Gemini Observatory Commentary on the UCG 2019 Report

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The Observatory thanks the UCG for their report following their August 2019 meeting at the Gemini-North Base Facility in Hilo, HI. In preparation for the 2020 meeting, we provide here some updates and responses to the issues raised in order of priority as expressed by the UCG at then end of their last report.

1. **Data reduction pipelines**
    a. The first public release of our new Python-based data reduction platform, DRAGONS, was made in October of 2019 to support imaging reduction for current facility instruments. Work is ongoing to add spectroscopy support and replace Gemini IRAF for our facility instruments. A release to support GMOS long-slit spectroscopy is expected in early 2022.
    b. Documentation of the science quality verification for DRAGONS is complete.
    c. Automatic reduction of Target of Opportunity (ToO) Observations made in imaging or GMOS Long-slit modes will be available in early 2021. These reduced data products will be uploaded to the Gemini Observatory Archive in essentially real-time (within one hour of the end of the observation).
    d. We acknowledge the need for comprehensive data reduction manuals that clearly describe how to control all available parameters. Our current priority is to replace Gemini IRAF before it becomes unusable in modern computing environments. We are tracking specific user requests (eg. from the helpdesk) for improved documentation and planning to address these first.

2. **Calibrations**
    a-c.An investigation was started in order to address flatfielding performance and the difficulties that arise sometimes when flatfielding GMOS imaging data. The main result is that twilight flatfields don't need to be near-simultaneous, provided that the relative QE correction is handled properly when reducing the data. Hence, there is no need to take very frequent twilight frames. This statement is limited to the timeframe where there are no changes in the instrument optics that would alter the throughput (i.e. development of bubbles, vignetting of any kind, defects or artifacts on any optical component - to mention a few examples). For data taken before the optical correction for the bubbles, all imaging data will feature a slight departure from a flat background at the bottom of the field of view and generally, flats closer in time to the observations may serve to best flatten the frame. Exceptions have been noted and it is recommended to try other sets of flats when the bubble is

particularly prominent. Alternatively, building a sky frame from the science frames (when possible) gives the best results.
d. See appendix on color corrections from Gemini filters to large survey filter systems

3. **Timing issues**
    a. Explanations for timing keywords for all facility instruments are now available on the Gemini website.
    b. We have begun a small project to estimate the total timestamp error by measuring the positions of navigation satellites (GPS, Galileo, etc…). Preliminary results are encouraging and show offsets of ~0.1 seconds. We need to collect more data but the closures due to COVID-19 have slowed this down.
    c. Adding DUT1 to the header can be done for new instruments. It would require significant software effort to do so for all our current facility instruments. The web page linked above also contains information on how corrections can be applied after the fact by the user.
    d. In the long term achieving open shutter timing accuracy at the millisecond level will be possible for new instruments but we do not have effort to upgrade our old instruments. For example, SCORPIO will use the detector clocking for relative timestamps, in particular for the high speed modes. The time stamping accuracy between the different arms in SCORPIO will be 10ms. The NTP time stamping offsets to the time standard is in general better than 5 ms but may occasionally be up to 10ms.

4. **Static universe**
Section 3 of Gemini's Strategic Scientific Plan, entitled "Preservation of Diverse Science in an Evolving Observatory," specifically addresses the requirement and plans for preserving static-sky science, *and precedes* the section on rapid response capabilities. It also points out that the development of the GEMMA-funded dynamical scheduler is a key component of this effort; the scheduler will be optimized for a balanced queue of static-sky and TDA programs. The SSP was posted on Gemini's website in July 2019, and then on arXiv in September (after the last UCG meeting) specifically to increase its visibility. The Observatory leadership and its advocates (Board, STAC, UCG, NGOs, etc) therefore need to continue to promote Gemini's actual priorities and plans, as detailed in the SSP, in order to combat such misconceptions. The GSM in Korea would have been an excellent venue for this; we plan to do this at the next GSM as well as the partner community meetings. Additionally, we have plans for a Mirror article to address this issue and will continue to post news and collect feedback on the OCS Upgrades web page and the Science Software Blog. The Gemini Program Platform recently passed its Inception (Final Design) Review; materials are available at the OCS Upgrades web page linked above. The panel contained several external members including UCG member Jonelle Walsh. The committee was very thorough and provided some excellent feedback.

5. **Users poll**

Gemini maintains a survey collection infrastructure (developed to create the short user satisfaction survey program) that could be used in collaboration with the UCG to create a survey regarding future user services.

6. **Archive fixes**
   The deployment of the upgraded Gemini Observatory Archive on March 18, 2020 provides support for 1) unicode in searches, which allows for searching on comet names (for example, "C/2016 VZ18" as the target), and 2) shift-click to select multiple rows in a table for download and the "select all" button is now aware if you are on the "observations" or "associated calibrations" tab. It also enhances the JSON api query CADC uses to mirror our metadata, which is a first step towards implementing the requested (in 9c) Solar System object image search tool for the GOA.

7. **Calibration strategies webpage updates**
   The following pages have been updated to explicitly communicate that Gemini Observatory policy is to allow for PI customization of Phase II program plans and calibration strategies so long as the telescope/instrument are not endangered.
   - https://www.gemini.edu/instrumentation/gsaoi/calibrations#Baseling
   - https://www.gemini.edu/instrumentation/gmos/calibrations
   - http://www.gemini.edu/observing/resources/near-ir-resources
   - http://www.gemini.edu/sciops/instruments/baselinecals.html

8. **Special calls for engineering time**
   In 2021 we plan to start a GEMS+F2 feasibility study project, and later could follow with a feasibility study about GeMS+GMOS. On-sky quick testing has already been done and there is not further observing work planned until we complete a formal feasibility study. We plan to provide an avenue for enthusiastic members of the observing community to contribute effort to the observations, after the feasibility study is approved and we move to further stages of the project.

9. **OIRLab User Support requests**
   The ideas proposed by the UCG are being used as we develop plans for the transition into NOIRLab and the User Support services they will provide. We have begun a collaboration with the CSDC at NSF's NOIRLab to host data products from the GOGREEN Large and Long Program as a technology demonstration and a base for other potential collaborations; this will be a first step in providing CSDC's Data Lab capabilities for Gemini data.

Finally, one item mentioned in the report but missing from the prioritized list was moving the GRACES ITC software to a free platform. This is complete and available from the GRACES web pages.

Appendix - filter calibrations

The UCG requested:

"Assess a strategy for periodically obtaining the color corrections from the Gemini filters to the large survey filter systems (e.g. SDSS, Pan-STARRS, DeCALS). "

We believe that the sensible periodic update is to redo transformations when new filters start being used.

The transformation can be calculated using spectral libraries and the known profiles, and/or using observations. Inger Jørgensen published transformation to the SDSS system for GMOS as it was in 2008[1].

Transformations between Pan-Starrs and SDSS have been published.

In the case where well-measured stellar spectra, filter profiles etc. are available, a synthesis is accurate and observations serve only as a check. If those aren't available, then observations are a requirement.

[1] https://www.cambridge.org/core/services/aop-cambridge-core/content/view/16634C4972E992FB116F01C0605F034E/S1323358000004227a.pdf/calibration_of_photometry_from_the_gemini_multiobject_spectrograph_on_gemini_north.pdf