Report of Gemini's Science & Technology Advisory Committee (STAC)
October 2012

The STAC held its third meeting on 29-30 October 2012 in Hilo.

STAC Membership
Lydia Cidale (by polycom)
Tim Davidge (in person)
Alastair Edge (by polycom)
Karl Glazebrook - Deputy Chair (in person)
Paulina Lira (not attending)
Kevin Luhman (in person)
Thomas Matheson (in person)
Jennifer Patience (not attending)
Henry Roe - Chair (in person)
Nathan Smith (in person)
Alan Stockton (in person)
Thaisa Storchi-Bergmann (by polycom)
Kim Venn (not attending)

UK withdrawal
3.1 The STAC thanks its UK colleagues for their expertise and advice and deeply regrets the loss of their contributions to the Gemini partnership with the withdrawal of the UK.

GHOS
3.2 The STAC appoints Nathan Smith to lead an Instrument Science Team for GHOS. Additional members will include Steve Margheim (Instrument Scientist for GHOS), a member of the GHOS instrument team, and 1-2 additional community members with scientific interests in this area.
3.3 The STAC asks the GHOS IST to investigate the science cases for installing GHOS in the Northern vs Southern hemisphere and report back by the time of its next meeting in April 2013.
3.4 The STAC will consider the choice of hemisphere for GHOS at its 2013A meeting in April 2013 taking into account both the science cases for each hemisphere provided by the GHOS IST as well as the follow-on impacts to other instruments under the 4+AO operations model. Depending on progress with GHOS this hemisphere decision may be deferred until the STAC's 2013B meeting.

SPIRou
3.5 While near-infrared high-resolution spectroscopy is a highly desirable capability, the STAC is not prepared at this time to recommend committing resources to the SPIRou project. At a minimum the GRACES experiment to observe at optical wavelengths via a long fiber needs to prove successful with sensitivity competitive with capabilities on other 8-10 m telescopes. The STAC will reassess the situation at its April 2013 meeting.

GRACES

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.

GMOS CCD Upgrades

3.7 The STAC concurs with the Observatory's current plans that aim to bring Hamamatsu CCDs to GMOS-South as soon as possible and then later proceed with Hamamatsu CCDs on GMOS-North. The STAC agrees with the Observatory's conclusion that the GMOS-South upgrade should not proceed until another instrument can effectively use the observing time during the time GMOS-S is off the telescope.

Large & Long-term Programs

The STAC believes that Large and Long-term Programs are an important component of the overall ensemble of observing projects at Gemini. Such projects have been possible via the NOAO Survey TAC, allocations from multiple partners, and/or allocations over multiple semesters. However, the STAC wants to encourage more large programs across the entire partnership as it believes this would benefit the overall scientific output of the observatory.

3.8 The STAC recommends the creation of a new system for Large & Long-term Programs (LLPs) to enable science requiring more time than can be typically acquired via individual PI proposals to the traditional partner TACs. The STAC recommends the following guiding principles:

- **All Gemini parties, partners, and host countries should be treated equally within an LLP system and have equal opportunity to participate and partake of LLPs. (In the remainder of these principles, "partners" refers to all Gemini parties, partners, and host countries.)**
- **Up to 20% of observing time of the participating partners should be invested in LLPs, recognizing that 1-2 years may be necessary to ramp up and that 10% in the first year is a reasonable goal.**
- **Participating partners will provide equal percentages of their time into a common pool to support LLP programs.**
- **Observing time for approved LLP programs will be charged against this common pool. If time is ever refunded to partners from the pool this should be done in a fair way proportional to the time contributed to the pool.**
- **There should be no limits on who may lead proposals or the composition of proposing teams. The goal is to produce the best science with Gemini without regard to team nationality.**
- **Selection of new projects should proceed once per year with the goal of having 2-4 new starts per year.**
- **An LLP need not request a balanced program across North/South, RA range, observing conditions etc., however the ensemble of approved LLPs must not be**

allowed to overly impinge on other observing programs. Therefore, the ensemble of approved LLPs should not exceed 20% of any relevant parameter, such as hemisphere, RA range, and Band.

- **Target-of-Opportunity observations should be allowed.**
- **The selection process will include Letters of Intent in order to ensure the TAC includes the proper expertise and a lack of conflicts of interest.**
- **Additional requirements will be placed on LLP proposals, including a management plan, data products plan, and annual progress reviews.**
- **In order to not create significant new work for Gemini, the TAC should be an expanded version of the existing NOAO Survey TAC.** ***[The opinion of the Canadian and Argentinean representatives was that the TAC should be a new entity managed by Gemini itself.]***
- **This Survey TAC should include representatives of the participating partners and a Gemini staff member to help advise on maintaining a balanced ensemble of LLPs distributed across RA range, observing conditions, and other relevant parameters.**
- **The TAC should approve only the most competitive and compelling proposals, without regard to nationality of the proposing team.**
- **The TAC should be willing to approve fewer than 2-4 proposals, including zero if none are sufficiently compelling.**
- **There should be no minimum time request, given that the additional proposal requirements should be sufficient to dissuade proposals that might otherwise be approved through a partner's TAC.**
- **Although partners may opt out of such a system, the STAC believes that this system will produce the best science if all partners opt in.**

Visitor Instruments

3.9 The STAC views a vibrant visitor instrument program as a key part of its vision for greater community engagement, bringing new capabilities to the community quickly, and providing more niche capabilities than are available with the facility workhorse instrument suite. The STAC recommends one additional principle be added to the proposed Visitor Instrument Policy: "If the effort needed from Gemini for a visitor instrument becomes significantly greater than predicted, Gemini should terminate that particular visitor instrument project." With this additional principle, the STAC endorses Gemini's draft Visitor Instrument Policy.

3.10 The STAC endorses Gemini's plans for offering community access to TEXES and the Speckle camera in a visitor instrument mode in 2013B.

3.11 The STAC received a report on the progress of IGRINS, a high-resolution near-infrared spectrometer covering all of H- and K-bands simultaneously at a resolving power of R~40K. IGRINS is under construction at UT Austin and the Korea Astronomy and Space Science Institute. It will be commissioned at McDonald Observatory in late 2013. The predicted sensitivity of IGRINS on Gemini would provide a highly desired capability. The STAC will stay in touch with the P.I. (Dan Jaffe) to be kept informed of progress on the project and the possibility of IGRINS as a future visitor instrument on Gemini.

Fourth Generation Instrument #3 (next instrument after GHOS)

The STAC discussed possible models for deciding on and procuring the next instrument after GHOS. The STAC feels it is extremely important to have significant involvement in choosing the next instrument by the community and instrument building groups. In consultation with Gemini development staff and to fit with the STAC's developing vision for a Long-Range Plan, the STAC came to the following recommendation:

3.12 The STAC recommends Gemini prepare a Request for Proposals (RfP) to be reviewed at its April 2013 meeting that can then be taken to the Board in May 2013. This RFP would be directed at instrument building groups to propose for funded design studies for instruments that would conform to the following principles:

- **The instrument should be a workhorse instrument, meaning that it has broad scientific appeal and enables a wide range of science cases.**
- **The proposals should be science driven and include science cases. Science cases that provide synergies with new capabilities coming online (e.g. LSST, JWST, ALMA, etc) are highly desirable, especially including capabilities needed to follow up survey discoveries.**
- **The instrument should fit within the technical constraints of the Gemini telescopes as they now exist.**
- **The expected cost of the instrument shall be capped at a cost that is to be determined as part of the process of defining the RfP.**
- **The technical risk of the instrument should be modest, i.e. the success of the instrument should not depend upon some not-yet-proven technology.**
- **The instrument should be highly efficient, maintaining the 8-m aperture advantage.**
- **Although proposals for all instruments fitting these criteria will be fully considered, it is the majority opinion of the STAC that a wide-bandwidth moderate-resolution spectrograph is likely to prove most compelling.**

Gemini North Adaptive Optics (GNAO)

The STAC strongly values having a basic workhorse AO capability at Gemini North as part of its vision for 2020 and beyond. The STAC reviewed the report of the GNAO workshop held in June. The STAC does not rule out pursuing a more ambitious upgrade to GNAO, perhaps including an adaptive secondary mirror, starting at some point late in the decade. However, given the current budget environment there is very low possibility in the next few years of embarking on the development of a new GNAO system more ambitious than the first option presented in the report, a ≤$5M(USD) single-conjugate narrow-field workhorse replacement for Altair.

3.13 The STAC thanks all the participants of the June GNAO workshop.

3.14 Because any Altair replacement would not arrive for at least 5 or more years, the STAC reaffirms it's earlier recommendation (1.16) to proceed with the proposed upgrades to Altair detailed in "Altair upgrades summary" with an estimated budget of ~$625K(USD).

3.15 The STAC recommends commissioning in 2013 an external design study of replacement Altair systems that could be built under a $5M(USD) cost cap. Both a major overhaul of the existing Altair system as well as an entirely new AO system are options to be considered. The STAC is particularly interested in understanding the predicted performance (e.g. sky coverage in both NGS and LGS modes, Strehl

ratio, and performance under varying observing conditions) in comparison to that of Altair currently and in the future with its planned ~$625K(USD) upgrade.
3.16 The STAC encourages the observatory to reform the Adaptive Optics Working Group (AOWG) to provide advice and expertise.

GPI
3.17 The STAC urges the observatory to work closely with the GPI team to ensure it is shipped by the end of March 2013 and delivered to Gemini South on the current schedule.
3.18 The STAC reiterates its recommendation 2.18 that the Observatory advertise as widely as possible that GPI will be available for PI science and that the Observatory consider mechanisms to include the community in commissioning as early as possible, potentially through a pre-SV call for targets. The STAC's intent is to involve the community as much as possible in the commissioning process, including Science Verification observations, and to make the process as open and transparent as possible.
3.19 The STAC recommends negotiating a follow-on contract with the GPI construction team for commissioning and support of the first year of operations.

GeMS/Canopus
3.20 The STAC believes it is important that GeMS be available to users and produce science-quality observations as soon as possible. The STAC is concerned that if GeMS is not available for science observations by the time GPI is ready to be commissioned that the schedule for GeMS may slip significantly. Given the pressure on Gemini resources, the STAC recommends further upgrades to Canopus, e.g. new wavefront sensors, wait until the system has been in regular use for at least 2 semesters and that such upgrades be coordinated with GPI commissioning.

F2
3.21 The STAC recommends commissioning F2 in only imaging and long-slit mode to reduce the risk of damage due to thermal cycling. Multi-slit mode would be implemented in coordination with other instrument activities at a later date. The STAC will regularly reassess the situation.
3.22 The STAC requests it be kept closely informed on progress of F2 to the flexure rig and telescope so that it has as much warning as possible if additional new problems arise.

Funding of technology development studies
3.23 The STAC strongly endorses the Observatory's plan to budget ~$100K(USD) per year to fund modest technology development studies that would be competed via proposals from the community. 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.

Instrument Upgrades
3.24 The STAC supports the concept of allocating ~$500K(USD) of IDF money once every 1-3 years to support upgrades of existing workhorse instruments.

Detector Controllers
3.25 The STAC continues to be concerned about the inefficiencies and risk of failures in the NIRI and GNIRS detector controllers. The STAC reiterates it's recommendation 2.31 that the detector controller upgrades to NIRI and GNIRS be contracted out if at all possible in order for the project to proceed as soon as possible.

Acquisition & Guider units
3.26 In response to its request 2.43 the STAC received a report ("A&G Science Dichroic Feasibility") on the possibility of retrofitting the existing A&G units with a dichroic to enable simultaneous dual instrument observations. The STAC thanks the Observatory for the report. The STAC judged the difficulty and cost of the project high relative to the potential scientific benefit with the existing instrument suite. Additionally, the STAC is concerned that the resources to pursue this project would not be available any time in the near future due to the existence of other higher priority projects. The STAC recommends the project not be pursued further.
3.27 The STAC received a report on the status of the A&G2 replacement project and will reassess the project at its April 2013 meeting. 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.

Michelle and T-ReCS
3.28 The STAC received the report "Mid-IR in a Campaign Mode" and concurs with its conclusion that a visiting campaign mode for Michelle or T-ReCS is not practical. The STAC reaffirms its earlier recommendation 2.5 that Michelle and T-ReCS be retired at the end of 2012B.

Remote Observing
3.29 The STAC received a report on "Remote Classical Observing" proposing a set of principles for how to proceed with enabling users to observe remotely from non-Gemini sites. With the removal of the requirement that remote observing be "necessary to the completion of the programme" and the addition of recommendation 3.30 below the STAC recommends that the principles laid out in this report form the basis of a future remote classical observing mode.
3.30 The STAC recommends that a core remote observing capability be installed by each NGO, and that these include the capability for a backup internet connection (e.g. direct ISDN dial in to base as Keck does). This would also require Gemini to have the required equipment at their end to support this. This would enable remote observing from partners countries with less risk and more local support, as an

intermediate option from the 'home university' one. It could also be used to phase in and test fully remote observing.

Data Reduction

3.31 The STAC received a "Data Reduction Update" report. The STAC reiterates its earlier statements that making cookbooks and reduction pipelines available to users will be transformational and enable a significant increase in scientific output. The STAC also reiterates its recommendations 2.34 and 2.35 that much progress could be achieved with a pragmatic 'quick-and-dirty' approach. While the STAC is keen to see progress in this area, it recommends the newly formed User Committee take responsibility for oversight of this issue.

Priorities

The STAC discussed several likely or potential resource conflicts in the near-to-mid future.

3.32 The STAC views the commissioning of F2 long-slit and imaging modes as a very high priority, however if F2 is not commissioned by the time GPI is ready to be commissioned the priority will likely shift to GPI. The STAC will assess progress on F2 in early 2013 ahead of its April meeting.

3.33 Given the time critical competitive nature of direct imaging of exoplanets, the STAC places a high priority on the commissioning of GPI and commencement of the GPI Campaign. The STAC currently recommends that if GeMS is not commissioned by the time GPI arrives on site that commissioning of GPI take priority over commissioning of GeMS. The STAC will reassess the situation at its April 2013 meeting.

3.34 Should a resource conflict occur between GPI and the GMOS Hamamatsu CCD upgrade, the priority should go to GPI as the science impact of a short delay on GPI is potentially much greater than that of an additional short delay on the Hamamatsu upgrade.

3.35 While ideally both projects would proceed in the next few years, the STAC places a higher priority on the development of the Fourth Generation Instrument #3 compared with a new AO system to replace Altair.

3.36 The STAC places a low priority on the A&G2 and GCAL2 projects relative to other instrumentation projects, including new instruments and instrument upgrades.

Science Time 2013B

3.37 The STAC endorses the observatory proposed science time goals and minimums for 2013A.

Future STAC Meetings

The STAC will convene by telecon as necessary and intends to hold its next in-person meeting in April 2013 ahead of the May 2013 Board meeting. The location and dates of the next STAC meeting are TBD.