

Gemini Science Committee

Meeting Resolutions

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OCTOBER 1993**RESOLUTION 3.1:**

The GSC express its strong concern about the continued delay in access to Mauna Kea, and the resulting serious implications for the Project schedule and instrumentation budget.

RESOLUTION 3.2:

At present, the Gemini Science Requirements gives no detailed specifications for image quality at optical and near-ultraviolet wavelengths at the f/16 focus other than the general requirements for adaptive optics. The GSC recommends as a goal that the telescopes not degrade the optical and near-ultraviolet encircled energy image quality provided by an optically perfect telescope, without wide field correctors, operating in good atmospheric seeing conditions with wavefront tilt corrections, by more than 15% of the encircled energy diameters. At 0.31 microns, this implies that 50% of the encircled energy should fall within a 0.13 arcsec diameter, while 85% of the encircled energy should fall within 0.27 arcsec. At 0.55 microns, the corresponding diameters are 0.12 (50% encircled energy) and 0.24 arcsec (85%). For comparison at 2.2 microns this corresponds to encircled energy diameters of diameters are 0.10 arcsec (50%) and 0.21 arcsec (85%).

The infrared image quality requirements outlined in the Science Requirements Document are the highest priority requirements. The GSC recommends that Optical and UV specifications for the F/16 focus should be considered desirable goals, and charges the Project to develop a more detailed specification of the UV performance, including a more complete atmospheric model that accounts for UV atmospheric scattering, prior to the final polishing specification being fixed.

RESOLUTION 3.3:

The GSC accepts the A & G concepts outlined by the A & G Working Group and recommends that the current concept for the Instrument Support Structure (ISS) can be carried to the PDR stage. However, the GSC also recommends that multiple uses of each side of the ISS be examined further, and that consideration be given to quick access to the interior of the ISS for maintenance and that the handling of instruments be considered further.

RESOLUTION 3.4:

The GSC recognizes the potential scientific gains from advanced AO systems on Gemini outlined by the AO Working Group. Given the rapid changes in technology available for adaptive optics systems and the AO Working Groups recommendation for a phased implementation of these capabilities, the GSC recommends that the Project undertake a design study in collaboration with the Canadian Project Office to investigate the compatibility of the proposed natural guide star AO system for use with laser beacons. Note that at the previous GSC meeting a resolution was passed which stated "Given the ban of laser guide stars on Mauna Kea, the Adaptive Optics Working Group should continue to pursue the use of natural guide stars for the initial AO implementation."

RESOLUTION 3.5:

The GSC endorses the detector procurement approach recommended by the Optical Imager and CCD working group, and requests that a more detailed budget be developed, in consultation with the Gemini Instrumentation Group, for each of the specific capabilities listed in the final report of this group. The Gemini Instrument Group should also further define the role of the acquisition camera within the current ISS concept.

RESOLUTION 3.6:

The GSC supports the recommendations made by the Infrared Camera working group, which includes the choice of a 1024 x 1024 array with the following image scales:

	Pixel Sizes (arcsec)	FOV's
1-2.4 micron	0.02; 0.08	20.5; 82
3-5 micron	0.042; 0.1	43; 102

and prioritizes the capabilities for the design study to be as follows: (1) 1024 x 1024 arrays.

The GSC also encourages the project to investigate further innovative approaches for procuring a 10 micron imager.

RESOLUTION 3.7:

The GSC supports the basic priorities outlined in the final report of the Infrared Spectrograph working group, in which a moderate resolution spectrograph with the following specifications is given the highest priority:

REQUIREMENTS:

Wavelength	0.9 - 5.5 micron
Detector	1024 x 1024
Pixel scales	0.05 + 0.15 arcsec/pixel
Slit Length	at least 50 arcsec
Optimum resolutions	2000 and 8000
Polarizing Prism?	Yes - MgF2

GOALS:

Slit length	150 arcsec
Resolving power	15000 - 30000
Cross-dispersed?	Yes
Multiobject?	Yes (0.9 - 2.5 microns only)

The goals of supplying cross dispersion and multi-object capability are highly desirable, although detailed costing will be required to determine if these are practical.

RESOLUTION 3.8:

The GSC recommends that the highest priority for the use of the High Resolution Optical Spectrograph (HROS) be at the Cassegrain focus with the overall through-put of this mode, particularly in the UV, being the high scientific priority. A spectral resolution of 100,000 is desirable, but resolutions covering the range 30,000 - 80,000 would be acceptable if this

choice is required to achieve high throughput and the necessary stability at Cassegrain. The capability should also exist for observations with a spectral resolution of 120000 in the high-resolution pier laboratory, with a goal of being able to implement this mode at Cassegrain. Whether these capabilities can be incorporated into a single instrument or require different instruments should be the subject of a detailed design study.

RESOLUTION 3.9:

The GSC recognizes that the wide-field option described in the final report of the Optical and Ultraviolet Multi-object Spectroscopy working group would simultaneously satisfy much of the needs for high spectral and spatial resolution spectroscopy. The specifications set by the working group for the Wide Field mode are:

Field Size	7 arcmin diameter
Image scale	0.1 arcsec/pixel
Wavelength range	370 – 1100 nm
Minimum/nominal slit	0.2/0.5 arcsec
Spectral resolution	1000-10000

OV should be balanced against the costs of developing the high spatial-resolution option, given the anticipated low cost of an instrument that would fill this niche. The specifications set for the high spatial resolution mode are:

Field Size	2 arcmin diameter
Image scale	0.04 arcsec/pixel
Wavelength range	370 - 1100 nm (no AO) 500 - 1100 nm (with AO)
Minimum/nominal slit	0.1/0.25 arcsec
Spectral resolution	300 - 4000

The GSC regards extending the UV performance of this instrument as its third priority.

RESOLUTION 3.10:

The Cerro Pachon telescope promises to provide unique observations, and will be one of the main research tools for astronomers in the partner South American countries. The GSC recognizes that there is currently a discrepancy between the initial instrumentation capabilities of the two telescopes, and recommends that the project continue to pursue innovative means of procuring instrumentation for the Cerro Pachon facility.

RESOLUTION 3.11:

The GSC recommends that the Gemini Instrument Group, in conjunction with the Project Scientist Team and National Project Offices, develop an instrumentation procurement plan incorporating:

- (1) scientific priorities;
- (2) instrument working group recommendations;
- (3) design studies (as necessary);

- (4) budgets;
- (5) work schedules; and
- (6) allocation of work packages.

This plan would be submitted to the GSC by April 1994 and to the Gemini Board of Directors by May 1994.

APRIL 1994**RESOLUTION 4.1:**

The GSC endorses the overall approach proposed by the Project to hold two comprehensive open Systems reviews each year. To streamline the review process, the PS's and GSC will define Science Working Groups only for these reviews. The GSC feels that these Working Groups will provide adequate external scientific review of the Project. The open systems reviews will allow the more detailed reviews to be organized in a less formal manner. The GSC encourages the Project to continue to use external representatives where possible on these detailed reviews and would like to receive reports from the PS's on the reviews.

RESOLUTION 4.2:

The GSC endorses the conclusions of the PDR Panel that the design for the Primary Mirror Assembly presented at the PDR will meet the science requirements. The GSC endorses the recommendations of the SWG and the PDR Panel for continuing development of a surface heating system for the Primary Mirror. The GSC believes that this system will be important for ensuring adequate margin in the control of the mirror surface temperature, so that the Gemini image quality requirements can be met under the wide range of temperature conditions that will be experienced at Mauna Kea and Cerro Pachon.

RESOLUTION 4.3:

The GSC recognizes that the image specifications of the Gemini Telescopes place unique demands on the Primary Mirror polishing requirements. Since the Primary mirror is unlikely to be tested in its cell prior to installation in the telescope, the GSC recommends that the Project Scientists create a Working Group to assess and recommend polishing options consistent with the UV and optical imaging goals, as well as the IR imaging requirements, as described in Version 2.0 of the SRD.

RESOLUTION 4.4:

The GSC recommends that the Project proceed with the Secondary Mirror System RFP using the following chopping requirements, as outlined and recommended by the Secondary Mirror Science Working Group:

The current chopping requirements in the SRD of up to 5 Hz chop with amplitude up to ± 15 arcsec (80% duty cycle) and up to 10 Hz chop with amplitude up to ± 7.5 arcsec (80% duty cycle) should be considered as goals for the Secondary Mirror RFP, with the option of lowering the chopping frequency requirements from 5 Hz to 3 Hz and from 10 Hz to 6 Hz if a substantial savings in cost and/or complexity could be obtained. A chop amplitude of up to ± 7.5 arcsec is a requirement.

Moreover, the SRD requirements for nodding should include nodding up to 5 arcsec within 1 second in addition to the current requirement of up to 60 arcsec within 5 seconds.

RESOLUTION 4.5:

The GSC recommends that the proposed model for CCD development, which includes detectors for WFS's, the acquisition cameras, the MOS, and HROS, but not for 8K science

imagers, be adopted as the baseline program. The GSC encourages broad participation of the international communities in this program through collaborative foundry runs, as this may allow for greater capability of the detectors ultimately delivered to the Gemini Telescopes.

RESOLUTION 4.6:

The GSC recommends that the scientific priorities for the IR imager remain unchanged from the previous meeting, and endorses the statement of work prepared by the Project. The GSC reiterates its recommendation that a wide field mode should be explored.

RESOLUTION 4.7:

The GSC sets the following requirements for the IR spectrograph. These are not listed in any particular order of priority:

- 1) Wavelength range 0.9-5.5 μ m
- 2) Detector Format: 1024x1024
- 3) Throughput: Maximizing throughput is a critical scientific priority
- 4) Spectral resolutions: The lowest dispersion mode must allow each atmospheric window to be covered across the 1024 array (R~2000), and an intermediate dispersion mode must be provided which allows the observations of key astrophysical lines between the atmospheric OH lines (R=8000).
- 5) Pixel scale: should be capable of exploiting 0.1-0.2 arcsec slits with sampling ~ 0.05 arcsec/pixel
- 6) Slit length: = 50 arcsec
- 7) Polarizing prism: Yes - MgF2

The following are considered to be desirable options, which will enhance the multiplex advantage of the spectrograph. With the exception of the first of these, they are not listed in any particular order:

- 1) Integral Field Mode (highest optional priority)
- 2) Cross dispersion or simultaneous wavelength coverage - covering J, H, and K
- 3) Multi-slit - with particular emphasis on J, H, and K
- 4) Slit length of 150 arcsec, with a pixel scale of 0.15 arcsec/pixel

In addition, spectral resolutions in the range 15000-30000 are considered to be options.

Recognizing that designs for this instrument will be generated through competition, the GSC must be represented in the selection process.

RESOLUTION 4.8:

The GSC recommends the procurement of a package consisting of two MOS instruments for use with the Mauna Kea and Cerro Pachon telescopes. Top priority requirements are identical for both instruments, although scientific benefits could be gained by optional differences between the Northern and Southern instruments. Thus the top priority MOS requirements, listed in no particular order, are:

- 1) Field Size: that which could be filled with a 4096 CCD (– 5:5 arcminutes)
- 2) Image Scale: 0:08 - 0.10 arcsec/pixel
- 3) Wavelength range: 0.37-1.10 μ m
- 4) Slit sampling: 2.5 times the image pixel scale
- 5) Imaging mode: Sufficient to support MOS mask production
- 6) Spectral resolution: up to 10,000
- 7) Integral Field Mode: sub-apertures with diameters 2.5 times the pixel scale over an 8 arcsec FOV
- 8) Slits: Capability to manufacture precision slit masks

In addition, the GSC identifies several desirable features that are optional. These might be incorporated into the design if resources permit, or identified as upgrade plans for the first generation instruments:

- 1) Extension of wavelength coverage with priority for the UV to the atmospheric cut-off for the Southern MOS, then to the IR up to 1.6 microns (north), then extending the IR coverage in the southern MOS and, finally the UV coverage in the North MOS, if coatings permit.
- 2) A high spatial resolution integral field mode to support adaptive optics capabilities at wavelengths longward of 700 nm.

RESOLUTION 4.9:

The GSC recommends that the scientific requirements for the HROS remain unchanged from the previous meeting.

RESOLUTION 4.10:

The GSC strongly encourages the Gemini Project to explore the shared use of the 10-20 μ m UKIRT spectrometer Michelle. The demonstrated performance of Michelle must take full advantage of the outstanding image quality and low thermal background of the Gemini telescopes at spectroscopic resolutions of 200-30000 in the 8-25 μ m region.

RESOLUTION 4.11:

The GSC recommends that a mid-infrared imager be part of the first generation instrumentation. The highest priority for this instrument is broad-band 10 micron capability, and it must exploit the high performance, high background characteristics for mid-infrared arrays. This instrument must also meet the following requirements:

- 1) Plate scale: ~ 0:13 arcsec/pixel (required to sample the telescope diffraction limit at 10 μ m).
- 2) Field of View: as set by array
- 3) Instrument background: $\leq 1\%$ effective emissivity
- 4) Throughput: must be high
- 5) Wavelength range: 5-25 μ m with extension to 30 μ m as goal
- 6) Filter requirements: one cold filter wheel with 20-30 slots for filters, etc.
- 7) Operating modes; both side- and upward-looking
- 8) Closed Cycle cooled operation

9) Tip-Tilt correction achieved by sensing in the peripheral guide field.

RESOLUTION 4.12:

Recognizing the absence of high spectral-resolution capabilities for the northern telescope, the GSC recommends that the Project continue to explore the option of providing a fibre-feed to the CFHT Coudé spectrograph.

RESOLUTION 4.13:

After assessing the balance of instrumentation between the Mauna Kea and Cerro Pachon telescopes, and examining preliminary costings for instruments prepared for the Project, the GSC recommends that the Project prepare an instrumentation plan with the following distribution of instruments, which are listed with no particular priority, for the first phase of the Gemini Instrumentation Program.

Mauna Kea:

[Optical Acquisition camera] (recognized not to be a science grade imager)
1 - 5 micron imager
1 - 5 micron spectrograph
Multi-object spectrograph (with imaging capability)
10 micron imager (could be moved to Cerro Pachon)
Fibre-feed to the CFHT

Cerro Pachon:

[Optical Acquisition camera] (see comment above)
Multi-object spectrograph which may have to be a copy of the Mauna Kea MOS (with imaging capability)
HROS

It is understood that a 1 to 5 micron imager will be borrowed from CTIO to commission the Cerro Pachon telescope.

The GSC believes that this plan provides the minimum complement that meets the Gemini Science Requirements Version 2.0, while satisfying the scientific aspirations of all the partner countries. It recognizes that the first years of the Instrumentation Development fund may have to be used to finance this plan.

OCTOBER 1994

RESOLUTION 5.1:

Given the demanding image quality specifications for the Gemini telescopes, the GSC believes that it is essential that a fully costed feasibility study be carried out on the primary mirror heating systems.

RESOLUTION 5.2:

With the elimination of the Nasmyth focus, and the addition of a pier laboratory for high resolution spectroscopy, the GSC recommends that the summary Table at the end of Section 3 of the Science Requirements Document be updated.

RESOLUTION 5.3:

The GSC strongly endorses the continuing efforts by CTIO & AURA to control light pollution at Cerro Pachon.

RESOLUTION 5.4:

The GSC recognizes that observing time will be at a premium on the Gemini telescopes, and that every effort must be taken to obtain observations in a highly efficient manner that exploits the unique characteristics of the telescopes and sites. Although it is recognized that some programs will be carried out in classical observing modes, the GSC also believes that to exploit the best conditions scientifically, be they of seeing, atmospheric emissivity, or conditions suitable for AO, it will be necessary to allocate at least 50% of telescope time on average as queue scheduled observing during the operations phase. To realize effective and reliable queue scheduling, the GSC further recognizes that:

- (1) alternative observing modes, such as remote observing and remote monitoring, will need to be investigated,
- (2) the time accounting schemes for queue and classical observing modes will have to be different, with time for queue observing based on hours actually used, and time for classical observing based on the total allocated hours,
- (3) observing time will have to be allocated internationally, involving both telescopes, to allow the operations team maximum flexibility in optimizing the scientific return to the Gemini Partnership.

RESOLUTION 5.5:

The GSC recommends that the requirements and goals outlined for the AO system in the Science Requirements Document be changed to read as follows:

Requirement:

Delivered Strehl Ratio > 0.5 at $1.6\mu\text{m}$ in median seeing conditions, with the intent of maximizing image concentration and sky coverage of a natural guide star system for $0.7\mu\text{m} < \lambda < 5.0\mu\text{m}$. This requirement is expected to deliver Strehls ~ 0.2 at $0.7\mu\text{m}$ in 10th percentile conditions.

The AO system should not increase the total emissivity by more than 15% for $2.2\mu\text{m} < \lambda < 5.0\mu\text{m}$ (i.e. a total telescope requirement of $\approx 19\%$).

The throughput of the AO science path should be maximized in the band $0.5\mu\text{m} < \lambda < 5.0\mu\text{m}$ and should not be less than 50% at any wavelength in this band.

The performance of the AO system as a function of zenith angle should degrade no faster than $\text{Strehl Ratio}(z) \geq \text{Strehl Ratio}(z=0)^n$, where $n = \sec(z)$ and $z = \text{zenith angle}$.

The stability of the AO system should be sufficient to ensure that delivered Strehl ratios be limited only by atmospheric effects for up to a one hour integration.

Goals:

The total AO emissivity should be less than 10% without ADC's in the band $2.2\mu\text{m} < \lambda < 5.0\mu\text{m}$.

The order of correction should be selectable with the goal that performance of the lower order corrections should not be compromised.

Laser Beacons: The natural guide star AO system should be designed in such a way that it can be upgraded to a laser guide star system with a priority to increase the system's sky coverage at the above performance levels.

RESOLUTION 5.6:

Given the critical scientific importance of the CCD detectors, and the expected difficulty of their meeting the science requirements, the GSC charges the CCD consortium to evaluate the scientific performance of the CCD's which would be available from all potential vendors, with a view to procuring the best possible for Gemini.

APRIL 1995**RESOLUTION 6.1:**

The GSC recognizes the budgetary situation and encourages all the partners to provide the Project support as agreed. The GSC supports the Project approach of acquiring the required capabilities in the most cost-effective fashion. The GSC is concerned that moderate cost capabilities that are key to the Gemini facility scientific performance, such as surface coating heating, silver coating capability, and dome air conditioning, are at risk in this situation and we urge that these capabilities be preserved.

RESOLUTION 6.2:

The GSC is encouraged by the Project's activities in developing a coating heating concept for the primary mirror, and providing for its implementation in the design of the primary mirror cell. The GSC reiterates that this capability is key to the imaging performance of the Gemini telescopes and urges that the Project activities be continued with the objective of a fully costed coating heating design that can be considered as part of the primary mirror cell CDR.

RESOLUTION 6.3:

The GSC endorses the general focus adopted by the Operations Science Working Group. The Working Group is encouraged in its efforts to:

- develop new observational scenarios, and use these to test the Observing Tool software package, which will be used in the planning of observations. The instrument builders should be involved in this process.
- develop a detailed model of how the observing queue will operate, including an assessment of the level of resources that will be required. It is recommended that the initial implementation of the observing queue should be kept as simple as possible.

The operational complexity of the Gemini Telescopes, coupled with the desire to exploit the benefits of queue observing, will require Gemini scientific staff at both sites during operations. In addition to obtaining observations and providing instrumentation support, an active scientific culture among these staff will be of critical importance for a successful operations phase.

RESOLUTION 6.4:

The GSC endorses the goal that GMOS for the MK telescope be optimized for performance between 0.5 μ m and 1.1 μ m. The GSC recognizes a strong scientific case for "good" performance as blue as λ_{3727} [OII] (below which a significant penalty due to bare silver coatings is incurred) and encourages the GMOS team to present throughput and image quality assessments for the Mauna Kea GMOS down to this wavelength.

In a complimentary fashion, a goal for the Cerro Pachon GMOS should be optimized performance between 0.3 and 0.5 μ m. The GSC recognizes a strong scientific case for "good" performance as red as H α at 0.66 μ m and encourages the GMOS team to present throughput and image quality assessments for the Cerro Pachon GMOS up to this wavelength.

It is understood that the cost of the two spectrographs cannot exceed the current limit.

There is great scientific interest in extending the long wavelength limit of the red system to $1.8\mu\text{m}$, as long as the cost limit is not exceeded.

RESOLUTION 6.5:

The GSC endorses and adopts the clarifications and modifications to the NIRI and MIRI performance requirements proposed by the IRISWG, and supports the proposed prioritization of the NIRS options.

Revised Near IR Imager requirements and goals:

Requirements:

- 1-5.5 μm wavelength coverage
- Array: 1024^2 InSb array with $27\mu\text{m}$ pixels
- High Throughput
- Internal Instrument Background: <1.2 telescope emissivity for wavelength $> 2.2\mu\text{m} < 0.5$ e/s/pixel at shorter wavelengths
- Three Plate scales: 0.02, 0.05, 0.11 arcsec/pixel
- Filters: two wheels of 20-30 slots for filters, grisms, and polarizers

Goals:

- Design for 2048^2 arrays
- Grism capability: $R\sim 700$, 1-2.5 μm
- Coronagraphic mode
- Pupil viewing

Revised Mid IR Imager requirements and goals:

Requirements:

- Wavelength range: 5-25 μm based on $\sim 256^2$ Si:As IBC arrays
- Plate scale: <0.13 arcsec/pixel
- Instrument Background: $<1\%$ effective emissivity in low emissivity atmospheric windows between 5 and 25 μm
- Filters: 20-30 cold filters

Desireable options:

- Dichroic feed to Gemini supplied by InSb array for near IR guiding/simultaneous imaging
- Optical design consistent with x2 upgrade in array size

Prioritization of near IR spectrometer options:

- The short camera (0.15 arcsec/pixel) and the grating turret be incorporated as part of the initial implementation
- Gemini initiate an off-line R&D activity aimed toward the eventual inclusion of a fibre based integral field unit into the collimated beam of the Spectrometer.

We also endorse the NOAO managed InSb array foundry run proposal and encourage the rapid finalization of this agreement and support the proposed procurement approach for the near IR array controllers. The GSC is please by and encourages continued involvement of the NIRI and NIRS teams in the foundry run and IR controller activities.

RESOLUTION 6.6:

The GSC endorses the AO/A&G SWG recommendation to modify the SRD requirements and goals for the Gemini AO system. The reviews AO science requirements and goals are as follows:

AO Science Requirements:

- Delivered Strehl ratio > 0.5 at $1.6\mu\text{m}$ in median seeing conditions, with the intent of maximizing image concentration and sky coverage of a natural guide star system for $0.7 < \lambda(\mu\text{m}) < 5.0$. We recognize that Strehl ratios exceeding 0.1 are scientifically valuable. We expect the system to deliver Strehl ratios of ~ 0.2 at $0.7\mu\text{m}$ in the best tenth percentile conditions.
- The AO system should not increase the total emissivity by more than 15% for $2.2 < \lambda(\mu\text{m}) < 5.0$ (i.e., a total telescope emissivity requirement of $< 19\%$).
- The throughput of the AO science path should be maximized in the $0.5 < \lambda(\mu\text{m}) < 5.0$ band and should not be less than 50% in this band.
- The performance of the AO system as a function of zenith angle should degrade no faster than $S(Z) \sim S(0)^n$, where $n = \sec(Z)$ and $Z =$ zenith angle.
- The stability of the AO system should be sufficient to ensure that the delivered Strehl ratios be limited only by atmospheric effects for up to a one hour integration.

AO Science Goals:

- The total AO emissivity should be less than 10% without ADCs in the $2.2 < \lambda(\mu\text{m}) < 5.0$ band.
- Laser Beacons: The natural guide star AO system should be designed in such a way that it can be upgraded to a laser guide star system with the priority to increase the system's sky coverage at the above performance levels.

RESOLUTION 6.7:

The Gemini coating development programs have basically achieved their goals, demonstrating the feasibility of high quality sputtered Al coatings, and very high quality sputtered coatings of bare and protected Ag. The coatings will allow the Gemini telescopes to achieve the overall requirements for telescope emissivity and coating reflectivity set out in the SRD, and nearly achieve the SRD goals. The enhanced UV reflectivity achieved by some protected Ag coatings is an encouraging development which should be pursued. The Project is to be applauded for the excellent work in this area.

The GSC feels that both the MK and CP coating chambers should be designed so as to accommodate sputtered Al, bare Ag and protected Ag coating deposition for both the primary and secondary Gemini mirrors. We anticipate that at the start of operations the coatings for the MK telescope would be bare or protected Ag on the secondary, primary and the science fold mirror. The initial configuration for CP is anticipated to be Al on the three surfaces. Ultimately the goal should be to have the capability to select the mirror coatings for each telescope for optimum scientific performance at any given time.

Further development of the details of the implementation of Ag coatings and protective layers is required, including ongoing work concerning the durability and cleaning of the various coatings. UV and visible reflectivity measurements, as well as IR emissivity measurements should continue to be used in the assessment.

SEPTEMBER 1995**RESOLUTION 7.1:**

The GSC recognizes the compelling science case for near-infrared sensing of tip/tilt and fast focus correction, and recommends that Gemini adopt this approach as the baseline On-Instrument Wavefront Sensing configuration for IR instruments, subject to the assessment of costing and technical trade-offs.

The GSC recognizes the compelling science case for a near-infrared spectrograph on Cerro Pachon, and welcomes NOAO's plans to duplicate the NIRS as a shared instrument for Gemini South.

RESOLUTION 7.2:

The GSC recognizes that improved sky coverage will have a large impact on a broad range of scientific programs utilizing the Adaptive Optics system. Therefore, the GSC recommends that the Project continue to investigate the ramifications of different design approaches for increasing sky coverage.

RESOLUTION 7.3:

The GSC applauds the detailed Integration and Commissioning planning done to date, and encourages its continued development to preserve the flexibility needed to respond to unforeseen events. The GSC recommends that:

- 1) engineering activities have highest priority during the integration and commissioning phases;
- 2) at operations hand over at Mauna Kea, the following capabilities will have been verified:
 - the facility meets its top-level science performance specifications;
 - the facility is capable of supporting classical and simple queue observations;
 - a time allocation process is in place to select the initial scientific programs for use of the facility;

These same capabilities should be in place at Cerro Pachon at the time of its operation handover.

RESOLUTION 7.4:

The GSC endorses the general approach adopted by the Project for instrumentation development, which is that:

- 1) the basic telescope infrastructure, such as the Instrument Support System, the Acquisition and Guiding Unit, and the Calibration Unit, is essential, and should be acquired in the most cost effective way;
- 2) the Phase I scientific instrumentation should be acquired in a cost capped manner.

However, the GSC is concerned that:

- 1) there is potential for cost growth and subsequent erosion of scientific capabilities in several areas. Frequent assessments by the Project Scientist (PS) team will be necessary as costs become better defined. The PS team should use the Science Requirements Document for guidance when considering trade-offs;
- 2) the increasingly heavy reliance on the early operations budget for the completion of the Phase I instrumentation program may be in conflict with other demands on these resources.

RESOLUTION 7.5:

The GSC emphasizes that the Gemini facilities represent the premier ground based astronomical facilities available to the partner communities. As such, the goal of Gemini operations is the effective utilization of these facilities to exploit the unique characteristics of the telescopes and sites, and execute the highest priority observations as identified by the partners. The GSC recommends that the Gemini Operations Plan be adopted as the basis for further developments. More specifically:

a) Science operations:

- the goal of Gemini operations is to optimize the time spent on highly ranked programs, consistent with the allocation of time among the partner countries;
- National Project Offices will be responsible for interfacing with their respective communities for the time allocation process, pre- and post-run assistance and maintenance of a priority ordered list of observing programs
- the ultimate responsibility for the scientific usefulness of the observations will reside with the principal investigator

b) Engineering Support

The versatility of the Gemini telescopes and the flexibility of queue-observing allow an "Adaptive Operations Model", which economises on engineering and technical staff but carries some risk of compromised scientific output. This model has a staffing level of 53 FTE technical and 84 FTE total manpower, supporting queue, service and remote observing. A single engineering team supports both telescopes, provided at least 50% of each telescope is queue scheduled. A lower level of technical support than that suggested for the "Adaptive Operations Model" is unacceptable.

c) Continuing Instrumentation Development

Because of cost constraints, most of the Gemini Phase I instruments have been designed with basic capabilities and upgrade options that would significantly extend their capabilities. A program to implement these upgrades, as well as to provide capabilities not in the Phase I instruments, is an essential part of Gemini operations. Ideas for new instrumentation should be solicited from the scientific communities of the partner countries.

d) Facility Improvements

A continuing program of facility improvements will be required to exploit the full potential of the facilities and maintain Gemini as competitive, state-of-the-art observatories.

In summary, the GSC finds that any operations plan must be able to support queue observing. A lower level of technical support than that suggested for the "Adaptive Operations Model" is unacceptable. The absence of an ongoing instrumentation development program is unacceptable.

APRIL 1996

RESOLUTION 8.1:

The GSC appreciates the high priority which the UK has given to Gemini Project activities. This has resulted in the placement of several key Gemini work packages in the UK and much of the ongoing work in the UK is on or near the critical path for the Project. We therefore are concerned that delays or other difficulties could occur as a result of planned major reorganizations of UK astronomy centers. The Gemini Project is on a very tight budget and delays will result in substantial problems for the Project. The GSC therefore requests that the PPARC prevent any negative impacts of the internal UK reorganization on Gemini work packages.

RESOLUTION 8.2:

The GSC continues to be very impressed with the work of the Gemini Project team. It is of very high quality and bodes well for the final Gemini product. We applaud the addition of coating heating and protected silver coating to the baseline capability for both sites.

An effective, easily executed regular mirror cleaning capability for both the primary and secondary mirrors is required in order to maintain the reflectivity and scattering performance of the Gemini telescopes for the operational intervals between mirror recoatings. It is essential that this capability be in place at the start of operational use of the telescopes.

RESOLUTION 8.3:

A convincing scientific case has been made for a Natural Guide Star (NGS) Adaptive Optics (AO) system with strehl ratios in the range of 0.2-0.6 in the 1.0-2.5 μ m range. The GSC thanks Simon Morris and collaborators for their contributions to the AO Science Document.

The GSC recommends that the Gemini Project proceed with a Phase I AOS with the following capabilities:

- NGS AOS;
- Wavelength Coverage: 1-2.5 μ m with manually changeable dichroic allowing observations to 0.85 μ m;
- Throughput and Emissivity: The deployment of GAOS will not lower the telescope throughput by >25% over the operating wavelength range, while the total emissivity of the telescope and GAOS (without ADC) in K must be <19%;
- Strehl Ratio: A minimum on-axis strehl ratio delivered to the detector of the near-infrared imager of 0.4 in H during median seeing conditions for bright guide stars. The on-axis strehl must be met during any one hour exposure within 45 deg of zenith when atmospheric conditions remain constant;
- Field of View: 2 arcmin diameter unvignetted field of view;
- Conjugation of the Deformable Mirror to a fixed optimal altitude;
- Sky Coverage: The intent is that sky coverage be maximized for the specified strehl ratios. A goal is that the natural guide star AO system should be designed such that it can be upgraded to a laser guide star system and a flexible control architecture, with the priority to increase the system's sky coverage at the above performance levels.

RESOLUTION 8.4:

The GSC recommends that near-infrared on-instrument wavefront sensors for tip/tilt and fast focus correction be adopted as the baseline in all Gemini Near IR instrumentation.

RESOLUTION 8.5:

The revised requirements for GMOS are as follows:

- Two spectrographs: one with red optimized coatings for GN, the other with blue optimized coatings for GS; the intent is to have competitive scientific performance at 3727Å on GS;
- Wavelength coverage: 0.4-1.1µm;
- Detector: 4096x6144 CCD mosaic;
- Image scale: 0.08 arcsec/15µm pixel;
- Minimum slit width: 0.2 arcsec (i.e. 2.5 times a spatial resolution element);
- Imaging mode: adequate to support mask construction;
- Maximum spectral resolution: 10,000 with 0.25 arcsec slit width;
- Integral field Module: Sub-apertures with 0.2 arcsec width, giving total sky coverage of 50 square arcsec, including sky;
- Flexure: spectrograph flexure will introduce systematic radial velocity errors no greater than 1 km/s/hr for zenith distances less than 60 deg at a spectral resolution of 5,000.

The following are desirable Options:

- Wavelength coverage from 0.36-1.8µm;
- IFU's with finer spatial sampling for wavelengths longer than 0.7µm.

The GSC is satisfied that the design presented at the PDR is consistent with the Scientific Requirements.

RESOLUTION 8.6:

The GSC recognizes the principle of shared instrumentation as a valuable part of the Phase II instrumentation program. The UK has proposed shared use of MICHELLE. MICHELLE will provide GN with unique and significant scientific capabilities. The GSC recommends that the proposal be accepted and that:

- 1) The incorporation of MICHELLE into the GN instrument complement be subject to the procedures to be developed as part of the Phase II process;
- 2) All other shared instruments be subject to the same process;
- 3) The expected performance capabilities and interfaces be part of the agreement.

RESOLUTION 8.7:

The GSC feels that NOAO's 1-5 micron imager (Cryogenic Optical Bench, COB) is adequate for commissioning GS. The GSC recommends that the Gemini Project undertake negotiations with NOAO for use of COB in commissioning of GS.

NOAO has expressed interest in shared scientific use of PHOENIX on GS. The GSC recognizes that PHOENIX could provide unique scientific capabilities on the Gemini Telescopes for high resolution spectroscopy in the 1-5.5 μ m interval. The GSC therefore requests that the US Gemini Project Office prepare a detailed scientific case and shared use Phase II proposal for Project Scientist team consideration at its next meeting.

RESOLUTION 8.8:

An ambitious Phase II Instrumentation program is essential to satisfy partner aspirations for the Gemini telescopes.

The Project Scientist Team is charged with formulating 1997 needs in the context of a conceptual Phase II program for GSC consideration at the next meeting, with the goal of a broader conference on new instrumentation options and opportunities leading to a preliminary Phase II program for GSC consideration at the spring GSC meeting.

Key elements of the Phase II Program should be as follows:

- a) Competitive AO capabilities on both telescopes are essential to achieve the science goals of the partner communities;
- b) We encourage conceptual design activities and science rationale preparation for the IFU on the NIRS, 1.8 μ m camera on GMOS, and HROS high stability lab for consideration as elements of the Phase II program;
- c) Examples of general capabilities that need to be addressed in the Phase II program include, NIR capability on GS, polarization capability on both telescopes, exploitation of Gemini image quality for high dynamic range observations, wide field capability, and high performance UV capability;
- d) Innovative means, for example shared instruments, for providing scientific capabilities, including MICHELLE on GN and PHOENIX on GS, should be considered.

RESOLUTION 8.9:

The baseline 'merging sequence' time allocation process appears to provide fair and reasonable access for the partner communities to the classical time and to desirable conditions for queue scheduled time, while emphasizing the scheduling of the most scientifically important programs. The proposed execution process also appears to be reasonable and fair, but further simulations are required to optimize selection parameters and demonstrate the effectiveness of the process.

We recommend that calibration time should be treated the same for classical and queue scheduled observations; there will be no charge for daytime calibrations while night time calibrations will be charged as observing time, with the exception that time for calibrations shared between queue observing programs will be equitably split between the programs.

OCTOBER 1996**RESOLUTION 9.1:**

We continue to be very impressed with the dedication of the Project staff to the Gemini goals. In light of the projected cash flow problems and the very tight construction and commissioning schedules, we reiterate the importance of the Gemini partners meeting agreed contribution schedules.

RESOLUTION 9.2:

The GSC welcomes the announcement that the SOAR project has been approved and we are looking forward to positive interactions between the Gemini and SOAR projects, including the possibility of shared instrumentation and infrastructure with Gemini-S. We see real advantages, both scientific and operational, if SOAR were to be located close to Gemini South on Cerro Pachon.

RESOLUTION 9.3:

The GSC endorses the HROS performance requirements given in the Table as the basis for Conceptual design activities.

	<i>R=50,000</i>	<i>R=120,000 - 150,000</i>
spectral range - total	300 - 1000 nm	300 - 1100 nm
spectral range - single exposure	350 - 700 nm	
throughput - no slit or CCD	>20% max > 10% min	>20% max > 10% min
nominal slit width	0.6 arcsec	0.24 arcsec
range of slit widths	0.1 - 10 arcsec	0.1 - 10 arcsec
slit length	60 arcsec	60 arcsec
image slicer	no	yes, deployable
atm disp compensation	no	no
image quality - dR	< 10%	< 10%
image quality - dPSF (10th %ile seeing)	< 10%	< 10%
simultaneous arc	required	required
maximum displacement of stellar spectrum in wavelength after 1 hour, without calibration	< 0.05 resolution element	< 0.05 resolution element
multi-object capability	yes	yes
multi-longslit	yes	yes
spectropolarimetry capability	yes	yes
scattered light order separation level	15x median seeing < 5% at 700 nm	15x median seeing < 5% at 700 nm
exposure time weighted mid-exposure actual exposure time	precise to 1 s precision of 1%	precise to 1 s precision of 1%
slit viewer	yes	yes

The GSC recognizes the scientific importance of a stable spectrograph that is capable of a radial velocity precision of 1 m/sec.

RESOLUTION 9.4:

The GSC is concerned that there is no agreement with NOAO for use of COB as the commissioning imager for Gemini-South, and urges an immediate resolution to this situation.

RESOLUTION 9.5:

The GSC endorses the Conceptual On-going Instrumentation Program proposed by the Project Scientist Team, as the basis for discussions at the Gemini Instrumentation Conference in January 1997.

The GSC is excited about the impressive gains now being made with AO and urges that a major focus of the conference be next generation AO and the associated instrumentation on both telescopes.

RESOLUTION 9.6:

The GSC recommends that Gemini undertake work in the following areas in 1997: 1) characterization of Cerro Pachon for adaptive optics, 2) initial design studies for a laser beacon adaptive optics capability to investigate expected performance, feasibility and estimated cost, and 3) a design for implementation of a NIR IFU capability in NIRS.

RESOLUTION 9.7:

The GSC recommends that:

- Gemini scientific staff should be allowed access to both queue and classical time.
- Staff time should be taken "off the top" after the liens for engineering and the host country.
- The bulk of staff time should be awarded through competitive evaluation of observing proposals.
- The staff share of time should not be a fixed fraction but should be variable depending on the quality of the proposals.

The GSC also recognizes the importance of Director's Discretionary Time for special scientific cases.

RESOLUTION 9.8:

Gemini scientific support will be provided by science fellows, who nominally will have 3-5 year fixed term positions, and staff astronomers. The GSC strongly endorses the proposal that science fellows have 40% of their time free for research, and that the fraction for staff astronomers should be 30%. The GSC urges that Gemini take steps to ensure that the staff are able to utilize these allocations.

RESOLUTION 9.9:

The goals for archiving in version 2.0 of the Gemini SRD should become the top-level requirements in version 3.0. More specifically:

- The encoding of devices and recording of data must be sufficient for the future re-creation of the observations from the information recorded with the data.

- A permanent record of all observations and ancillary data must be established in perpetuity.
- The data as recorded should be suitable for inclusion in an existing archive. Gemini should not be required to establish such an archive.

RESOLUTION 9.10:

The GSC recommends that the Project organize a workshop in 1997 with the aim of describing and quantifying the observational capabilities in the partner countries required to support the use of the Gemini telescopes in an optimum way.

RESOLUTION 9.11:

In order that Gemini fully exploit its potential and operate as the principal optical-infrared observatory of the partner countries and provide the focus for the development of their ground-based astronomy communities, we urge the Board to fully support the long-term, realistic funding of (1) a continuing instrumentation program as described in Resolution 9.6, and (2) the scientific operations of the telescopes.

RESOLUTION 9.12:

The GSC endorses Version 3.0 of the SRD and recommends its acceptance by the Gemini Board.

APRIL 1997**RESOLUTION 10.1:**

The GSC congratulates the Project team for keeping the project on schedule during a difficult period and continuing its excellent leadership and management. We would like to recognize the OCS team for the excellent progress in developing the Observing Tool, which is critical for the efficient development and scheduling of observations with the Gemini telescopes.

RESOLUTION 10.2:

We feel that the participation of scientific representatives from all of the Gemini partners in the Gemini scientific oversight activities is essential. We are very concerned about the inability of representatives from Argentina, Brazil, and Chile to participate in the recent Project Science team and GSC meetings and suggest that the Project explore with the National Project Offices innovative ways to enable this participation.

RESOLUTION 10.3:

We welcome the significant UK contribution brought forward into 1997. This development is a key to the timely completion of the Gemini telescopes. We recognize that significant delay in any partner contributions will force the project to slow down, which will have a major impact scientifically because of increased project cost and a lessening of focus on the timely completion of the Gemini telescopes.

RESOLUTION 10.4:

Given the difficulties in obtaining SiC blanks for the Gemini secondary mirrors, we endorse the project approach of acquiring a light weight glass secondary for commissioning, but reiterate our goal to meet the scientific performance requirements at operational handover.

RESOLUTION 10.5:

The GSC endorses the Instrument Forum approach to implementing the On-going Instrumentation Program. The instrument development fund is a precious resource and we expect the Gemini Project, together with the National Project Offices and instrument teams, to implement in a cost-effective manner the approved on-going instrumentation program. The content of the on-going program and the top level performance requirements must be approved by the Gemini Project Scientist with the advice of the GSC.

RESOLUTION 10.6:

We are encouraged by the technical success of the GMOS CDR but are distressed by the very significant cost growth. The GSC feels that two GMOSs, one for Gemini-N and one for Gemini-S are a fundamental part of the Phase I instrumentation program. The GSC recommends that the Project maintains tight fiscal pressure on the GMOS team in order to minimize this cost growth, and with great reluctance we recommend that the additional resources suggested by the Instrument Forum are at the expense of the near-infrared upgrade to GMOS. In view of the scientific importance of the GMOS IFU's we encourage the GMOS team to consider how to retain the IFUs.

RESOLUTION 10.7:

The GSC notes with pleasure that the HROS conceptual design based on the performance specifications listed by the GSC at its last meeting appears to be technically feasible. However this full-up Cassegrain HROS is judged by the UK Project Office and the IGPO to cost much more than the available \$2.7M to complete. We recommend that the Project investigate very substantial simplification of the instrument, i.e., a single R=50K resolution, UV optimized, and with as few moving parts as possible, and report to the next OISWG and the Instrument Forum what can realistically be achieved within the available budget (i.e., what the UK Project Office will sign up to deliver for \$2.7M), and assess the scientific viability of this simplified HROS. It is noted that a bench mounted spectrograph in the high stability lab with complementary high resolution capability ($R=120K-10^6$) is a high priority in the proposed on-going instrumentation program.

RESOLUTION 10.8:

The GSC endorses the delay in implementation of the short red camera and the Wollaston prism as cost saving measures, with the understanding that the designs will be carried to the CDR level. The GSC recommends that the nominal 'low' spectral resolution mode be adjusted down from 2000 to 1800 in order to provide complete spectral coverage in the cross-dispersed mode.

The NIRS IFU implementation should be kept relatively simple, since this is a new capability, with little experience concerning implementation or use. Performance guidelines for the IFU are as follows:

- Map a 2D area of image plane onto a single long slit with maximized fill factor.
- No additional blocking filters.
- Plate scales: 0.05 and 0.15 arcsec. One of these is required, with a goal of supplying both.
- Switching between IFU and long slit use, or between IFU plate scales should not require warming of the dewar.

RESOLUTION 10.9:

The GSC endorses the MIRI CoDR report and strongly supports the primary goal being superior imaging capability from 8 to 26 μ m, and that enhancements including spectroscopic capability should not compromise imaging performance, nor drive optical or mechanical design considerations.

RESOLUTION 10.10:

The GSC endorses the NOAO proposal for use of COB for commissioning of Gemini South, and the shared scientific use of Phoenix between NOAO and Gemini during scientific operations and recommends that Gemini proceed to negotiate an agreement with NOAO on this basis. The GSC remains enthusiastic about the possibility of shared use of a clone of NIRS between the SOAR telescope and Gemini South as a very cost effective means for providing a near IR spectroscopic capability at Gemini South.

RESOLUTION 10.11:

The GSC recommends the following revised Science Performance Requirements for GAOS:

Wavelength Coverage:

- 1-2.5 μm baseline with requirement of changeable dichroic, allowing observations to 0.85 μm . A goal is to extend observations to 5 μm and not preclude use to 0.5 μm .

Throughput and Emissivity:

- The deployment of AO will not lower the telescope throughput by >25% over the baseline wavelength range. With the changeable dichroic the same throughput specification is required for 0.85 - 1.0 μm .
- The total emissivity of the telescope and AO system (without ADC) in K must be <19%, with a goal of this emissivity out to 5 μm .

Flat Fielding:

- It is required that the flat field instability does not cause systematic effects larger than the photon noise over a 5x5 arcsec² region within a 1 hour integration in J through K. It is a goal to match this in L and M.

Strehl Ratio:

- A minimum on-axis strehl ratio delivered to the detector of the near-infrared imager of 0.4 in H during median seeing conditions for bright guide stars. The on-axis strehl must be met during any one hour of exposure within 45° of zenith when atmospheric conditions remain constant. The intent is that, when applied to a background-limited point source observed at a zenith angle of 45°, this strehl ratio will result in roughly a factor of 2 improvement in S/N ratio over what would be obtained with tip/tilt/focus compensation during the same integration time. This system is expected to deliver a commensurate performance at J.

Field of View:

- 2 arcmin diameter unvignetted field of view
- Conjugation of the DM to an optimal altitude is required

Sky Coverage:

- The intent is that sky coverage be maximized for the specified strehl ratios. The natural guide star AO system should be designed such that it can be upgraded to a laser guide star system and have a flexible control architecture, with the priority to increase the system's sky coverage at the above performance levels.

RESOLUTION 10.12:

The GSC is pleased that representatives of all the Gemini partners participated in the first Gemini Instrumentation Workshop held in Abingdon. The GSC congratulates the organizers for staging a very successful Workshop, and the editors for capturing the workshop discussions in their Report. We recommend (1) that this report be adopted as the basis for development of a proposed on-going instrumentation program for discussion at the Fall GSC meeting and (2) that additional workshops be held periodically as part of the continuing re-evaluation of the on-going instrumentation program.

The new components recommended for consideration in the on-going instrumentation program are:

- A&G polarization modulators for both optical and IR at both telescopes,
- a high stability lab spectrometer,
- a LGS/NGS AO capability for Gemini-S,
- a NIR Multi-object Spectroscopic capability for Gemini-N or S, and
- a NIR imager/coronagraph for Gemini-S.

Guidelines for the future instrumentation capabilities are given in Resolutions 10.13 - 10.17. These guidelines should be reviewed by the appropriate instrumentation SWG and the Project Scientist team prior to the next Instrumentation Forum and GSC meetings.

RESOLUTION 10.13:

Polarization measurements will require implementation of a polarization modulator in the A&G unit above the bottom port. The Niri and NIRS are designed to incorporate Wollaston prism polarization analyzers; however, implementation of polarizing capability in GMOS and HROS requires further assessment.

Performance guidelines for polarization:

- Optical/IR polarization modulator plates in front of up-looking ISS port.
- Implementation must be remotely retractable and allow for unvignetted use of bottom port over the full 9 arcmin diameter (goal) science FOV
- Wavelength coverage: 0.3 - 1.2 μ m for GMOS, HROS and 1-5 μ m
- FOV: min of 1 arcmin. Extended FOV for OIWFS must be maintained
- Assessment of possible operating modes with GMOS and HROS
- A minimum of one modulator wheel with a goal of two that can be used in series
- Calibration capability

RESOLUTION 10.14:

The high stability lab in the pier provides a very stable environment for precision radial velocity measurements. A fibre-fed, stable bench-mounted optical spectrograph equipped with an absorption cell provides the greatest sensitivity currently for detection of low mass companion, and higher resolution modes would enable many studies in stellar physics.

Performance guidelines for pier spectrograph:

- Bench mounted in telescope pier; fibre fed from cass focal station
- Wavelength range: H&K lines to 1.1 μ m; simultaneous spectral coverage of at least 100 nm for 120K mode
- Resolution: 120K required, with goals of 300K, 500K, & 1000K
- Absorption cell for high stability wavelength reference
- Maintain throughput under poor seeing conditions
- Study to determine throughput capabilities to High Stability Lab

RESOLUTION 10.15:

The ability to obtain near diffraction-limited imaging capabilities at near-IR wavelengths, on both Gemini telescopes, through implementation of adaptive optics is of paramount importance in effectively addressing key scientific issues over the whole range of science topics addressed by the Workshop.

Performance guidelines for CP AO system:

- Wavelength range: 1-2.5 μm required, 0.7-5 μm goal
- Operating Zenith angle range: 1 to 60 deg
- Switchable between NGS and LGS
- Strehl ratio performance requirements for NGS mode: the minimum requirement is to achieve Phase I strehl ratio performance, with a goal of achieving TBD strehl ratio at H under good conditions
- Strehl ratio performance requirements for LGS mode: TBD
- Preserve location of telescope focal plane, with the intent of allowing AO images to feed range of instruments?
- AOWFS and DM conjugated to opt alt or PM or both?

RESOLUTION 10.16:

The continued development of large format Near-IR Arrays provides an opportunity for three powerful new capabilities in the area of 1-2.5 μm multi-object spectroscopy: advanced integral field spectroscopy, small field multi-slit spectroscopy for use with AO correction, and wide field multi-object spectroscopy over as much of the available f/16 FOV as possible.

Performance guidelines for multi-object near-infrared spectroscopy:

- Wavelength range: 1-2.5 μm
- Array Format: min of 2kx2k, goal of 4k in at least one dimension
- Resolution: R~6000 requirement, and ~30K goal
- IFU with 0.05 arcsec pixels, FOV 5 arcsec (or as large as practical) minimum spectral coverage of ~1000 pixels
- Multi-slit with 0.05 arcsec pixels over a minimum 30 arcsec FOV. Flexibility in number, location, size, length of slitlets is highly desirable
- Multi-Object with 0.15 arcsec pixels over a minimum 5.5 arcmin FOV
- A goal is to combine two or more of the above modes in a single instrument
- Slit masks or other object selection devices should be changeable during an observing session without warming the spectrometer or significantly interrupting operations
- Mode changes should not require warming dewar
- NIR OIWFS for tip-tilt and fast-focus corrections

Study should determine optimum choice of spectral resolution for working between OH airglow lines.

RESOLUTION 10.17:

A small field near-IR imager with pixel scales and optics designed to exploit AO performance and tip-tilt corrected images with optimized near-IR coronagraphic imaging capability will address a very wide range of science topics.

Performance guidelines for IR imager:

- Wavelength range: 0.8-5 μ m
- Pixel scales: 0.01, 0.02, 0.05 arcsec
- Array format(s): 1kx1k with goal of 2kx2k
- Optimized coronagraphic mode
- Assume facility AO
- NIR OIWFS for tip-tilt and fast-focus corrections

Studies to evaluate coronagraphic performance and mask requirements and consider role of AOWFS within instrument.

OCTOBER 1997**RESOLUTION 11.1:**

We commend the Project team's performance, notably the rapid progress in assembly of the Gemini facility on the summit of Mauna Kea, and in maintaining the overall project schedule and budget in face of significant challenges.

RESOLUTION 11.2:

We welcome Chile back into the Gemini partnership. The GSC is very encouraged by Chile's interest in and support of the Gemini Project, and look forward to working with Maria Teresa Ruiz as Chilean Project Scientist.

RESOLUTION 11.3:

The simplified HROS as specified in the table given is an exciting scientific instrument for Gemini-S. We recommend that this table be adopted as revised performance requirements for HROS. Any significant relaxation of the fundamental performance specifications, including flexure, spectral coverage, slit width/resolution product, throughput and order spacing would severely compromise the scientific promise of this instrument.

Revised HROS Performance Requirements

<i>Function</i>	<i>Requirement</i>
Operating Locations	Cass only
Detector	2 x (2048)
Pixel Size	13.5 μ m
Slit width-resolution product	30,000 arcsec
Resolving Power (3 pixel)	50000
Slit width (R=50000)	0.6 arcsec
Total spectral coverage	300 -- 1000 nm
Simultaneous spectral coverage 3	25 -- 1000 nm (orders truncated > 830 nm)
Stability	0.05 resolution element/hour
Spectral image quality (dR)	< 10% resolution element
Spatial image quality (dPSF)	< 10% median seeing
Efficiency	> 20% (at 500nm) > 10% (at all wavelengths)
Slit width	0.1 to 10 arcsec (variable)
Slit length	0.25 to 60 arcsec (variable)
Minimum order spacing	7.0 arcsec
Scattered light	< 5% at 700nm
Polarimetry	Future upgrade
Slit viewer	Yes
Coronagraphic capability	Yes
Multi-slits	Maybe
ADC	None
Filters	Yes

RESOLUTION 11.4:

The GSC endorses the GMOS team proposal to provide an IFU for GMOS and a single mask maker for operational support of the GMOS's.

RESOLUTION 11.5:

The GSC recommends the following performance guidelines for the A&G polarization modulators:

- Optical/IR polarization modulator plates in front of the up-looking ISS port.
- Implementation must be remotely retractable and allow for unvignetted use of the bottom port over a minimum 7 arcmin diameter science FOV with a goal of 9 arcmin
- Wavelength coverage: 0.3-1.2 μ m and 1-5 μ m with a goal of 0.3-2.5 μ m with a single waveplate
- FOV: minimum of 1 arcmin. Extended FOV for OIWFS must be maintained
- A minimum of two modulator wheels that can be used in series
- calibration capability

RESOLUTION 11.6:

The GSC recommends the following guidelines for the high resolution pier spectrograph:

- Bench mounted in telescope pier; fibre fed from cass focal station
- Wavelength range: H&K lines to 1.1 μ m; simultaneous spectral coverage of at least 100 nm for 120K mode
- Resolution: 120K required, with goals of 300k, 500k, and 1000k
- Stability: <0.01 resolution elements/hr (3 pixels per resolution element); an absorption cell will be employed for high stability wavelength reference
- Maintain throughput under poor seeing conditions
- Sky subtraction capability
- A study should be conducted to determine throughput capabilities to the High Stability Lab

RESOLUTION 11.7:

The GSC adopts the following guidelines for the Cerro Pachon AO system:

- Wavelength Range: 1-2.5 μ m, with 0.5-5 μ m as a goal
- Operating zenith angle: 1 - 60°
- Switchable NGS and LGS modes. The emphasis is on LGS, but must support on-axis NGS as well
- Strehl ratio: NGS -- at a minimum achieve the same level as GAOS. LGS -- = Strehl ratio and sky coverage at H achieved by GAOS in the LGS mode
- General Spectroscopic performance (LGS): TBD% sky coverage at TBD% slit throughput in a 0.1 arcsec slit at H
- Preserve location of the telescope focal plane, and feed any instrument mounted on the ISS

- Design capabilities may be for either altitude or telescope conjugated systems. The capability to handle either mode is preferred, but this issue will be re-visited when CP site characterization is completed

The system will also be optimized to support AO instrumentation:

- Coronagraphic Imager -- should provide low scattering, waffle mode rejection, and an apodized mask possibly integral to the AO unit
- Multi-slit/IFU spectroscopy -- issues are slit throughput, short wavelengths, and the ability to boost sky coverage
- ~ 2 arcmin field of view
- Maintain at least the same throughput and emissivity specifications as GAOS

RESOLUTION 11.8:

The GSC endorses the Preliminary Ongoing Instrumentation Program as being consistent with our scientific priorities, given the limitations in available resources. The strengths of this program are the timely implementation of LGS AOS at CP, and provision of instrumentation to exploit this capability. We are concerned that this program defers critical scientific capabilities such as the High Stability lab spectrograph, IR MOS capabilities and LGS capability at MK until the latter half of the next decade, thus severely compromising Gemini's competitiveness and timely exploitation of the full range of atmospheric conditions. We recommend that significant additional resources for the instrument program be sought, in order to ensure future competitiveness and operational efficiency of the Gemini observatories.

RESOLUTION 11.9:

RESOLUTION 11.10:

RESOLUTION 11.11:

The GSC is unanimous that Australia should be accepted into the Gemini Partnership. Australian participation would strengthen the partnership by adding significant technical and astronomical expertise.

The GSC believes that Australian contributions to the construction and operations budgets must provide 'added value' to the Gemini Observatory. The major portion of the Australian contribution to these budgets should thus be used to accelerate the ongoing instrumentation program and enhance the scientific productivity of the Observatory.

The GSC recognizes that the Australian portion of observing time has to be accommodated within the current partnership shares. We believe acceptable models exist for preserving appropriate and fair levels of observing time for the current partners. We task the PS team to develop these options in order to reach agreement in a timely manner.

RESOLUTION 11.12:

We recognize the mutual benefits in training, education and enhanced partner involvement in Gemini operations that will arise from extended visits of national support staff and community astronomers to the Gemini Observatory. It is further recognized that these visits will play a key role in creating and sustaining the vibrant scientific culture necessary to attract and motivate quality scientific staff for Gemini.

RESOLUTION 11.13:

The GSC endorses the Operations SWG recommendations concerning the observing process, namely:

- the scientific and technical cases forwarded to Gemini by the NPO's should be restricted in length to a total of two pages of text plus one of figures;
- to maximize efficient use of telescope time, pre-planning of programs with the Observing Tool should be expected for all users, classical as well as queue;
- Gemini should support flexible and responsive access to the telescopes, via the classical and the queue modes. The partners may elect to use part of their classical time in service mode, executed by visiting astronomers.

RESOLUTION 11.14:

The GSC endorses the Operations SWG recommendations concerning scientific data rights, namely:

- The definition of scientific ownership of Gemini data should not preclude the long-term scientific use of the data by the partner communities. Engineering and commissioning data obtained after Gemini instrument acceptance should be treated the same as science data;
- Information associated with a program should be accessible with the following restrictions: (1) non-proprietary (e.g. available in public queue/schedule or archive): Gemini calibrations, title, investigators, instrument, abstract, (2) proprietary (18 month period): science data, and (3) the full science case is the property of the applicants;
- the 18 month proprietary period should begin immediately upon completion of each science observation within a science program. Applicants should be permitted, via either their NTACs or NGOs, to petition the Director for an extension to this period, or to shorten the proprietary period. Normally this would be at the time of submission; the highest priority use of the Gemini archive will be for scientific research. However, it is recognized that the archive should allow access for educational and historical use.

RESOLUTION 11.15:

The GSC endorses the following mission statement for the Gemini Observatory:

To fulfill the scientific aspirations of the Gemini astronomical communities by developing, operating and maintaining the Gemini telescopes as forefront optical and IR facilities for astrophysical research.

To achieve this, the Observatory will work in partnership with its communities to ensure excellence and cost effectiveness in the facilities, instrumentation, and in the support it provides to the entire Gemini telescopes user community.

RESOLUTION 11.16:

The GSC endorses the science verification goals and process outlined by the Project. The Gemini Scientific staff, the Project Scientist team, and instrument science teams will meet early in 1998 to develop preliminary Science Verification plans for the telescopes and instruments which will be presented to the GSC at the next meeting.

RESOLUTION 11.17:

The National Workshops held in Canada, the UK and the US, have already provided valuable results; namely educating the community about the Gemini scientific opportunities and identifying the need for significant amounts of observations on 4m class telescopes, particularly deep, wide field optical and IR imaging, to enable most effective use of the Gemini telescopes. We urge rapid compilation and synthesis of the results so the partner communities can assess requirements for supporting capabilities.

APRIL 1998

RESOLUTION 12.0: Tim Davidge

The GSC thanks Tim Davidge for his many years of service to the Gemini Project, through his roles as GSC Executive Secretary, working group member, telecon reporter, and GMOS Deputy scientist.

We particularly recognize his contributions to the GSC Motions and his remarkable on-line performance in recording the GSC resolutions which is unlikely ever to be equaled.

RESOLUTION 12.1: Project status

The GSC conveys its congratulations to the Gemini Project team for the continued excellent progress toward completion of the Gemini Telescopes and facilities.

Recent accomplishments we would like to highlight include:

- (1) The Telescope and Enclosure and I&C team maintained the viability of the Dec. 98 first light on MK, in spite of many obstacles.
- (2) The Optics Group and REOSC completed the MK primary mirror and delivered it to Hawaii in time to support first light in Dec. REOSC achieved a surface error of about 16 nm rms; it is the best 8-meter mirror produced so far.
- (3) Installation and initial commissioning of the MK coating chamber was completed by RGO. The initial test achieved a superb vacuum of 3×10^{-8} torr.
- (4) The TCS team from RGO and RAL delivered a key software control system, the Telescope Control System, within budget and on schedule - a superb job.

The GSC thanks Dick Kurz for his invaluable contributions to the Gemini Project.

RESOLUTION 12.2: Secondary Mirrors

The GSC is disappointed with the failure of the SiC blank fabrication effort. We endorse the Project's approach of providing light-weighted Zerodur secondaries for commissioning and scientific operations as the only viable approach under the circumstances. We recommend that early tests of the Zerodur secondary on the MK system be carried out to evaluate quantitatively the degradation in imaging, tip/tilt correction, chopping performance, and impact on adaptively corrected images, in order to expedite a decision regarding the future acquisition of high performance secondaries.

RESOLUTION 12.3: Partner shares in the Instrumentation Program

The GSC recognizes that equity in the instrumentation program is an important goal that has not yet been realized. We strongly encourage initiatives that promote collaborations including the involvement of scientific and technical personnel (e.g. graduate students, post-docs, senior researchers, and engineers) from the South American partners in development and scientific exploitation of instruments being developed throughout the partnership. We also encourage the identification of potential South American industrial suppliers and collaborators.

The GSC recognizes that additional resources may be needed from the IDF to support these collaborations, in keeping with the original intent of this fund.

RESOLUTION 12.4: Revised OGIP

We endorse the revised OGIP schedule that provides for earlier development of the High Stability Lab Spectrograph, Large-Field IRMOS, and the MK LGS upgrade. In addition, we recommend the following:

- (1) accepting the proposal by NOAO to clone the NIRS for 50% shared use between SOAR and Gemini-S
- (2) an IFU and Wollaston prism for the NIRS clone are considered to be very important scientifically and should be pursued
- (3) development of NIR PWFS following the IGPO proposed approach
- (4) acquisition of a NIR lab controller
- (5) early initiation of the IRMOS development studies in order to expedite the acquisition of this capability on the Gemini telescopes

RESOLUTION 12.5: Integrated Adaptive Optics Program

Owing to the fundamental importance of LGS/AOS to enhancing Gemini science, the GSC strongly supports a process which leads to the best overall LGS/AO systems performance achievable within available resources with appropriate division of responsibility among the IGPO and the partner countries. The GSC therefore endorses the process recommended by the instrument forum including the following key elements:

- (1) an open forum aimed at encouraging and evaluating a broad range of proposals for system and subsystem concepts.
- (2) proposal review and recommendation for conceptual design approach(es) by a panel comprising an appropriate balance of AO experts, IGPO staff and broadly experienced scientists.
- (3) International participation both in proposals for system and subsystem concepts and in the review panel.

RESOLUTION 12.6: Supporting Capabilities

The GSC thanks the NPOs and Phil Puxley for their efforts in assessing the requirements to support the scientific use of the Gemini observatory. The GSC is pleased with the outcome of the workshops, held by the NPOs, which are summarized in the draft report "Supporting Capabilities for the Gemini 8M Telescopes". We encourage the partners to explore methods for providing the required capabilities.

RESOLUTION 12.7: Preparations for Operations

We recommended that the Project and NPOs plan for the first TAC process to be Sept. 99 in order to enable community access to the Gemini telescopes and instruments as soon as possible after science verification. We recognize that the initiation of this process depends on the successful completion of the telescope commissioning on the current schedule.

RESOLUTION 12.8: Preliminary Science Verification Plan

The GSC endorses the preliminary Science Verification plan principles and approach, and it looks forward to version 1.0 of the SV plan to be discussed at the next GSC meeting. We feel that the principal goal of SV is the end-to-end testing of the Gemini systems with prompt access by the Gemini communities after successful SV demonstration. The GSC feels that SV should nominally require no more than 2 clear nights per instrument mode.

RESOLUTION 12.9: Science Archive

The GSC thinks a Gemini science archive is scientifically compelling. Such an archive should provide the scientific community with tools for effective online access to all Gemini science data and supporting information in order to promote further scientific exploitation of those data. The Gemini Science Archive should guarantee that the valuable datasets obtained with the Gemini Telescopes are usable by future generations for research and education.

The Project should further study the implementation and the resources required for a Gemini science archive.

OCTOBER 1998

RESOLUTION 13.1: Construction Progress

The GSC congratulates the Gemini staff on the very impressive progress in integrating the telescope assembly on Mauna Kea and the successful delivery of the telescope and M1 cell to Chile. The GSC encourages the Project to advance the Cerro Pachon schedule as much as possible.

RESOLUTION 13.2: Added Value

The GSC endorses the use of the Australian contribution to the operations budget outlined by the IGPO. Support for the development and operation of a Science Archive, additional technical and operational support for the adaptive optics program, additional daytime observing staff support, and the visitor/sabbatical programs will add significantly to the scientific effectiveness of the Gemini Observatories.

RESOLUTION 13.3: Operations Contributions

Timely partner contributions to the Gemini operations budget are crucial to the effective operation of the Observatory. The GSC is very concerned about the impact of the missed 1998 contributions from the South American partners, which may preclude the timely ramp up of support for the science archive development.

RESOLUTION 13.4: Partner Participation

The GSC welcomes the Australian community to the Gemini Partnership. Their enthusiastic participation in the Committee of Gemini Offices, On-Going Instrumentation Program, and the Gemini Science Committee is already apparent and very valuable to the Gemini Observatory.

We recognize the difficult economic situation in South America, but we would like to reiterate the importance of participation and interaction in the GSC by representatives of the South American partners.

RESOLUTION 13.5: The use of UH-AOS on Gemini-North

Achieving diffraction-limited near IR images with the UH-AOS (Hokupa'a) during telescope commissioning is an exciting prospect supported by the GSC. The elements of the agreement with the UH/IfA are acceptable to the GSC.

The telescope commissioning support, "shared risk" service observing during telescope commissioning, and the UH/IfA supported community access after operational hand-over are exciting prospects.

Expectations in the community for the shared-risk use of the instrument should be managed consistent with the limited opportunity. The proposal selection process for the "shared risk" service observations should be conducted in a manner that minimizes the burden on the Gemini staff.

After operational hand-over, we would expect the UH team to report on their use of telescope time.

RESOLUTION 13.6: First TAC

The GSC recommends that the Project adopt an extended shared-risk first semester extending from operational hand-over (June 2000) through January 2001 with a proposal deadline of January 31, 2000. This will be followed by normal six-month semesters phased with existing semester definitions in the partner countries.

RESOLUTION 13.7: GNIRS Status

The GSC is extremely disappointed that the GNIRS delivery date has slipped substantially. However, it reaffirms that the GNIRS capabilities including 1-5um intermediate dispersion spectroscopy and IFU capabilities are very high priorities. The GSC believes that GNIRS should be completed, provided that the process, recommended by the AURA review panel, demonstrates that the instrument delivery can be achieved on the timescale presented. We recommend that additional funding be provided to accelerate the GNIRS delivery schedule.

It appears that descope options such as eliminating one of the pixel scales do not advance the schedule sufficiently to compensate for the loss of capability. Any decision on provision of the GNIRS clone should be deferred until the impact of the GNIRS schedule slip and other available options are better understood. The GSC recognizes that the estimated cost of GNIRS is comparable to those of other instruments with similar capability.

RESOLUTION 13.8: IR Spectroscopic Capabilities

The GSC notes the large gap in IR spectroscopic capability resulting from the delays to GNIRS and the consequent delay to the GNIRS clone. The PS team is charged with assembling information on potential ways to fill the gap, including:

- NIRI grism upgrade
- GMOS near-IR extension
- GNIRS Clone
- Acceleration of some IRMOS capability
- Coronagraph-Imager Spectroscopic Mode
- A possible Phoenix with a lower dispersion mode
- Other possible capabilities including visitor, shared or cloned instruments

The Project and the PS team should evaluate these options including the capability, schedule, budget and availability and provide a report to the GSC electronically for comments. The evaluation should be completed on a timescale similar to that of the GNIRS delta-review and assessed by the GSC and the Instrument Forum.

RESOLUTION 13.9: T-ReCS (MIRI) Spectroscopic Mode

The GSC finds that the scientific case for implementing a spectroscopic mode in MIRI is compelling providing that it has minimal impact on the delivery. We recommend that the project negotiate to provide this capability using funds from the IDF.

RESOLUTION 13.10: Steve Strom and Charlie Telesco

The GSC thanks Steve Strom and Charlie Telesco for their substantial contributions to the Gemini project through their membership of the Science Committee.

APRIL 1999

RESOLUTION 14.1: Progress

The Gemini Science Committee would like to join the Committee of Gemini Offices in commending the Project's efforts towards commissioning the Mauna Kea Observatory.

RESOLUTION 14.2: Additional Support from the U.S.

The GSC is very grateful to the NSF for providing funding for the high-bandwidth link from Hawaii to the U.S. mainland. This link will substantially improve communications between the partner countries and the Observatory. The GSC encourages exploration of avenues to provide similar high-bandwidth communications to La Serena and Cerro Pachón.

The GSC is delighted that NASA is considering providing funding for a Coronagraphic-Imager for Gemini-South.

RESOLUTION 14.3: The Gemini Science Archive

The GSC wishes to see a timely and well thought-out scientific archive. The GSC is concerned that problems with partner contributions to operations are delaying archive development at a critical time and encourages the Project to expedite this work.

RESOLUTION 14.4: Detector Development

The Gemini Science Committee endorses the Instrument Forum recommendation that states:

The Gemini Instrument Forum recommends that the IGPO join the consortium investing in the development of high performance UV- and red-optimized CCDs at Lincoln Labs. If successful, these devices should be seen as the priority route for HROS and as an upgrade path for the GMOSs.

Specifically, we recommend that we invest in both "red-optimized" high-resistivity devices and UV-optimized devices (with an appropriate division between "standard epitaxial" and "high-resistivity" devices) up to a total of one lot.

This is based on an expectation that the following are needed:

- One red-optimized (with low fringing) device and one UV-optimized (to 300 nm) device for HROS. The HROS UV device could be a standard epitaxial device.
- Six "red-optimized" devices (with low fringing and good blue response down to 400 nm) for the GMOSs.
- Spare devices could also be used in the High Stability Lab Spectrograph.

This resolution does not prejudice the current contract with EEV.

RESOLUTION 14.5: Advancement of the Adaptive Optics Program

The possibility of upgrading the UH AO system "Hokupaa" and deploying it to Gemini South is scientifically very exciting. The GSC is concerned about providing instrumentation for Hokupaa at Gemini South, the impact it would have on the rest of the AO program, and

operational support needs. We encourage the Project to develop a comprehensive AO program before the next CGO/GSC meetings that includes addressing these concerns.

RESOLUTION 14.6: Filling the Near-Infrared Spectroscopic Gap

Gemini North:

The GSC endorses the spectroscopic upgrade to NIRI and the loaned use of CIRPASS on Gemini North. Both capabilities should be available by operational handover at Gemini North.

Gemini South:

Gemini should aggressively pursue the options of using FLAMINGOS or IRIS-2a to provide IR MOS capabilities at Gemini South. As a loaned instrument, FLAMINGOS could provide IR MOS capabilities by late 2000. IRIS-2a might be available by mid-2001, and could be upgraded to have IR MOS capabilities. FLAMINGOS or IRIS-2a would provide key capabilities at Gemini South early in the operational era.

The GSC wishes the project to explore the resources required to interface and support these instruments, including their use in queue scheduled time, and if reasonable, pursue their use on Gemini.

RESOLUTION 14.7: Mid-term Near-Infrared Spectroscopic Capabilities

Recommendations from the Abingdon meeting in January 1997 and the subsequent GSC meetings have repeatedly endorsed the imperative need for two key infrared capabilities on the Gemini telescopes to fulfill the core scientific mission of the Gemini Observatory. They are:

(a) 1 – 2.5 micron multi-object spectroscopy (MOS) at moderate spectral resolution to allow effective work between the OH lines. J, H and K band MOS capabilities over a field of view several arcminutes across represents a unique niche for Gemini if such an instrument can be delivered to one of the Gemini telescopes as early as the beginning of 2002. In particular, it would allow the Gemini community to explore the high-redshift universe in a most competitive fashion.

(b) High spatial resolution 1 – 2.5 micron integral field unit (IFU) spectroscopy over a field of view of a few arcseconds at a spectral resolution sufficient to allow effective observations between the OH lines. This capability would exploit the unprecedented image quality of the Gemini telescopes using adaptive optics. Sub-arcsecond IFU observation will make possible astrophysical observations to explore star and planetary system formation, the structure and dynamics of galactic nuclei, and the internal kinematics, structure and composition of distant galaxies.

The GSC recommends that the Gemini Project acquire an IR MOS instrument in 2002. FLAMINGOS-II and IRIS2-g may provide this capability. Consideration should be extended to alternatives to these two instruments by soliciting proposals from the communities. This process should be conducted as rapidly as possible. The US, UK, and Canadian SACs regarded the IR MOS as a higher priority than the IR IFU capability.

The GSC recognizes the scientific potential of the NIFS instrument and recommends that the project proceed with the plan contained in the Instrument Forum resolution (March 1999).

These acquisitions would fulfill some of our IR spectroscopic aspirations and would allow Gemini to proceed towards the design and construction of the wide-field GIRMOS planned in the On-going Instrumentation Program.

RESOLUTION 14.8: User Support

The Gemini Science Committee endorses the distributed user support model recommended by the Operations Forum, as follows:

1. An on-line system of documentation on Web pages, coupled with a remotely-accessible database for handling queries and answers to the queries (help desk).
2. The National Gemini Offices will provide first tier support of researchers within each partner country. This will include providing answers to most questions.
3. The country that built an instrument will handle more complex questions on that instrument. This second tier support may be done by the Instrument Scientist for that instrument or by other experts within the National Gemini Office. Gradually, the Gemini Observatory will become expert in the instruments and will take on this function.

RESOLUTION 14.9: Visitor Support

The GSC views long- and short-term visitors from the partner countries as an important component of Gemini operations. We encourage the Project to explore ways to accommodate classical observers observing from the base facilities and other visiting scientists and engineers. We are concerned that inadequate resources have been identified to support visitors and classical observers.

RESOLUTION 14.10: Guaranteed Time for Instrument Builders

Gemini will require the best instrumental talents of the partnership to provide state-of-the-art instrumentation to keep the Observatory competitive. The GSC believes that offering telescope time to builders of Gemini facility instruments is an effective incentive, and that the need for incentive will increase given the competition from other large ground-based telescopes and space missions. The Project Scientist team should develop a model for guaranteed time for instrument builders for discussion within the Gemini communities.

RESOLUTION 14.11: Evolution of the GSC

The Project Scientist Team should present the terms of reference describing the role of the GSC during the operational phase at the next GSC meeting.

OCTOBER 1999**RESOLUTION 15.1: Progress with Gemini-North**

The GSC congratulates the Gemini Observatory team on the outstanding first results obtained with Gemini-N, and presented at the dedication in June. The breathtaking images obtained with the University of Hawaii instruments, Hokupa'a and QUIRC, demonstrate the potential of the telescopes in dramatic fashion. We appreciate the hard work, skill and dedication of the whole Gemini staff, the University of Hawaii AO team, and the forbearance of their families.

We also congratulate the Observatory on the continuing progress in integration and commissioning of the northern telescope and the impressively rapid assembly of the southern telescope.

RESOLUTION 15.2: Partner Participation

The GSC is gratified to have representatives from all the Gemini partners participating in this meeting. The involvement and participation of all the partners in the setting the scientific perspective for the Gemini Observatory is essential. We would also like to welcome Luis Campusano as the Gemini Project Scientist for Chile and look forward to his involvement in the Gemini activities.

RESOLUTION 15.3: Availability of NIRSPEC

The GSC welcomes the availability of Keck/NIRSPEC time to the Gemini community.

The GSC recommends that there be no upper limit to the amount of time that can be requested in an individual Keck/NIRSPEC proposal, and that the scientific assessment be the responsibility of an external TAC, with the Gemini staff providing technical feedback and managing the proposal process.

The GSC recommends that both Gemini and the national project offices advertise the availability of the Keck/NIRSPEC time.

The GSC expects that a large number of proposals will be received, creating a significant burden on the Gemini staff involved in this program. In the future, the GSC recommends that similar agreements be implemented such that time can be allocated through the NTACs.

RESOLUTION 15.4: Polarization Module

The GSC recommends that IGPO proceed with negotiating the development phase workscope for the Polarization modules with the UKGPO. The initial implementation should consist of Polarization modules for both Gemini telescopes and a single set of 95mm half wave plates covering 0.3 to 2.5 μ m and L-band. We encourage the project team to pursue an accelerated schedule for development.

RESOLUTION 15.5: GNIRS Restart

The GSC is pleased that GNIRS has been restarted. This spectrograph will provide the Gemini community with a very competitive capability for 1—5 μm spectroscopic observations when it is delivered in July 2002.

RESOLUTION 15.6: Coronagraphic Imager

The GSC is very pleased that the \$4.6M NASA funding of the Coronagraph/Imager is accomplished and that the CoD is underway. The GSC endorses the scientific perspective outlined in the Ron Probst memo of 5 October with the following recommendations:

- Extend dual channel capability to the M band
- Consider polarimetric capability as the highest priority of the second priority capabilities
- Evaluate the cost, schedule, and performance trades of the coronagraph utilizing the proposed Gemini MCAO design compared to an internal AO system.

RESOLUTION 15.7: AO Program

Multi-conjugate adaptive optics (MCAO) offers a unique and exciting science opportunity for Gemini to deliver diffraction-limited IR images over a 2 arcmin field. The GSC strongly recommends proceeding with the Conceptual Design of the MCAO system, leading to a CoDR in early 2000.

The CoD study should include a development of the science case for MCAO with an optimized instrument complement as well as a cost, schedule and management plan to completion together with risk assessment. It should culminate in a CoD Review by an independent panel with attendance from the partner countries.

We recognize that building the MCAO system would imply over-committing funds if no other changes are made to the IDF/FDF. Changes to the IDF would likely also be required in order to ensure adequate instrumentation to exploit the MCAO. In order to address these issues, we recommend the following process: (1) the FlamingosII/IRIS-2g Conceptual Design studies assess how their instruments would exploit MCAO; (2) the performance of GMOS, GNIRS, PHOENIX and the Coronagraph with the MCAO system be assessed, and (3) after the CoD studies and other instrument assessments are completed; a GSC/IF meeting be held in order to reassess the entire IDF/FDF content including the AO program. This reassessment may involve canceling some elements of the IDF/FDF program, and will recommend which IDF/FDF projects should proceed. Subsequent reassessment would be required during the execution of the MCAO program.

The MCAO development is potentially of great strategic importance to the Gemini communities, and it is essential to keep them informed about progress in this exciting program. We propose that the AO team develop a web page and provide approximately monthly updates to the NPOs.

At all phases of the MCAO program, the IGPO should actively pursue technical and scientific partnerships with groups in the national Gemini communities that have interest and expertise in AO science and technology.

RESOLUTION 15.8: Guaranteed Time for Instrument Builders

The GSC endorses the draft Guaranteed Time Policy and requests that the Project Scientist team develop an implementation plan for consideration by the national SACs and the GSC. A list of instruments for consideration should be provided.

RESOLUTION 15.9: First Semester

The GSC endorses the instrument and operational modes to be offered for use in the first, shared-risks semester. These are NIRI, in both queue and classical modes, and Hokupa'a + QUIRC and OSCIR in classical mode. An assignment of 50% of the time for engineering, with the remaining time distributed in blocks between queue and classical modes, would provide good scheduling flexibility during early use and management of community expectations.

RESOLUTION 15.10: Gemini Staff Proposals

The GSC endorses a process for Gemini staff proposals that includes proposal submission and processing on a timeline which parallels the partner activities and for assessment by a Gemini TAC comprising the Director, Associate Directors and external representatives. Recognizing that telescope time is a scarce resource we encourage feedback on the usage of staff time via the ITAC and GSC.

RESOLUTION 15.11: Terms of Reference for the ITAC

The GSC endorses the Terms of Reference for the ITAC, as follows:

The International Time Allocation Committee (ITAC) will consist of one representative from each NTAC and the two Gemini Associate Directors (or their designates). The chair will cycle between the Gemini Associate Directors.

The ITAC will advise the Director on resolving any conflicts that arise during assembly of the draft queue and classical schedule. The ITAC will recommend resolution between what it decides constitute identical programs in accordance with Gemini Observatory policy.

In seeking resolution between duplicate programs, collaboration between groups will first be encouraged. If that is not possible, (a) for classical programs duplicate observations may be made, or (b) for queue programs the data will be taken once and distributed to all parties.

The ITAC will recommend the cut for the overfilled, merged queue and the position of the scientific ranking bands. The ITAC will report on the balance in the historical usage of time.

RESOLUTION 15.12: Archiving Data from Visiting Instruments

While the GSC recognizes that Gemini is unable to mandate that visiting instruments conform completely to Gemini standards, we urge Gemini to explore the options for archiving data from visiting instruments in an accessible and scientifically useful way that does not put an extraordinary load on the visiting instrument team.

RESOLUTION 15.13: Terms of Reference for the GSC

The GSC endorses the following Terms of Reference for the GSC:

The Gemini Science Committee (GSC) will provide the Gemini Director with strategic and near-term advice on scientific issues. This will include the content of the on-going instrumentation program and scientific performance requirements for Gemini instrumentation. The GSC will also recommend or endorse changes to the Science Requirement Document and the Science Operations Plan.

The GSC should also assess the Observatory's responsiveness to the national scientific communities and evaluate the Observatory performance from a scientific point of view.

The GSC Chair shall submit a formal annual report to the Gemini Director which will be made generally available.

The GSC consists of a total of fifteen active astronomers from the Gemini partnership; six from the US, three from the United Kingdom, two from Canada and one each from Chile, Argentina, Brazil and Australia. The members of the GSC are generally expected to be users of the Gemini Telescopes` and are appointed by the partner countries through a mechanism determined by them. The scientific representatives to the Committee of Gemini Offices (generally the National Project Scientists) are expect to be members of the GSC. The scientific representatives to the CGO, in consultation with the Gemini Director, will appoint the Chair of the GSC from the membership of the GSC for a two-year term. The Gemini Director and the Gemini Associate Directors for Development and for Gemini-North and Gemini-South shall be ex-officio members of the GSC.

The GSC shall attempt to develop a consensus on major issues. In the event that a consensus cannot be achieved, the chair will communicate the partner perspectives to the Director.

The GSC recommends that the Director clearly articulate the interrelationships of the various Gemini committees (IF, OF, GSC, CGO, AOC-G, Gemini Visiting Committee, etc.)

RESOLUTION 15.14: Todd Boroson

The GSC wishes to express its deep sense of appreciation for the major contributions to the development and success of the Gemini Observatory that Todd Boroson has made during his tenure as U.S. Gemini Project Scientist. We look forward to working with the new U.S. Project Scientist, Bob Schommer, when he assumes his position February 1, 2000.

JUNE 2000**RESOLUTION 16.1: Instrument Complement**

The GSC notes the report of the MCAO CoDR and sees the potential of an exciting future for Gemini with MCAO. However, MCAO only makes sense if it has a well-defined instrumentation program to exploit it. The science case for imaging is nearly in place but the case for spectroscopy needs additional detailed study. The GSC recognizes that this study needs to be completed urgently and recommends the injection of funds sufficient to do this (\$50k). We recommend that Gemini sponsor an “MCAO Science and Instrumentation” workshop this September to explore and fully develop the science case for MCAO, particularly as regards multi object spectroscopic rationale and requirements necessary for the optimal scientific exploitation of the MCAO capability.

We commend Gemini for developing collaborative laser risk reduction programs and we consider this a major step forward in this critical area with potential benefit to the entire astronomical community. The availability of sodium lasers is fundamental to the success of future Extremely Large Telescopes.

The commitment for MCAO implies a commitment to MCAO instrumentation. We feel this instrumentation development must start as soon as possible in order that the instruments be available when MCAO comes on line. We encourage Doug Simons to explore mechanisms for external sources so as to reduce the cost to the Observatory for an imager.

MCAO spectroscopy will inevitably be a high-cost project, of order \$10M-\$15M. The GSC seeks the support of the Gemini Board in identifying the extra funds needed for this and feels that the proposed funding increment is insufficient.

In addition, the GSC recognizes the need to make hard choices in the existing instrument program in order to fund MCAO and its instrumentation.

- (i) Given the outcome of the CDR on HROS, we would support a stop-work order on the HROS team. We recommend that the Observatory explore mechanisms for moving forward to provide high dispersion spectroscopic capability.
- (ii) Recognizing the broad interest of the community in IRMOS science, the GSC would like to see detailed calculations of the sensitivity of Flamingos II, in a very short time scale as specified in IF Action 7.4. Timely delivery of the instrument is essential to meet the science goals. If sufficient funds are not available the GSC encourages sharing of the instrument with CTIO/SOAR.
- (iii) We view the laser beacon for Hokupa’a South to be of a lower priority. We recommend that it not be pursued further.
- (iv) We recommend that Phoenix becomes a lower cost visitor instrument. This will still provide the capability to carry out the important high resolution science at reduced cost.
- (v) We recommend that implementation of the NIR PWFS be postponed.

We recommend that NIFS and Flamingos II fabrication be commenced as soon as possible, and that an announcement of the opportunity for the High Stability Lab spectrograph be issued. NIFS will exploit Altair/LGS to provide high spatial resolution IFU spectroscopic capability in the key 1-2.5 μ m range. It will address a wide range of science from detailed studies of the star formation processes and of active galactic nuclei, to the nature of disk galaxies at $z \sim 1$. The wide field (non-AO) IR MOS capability provided by Flamingos II in the 1-2.5 μ m range is of high scientific priority for the Gemini community. It offers a broad range of outstanding science opportunities from the study of star-formation to the mass assembly history of galaxies and clusters. We also view the High Stability Lab Spectrograph to be an important capability for Gemini. Its capabilities would be unique among 8-10m class telescopes. Scientific applications range from QSO absorption line studies to planetary detection and would also address issues in stellar physics including astroseismology, surface convection, abundances, magnetic fields, and interstellar medium work such as light element abundances and nucleosynthesis.

RESOLUTION 16.2: Near IR Coronagraph/Imager (NICI)

The GSC received a verbal report on the Coronagraph/Imager conceptual design and CoDR. The GSC congratulates the Coronagraph/Imager team on their conceptual design and the successful CoDR. We believe that the capabilities incorporated in the baseline NICI are consistent with the Gemini scientific desires in this area. The GSC endorses funding the low cost option for spectroscopic capability that has been identified by the NICI team.

RESOLUTION 16.3: Construction Project Progress

The GSC congratulates the Gemini Project team on continued excellent progress in commissioning Gemini North and the impressively rapid assembly of the Gemini South telescope. Special mention should be given to the successful initial commissioning of the chopping capability and the successful recoating of the Gemini North primary mirror.

We are all eagerly anticipating the initial scientific use of Gemini North starting next month.

RESOLUTION 16.4: NIRSPEC/Keck Program

The GSC joins the OF in recognizing the exceptional effort by Tom Geballe and Marianne Takamiya in implementing and executing the Gemini/NIRSPEC program on Keck.

RESOLUTION 16.5: Gemini North 2001A Schedule

The GSC endorses a normal cycle for 2001A at Gemini North pending a successful outcome of the August Readiness Review. The semester runs 1 Feb – 31 July with a Call for Proposals released no later than September 1, 2000. Semester 2001A is shared risk, with no quick response, 30-50% engineering time, and science time optimized with engineering efforts for G-S.

RESOLUTION 16.6: Gemini South Initial Science Use Schedule

The GSC endorses a March 31, 2001 proposal deadline with science operations starting August 1, 2001 assuming continued success in the integration and commissioning of Gemini South. We encourage the Observatory to develop plans for a Demonstration Science program to take place prior to the start of the semester, if the opportunity arises.

RESOLUTION 16.7: Guidelines for Proposals submitted to Multiple TACs

The Gemini partnership will generate collaborative proposals that will be submitted to more than one partner TAC. The GSC endorses the following guidelines for such proposals.

- (a) The proposal should specify the total time requested from all TACs as well as the time requested from the individual TAC.
- (b) The proposal should also specify the estimated minimum time for worthwhile scientific results.
- (c) The proposal principal investigator(s) should recognize that there will not be any consultation between the NTACs on such proposals.
- (d) The ITAC will use information provided by the NTACs to judge the time required to meet the science goals of the proposal and act accordingly.

This information should be placed on the Gemini Web pages and on the partner specific proposal information pages

RESOLUTION 16.8: QuickStart Service Program

The GSC acknowledges the enthusiastic response of the Gemini communities to the first call for proposals and is eager to see the exciting science that will result from the initial scientific use of Gemini North.

RESOLUTION 16.9: Demonstration Science Programs

The GSC heard presentations from the leaders of the science demo programs. Both programs have excellent science teams and are proceeding with science definition and observation planning. We are pleased that all partners are represented in these programs. The GSC believes they are on track to achieve the goals of the Demo Science programs. It is desirable that updated performance-and-use information derived from DS programs be available for the Semester 2001A Call for Proposals.

RESOLUTION 16.10: Next GSC Meeting

The next GSC meeting will be held in Durham, UK 19-20 April 2001.

RESOLUTION 16.11: Retiring GSC members

GSC acknowledges the contributions of Suzanne Hawley, Buell Jannuzi, Gary Da Costa, and Jean-Rene Roy for their long-standing service on the GSC.

RESOLUTION 16.12: Jean-Rene Roy

The GSC wishes to express its deep appreciation for the major contribution to the development and success of the Gemini Observatory that Jean-Rene Roy has made during the tenure(s) as Canadian Project Scientist, and Gemini Board member and chair. We look forward to his continued involvement with Gemini and to seeing his utilization of the Gemini Telescopes.

RESOLUTION 16.13: Fred Gillett

The GSC wishes to express its strongest appreciation to Fred Gillett, the Gemini Project Scientist, for his exceptional leadership and invaluable contributions to the development and implementation of the strategic planning of the Gemini Observatory during its construction phase. Fred played a crucial role in the definition of forefront instruments for both Gemini Telescopes and of the structure of National Gemini Offices. Through his many years at the head of the Gemini Science Committee and of the Gemini Project Scientists team, Fred showed a remarkably focussed scientific vision and a rigorous and unrelenting dedication in his efforts to ensure that both Gemini Telescopes meet their requirements, and as many goals as possible, for their optimal performance. In his own style, Fred showed unusual abilities in raising and solving issues while taking into account the concerns and desires of all Gemini communities with all fairness.