Swift Cycle 16
Abstracts of selected proposals
(NNH19ZDA001N-Swift Cycle 16)

Below are the abstracts of proposals selected for funding for the Swift Cycle 15 program. Principal Investigator (PI) name, institution, and proposal title are also included. **120** proposals were received in response to this opportunity. On February 26, 2020, **30** proposals were selected for funding.

Ajello, Marco/Clemson University
HUNTING HIGH REDSHIFT BLAZARS WITH SWIFT AND SARA-CT/ORM

The class of AGNs called blazars, are prominent members of Fermi detected sources. The study of blazar evolution with redshift is important as they also provide a powerful diagnostic tool to study the evolution of the Extragalactic Background Light (EBL). Using blazars as cosmological probes requires knowledge of their redshift. We propose to jointly use Swift-UVOT and SARA-CT/ORM, a 0.65m and 1m telescope in Chile and Spain respectively, to derive photometric redshifts for sources above z~1.3. This method makes use of 10 UV-optical filters, which allows for reliable redshift measurements. This project will deliver measurements of the Spectral Energy Distributions for 20 3FGL blazars and establish photometric redshifts for those with z > 1.3.

Bodewits, Dennis/Auburn University
Rapid follow up characterization of cometary outburst ejecta

We request 36 orbits of observing time to rapidly follow-up on three comet outburst, fragmentation, or disintegration events. We will use Swift to measure the mass and chemical composition of the ejecta. By monitoring the comets activity in a period of two weeks afterwards we will determine whether the outburst triggered permanent activity, and if the chemical composition of the ejecta differs from material released by quiescent activity. This allows us to study the cause of cometary outbursts and to investigate how materials on the comets surfaces are altered with respect to more primitive sub-surface volatiles. Swift provides a unique combination of wide-field imaging and spectroscopy in the UV with rapid follow-up capabilities that is critical to meet our objectives.

Bogdanov, Slavko/Columbia University
SWIFT MONITORING OF NEARBY X-RAY BINARY-RADIO MILLISECOND PULSAR TRANSITION OBJECTS

The identification of three binary millisecond pulsars transforming between accreting and rotation-powered states has finally closed the evolutionary missing link between low-mass X-ray binaries and recycled pulsars. These discoveries imply that their parent population, redbacks, may also be recycled pulsars that sporadically revert to/from a low-luminosity accreting phase. We propose a Swift X-ray and UV monitoring campaign of all such nearby binary radio millisecond pulsars aimed at catching them in the act of switching to/from an accreting state. This effort would greatly aid in constraining key aspects of the poorly understood transition process of pulsars between accretion and rotation power.

Brown, Peter/
Swift and SIRAH: UV to NIR observations of Type Ia Supernovae Beyond the Twilight Zone

While Swift observations have uncovered a large diversity in the UV luminosities of Type Ia Supernovae (SNe Ia), the physical origin of the diversity of these standard candles and the cosmological impact is still unknown. One prime limitation is the lack of precision in the distances, with most Swift SNe being too close for a Hubble-flow distance but not close enough for a Cepheid-based distance. We propose to observe a sample of twenty-four Type Ia Supernovae (SNe Ia) in the nearby Hubble flow with Swift's Ultra-Violet/Optical Telescope (UVOT). In coordination with the Hubble Space Telescope's (HST) SIRAH program, these SNe will have well-measured peak absolute magnitudes encompassing the UV, optical, and near-infrared (NIR). Analysis of these observations will show whether the physical cause of the UV dispersion already observed in the UV peak magnitudes and colors also has an impact on the optical luminosities, thereby affecting the usefulness of SNe Ia as standard candles. The sensitivity of the UV to many of the systematic uncertainties (metallicity, extinction, viewing angle, etc) may allow the identification and correction of differences between otherwise ``standard'' candles. This program capitalizes on Swift's unique strengths of rapid response, short term scheduling, and UV capabilities to improve our understanding of the standard candles essential to studies of the expanding universe.

Chomiuk, Laura/Michigan State University
In Search of Shocks: Monitoring Novae with Swift

Abstract for Swift Cycle 16 Proposal #1619110:
In search of shocks: monitoring novae with Swift
Science PI: Elias Aydi (Michigan State University)
Phase 2 PI: Prof. Laura Chomiuk (Michigan State University)

The lack of X-ray detections from shocks that power gamma-ray emission in novae challenges our understanding of these shocks. Whether this lack points to something fundamental about the shock physics, or is simply an issue of small-number statistics, is unclear. We request monitoring of up to two bright novae with Swift (160 ks total request), for one year after discovery, to expand the sample of gamma-ray novae with exquisite X-ray light curves. The resulting data will be interpreted alongside multi-wavelength observations to better understand shocks in novae, particularly characterize the luminosity, duration, temperature, location, and absorbing column of these shocks.

Corsi, Alessandra/Texas Tech University
A SEARCH FOR BL-IC SNE WITH X-RAY AFTERGLOWS USING ZTF+SWIFT

The rare class of massive-star explosions dubbed broad-lined (BL) Type Ic supernovae (SNe), estimated to constitute only ~5% of the Ib/c (stripped-envelope core-collapse) SN population, is of special interest due to its relation to gamma-ray bursts (GRBs). GRBs are the most relativistic explosions arising from a collapsing compact object. What makes some BL-Ic SNe produce a GRB remains a mystery. Two key questions are yet to be answered: (i) What fraction of BL-Ic SNe have radio/X-ray afterglows powered by relativistic ejecta? (ii) Are low-luminosity GRBs beamed? Our proposal aims at answering both of these questions via follow-up observations of SNe discovered by the Zwicky Transient Facility (ZTF), using the Neil Gehrels Swift observatory and the Karl G. Jansky VLA.

Cowen, Douglas/Pennsylvania State University
Swift FOLLOW-UP SEARCHES OF COINCIDENCES FROM THE AMON nu + gamma PROGRAM

We request a set of four Swift ToO campaigns to search for X-ray and/or UV/optical counterparts to low false alarm rate multimessenger neutrino + gamma-ray coincidences during Cycle 16. We will be monitoring three distinct channels for such coincidences and will trigger on any with false alarm rates, computed using scrambled datasets, of less than 4/yr.

Our program will flag a priori unlikely coincidences between high-energy neutrino data from the ANTARES and IceCube neutrino observatories and gamma-ray data from the Swift-BAT, Fermi-LAT, and High Altitude Water Cherenkov (HAWC) gamma-ray observatories.

A 4-tile or a 7-tile mosaic of pointings will survey each alert localization for new, flaring, or otherwise unusual sources, with further follow-up observations of individual sources scheduled as warranted.

Cowen, Douglas/Pennsylvania State University
Searching for High-Energy Neutrino Sources with Swift

In 2017, Swift follow-up observations of an IceCube high-energy neutrino resulted in the first compelling evidence of a source of high-energy neutrinos, the flaring blazar TXS 0506+056. We propose further prompt searches for X-ray and UV/optical counterparts to IceCube high-energy likely-cosmic neutrinos with Swift. From the new IceCube Gold and Bronze alert streams, we will select 12 neutrinos with a 50% localization <~0.3 degrees to prompt a 4-pointing mosaic by Swift, providing roughly 50% coverage of the error region at a depth of 1 ks. A total of 58 ks is required, including monitoring of five candidate sources from the 12 campaigns. Discovery of new electromagnetic counterparts to high-energy neutrinos are crucial for our understanding of their source population and may reveal the origins of the highest-energy cosmic rays.

Earnshaw, Hannah/Caltech
UNDERSTANDING EXTREME ULX VARIABILITY: NGC 925 ULX-3

NGC 925 ULX-3 is a recently-discovered, highly variable ultraluminous X-ray source. This proposal is to observe NGC 925 ULX-3 on a ten-day cadence over its visibility window of 275 days in order to monitor its flux variability. These observations will be used to produce a light curve, which will allow us to establish whether the extreme variation of this source is periodic or irregular and sudden, and therefore what physical mechanism is behind its variability. This insight into the accretion physics of this source contributes to NASA's Physics of the Cosmos goal to better understand extreme accreting sources. The funding granted through this budget will enable the analysis, publication, and communication of the results of these observations.

Foley, Ryan/
PROBING THE PROGENITOR METALLICITY OF TYPE IA SUPERNOVAE WITH EARLY-TIME UV SPECTROSCOPY

Ultraviolet (UV) observations of Type Ia supernovae (SNe Ia) are useful tools for understanding progenitor systems and explosion physics. In particular, UV spectra of SNe Ia, which probe the outermost layers, are strongly affected by the progenitor metallicity. Theoretical models suggest that differences between various explosion models and changing progenitor composition may have relatively little effect on the appearance of optical SN data, but significantly change UV spectra. To disentangle metallicity from various explosion effects, we developed an improved data-reduction pipeline and published >100 SN Ia UV spectra observed by the Neil Gehrels Swift

Observatory. This is the largest UV (< 2900 A) spectroscopic sample of SNe Ia to date. With this sample, we see a significant dependence of SN Ia UV spectrum on host-galaxy metallicity (as the proxy of progenitor metallicity) near peak luminosity. We also find the early-time UV spectra are likely stronger metallicity indicators than near-peak UV spectra. However, the current early-time sample is still small. Here we propose to observe the UV spectra of 6 nearby (z = 0.015) SN Ia at least one week before peak, with the purpose to better investigate the metallicity effect and improve the cosmological precision of SN Ia.

Gezari, Suvi/University of Maryland
Swift Follow-up of Infant Tidal Disruption Events in ZTF: Building a Legacy Sampl

The Zwicky Transient Facility (ZTF) is on track to transform the field of tidal disruption events (TDEs). In the first 1.5 yr of ZTF survey operations, we have demonstrated that TDEs can be efficiently and promptly discovered using a combination of optimized filtering of the ZTF transient alert stream and follow-up spectroscopy with the fully automated Spectral Energy Distribution Machine (SEDM) low-resolution spectrograph. Here we propose a Swift Cycle 16 program to capitalize on the early discovery of TDEs from ZTF and to use Swift's unique simultaneous X-ray and UV monitoring capabilities to measure the broadband evolution of a legacy sample of ! 10 TDEs from their infancy, and definitively resolve the ongoing debate as to what is powering the UV/optical and X-ray emission in TDEs, accretion onto the central black hole and/or circularization of the stellar debris streams.

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Holwerda, Benne/University of Louisville
A SWIFT DEEP/WIDE SURVEY

Deep UV observations of LADUMA's CDFS field exists in a single field, with XMM (Antonucci+ 2015) and SWIFT (Hagen+ 2015).

We ask for SWIFT observations of 8 fields around this central deep field in UVM2 and UVW1 to obtain rest-frame ultraviolet (GALEX NUV) at z= 0.15 and z=0.35. In combination with planned LSST u-band observations, this will make the rest-frame NUV information available from z=0--1 for the entire CDFS, key to following the evolution of massive star formation.

Deep HI observations of this field (the LADUMA project) are ongoing together with the wide SWIFT survey will reveal the relation between gas supply and massive star formation and its evolution. SWIFT is the only instrument that can deliver the filter combinations and resolution in a wide field.

Kaur, Amanpreet/PENNSYLVANIA STATE UNIVERSITY
CLASSIFICATION OF NEW X-RAY
COUNTERPARTS FOR FERMI UNASSOCIATED GAMMA RAY SOURCES USING
SWIFT ARCHIVAL DATA

Out of 5098 sources in the 4th Fermi catalog (4FGL), about one-third are unassociated. Nonetheless, the two most dominant extragalactic and galactic populations in the gamma-ray sky are blazars and pulsars, respectively. We have recently developed a machine learning algorithm to identify blazars and pulsars among the Fermi unassociated sources utilizing Swift-XRT data in conjunction with Fermi. This method associates probability values for each source labeling it as a pulsar, a blazar or neither of the two, which could possibly be some new enigmatic source (aka ambiguous). We have successfully utilized this method to find (and confirm independently in some cases) blazars and pulsars in the previous Fermi catalogs. Swift-XRT has already observed ~ 150 of the 4FGL unassociated sources. Our proposed work would utilize these existing Swift-XRT data, along with Fermi source parameters, to characterize the discovered X-ray counterparts as new likely blazars, pulsars, or ambiguous sources. This proposal would hence enable our team, as well as the whole community, to use these source classifications to guide follow-up with broadband observations and to enable further population studies.

Kennea, Jamie/Pennsylvania State University
SWIFT LOCALIZATION OF MAXI DISCOVERED GALACTIC X-RAY TRANSIENTS

We propose to continue the highly successful program to use Swift to localize Galactic X-ray transients discovered by MAXI, the operational phase of which has been extended until March 31, 2021. MAXI scans almost the entire X-ray sky every ~92 minutes, with a source detection sensitivity of ~60 mCrab in one orbit and ~15 mCrab in one day, discovering X-ray transients with 0.1-0.5 degree accuracies in the 2-20 keV energy band. Swift provides rapid follow-up of MAXI triggers and localization up to 1.4 error radius, which is vital for identifying any optical/radio counterpart. XRT observations will also provide measurements of the low energy X-ray spectra. UVOT data will provide astrometric corrections and possibly optical counterparts. Swift is proven to be uniquely capable in this task.

Kennea, Jamie/Pennsylvania State University
KEY PROJECT: THE DETECTION AND MONITORING OF ELECTROMAGNETIC COUNTERPARTS OF GRAVITATIONAL WAVE SOURCES WITH SWIFT

We seek to support the Swift program to identify EM counterparts of GW events in the final part of O3 and the start of O4. Based on lessons learned during O2 and the in-progress O3, including the detection of the first NS-NS merger event with an EM counterpart, GW 170817, we propose to greatly enhance the Swift GW follow-up program with 4 new initiatives. These include optimizing our follow-up strategy and trigger criteria, increasing sensitivity utilizing pre-imaging surveys, searching for prompt emission in BAT data ,and refactoring our response for the expected higher rates and smaller localizations in O4. In addition, we request deep follow-up observations at high priority in order to monitor and characterize any EM candidate detected by Swift or other observatories.

Kennea, Jamie/Pennsylvania State University
RAPID SWIFT FOLLOW-UP OF FAST RADIO BURSTS

We seek to quickly identify counterparts to FRBs. To date no clear counterpart has been detected at non-radio wavelengths, and the progenitor systems and emission mechanism remain unknown. New radio surveys are now on line that detect a large population of these events in real-time. We propose extremely rapid response follow-up observations with XRT and UVOT. We also propose to save the contemporaneous BAT event-by-event data when the FRB position is within the BAT FOV. This program will provide the earliest and deepest multi-wavelength constraints on non-radio emission from FRBs, as well as the greatest chance of finding a transient counterpart. This program will significantly enhance the science return of \swift, and extend its transient response to help solve the mystery of FRBs.

Lyutikov, Maxim/Purdue University
THE ORIGIN OF PLATEAUS AND OF THE SUDDEN STEEP DECAYS IN GRB AFTERGLOW

One of the most surprising results of the Swift observations of afterglow is the presence of a sudden steep decays in afterglow curves, e.g. in GRB 070110. We will develop a model of early GRB afterglows with the dominant X-ray contribution from the reverse shock (RS) propagating in highly relativistic (Lorentz factor ³w < 106) magnetized wind of a long-lasting central engine. We will assume that the central source produce wind luminosity that is carried by particles and magnetic field, As the outflow starts to interact with the external medium, the RS forms and accelerates particles with a power law distribution The accelerated particles produce synchrotron emission in the ever-decreasing magnetic field and lose energy to the adiabatic expansion. We will investigate how emission from the long-lasting RS in fast wind can resolve a number of contradicting GRB observations: Flares, Fast optical variations, Naked GRBs (GRBs without an appreciable afterglow emission), Similarity of short and long GRB s afterglows, Missing jet breaks, Chromatic jet breaks, Missing orphan afterglows, Missing reverse shocks problem.

Margutti, Raffaella/
Explosion Mechanisms and Energy Sources Powering Super-Luminous Supernovae

This proposal is dedicated to the study of Superluminous Supernovae. This proposal has still to be triggered. Future work include the identification of a suitable target for the observations, triggering of the observations, data reduction, data modeling, interpretation of the results and publication of the results in an international journal.

With peak luminosities Lpeak'1045 erg s-1, the new class of Super-Luminous supernovae (SLSNe) outshine standard SN explosions of a factor ~10-100 and represent the death of the most massive stars in our Universe. The nature of their exceptional luminosity is still unclear and requires exotic explosion mechanisms and/or peculiar sources of energy. Here we propose rapid Swift follow up of 2 newly-discovered SLSNe to map their UV and X-ray emission during the early stages of their evolution as part of our multi-wavelength effort through programs on the VLA, Chandra and optical/NIR facilities. The final aim is to: (i) Pin down the energy source of SLSNe; (ii) Map the diversity of their progenitor stars and pre-explosion evolution.

Metzger, Brian/Columbia University
Origin of Early UV Emission from Binary Neutron Star Mergers

The binary neutron star (BNS) merger GW170817 was accompanied by luminous early UV emission, which may exceed that from r-process radioactive decay. We will conduct a systematic exploration of proposed origins for enhanced early-time UV emission from BNS mergers, ranging from the radioactive decay of free neutrons to ejecta re-heating by a GRB jet or wind from the magnetar remnant. Relativistic hydrodynamical simulations of the interaction between a relativistic outflow from a central engine and the ejecta will be post-processed using an r-process nuclear reaction network and radiative transfer simulation to produce a suite of theoretical UV light curves. Our results will enable UV data on BNS mergers collected by Swift UVOT to be to be translated into probes of the merger physics.

Modjaz, Maryam/New York University
Multi-Wavelength Characterization of Young Fast Evolving Transients for LSST and Beyond

We propose to use Swift to study the UV&X-ray flux of young, rare, interesting, blue transients which we will efficiently identify using a combination of overlapping ZTF/ASAS-SN daily cadence survey data as part of their committed TESS followup and an efficient classification method originally developed for LSST. This strategy will enable us to obtain early UV observations of rare, difficult to detect objects such as Fast Blue Optical Transients (FBOTs) and Infant Supernovae in order to constrain their progenitors and explosion mechanisms. Furthermore, following such transients with Swift will allow us to improve the detection and follow-up strategy for future surveys, such as LSST, by allowing us to accurately characterize UV emission from nearby objects and extrapolate them to high z.

Reines, Amy/Montana State University
A Statistical Approach to Star Formation and Quenching in the Local Universe

The combination of Swift/UVOT NUV imaging and MaNGA integral-field spectroscopy is uniquely suited for investigating some of the most important questions of galaxy evolution, including the processes that regulate star formation and its quenching, and the relationship between stellar and nebular attenuation on the kpc-scales relevant to high-z surveys. We have been using archival UVOT images of 150 MaNGA galaxies to investigate these topics. However our sample is deficient in red, high-mass galaxies and small, blue objects. We propose to correct this by using UVOT to observe 14 of these extreme systems. These data will create a statistically complete sample, and allow us to explore quenching and attenuation in nearby galaxies without the biases associated with galaxy selection.

Ricci, Claudio/George Mason University
UNDERSTANDING THE ORIGIN OF THE NUCLEAR RADIO EMISSION IN RADIO-QUIET AGN

The goal of the proposal is to use simultaneous Swift and ALMA observations of a nearby, variable unobscured AGN to understand the origin of the nuclear radio emission in radio quiet AGN. The origin of the compact radio/mm emission observed in the vast majority of Active Galactic Nuclei (AGN) is in fact still largely debated. It has been recently proposed that this radiation is produced by synchrotron emission from the accretion disk corona, which produces also the X-ray emission ubiquitously observed in AGN. The size of the region responsible for the < 100 GHz emission is expected to be consistent to that of the X-ray corona, so that the detection of correlated 100 GHz and X-ray variability would be the smoking gun to prove that the compact mm emission is associated to the corona. Besides, this would also be fundamental to understand the origin of the X-ray emission, proving, for the first time, that the X-ray corona is magnetically-heated. The monitoring proposed here will combine ten X-ray and UV observations carried out by Swift with ALMA observations at 100 GHz (recently awarded to our group with priority A).

Santander, Juan/University of Alabama-Tuscaloosa
THE NEUTRINO/BLAZAR COSMIC GAMES: IC170922A AND TXS 0506+056, WHAT NEXT?

Despite having been for long time merely a prediction by some cosmic-ray theorists, nowadays multi-messenger astrophysics reveals to be a blooming field and promising ground for discoveries. The coincidence of an IceCube high-energy neutrino with a gamma-ray blazar has directed the attention to this class of objects, as the most promising one to make a first step forward into the open question of the high-energy cosmic-ray origin. Building on this successful detection, we propose Neil Gehrels Swift Observatory follow-up observations of promising neutrino source candidates. The Swift data will be a crucial complement to our ancillary multi-wavelength observations to provide further proof of the AGN-neutrino link.

The program involves target of opportunity follow up observations of astrophysical neutrino events from IceCube coincident with known or newly-detected gamma ray sources. Swift XRT and UVOT observations will be analyzed by the PI, students and Co-I team to search for X-ray and UV counterparts and characterize their spectra.

This program is well-aligned with the scientific objectives of the Swift mission, making use of the unique sensitivity of Swift in the UV and X-ray range, and with NASA' Strategic Objective 1.1 "Understand The Sun, Earth, Solar System, And Universe".

Shappee, Benjamin/University of Hawaii
EARLY-TIME UVOT AND XRT FOLLOW-UP OF BRIGHT TDES DETECTED BY ASAS-SN

We propose to use Swift to obtain ToO observations of 2 nearby tidal disruption events (TDEs) detected by the All-Sky Automated Survey for Supernovae (ASAS-SN) in 2020-2021. We request 30-60 epochs of observation with 1.5-3ks per epoch, for a total of 90ks. ASAS-SN covers the entire visible sky to g < 18.5 mag every 20 hours, and we have discovered six bright, nearby TDEs in 2018 and 2019. Most TDEs detected by ASAS-SN are being discovered well before peak light, allowing for early-time observations that have not been previously possible. Swift observations have provided critical early-time data about the X-ray and UV emission of these recent TDEs, driving new theoretical models of TDE physics. The proposed observations will allow us to obtain similar early-time data for future bright TDEs.

Tomsick, John/University of California, Berkeley
TOO Observation of GRBs Detected with the COSI Balloon Payload

The Compton Spectrometer and Imager (COSI) is a wide-field (25% sky), balloon-borne gamma-ray telescope (0.1-5 MeV) that will launch from New Zealand around April 1, 2020. COSI goals include localizing GRBs and performing measurements of their gamma-ray polarization to probe the prompt emission mechanism. If the 2020 flight lasts as long as the 2016 flight did (46 days), we anticipate detecting ~3-4 GRBs and definitively measuring the polarization of ~2 GRBs. We are requesting Swift TOO observations of GRBs detected by COSI if the fluence level is high enough to permit a polarization measurement or if there is a plausibly associated gravitational wave detection. Swift/XRT observations will refine the position to identify the host galaxy and determine the redshift.

Valenti, Stefano/UC Davis
HIGH CADENCE UV LIGHT CURVES OF EXTREMELY YOUNG SUPERNOVAE

In the hours after explosion, supernovae (SNe) provide clues about their progenitor star systems and their explosion mechanisms. We are conducting a 12-hour cadence SN search of nearby galaxies (D<40 Mpc; the DLT40 Survey), directly tied to rapid ground-based imaging and spectroscopy. Our survey has found 11 SN Ia, 2 SN Ib/c, 4 SN II and one kilonova during the last three years, 14 within <2 days of explosion. We have brought a second search telescope online in Australia, making our program more robust to weather and allowing for a sub-day cadence search. In several instances, DLT40 and its ground-based follow-up have revealed early light curve features (which vary on

several hour time scales) that point to shock breakout, CSM or companion star interactions. One of the main limitations is the cadence of the accompanying Swift UV observations, which start <1-2-days after the request, and have typical cadences of <1 day. Here we request early, very high cadence (<6 hours) UV photometric light curves of all young DLT40 SNe which have nondetections within <24 hours of discovery. This dataset of <5 SNe will point to the progenitor system and environment.

Vasilopoulos, Georgios/Yale University
EXPLORING THE PROLONGED LOW FLUX STATE OF NGC 300 ULX1

It is now clear than many of the ultra-luminous X-ray sources (ULXs) host rotating neutron stars (NSs), but some of their fundamental properties still remain elusive. Among others, we do not know if mass transfer is stable, and we do not fully understand the formation and evolution of outflows. NGC 300 ULX1 is an ideal system for shedding light on these open questions. Its mass accretion rate remained almost constant for a period of at least 4 years, and its magnetic field is fairly well constrained. On September 2018 the system entered a low-flux state, and has remained in that state till today. Continuous monitoring of the system is crucial for identifying patterns of long-term X-ray variability, monitoring this prolonged and unusual off state , and providing prompt trigger alerts for a re-brightening.

Vestergaard, Marianne/University of Arizona
MONITORING THE SLEEPING MONSTER IN AGN MRK 590 AND CLUES TO THE NATURE OF ITS RADIO EMISSION - updated version

After a 10-year hiatus, Mrk 590 seems to be rekindling its nuclear activity! Our existing Swift monitoring data show that the AGN is likely to reach its historical high luminosity state relatively soon. We wish to seize this rare opportunity to document, for the first time ever, the onset of AGN activity if and when it occurs since this can lead to significant insight on the long-standing problem of how AGNs are triggered and fueled. We wish to continue our current monitoring of Mrk 590 with Swift at a ~2-week cadence and with the VLBA on a 7-week basis during Cycle 16. Here, we aim to determine the nature of the radio emission in Mrk 590, confirm its connection to the X-ray processes, and to document the black hole state change from low/hard state to high/soft state, should it occur, since this has not been observed for massive black holes to date.

This monitoring program also serves to trigger other ToO programs with Swift, NuSTAR, XMM, HST and the VLT and the observing program is an important part of a broad-scoped and multi-wavelength study of this remarkable AGN.

This program fully utilizes the full capabilities of Swift by needing both XRT data and the full suite of UVOT broad-band pass images at each visit (each observing epoch).

Wargelin, Bradford/Smithsonian Astrophysical Observatory
Proxima Centauri's Stellar Cycle

Over a decade of optical monitoring has established the existence of a solar-like 7-year stellar cycle in Proxima Centauri, a fully convective dM5.5e star, with further support from Swift X-ray and UV observations that now span more than one full cycle. This important discovery, along with recent theoretical and observational work on fully convective stars, is leading to major advances in our understanding of the structure and evolution of late M stars, and of cool-star magnetic fields in general. We request twelve 3.5-ks observations with 16-day spacing to continue our long term X-ray/UV study of the cycle. Proxima is the only late-type M star practical for such work, and Swift is uniquely well suited for the challenges of monitoring high-energy emission from this flare star.

Youngblood, Allison/LASP
Defining the Energy Budget for Abiogenesis on M-Dwarf Planets

Exoplanet atmospheres and their ability to support the development of life strongly depend on the stellar radiation environment and its variability. We propose a pilot program with the UVOT UV grism to obtain spectroscopy of flares from the young, planet-hosting M dwarf AU Mic. M dwarfs have a deficit of 200-250 nm NUV flux, which is thought to be critical for origin of life scenarios, but enhancements in flux during flares may be able to compensate for the deficit. Spectrally-resolved measurements of M dwarf NUV flares are few, and Swift is the only available observatory that can perform NUV flare spectroscopy on nearby, young, active M dwarfs. We will determine if AU Mic's flares can accommodate several origin-of-life theories, and evaluate the utility of the UV grism for future, more in depth NUV flare studies.