

Motivation: Rapid follow-up observations of astrophysical transients and multi-messenger events facilitate some of the highest-priority science goals in the Canadian Astronomy Long-Range Plan. But the discovery, triage, observation, data reduction, and analysis of those events currently requires a complicated workflow across multiple different tools and software interfaces. This poster presents a summary of Gemini Observatory's ongoing efforts to streamline the process of transient follow-up from discovery to publication. Gemini is working to build real-time, automated, quick-look reductions of target-of-opportunity observations, a new scheduling platform with full API access for submitting follow-up requests programmatically, and a pipeline that will connect each stage of the transient follow-up process. Our goal is to build cohesive, accessible tools that enable high-impact transient science from Gemini Observatory in the coming decade.

**DRAGONS & FIRE** See our Capabilities Brochure to lals.≥x6al learn more about Gemini's **1913** - 244 workhorse instrumentation for time-DRAGONS: Data Reduction for Astronomy from Gemini Observatory domain astronomy Gemini Observation and Analysis termineWavelengthSolution Current filename: N20170416S0058\_mosaic.fits of Targets System (GOATS) Example of lumber of lines to sum: 1 browser-based interactive GOATS will connect the full Gemini ToO infrastructure from discovery to Feature width in pixels tools for data stimated central wavelength (n follow-up, data reduction, and publication. In this framework, new astrophysical reduction with transients will first be discovered from telescope data streams by "brokers" like Calibrating to wavelengths in a DRAGONS NOIRLab's ANTARES. hile the mouse is over the Example target & observation manager; synthesizes data, requests followup via NOIRLab's ANTARES broker for APIs (Coulter+23, Jones+21) discovering astrophysical transients ernal Services 😯: IP **Documentation: & Tutorials** More Tutorials TNS NED SIMBAD VizieR https://gitlab.com/nsf-noirlab/csdc/usngo/ dragons.readthedocs.io WISE DSS **DRAGONS** tutorials ADS ASAS-SN ZTF Cone SNAD ZTF ÷ < > ● Ø Users can ingest those transients into target and observation managers (TOMs) and submit ToOs to Gemini at the click of a button, facilitated by the new Gemini Program Platform. Data will be uploaded to the Gemini Observatory Archive, automatically reduced with FIRE or interactively reduced by the user, and then ingested back into the TOM for analysis and subsequent follow-up observations. observation Alert broke domain e.g., ANTARES **GOATS** Portal Observatory surveys e.g., LSST aw data + Quick-look reduced dat Schematic of the powered b VERA C. RUBIN TOM Data reduction DRAGONS SQ\* ANTARES full GOATS GOA process OCTOBER 19, 2022 BY MATT WILLIAMS Credit: NOIRLab, existing data connection GOATS Astronomers Just saw the Most Powerful existing tools Universe Today Gamma-ray Burst Ever Recorded tool to be developed data connection to GOATS will reduce overheads in the scientific process by automating repetitive tasks (e.g., downloading observed data, data reduction, and even routine analyses like identifying a common transient's class by its spectral lines) and allow scientist to focus on interpreting their data. GOATS will be built using institutionally supported software to facilitate long-term maintenance and continued use throughout the astronomical community. It will be part of a suite of similar tools, built across NOIRLab for other telescopes and data streams.







North and South (DRAGONS) is Gemini's Python-based data reduction platform. DRAGONS supports the science-quality reduction of data from GMOS, NIRI, GSAOI, and F2 imagers plus the GMOS long-slit spectrograph (including nodand-shuffle observations). The goal of DRAGONS is to support Python-based data reduction for every Gemini instrument and observing mode, replacing and streamlining previous IRAF-based routines. Next up in 2024: GNIRS and Flamingos-2 long-slit spectra as well as GNIRS cross-dispersed spectra. FIRE: For fast-evolving transients like kilonovae, fast data reduction can be critical. The Fast Initial Reduction Engine (FIRE) will support night-time quicklook reductions of Gemini target-of-opportunity data with immediate upload to the Gemini Science Archive. The development of FIRE is completed, incorporating FIRE into operations is TBD. FIRE was successfully tested on GMOS longslit spectra of GRB 221009A, the brightest gamma-ray burst ever observed; reduced (quicklook) data were available within minutes following the end of the observing sequence.







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# Gemini Program Platform (GPP)

The Gemini Program Platform is a future tool to replace Gemini's Phase I Tool (PIT) and Observing Tool (OT). The GPP will fix longstanding over-complications in the Gemini proposal and observing process with a new browser-based interface that automatically creates full, executable observations, has a fully-integrated integration time calculator (ITC), employs automatic real-time scheduling, and has full API access for programmatic scheduling of observations.

View of an example target in the GPP

Target observability on a given night will be easily available



GPP will generate new schedules in under a minute as ToOs occur, creating schedules for Gemini North and South simultaneously as appropriate, and will have automated queues that can be evaluated via reproducible metrics to ensure they reflect the TAC's rankings.

Everything that can be done via the user interface can be done programmatically in GPP, and Python-based examples will be provided for the user community. Both the improved UI and programmatic infrastructure will mean a much quicker workflow from transient discovery to getting your data. GPP is expected to be available in 2024A.

> Check out the live GPP demo yourself explore.gemini.edu

In the meantime, we have new telescope status pages to help with triggering observations. The new format includes the status of the telescope, pertinent weather information, skycams at each site, and available instruments and their current configurations.

New status pages with more convenient realtime information for ToOs







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