

REPORT OF GEMINI'S SCIENCE & TECHNOLOGY ADVISORY COMMITTEE (STAC)
APRIL 2013

The STAC held its fourth meeting on 22-23 April 2013 in Tucson.

STAC Membership

Lydia Cidale (by polycom)	Paul Martini (in person)
Tim Davidge (in person)	Thomas Matheson (in person)
Debra Fischer (in person)	Henry Roe - Chair (in person)
Don Gavel (in person)	Nathan Smith (in person)
Karl Glazebrook - Deputy Chair (in person)	Alan Stockton (in person)
Paulina Lira (in person)	Thaisa Storchi-Bergmann (in person)
Kevin Luhman (by phone)	Kim Venn (in person)

In order to align the composition of the STAC with that of the Board, the STAC welcomed the three new committee members appointed by the Board: Debra Fischer of Yale University, Don Gavel of Lick Observatory, and Paul Martini of Ohio State University.

The STAC is pleased to report that Gemini's activities of the past 6 months and plans for the next 6 months are in good alignment with the STAC's priorities from this meeting and the last meeting. The STAC applauds the observatory and considers this a sign of progress and stability.

One of the key goals of the STAC is to ensure that, especially in the current era of highly constrained financial and personnel resources, the ensemble of projects being pursued by Gemini is not only ambitious but achievable. An overly-ambitious unachievable agenda leads to great inefficiencies and frustrations, both in the user community and in the observatory. The STAC is pleased to see good progress in the recent past toward the creation of an ensemble of achievable and ambitious goals.

The STAC encourages the observatory and Board to consider flexible and creative ways of enabling the observatory to accomplish projects that are of high priority, e.g. as discussed below in 4.30-4.33 the ability to trade observing time for instrumentation.

Large & Long-term Programs (LLPs)

4.1 The STAC strongly endorses moving forward with Large & Long-term Programs in the manner described in the Working Group's draft of 2013-Apr-12.

4.2 For the optional and potential edits laid out in the draft:

- **The STAC recommends that the Large/Long Program Time Allocation Committee (LPTAC) be appointed by the Gemini board members of the participants in the LLP program. Additional members may be appointed by the Observatory in order to balance the scientific expertise in the committee.**
- **The STAC strongly recommends that the Gemini Director be responsible for taking the LPTAC recommendations and approving the list of programs to be executed.**
- **The STAC recommends that the proposal approval process include the statement that the Director "may on occasion act to consider Partner shares in the long-term operation of the program."**

4.3 The STAC feels that programs in the LLP should be required to return high-level data products to the observatory. Details will depend on the nature of individual programs and should be a component of the proposal evaluation.

4.4 While the STAC recommends an annual review of the LLP program and its details by both the STAC and the Board, the STAC strongly recommends that the Gemini Director be given the charge by the Board to move forward with the implementation of LLPs in a approach consistent with the Working Group's draft of 2013-Apr-12.

FLAMINGOS-2 (F2)

4.5 Recognizing resource limitations in the development group at Gemini and thermal cycling risks the STAC reiterates its previous recommendation (3.21) to initially commission and offer to users only the imaging and long-slit modes on F2. In the near-term the STAC is pleased with the strong user demand for F2 imaging and long-slit modes, but recognizes that commissioning and regular use of the multi-object spectrograph (MOS) mode is highly desirable. The STAC supports moving ahead with commissioning the MOS mode in 2014A if that fits with the sequencing of other development projects. The STAC supports moving ahead because commissioning the MOS mode should not require a significant number of thermal cycles. However, before MOS mode is offered in a general call for proposals the STAC will revisit the issue of thermal cycling risk and may recommend that MOS-mode be offered in a limited fashion with only a modest number of mask changes per semester.

4.6 In terms of development priorities and sequencing the STAC recommends that putting F2 behind MCAO not be pursued until MOS mode is commissioned and in regular use.

GMOS CCD Upgrades

4.7 The STAC is pleased with the progress and the Observatory's plans to install the first set of Hamamatsu CCDs in GMOS-South in October 2013.

4.8 After considering the cost, potential risks, and the importance of upgrading GMOS-North as soon as possible, the STAC recommends the Observatory immediately order a second set of Hamamatsu CCDs in order to be ready to upgrade GMOS-North at the earliest opportunity.

NIRI

4.9 The STAC reiterates its statement from May 2012 that "The STAC highly values near-infrared imaging capability on Gemini North and considers it a fundamental capability that should be available to the Gemini communities."

4.10 Given the current fiscal environment and the STAC's commitment to near-infrared imaging capability on Gemini North, the STAC endorses the observatory's proposed plan for a package of NIRI upgrades that will restore NIRI to its original capabilities and extend its operational lifetime, but not represent a significant improvement in those capabilities.

4.11 The STAC endorses that the proposed mechanical restoration include NIRI's spectroscopic capability, because, as presented, including the spectroscopic mode

would not add significant additional cost. While the STAC values the flexibility offered by NIRI's spectroscopic mode, e.g. when GNIRS is off the telescope, if at any point the inclusion of the spectroscopic mode in the restoration project appears to be adding significantly to the total cost, then the STAC will revisit the issue and may recommend proceeding with an imaging-only version of the project.

4.12 If NIRI suffers a significant failure before the restoration project can proceed, the STAC will revisit the priorities, however acknowledges that with the current limited development resources at Gemini a failure could lead to a long downtime before the restoration project can be completed.

Transition Plan Changes with High-User Impact

4.13 The STAC reviewed the observatory's prioritized list of three additional areas to seek potential savings. In considering their potential impact to scientific productivity the STAC concurs with the Observatory's opinion that the ranking from lowest to greatest impact on users is:

- Replace the Gemini Science Archive
- Increase classical and queue visitor observing
- Further reduce data reduction support

The STAC concurs with the Observatory that in the pursuit of cost savings the impact on users should be minimized.

Detector Controller Upgrades

4.14 The STAC endorses the observatory's proposed detector controller upgrade project that focuses on upgrading GNIRS, followed by NIRI. The STAC endorses the observatory's plan to outsource much of this work and proceed with the proposed 2 year timeline for completing the project

Acquisition & Guider units

4.15 The STAC received a report on the latest version of the A&G-2 project, which has been descoped to a package of upgrades to the existing A&G units. The STAC reiterates its earlier recommendation 3.27: "The STAC understands and appreciates the Board's high level of interest in the A&G2 project, however recommends that it be given a low priority relative to other instrumentation projects. While the amount of telescope downtime required for annual maintenance of the current A&G units is high (~1 week per year per site), the STAC places a much higher priority on instrumentation progress."

4.16 Given the current and anticipated future instrumentation suite, for an A&G upgrade the STAC places a higher priority on sensitivity and sky coverage than further reducing flexure.

Altair

4.17 The STAC strongly values having a basic workhorse AO capability at Gemini North as part of its vision for 2020 and beyond. Given the current fiscal environment any replacement to Altair will not arrive until at least near the end of the current decade. Therefore, the STAC reiterates its recommendation to move forward with a package of upgrades to Altair to improve performance and extend

operational lifetime. The STAC endorses moving forward with the “DEV13-300 Altair upgrades” project as presented at the meeting.

4.18 Separately from the primary upgrade project, the STAC endorses moving forward immediately with procuring and installing a new L' dichroic beamsplitter, which would significantly enhance exoplanet imaging capabilities at Gemini North for a very modest cost.

4.19 Separately from the primary upgrade project, the STAC endorses moving forward with procuring and installing a new science beamsplitter that will enable the use of GMOS with Altair.

4.20 The STAC recommends moving forward with commissioning a GMOS-Altair mode to be ready in time for when the new Hamamatsu CCDs are installed in GMOS-North. This would provide a unique capability and immediate science returns.

GeMS/Canopus & GSAOI

4.21 The STAC applauds the observatory for the progress on GeMS and providing Science Verification data to users. The STAC is keen to see the system be brought into regular and reliable operations.

4.22 The STAC recommends no artificial cap be placed on the number of hours that GSAOI is offered in the Call for Proposals. The STAC recognizes that ultimately there is a limit to the total number of nights that GeMS can be supported on-sky, just as there are constraints to other observing conditions such as how many dark nights there are in a semester. However, the STAC is concerned that an artificially low limit in the Call for Proposals is harmful to scientific productivity.

4.23 While the STAC has recommended (3.20) a minimum of 2 semesters of regular operations before upgrading Canopus further, the STAC views a wavefront sensor upgrade to Canopus to increase sky coverage as a high mid-term priority.

4.24 The STAC welcomes and strongly encourages the current Australian effort to secure funding to upgrade the wavefront sensors on Canopus. The STAC strongly recommends the Board approve a mechanism to reward the Australian effort with observing time in order to help secure the funding in line with its recommendations 4.30-4.33 below.

Small Project Development Fund

4.25 In response to recommendation 3.23, the Observatory presented a plan to move forward with creating a new small project Science and Technology Development Program to fund 1-2 projects per year up to a maximum of US \$50-100K. The STAC endorses the plan and strongly recommends the Board approve moving forward. The STAC is keen to have such a system for additional community input and engagement, particularly where it can be used to leverage outside resources to help with upgrades to existing capabilities and commissioning of new modes.

4.26 The STAC endorses the proposed proposal review process, in which a committee of 5 review the proposals and presents them to the full STAC for final approval. The selection committee consists of the Gemini Head of

Instrumentation, 2 Gemini staff (designated by the Gemini Head of Science), and 2 STAC members (designated by the STAC Chair).

4.27 The STAC recommends that the guidelines for proposals be left as flexible and non-restrictive as possible in order to encourage innovation, creativity, and maximum scientific impact. e.g. While the STAC anticipates that most, if not all, successful proposals will come from proposers in a Gemini partner or host, in order to maximize the competition and benefit to Gemini the STAC recommends that this not be made a requirement.

4.28 The STAC requests the Observatory develop an initial list of potential project areas to be included in the first Call for Proposals, however strongly recommends that the call also include a statement that proposals will be considered in any area that otherwise fit the guidelines of the Small Project Development Fund.

4.29 The STAC recognizes that creative proposals may include an aspect of cost-sharing from outside resources. In a similar manner as discussed in 4.30-4.33, the STAC recommends that trading modest amounts of observing time for cost sharing on these Small Projects be allowed as a way of creatively leveraging the available development funds within the partnership.

Use of Observing Time to Leverage Development Funds

4.30 In the current fiscal environment, the STAC is keen to seek creative ways to advance the capabilities available to Gemini users. The STAC strongly endorses the concept of trading observing time for instrument funding in a manner similar to the NSF TSIP program. The STAC recommends that the Board be open to trading modest amounts of observing time for instrument funding or progress on desirable instrumentation projects, which could include software as well as hardware. A key point in the STAC's discussions is that any observing time traded in such a deal is still being used to produce science for the Gemini partnership.

4.31 The STAC recommends that the Board establish a method for fairly valuing observing time to be used in future trades of observing time.

4.32 The STAC recommends that each proposal should be considered on a case-by-case basis at the Board and STAC levels and that to be successful any projects proposing time trades must align with the observatory's priorities as set by the Board and STAC.

4.33 While the STAC does not recommend a single quantitative upper limit to what fraction of observing time might be traded in this manner, in the STAC's discussions it was assumed that the sum of such trades would not add up to more than ~10% of observing time so as not to overly impact partner observing time.

Fourth Generation Instrument #3 (4gen3; next instrument after GHOS)

4.34 The STAC strongly endorses the observatory's response to 3.12 for a method of soliciting instrument concepts from the community via an Announcement of Opportunity in October 2013 and a proposal deadline of 15-Feb-2014. The STAC recommends that the Board approve the plan so that the observatory can move forward with announcing to the community its intentions on or before 1-June-2013.

4.35 The STAC strongly encourages the Observatory to announce its intentions to the community as soon as possible and to release as much information as early as possible, particularly regarding the anticipated budget.

4.36 The STAC recommends that proposals for 4gen3 be allowed to include cost-sharing in return for guaranteed telescope time, in the manner discussed in 4.30-4.33.

GPI

4.37 The STAC is concerned about slips in the GPI schedule, but is pleased with the current progress and plans for first light on sky in 2013Q3. The STAC places a very high priority on seeing GPI commissioned and producing observations for users as soon as possible.

4.38 The STAC endorses the current plan to offer Science Verification time to the community for observations in November/December 2013 and to offer GPI as part of the regular 2014A Call for Proposals. The STAC considers it crucial that the community be able to propose observations and have access to data as soon as possible. If the schedule slips such that GPI is not included in the regular 2014A Call for Proposals, then the STAC will recommend some expanded early science access program beyond the usual SV.

GRACES

4.39 The STAC is highly concerned with the schedule delays and cost increases in this project. The STAC is keen to know the answers to the performance questions that will be learned by completing Phase 1 of the project. However, because of the current fiscal environment and the STAC's concerns about the technical risks, the STAC recommends that no additional funds be invested in this project until the 270-m fiber is proven in the lab and that no additional funds be invested in this project beyond the current contract unless the Phase 1 results are available for evaluation.

4.40 The STAC reiterates (3.6): "Given the uncertainty in what performance will be achieved on-sky with GRACES, the STAC will re-evaluate GRACES after Phase 1. To provide a scientifically interesting capability and proceed beyond Phase 1, the GRACES system must provide sensitivity that is competitive with that of facility high resolution spectrographs on 8-10 meter class telescopes at visible and longer wavelengths."

GHOS

4.41 Due to the slowness in having a finalized contract for GHOS, the STAC is waiting to activate the IST discussed in 3.2. Expecting that a final contract will be signed soon, the STAC is asking the IST to form and begin to consider the North vs. South hemisphere issues in time to present initial findings at its October 2013 meeting.

Vision & Long-Range Planning

4.42 The STAC continued its discussion of its vision for Gemini over the next 1-2 decades, both as a stand-alone facility as well in its relationship with existing and soon-to-exist facilities such as Pan-STARRS, PTF, LSST, ALMA, JWST, SKA, MS-

DESI, ELTs, etc. The STAC will present the Board with a draft document at its October 2013 meeting.

4.43 Key aspects of the STAC's discussions included:

- **Flexibility** - One of Gemini's great strengths is its flexibility in switching instruments rapidly, observing the time domain, and with Targets of Opportunity. This flexibility must be cultivated and developed further, extending to new more flexible modes of operating and providing instrumentation capabilities to users. On a longer time scale Gemini offers the flexibility of moving instruments between hemispheres.
- **Enabling innovation** - Gemini should work to enable innovation, within both the observatory and the user community. The history of astronomy is littered with examples of users coming up with clever uses of existing instrumentation that significantly expand capabilities and produce outsized scientific impact.
- **Learning from the past** - An additional aspect of flexibility is learning from the past. Past history shows that it is difficult or impossible to predict what will have the most scientific impact a decade or more in the future; more feasible is predicting progress in what is technologically possible. Engaged and talented users will be able to take solid workhorse capabilities and apply them to the biggest scientific questions of the day.
- **Image quality is timeless** - Higher image quality means both better resolution of spatial features, but also more photons down spectroscopic slits and/or higher resolution spectra. In the timescale of Gemini's Long-Range Plan, HST will almost certainly have been deorbited and high-resolution visible wavelength imaging will have to be done from ground-based telescopes.
- **Realism & Ambition**: Gemini must pursue a plan that is achievable within the technical and fiscal constraints, but to stay relevant and productive Gemini must also pursue an ambitious agenda. The balance of these will be a critical part of Gemini's success.

4.44 As part of its discussion, the STAC received a report on the April 2013 workshop "Spectroscopy in the Era of LSST", which made clear that Gemini can play a valuable role in following up rare transients and objects uncovered in the LSST dataset. These events and objects will be rare enough that there would never be more than a single target within the field of view of Gemini. The most valuable capability that Gemini could provide for LSST followup is high-throughput single object spectroscopy, but with flexibility in specifying the bandwidth and/or resolution.

Priorities

4.45 The STAC recognizes that in the current environment of limited resources, both financial and personnel, an instrument failure may result in significant downtime and that in the event of such a failure the STAC will work closely with the observatory to determine how to proceed and the impact on priorities.

4.46 In the near-term (~6 months) the STAC's ranked priorities for development projects beyond the required operations, maintenance, and execution of the transition plan are:

1. GPI (The STAC reiterates 3.32, 3.33, 3.34)
2. GMOS-South Hamamatsu CCDs
3. 4Gen3 (RfP needs to be released in October)
4. Small Project Development Fund
5. F2 commissioning of imaging and long-slit modes
6. GeMS/GSAOI handover from development to operations
7. GHOS

4.47 In the mid-term of the next 1-2 years the STAC's ranked priorities beyond the above near-term priorities are:

1. GMOS-North CCDs (commence ordering ASAP)
2. F2 MOS-mode in general operations (thermal cycling risks must be considered)
3. GeMS/GSAOI upgrades (including NGSWFS)
4. Detector controllers (GNIRS and then NIRI)
5. NIRI restoration project
6. Altair Upgrades
7. GRACES
8. A&G 2

Science Time 2014A

4.48 The STAC endorses the observatory proposed science time goals and minimums for 2014A.

Future STAC Meetings

The STAC will convene by telecon as necessary and will hold its next in-person meeting on 29-30 October 2013 in La Serena with an optional summit visit day on 28 October.