine cell' enhancements are also given.

Demonstration science

The GSC considered the 8 science proposals contained within the "A Commissioning Science Program for bHROS" document that it had received from Mike Barlow (bHROS Project Scientist) in June. This document had been written in response to the GSC's request for 'campaign science' proposals from both the bHROS and Hok-85 teams, to help it decide the commissioning priority for these two instruments. When the Board then decided at its May meeting to mandate the order and timing of the commissioning of these two instruments, it also requested that the GSC consider the bHROS proposal as the basis for a demonstration science program with this instrument, and make recommendations to the Director accordingly.

To aid the GSC in its assessment of the bHROS proposal, two GSC members (KG & TB) undertook a careful review of each of the 8 science programs, seeking additional advice from high resolution spectroscopy 'experts' within their institutions. In adjudging the merits of each program for demo science, the two most important criteria were seen to be: (i) that the science have high and immediate impact, and (ii) that the observations exploited well the R=150,000 spectral resolution of bHROS, thus demonstrating its 'niche' capability. On this basis, the GSC identified 4 programs which it regards as being well-suited for demo science, and would recommend 5 nights of DD time (in total) be

allocated to. Details of these programs, what priority they should be given, and some qualifying comments, are given in the table below.

Recommended programs for bHROS demo science			
Priority	Program (PIs)	Nights	Comments
1.	**A. QSO abs line studies** (Murphy & Carswell) **C. Highly sensitive test of dark energy dynamics** (Webb & Crighton)	2	Combine the "Varying α" components of these two studies into a single program. This is high impact science irrespective of outcome, with excellent use of R=150K capability.
2.	**D. Lithium isotopic abundances in halo Stars** (Asplund et al.)	2	Science of fundamental astrophysical importance; need for and exploitation of R=150K capability not so clear; on balance, still merits support.
3.	**F. Determination of spectral profile of DIBs** (Webster & Walker)	1	Potential to solve the long-standing mystery of origin of diffuse interstellar bands; spectroscopy at R=150K would be a first; unclear how clear-cut results will be.

2.3 AO-fed modes

The GSC placed heavy weight on the detailed and well-informed advice it received from the AO-SWG with regards to the relative priorities for AO-related engineering effort and the commissioning of various AO-fed modes on the telescopes. In particular, it endorsed the two items which the AO-SWG identified as having the highest urgency: (i) rectification of the conjugation and vibration problem with ALTAIR, and (ii) commissioning of the Laser Guide Star system with ALTAIR. The GSC also recognized the strong case that exists for feeding the GMOS-IFU with ALTAIR, based on the numerous scientific and operational benefits that would be realized.

2.4 New CCDs for GMOS

The GSC was informed of the continuing unavailability of red QE-enhanced CCDs, in particular the favored "Lesserized" MIT/LL devices, which offer not just better red sensitivity, but also very competitive 'blue' performance compared to GMOS's current E2V devices. Since many observational programs would benefit greatly from GMOS having better red sensitivity (particularly 'cosmological' ones), this delay is causing considerable frustration in our communities.

In an attempt to remedy this situation, Doug Simons put forward a proposal which would lead to the installation of red-sensitive CCDs in either GMOS-N or GMOS-S by mid-2005. The first choice is still the "Lesserized" CCDs, subject to Mike Lesser being able to solve his processing oven contamination problem by the end of 2004. In this case the new CCDs will be installed in GMOS-S. The alternative option should this fail, is to acquire "BIV" (Boron Implant) devices and install them in GMOS-N. These devices offer enhanced red sensitivity, but are no better (if not inferior) in the blue, compared with the existing E2V devices.

The GSC strongly endorsed this proposal and the choices made as to which of GMOS-N and GMOS-S should receive the new CCDs in each of these two scenarios. Furthermore, with both of the Gemini telescopes soon to have silver-coated mirrors (M1-M3) and hence be 'red-optimized', the GSC saw considerable merit in installing red-enhanced CCDs in both GMOS-N and GMOS-S, once further such devices become available. The options to do this should be reviewed and further discussed at the next GSC meeting.

2.4 Observing efficiency and telescope functionality

A long-standing issue for the GSC has been the question of the observing efficiency and functionality of the Gemini telescopes, and the gains that can still be achieved in these areas. To this end the Observatory has been responsive to the recommendations of the GSC, the attention to and reduction in observing overheads associated with NIR and MIR observations reported by Peter Gray at this meeting being one example. However, the concerns raised at this meeting over telescope productivity further emphasizes the need to continually strive for improvements in this area, since efficiency gains lead to a larger fraction of time being spent on science targets, and hence the delivery of more data to the user and better program completion rates. Moreover, the GSC sees the allocation of Observatory resources and effort to this area to be of similar importance and priority to instrument commissioning. Hence tasks of this nature are included in this section on commissioning priorities.

Prompted by persistent observer feedback[2], the GSC identified an 'urgent' set and a 'long-term' set of telescope functionality tasks that require attention. The former concern inadequacies with the "seqexec" software responsible for executing observing sequences: (i) Problem recovery – the lack of an easy means of repeating observations that fail or are aborted. (ii) System robustness – reduce likelihood of inadvertent observer errors. (iii) TCS/OCS communications – replace current system of verbal commands with proper link. (iv) Observing log – replace manual entry with automated electronic logging. With a modest amount of effort all four of these problems could be fixed, leading to a significant improvement in observing efficiency. The second 'long-term' set comprises the outstanding action items recommended in Patrick Wallace's "Mid-IR Observing Efficiency" report for improving observing efficiency.

[2] From numerous NGO visiting observers and classical observers.

2.5 Final commissioning and engineering priorities

The two tables below contain the GSC's final 'commissioning' and 'engineering' priorities for the next 12 months, the latter being for tasks which will enhance observing capability, efficiency and performance. While different tables are used to distinguish commissioning and engineering tasks, the only discriminator when it comes to their execution should be priority band. In other words, all the Priority Band 1 tasks in *both* tables should be completed before moving on to tasks in the second priority band. Note that an "off list" category is included this time to indicate those instruments/modes that should not be considered for commissioning in the next year.

Commissioning Priorities		
Priority band (high to low)	**Gemini North**	**Gemini South**
1.	ALTAIR + LGS GMOS – new CCDs [2] NIFS NICI – acceptance tests	Hokupa'a-85 [1] GMOS – new CCDs [2] GMOS – n/slit + ADC [3] NICI
2.	ALTAIR + GMOS IFU[3] MICHELLE polarimetry	bHROS – baseline mode
3.		bHROS + new CCDs
Off list	TEXES [4] GPOL + NIRI polarimetry	bHROS + iodine cell GPOL + GNIRS

Notes:

- [1] – commissioning must be completed by end of 2004B, otherwise pull from telescope.
- [2] – as per Doug Simon's plan: if "Lesserized" CCDs become available, then GMOS-S first; if "BIV" CCDs, then GMOS-N first.
- [3] – priority of these modes linked strongly to the long lifetime of GMOS envisaged in instrument roadmap (see §3).
- [4] – location of TEXES in "off list" subject to further discussion and clarification of its status in future instrument roadmap (see §3).

Observing-Related Engineering Priorities		
Priority band (high to low)	**Gemini North**	**Gemini South**
1.	ALTAIR – vibr & conjug Tel functionality – urgent [1]	Tel functionality – urgent [1]
2.	Tel functionality – l/term [2] Site evaluation [3]	Tel functionality – l/term [2]
3.	Parallactic angle tracking & non-sidereal mode	Parallactic angle tracking & non-sidereal mode

Notes:

- [1] – eliminate the 4 problem areas with the "seqexec" observing sequence software (see 2.4 above)
- [2] – eliminate the remaining problems that reduce observing efficiency, as identified in the Wallace report.
- [3] – acquisition of turbulence profile and other AO-specific data for Mauna Kea, as per the recommendation of the AO-SWG.

3. Number of instruments supported – an instrument 'roadmap' for the future

Input was solicited from the GSC on the issue of the number of instruments that could be supported on the Gemini telescopes in the future. This was prompted by a looming 'log-jam' of instruments where, for the first time, the Observatory will have more instruments than available ports to mount them on the telescopes.

In response to this, the GSC formulated an 'instrument availability' plan (projecting to the end of 2007), which it puts forward to initiate discussion and to provide a starting point for the Observatory developing a 'roadmap' for the instrument configuration of the two telescopes over the next few years. In doing so, **the GSC sees it essential that there be much more effective forward planning in this area, with a continual evaluation of current and new instrumentation.**

In developing this initial plan – which is encapsulated in the table below – the GSC's primary consideration was that of science and scientific productivity, placing an emphasis also on exploiting the things that Gemini does best, where it has a distinct competitive edge over other 8-10m facilities (e.g., AO and low-emissivity performance). It was also mindful of the resource and contractual constraints the Observatory faced. The latter make the task of identifying a clear way forward a particularly challenging one, and highlight the need to make some hard decisions in terms of instrument availability and decommissioning. Specific requirements and issues that the GSC see as important in this

context and which must be kept in mind as the roadmap is further developed are as follows:

(i) A stable set of core instruments:

Maintaining a 'steady state' in availability for at least a minimum core set of facility instruments has been widely acknowledged as a key contributing factor to the high scientific productivity of the VLT and Keck telescopes, and **one which the GSC regards as of paramount importance to Gemini.** Not only does such stability and longevity in instrumentation ensure the routine completion of science programs, but it also allows observers to be more ambitious and strategic in their scientific use of the telescopes. The instruments the GSC identified as being 'core' and the reasons for doing so are as follows:

- **GMOS-N & GMOS-S** – prime dark-time instruments on GN & GS.
- **NIRI** – essential for AO imaging/spec with ALTAIR on GN.
- **GNIRS** – prime bright-time instrument on GS.
- **FLAMINGOS-2** – its wide-field NIR MOS capability will give Gemini a distinct competitive advantage in the south; it should go straight to GS and be given 'core' status once commissioned (in 2006).

In laying out a roadmap for stable instrumentation, the GSC also sees this as an essential requirement for enabling and facilitating the execution and completion of 'large' programs – a need that will become more important in the Aspen instrumentation era**.** Participation and collaboration in such programs by all partners needs to be encouraged.

(ii) Recognization of the Observatory's finite resources for instrument support/commissioning:

It was very helpful to the GSC to get from the Observatory a realistic assessment of the number of instruments it can support on the telescope at any given time (4), the number of instrument swaps it can undertake per semester (~2), as well as a reminder (from the engineering/operations report of Peter Gray) of the heavy demands placed on Observatory staff by instrument commissioning. Importantly, the Observatory will in 2005 reach the point where the number of available instruments will exceed the number it can realistically support. Furthermore, even now (prior to this instrument 'log-jam' occurring) the commissioning of new instruments is stretching the resources of the Observatory to the point where the amount of engineering support than can be devoted to other important areas such as science operations and improving observing efficiency, is limited. Clearly the finite resources of the Observatory have to be recognized in future instrument scheduling; to this end the GSC sees the following as important features of its recommended roadmap:

- Limit the number of instruments supported per telescope per semester to 4 and the number of instrument swaps to 2.

- In no longer offering Phoenix (on GS) beyond 2005, leave the low-mass port vacant, thereby releasing resources to support swap of T-ReCS /NICI/GNIRS.
- Leave the instrument complement on GN unchanged over the entire 2005-2007 period, hence minimizing the commissioning load on this telescope and allowing efforts to be focused on the successful implementation of the AO-LGS system, as well as elsewhere within the Observatory.

(iii) Decommissiong instruments:

In recommending that both a core set of instruments be maintained and the number of instruments offered on each telescope be capped at a level that Observatory resources can accommodate, the GSC was cognizant of the fact that some instruments can no longer be made available to the community, and should therefore be decommissioned. The GSC looked very carefully at this issue, paying close attention also to the contractual obligations Gemini has to the instrument builders in terms of guaranteed and compensatory time, which in most cases is taken over 3 years. While not an easy choice, the GSC did reach a consensus on what instruments and facilities it thought should be considered for decommissioning during the 2005-2007 period:

- **AcqCam** on GS – no longer offer it for science programs
- **GPOL** on GN & GS – polarimetry with GMOS and NIRI not seen to be of sufficiently high scientific priority to be included in our roadmap (although polarimetry with MICHELLE still supported, consistent with closing out commissioning of this instrument).
- **Phoenix** – retain only until MCAO arrives in 2006.
- **bHROS** – decommission once MCAO+GSAOI become operational in 2007

It will also be noticed that the high-resolution mid-infrared spectrometer, TEXES, is not included in the GSC's instrument roadmap. While acknowledged as an important instrument for addressing key Aspen science questions, it simply could not be accommodated within this exercise of applying the hard constraints described above and ensuring an adequate return on the investment in existing and future 'pre-Aspen' facility instruments over the 2005-2007 time-frame. As such, the GSC views TEXES as 'Gemini's option' in terms of an off-ramp: If the Observatory is absolutely convinced that it has the resources to support it, then it should proceed with deploying it on Gemini-North; otherwise it should be the first instrument to go from the 2005-2007 plan..

(iv) Advanced notice to the community:

While the discontinuation of some instruments and not offering others every semester will undoubtedly cause some pain in the Gemini community, that pain can be mitigated by advertising these changes well ahead of time, so that astronomers can plan accordingly and ensure that ongoing programs are completed. This further emphasizes the need for long-term planning in instrument availability, and for that plan to be endorsed and adhered to so that the community is informed well in advance of what changes are to take place.

A suggested 'roadmap': 2005-2007

Gemini North	*Gemini South*
2005	
GMOS-N	**GMOS-S** (+ ← bHROS*)*
NIRI	**GNIRS**
MICHELLE / ← NIFS	T-ReCS / ← NICI
ALTAIR + LGS	Hok85 / Phoenix

2006	
GMOS-N	**GMOS-S** (+ bHROS)
NIRI	**← FLAM2**
MICHELLE / NIFS	T-ReCS / NICI / GNIRS
ALTAIR + LGS	

2007	
GMOS-N	GMOS-S / ← GSAOI
NIRI	**FLAM2**
MICHELLE / NIFS	(T-ReCS/GNIRS)* / NICI
ALTAIR + LGS	MCAO

Explanatory notes:

- Rows of the table indicate the following ISS ports (from top to bottom in each year): the two side ports and one upward-looking port which accommodate 'high-mass' instruments (bordered by the heavier line); the 'low-mass' facility/ instrument port.
- Instruments in **bold type** are the **core set** that defines a stable instrument configuration over the long term.
- The introduction of new instruments is indicated **by** a ← symbol to their left.
- Multiple instruments listed within a row indicates they are to be swapped on that port.
- *Recommend either T-ReCS or GNIRS is decommissioned in 2007, with the choice being based on user demand over the 2005-2006 period.

4. Telescope Operations and Engineering

4.1 Efficiency, performance and support issues

The GSC appreciated the detailed report that it received from Peter Gray on the engineering and support activities at the Observatory, and in particular hearing of the progress achieved over the last year in the key area of observing efficiency. It was encouraged by the advances that had been made in this area on many fronts, and as stated elsewhere in this report, sees it as essential that these efforts continue. The GSC also applauds the Observatory's successful silver coating of the M1-M3 mirrors on Gemini-South, and achieving such an impressively low total telescope emissivity (1.7% at 9μm).

The GSC was also pleased to hear that a seeing monitor was now operational at Cerro Pachon, and that plans are now in place for installing a duplicate system at Mauna Kea.

An area of concern flagged at the last GSC meeting was the impact the current engineering support model had on the scientific productivity of the telescopes, given that there are no support personnel available at the telescopes over weekends. In response, the GSC received at this meeting a more detailed outline of how the present support model works, and an assessment of the requirements for and the cost-effectiveness of changing to full '7 day per week' support. However, it found it difficult to make its own judgment on the latter, since it is still not clear what fraction of the technical time-loss at the telescopes can be attributed to not having weekend support. The GSC would appreciate this being clarified at its next meeting.

4.2 A&G system

The GSC also welcomed Peter Gray's assessment of the current telescope A&G system, in particular what the major problems with it are, the impact these problems are having on telescope operations and efficiency, and what priority needed to be given to replacing them. It is clear that the current system has a significant adverse impact on telescope performance: they are the major cause of technical time-loss on both telescopes and they seriously limit the telescopes' aO and offsetting performance. Furthermore, repairing them is time-consuming, with access being very difficult. The GSC was persuaded, therefore, that there was an urgent need to look critically at the possibility of replacing the existing A&G system on each telescope. This would be best approached through a proper design study that would provide a detailed evaluation of the possible options (e.g., upgrade to existing system versus a completely new system), their cost (and hence cost-effectiveness), and their impact on telescope operations and efficiency.

The GSC was also alerted to the possibility of installing infrared wave-front sensors (IR-WFS) in a new A&G. They had the potential to considerably enhance A&G capability relative to existing systems, since new science programs may well be enabled (e.g., studies in highly dust-obscured regions), and additional telescope time would be reaped by extending observing into daylight hours. The GSC was supportive of this concept, and would encourage it to be developed further within the framework of the suggested design study. It requests that it be kept informed on the feasibility and performance of IR WFS's at future meetings.

5. GSC Working Groups

5.1 AO Science Working Group

The GSC was very pleased to see that this SWG had been successfully reconstituted at the end of last year, and had been very active in the time since, having held two face-to-

face meetings and five telecons during this period. It was very grateful to Richard Myers for agreeing to chair this group and for all his efforts in reactivating it.

The GSC was also appreciative of the report it received from the AO-SWG at this meeting[3], and the clarity with which key questions relating to the Gemini AO program that the Director and GSC Chair had posed to this group over the last year, had been addressed. As mentioned elsewhere in this report, this provided essential input in making recommendations and setting priorities for AO at this meeting.

In receiving the AO-SWG report, the GSC was also updated on the progress made in further developing the science cases and understanding the technical issues for GLAO. A "GLAO Science Workshop" had only just been held a week before to bring people together to report and discuss their work in these areas. The GSC was encouraged by the first preliminary GLAO modeling results which showed a factor of ~2 improvement in 80-percentile seeing conditions (FWHM = 0.65 arcsec) over a 10 arcmin field in K. It was also impressed by the simulations of Laird Close which demonstrated the benefits an adaptive secondary mirror would provide in further exploiting the low emissivity of the Gemini telescope in the near- to mid-infrared regime, even with existing instruments, and in enhancing studies requiring very accurate psf subtraction (through the provision a well-behaved psf). Based on these early promising results, the GSC encourages further development of these important areas of the GLAO study, and looks forward to receiving more finalized and detailed information for consideration at its next meeting.

An important deficiency highlighted by the GLAO modeling is the lack of turbulence profile data for the atmosphere above Mauna Kea. This information is essential for properly evaluating the feasibility of future AO instrumentation at this site, such as GLAO. The GSC endorsed the AO-SWG's view that this item is now of considerable urgency, and included it in its table of 'engineering' tasks with the appropriate priority.

5.2 WFMOS Science Working Group

This science working group was established to take stewardship of the scientific drivers (and the related technical issues) for the Aspen instrument WFMOS (Wide Field Multi-Object Spectrograph). Formed in May, this group contains ~15 members from across the Gemini partnership, and is chaired by David Koo from Lick Observatory.

The GSC received a short report from David on the initial activities of his working group. This focused mainly on the outcomes of their first face-to-face meeting held in San Francisco in August. One of the key issues discussed at this meeting was the option of putting WFMOS on Subaru. This was viewed very positively by the WFMOS-SWG, since it had many potential technical advantages (bigger field of view, sturdier top-end structure), without any significant disadvantages. The primary risks it could see in achieving the science goals with WFMOS, were political and operational ones (how will such a collaboration with the Japanese work, how will the science teams be formed, how

[3] A copy of the AO-SWG report should be made available with this GSC report on the Gemini website.

will Gemini ensure the needs of the smaller partners are met?) rather than scientific and technical ones.

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The WFMOS-SWG had also looked in more detail at the requirements of the two main science drivers for this instrument: the 'dark energy' and 'galaxy genesis' programs. These still remained compelling and challenging programs, with no real dangers flags identified for either of them. The possibility of either a near-IR channel or a near-UV channel was being explored as a worthwhile means of extending the galaxy redshift survey required for the dark energy program to higher redshifts ($1.3 < z < 2.5$). In terms of nights required, simulations suggest this still remains at 100-150 for the dark energy program, but that 400 would be required for the galaxy genesis program! However, it was noted that more work needed to be done to better define the detailed requirements of the latter program.

Since the consideration and progression of these issues by the WFMOS-SWG is very much 'work in progress', the GSC felt that a detailed response would be premature at this stage. However, encouraged by the very positive input from the WFMOS-SWG on the Subaru option, the GSC endorsed the initiative taken by the Observatory in this context, and urges that this proposed collaboration with the Japanese be further explored and developed at all the appropriate levels (Board, Observatory, WFMOS feasibility study, and within the WFMOS-SWG).

5.3 Operations Working Group

The GSC had received the recommendations of the OpsWG from its last two meetings, and was happy to endorse them in most cases. Items that were specifically noted at this meeting were:

- The successful negotiation of a time swap with Keck (starting in 2005A), with 5 nights of Michelle time on Gemini North being traded for 5 nights of HIRES time on Keck. The GSC was, however, disappointed to learn that only 4 HIRES proposals had been received from the entire Gemini partnership for 2005A.
- Agreement on a more equitable system in charging partners for classical and queue time.
- The good progress made at the August OpsWG meeting in defining a set of metrics for the NGOs. This is being developed further by a special sub-committee of the OpsWG, who plan to present a draft proposal to the Board at its November 2004 meeting.

The GSC did spend some time discussing a proposal from the OpsWG to penalize queue program PIs who fail to meet the Phase II submission deadline. This involved demoting the program down into the next lowest science ranking band. A consensus was reached that a system involving "penalties" was the wrong approach to take in this case. Instead the GSC recommends that the Phase II submission deadlines be strictly enforced; should they not be met, then the program in question will simply be dropped from the queue altogether. However, this places the following two important requirements on the

Observatory and the NGOs if it is to work: (i) more effective communication of the Phase II deadlines to PIs, with a clearer explanation of the double-deadline system, and (ii) making the Observing Tool available to PIs (and the NGOs) in a timely manner.

5.4 Data Pipeline Working Group

One of the outcomes of the recent Board retreat was a request to the GSC to form a "data pipeline" working group. Their charge is to define the specific processing procedures required for each Gemini instrument to meet the Board's operational definition of a data pipeline system, viz., that data be processed to the degree that all impediments to further reduction and analysis have been removed before they are provided to the user. This working group needs to be formed as soon as possible and accomplish its task within six months to be in synch with the Board's budget planning timetable.

In response to this request, the GSC regarded it as essential that the core members of this working group be the most productive users of each instrument, who have worked extensively with the data and are highly familiar with the required reduction steps. The US and UK NGOs volunteered to identify/provide such people, and involvement of key Gemini Observatory staff was seen to be crucial as well. The GSC will work towards establishing this group by the end of November (2004).

6. Next meeting: date and venue

The next meeting of the GSC will take place in April 2005, when it will consider the outcomes of the concept design and feasibility studies for the Aspen instruments. The date and location of this meeting are yet to be determined. Given the fundamental importance of the Aspen process to the future of Gemini and the significant investment of time and money that it has and will involve, the GSC requests that the Observatory provide it with the documentation associated with the design/feasibility studies well in advance of this next meeting.

The arrangement at this most recent meeting of having the GSC and AOC-G meet jointly for one of the two days was considered to be a very positive and useful experience by the GSC. Accordingly, in consultation with the Chair of the AOC-G, it was agreed that this would be repeated when the two committees meet a year from now in La Serena. Although still to be confirmed, this is likely to be during the week of 10-14 October 2005.