Poster - Session 9
Swift J1357.2-0933, a nearby very-faint X-ray transient

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In the last decade a new population of X-ray transients has been discovered. They show anomalously low peak luminosities (2-10 keV) of 10^{34} to 10^{36} erg s^{-1}. A large fraction of them is expected to harbor accreting neutron stars and black holes in binaries systems. These very faint X-ray binaries provide a new regime to study accretion onto compact objects, and therefore they can improve our understanding of accretion physics and binary evolution models.
Swift J1357.2-0933 is a very-faint X-ray transient recently discovered during outburst in January of 2011, which nature is still unknown. The low column density towards the source and its proximity ($\sim$1.5 kpc) provide an exceptional opportunity to study the X-ray spectrum of a very-faint X-ray transient in unprecedented detail and search for features such as X-ray bursts, X-ray pulsations and eclipses/dips in the X-ray lightcurve. This provides the opportunity to gain insight into the nature of this system and allows for a deeper understanding the peculiar population of very-faint X-ray transients in general. We present our initial results from *Swift*/XRT observations obtained along the outburst of this unique source.

Oral - Session 9.5.2
Swift observations of sub-luminous accreting black holes and neutron stars

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Sub-luminous accreting black holes and neutron stars (with a low-mass donor) have atypical low X-ray luminosities of 10^{34-35} erg s^{-1} which corresponds roughly to 0.01%-0.1% of the Eddington luminosity. The last decade a large amount of observational information on the behavior of those systems at such low accretion rates has been obtained, both for brighter transients which on their way to their quiescent state go through this accretion rate regime, as well as for those transients which never become brighter than a few times 10^{35} erg s^{-1}. In addition, a growing number of systems are known which are persistent at X-ray luminosities in this enigmatic luminosity range. *Swift* has been and still is of paramount importance for understanding the behavior of these systems at those faint X-ray luminosities. Its flexibility in scheduling observations as well as the XRT sensitivity in the 0.5-10 keV X-ray band have played a crucial role in studying those enigmatic systems. I will present a shot overview of our knowledge of those systems, focussing on the major contributions made with *Swift* and what we can learn from them with respect to the theories explaining accretion flows near compact objects and how they can help to constrain fundamental properties of compact objects.

Poster - Session 1
GCN: New Features and a Swift Focus

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We present the GCN (Gamma-ray Coordinates Network) system; a description of its functions and capabilities with a focus on the recently added functions, features, and new data types. With several new non-GRB-related notice types recently added, GCN continues its efforts to broaden the scope and is transitioning to TAN (Transient Astronomy Network). Also, emphasis will be given to the *Swift* portion of GCN.

Oral - Session 5.2.2
A Search for Lyman Break Galaxies in the CDF-S Using *Swift* UVOT

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While the *Swift* satellite is primarily designed to study gamma-ray bursts, its ultraviolet and optical imaging and spectroscopy capabilities are also being used for a variety of scientific programs. In this study, we use the UV/Optical Telescope (UVOT) instrument aboard *Swift* to discover $0.5 < z < 2$ Lyman break galaxies (LBGs). UVOT has covered ~ 266 arcmin^2 at >60ks exposure time, achieving a limiting magnitude of $u < 24.5$, in the Chandra Deep Field South (CDF-S). Applying UVOT near-ultraviolet color selection, we select 50 UV-dropouts from this UVOT CDF-S data. We match the selected sources with available multiwavelength data from GOODS-South, MUSYC, and COMBO-17 to characterize the spectral energy distributions for these galaxies and determine stellar masses, star formation rates (SFRs), and dust attenuations. We compare these properties for LBGs selected in this paper versus $z \sim 3$ LBGs and other CDF-S galaxies in the same redshift range ($0.5 < z < 2$), identified using photometric redshift techniques. Using the GOODS-South multiwavelength catalog of galaxies, we simulate a larger and fainter sample of LBGs to compare their properties with those of the UVOT-selected LBG sample. We conclude that UVOT can be useful for finding and studying the bright end of $0.5< z <2.0$ LBGs.

Poster - Session 3
Energy Dependent Spectral Lags in GRBs

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Fermi Gamma-ray Burst Monitor has detected more than 750 γ-ray bursts (GRBs) so far of which $\sim$20% are short bursts with durations (T_{90}) less than 2 s. It is generally observed that long duration GRBs exhibit lags ranging from 0 to 10s of seconds while short GRBs exhibit lags in the range 0 to a few tens of milliseconds. We choose a set GBM GRBs which are bright in the high energy (Bismuth Germanate, BGO, energy range 0.15-40 MeV) detectors and confirm this general trend. We also study the evolution of spectral lags as function of γ-ray energy. We find that different GRBs exhibit different types of variation in spectral lags as a function of energy. In a few of the GRBs the lag changes sign at MeV energies suggesting that the $> MeV$ γ-rays lead while the $< MeV$ γ-rays lag with respect to lower energy (20-40 keV) γ-rays. We also study the energy dependence of lags in different parts of the light curves and relate this to the spectral evolution of the burst.

Oral - Session 4.2
Swift Observations of Small Bodies in the Solar System

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Comets and asteroids are considered relatively pristine leftovers from the early days of our Solar System, so their composition provides fundamental observational tests of cosmogony and the evolution of our solar system. The instruments on board *Swift* provide a unique window for studying these small bodies.

Asteroid shapes, sizes, and surface geology are dominated by impacts. This was dramatically illustrated by our *Swift* observations of (596) Scheila within a few weeks after it was impacted by a smaller asteroid. Reflectance spectroscopy provides the most direct information about the surface compositions of asteroids. The band between 200 - 300 nm contains significant compositional signatures, in particular for primitive asteroids. UVOT fills in an important gap between Far-UV instruments on planetary missions such as Dawn, Rosetta and New Horizons, and ground based observatories that cover visible wavelengths.

For comets, the wide spectral and spatial grasp of the UVOT grism permits simultaneous sampling of the molecular daughter fragments responsible for most of the UV and optical emission from coma gases, while UVOT images reveal the distribution and temporal development of gas and dust in the coma. Simultaneously, XRT spectra reveal the interaction between coma gases and the solar wind. When solar wind ions fly through an atmosphere they are neutralized via charge exchange reactions with the neutral gaseous species. These reactions depend strongly on target species and collision velocity, and the resulting X-rays are a strong diagnostic of local solar wind conditions and of bulk properties of the cometary gas.

In my talk I will provide an overview of our results with *Swift*.

Poster - Session 3
A gamma-ray burst in slow motion: GRB 110205

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Thanks to an early alert from *Swift* GRB 110205 was observed by a variety of instruments. We could obtain early data with TAROT, and extended follow-up using telescopes in France. We used this data, as well as X-ray, gamma-ray, and ground observatory observations to explore the physics of the fireball through its different phases, internal, reverse and forward shocks. Though during the later phases the burst can be considered as "canonical" several problems arise during the prompt phase.

Oral - Session 6.2.1
Ultraviolet Observations of Supernovae with UVOT – One of *Swift*'s Great Legacies

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Swift has observed nearly 200 supernovae (SNe) in the X-rays, Ultraviolet (UV), and optical during its first 7 years in orbit. I will focus on the UV observations and how *Swift*'s rapid response and short term scheduling has created the largest sample of UV light curves. The *Swift* sample covers all major types and most subtypes and many unique objects and will be the primary comparison sample for high redshift SNe observed in the rest-frame UV by large, ground-based optical telescopes for decades to come. The large and growing sample can address many scientific questions. From the shock breakouts seen from core-collapse SNe to those not seen in the thermonuclear SNe Ia, early UV observations are sensitive probes of the progenitor systems. Furthermore, the UV region is very sensitive to differences in metallicity and extinction, and a better understanding of those variables will improve the usefulness of SNe Ia as standard candles. While the *Swift* sample is already quite impressive, continued observations will give greater statistical power to these systematic differences and increase our knowledge of the diversity of stellar explosions in the local universe.

Oral - Session 9.2.3
Swift J1644+57: Discovery Of A Newly Active Massive Black Hole

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On March 28, 2011, the Swift Burst Alert Telescope triggered on an object that has no analog in over six years of Swift operations. Followup observations by the Swift X-ray Telescope have shown a new, bright X-ray source with highly variable flux (covering 3 orders of magnitude in flux over the first few days) that has been much more persistent than gamma-ray burst afterglows. Optical photometry shows a decaying NIR source coincident with the X-ray object. Ground-based spectroscopy found a redshift of 0.35, implying extremely high luminosity, with integrated isotropic X-ray energy output exceeding 10^{53} ergs in the first two weeks after discovery. Deep serendipitous archival X-ray observations show no counterpart over the past 20 years to fluxes orders of magnitude below the light curve peak values. There is strong evidence for a collimated (or beamed) jet. The observational properties of this object are unlike anything ever before observed. We interpret these unique properties as the result of emission from a relativistic jet produced in the aftermath of the tidal disruption of a star by a massive black hole in the center of the host galaxy. If so, we expect the source to decay slowly as the stellar remnants are accreted onto the central black hole.

Oral - Session 7.2.1
Variability monitoring of AGN with *Swift*

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We present the results of year-long XRT and UVOT *Swift* monitoring campaigns on four AGN with a range of accretion rates: The narrow line Seyfert 1 (NLS1) galaxies 1H 0707-495 and IRAS 13224-3809 ($\dot{m}_E \sim 1$), the low black hole mass (10^5 $M_\odot$) Seyfert 1 galaxy NGC 4395 ($\dot{m}_E \sim 0.01$) and the LINER M 81 ($\dot{m}_E \sim 0.0001$). Each visit typically lasted for 1 ksec and a variety of UVOT filters were used.

In NGC 4395 there is very close correspondence between the X-ray and all UVOT bands on all observable timescales from months to hours. The X-ray and UVOT lightcurves are very similar. Two 3 ksec TOO observations triggered during a high flux period indicate that the UV lags the X-rays by ∼400 secs.

As the nucleus of M 81 is much fainter compared to the surrounding galaxy than our other targets the UVOT variations are less clear but very weak variability is seen in the W1 band which is approximately simultaneous with the X-ray variability.

The situation for the NLS1s is rather confusing. The large amplitude variations seen in the X-rays do not generally have corresponding W2 variations, though such variations are occasionally seen. Large amplitude changes are also sometimes seen in the W2 when the X-ray flux is low and relatively quiescent. The cross-correlation function does suggest a very weak X-ray/W2 zero lag correlation in IRAS 13224-3809, but nothing significant is seen for 1H 0707-495.

We conclude that the UV variability in the high accretion rate NLS1s is probably mostly intrinsic disc variability whereas in the lower accretion rate AGN, and certainly in NGC 4395, the UVOT variability is largely attributable to reprocessing of X-ray emission. The origin of UV emission in LINERs such as M 81 has long been disputed and our results are consistent both with reprocessing of X-ray emission from a truncated disc or with synchrotron emission from a jet.

If time permits, we can also discuss the results of simultaneous radio monitoring of M81 which reveal the clearest X-ray/radio correlation yet found in any non-blazar AGN, with a radio lag of ∼55 days.

Poster - Session 9
A Christmas minor body falling onto a neutron star

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The tidal disruption of a solar mass star around a supermassive black hole has been extensively studied analytically and numerically. In these events the star develops into an elongated banana-shaped structure and is disrupted. After completing an eccentric orbit, the bound debris fall onto the black hole, forming an accretion disk and emitting energy. The same process may occur on planetary scales, if a minor body orbits too close to its star. In the Solar system comets fall directly onto our Sun or onto planets. However, if the star is a compact object, the minor body can become tidally disrupted, producing a strong high energy emission. We found that the peculiarities of the Christmas burst (formally GRB 101225A) can be explained by a tidal disruption event of a minor body around a Galactic neutron star.

Oral - Session 13.2.3
Swift contribution to the Fermi Pulsar revolution

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One of the major breakthroughs of the *Fermi* mission has been the discovery of dozens of radio quiet neutron stars. In gamma-rays such objects are singled out owing to the time signature of their photons. However, to maximize their signal, usually buried in the galactic background, the knowledge of their precise position help greatly. Rapid *Swift* observations of candidate pulsating neutron stars have unveiled the counterpart of 4 gamma-ray pulsars allowing the optimization of their light curves. Conversely, when no *Swift* source was found, the XRT upper limits have been used to set limit on the ratio between gamma and X-ray fluxes and to assess the observing time needed by *Chandra* or *XMM-Newton*.

Poster - Session 9
A New Class of Relativistic Outbursts from the Massive Black Holes in the Nuclei of Distant Galaxies

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The recent discovery of the transient source *Sw* J1644+57 (also known as GRB 110328A) has revealed an entirely new and potentially revolutionary class of high-energy outbursts. Like gamma-ray bursts (GRBs), *Sw* J1644+57 is associated with the birth of a relativistic jet, and thus provides a unique laboratory to probe one of the most extreme environments of astrophysics. Yet unlike GRBs, which are brief, catastrophic explosions, the engine powering *Sw* J1644+57 is extremely long-lived, generating luminous X-ray emission for months after discovery. While definitive evidence for its origin remains elusive, the nuclear location and prompt onset suggest the sudden accretion of material onto a massive black hole, possibly due to the tidal disruption of a star. Here we present an overview of the discovery and basic theoretical framework for *Sw* J1644+57, as well as continued panchromatic monitoring of the source. We also describe a second high-energy transient, *Sw* J2058+05, which shares of many of the same properties that made *Sw* J1644+57 so exceptional.

Oral - Session 6.2.2
Swift Observations of Palomar Transient Factory Discoveries

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The Palomar Transient Factory (PTF) is an ongoing wide-field (7.8 deg^2), high-cadence (minutes to days) survey of the optical sky pursuing two primary goals: First, to perform systematic studies of known classes of transient and variable objects (supernovae, extragalactic novae, RR Lyrae, AGN, etc.); and second, to enable the discovery of new classes of transients by exploring new regimes of sensitivity and fast variability. Prompt X-ray and UV observations of PTF discoveries with *Swift* have been vital to our understanding of many of these sources. Here we highlight some of the main results from this PTF-*Swift* synergy, including the discovery of a new class of UV-bright luminous supernovae, the discovery of a thermal outburst from the nucleus of a previously inactive galaxy, constraints on the progenitor system of the nearby Type Ia supernova PTF11kly (SN 2011fe), and early observations of shock breakout from the Type IIb supernova PTF11eon (SN 2011dh). Finally, we discuss the prospects for *Swift* follow-up of optical transients discovered in upcoming synoptic surveys (PTF2, LSST).

Withdrawn - Speaker unable to travel
Multi wavelength variability study of Blazars CGRABs J0211+1051

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Blazars are known to emit copiously throughout the electromagnetic spectrum. They exhibit the variability in flux and polarization over several time scales. Therefore for study of energy generation processes in these objects, one needs to cover all possible energy bands. The broad energy coverage by the instruments on-board *Swift* (optical-to-X-rays) and *Fermi* ($0.1-100$ GeV), makes them ideal for the study of Blazars.

We are regularly monitoring a sample of blazars at optical wavelengths for their variability property. In this contribution we present multi-wavelength study of a BL Lac object CGRABs J0211+1051, which was also observed simultaneously by *Swift* and *Fermi*. Ground-based optical observations were carried out during 2011 January 30 to February 03 using photo-polarimeter and EMCCD mounted on 1.2 m & 20″ telescopes, respectively, of Mt. Abu Infrared Observatory (MIRO) India. From polarimetric observations it we notice that the source shows significant intra-night as well as inter-night variation of the polarization degree (PD). A sudden change seen in the position angle (PA) within two consecutive nights, accompanied by a rise in the PD, indicates, perhaps, the fresh injection of electrons in the jet.

Swift and *Fermi* data, together with MIRO measurements, were used both to study the variability in different energy bands and to build a spectral energy distribution (SED), in order to better understand the nature of this source. We present preliminary results of this work.

Poster - Session 13
Discovery and Multi-wavelength Observations of the New Gamma-ray Binary 1FGL J1018.6–5856

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We present the discovery and multi-wavelength observations of a new gamma-ray binary system. From the search for periodic modulation in the 100 MeV to 200 GeV Fermi-LAT light curves of all sources in the first Fermi-LAT catalog, 1FGL J1018.6–5856 was found to have a 16.6 day modulation in its gamma-ray light curve that is accompanied by spectral variability. We also identified a counterpart in the X-ray, radio and optical wavebands using data from the *Swift*/XRT, ATCA, and telescopes at SAAO and LCO. The X-ray and radio counterparts are highly variable - the X-ray flux is modulated on the orbital period with maximum X-ray flux coinciding with the phase of maximum gamma-ray flux. Considering the current limited photon statistics in the XRT spectra, there is no significant evidence for phase dependence in the X-ray spectrum and absorption. The optical counterpart has a spectral type of approximately O6V((f)) and shows little variability in a series of *Swift*/UVOT observations. The overall properties of 1FGL J1018.6-5856 indicate that it is a member of the rare gamma-ray binary class of objects, and that it shares several properties with LS 5039. However, there are also several differences from LS 5039, including the relative phasing of the gamma-ray flux and spectral modulation and the shape of the X-ray light curve. The similarities and differences are expected to allow us to more fully develop our understanding of the astrophysics involved in these enigmatic objects.

Oral - Session 8.1
Twelve Years of Education and Public Outreach inspired by *Swift*

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An overview of the *Swift* Education and Public Outreach (E/PO) program will be presented. Since 1999, *Swift*'s E/PO program has included the development of educator guides, popular websites, high-leverage informal education efforts and extensive teacher training programs. The public relations efforts for *Swift* will be summarized and plans for future *Swift* E/PO in 2012-2014 will be outlined.

Poster - Session 10
The Palermo Swift-BAT Hard X-ray Catalogue: results after 66 months of sky survey

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The Burst Alert Telescope (BAT: 14-150 keV) on board of Swift is providing the opportunity for a substantial gain of our knowledge of the Galactic and extragalactic sky in the hard X-ray domain, thanks to its continuous monitoring of the sky (50%-80% per day). Here we present the third Palermo Swift-BAT hard X-ray catalogue obtained from the analysis of the data relative to the first 66 months of the Swift mission and including about 1800 hard X-ray sources. With a program of soft X-ray follow-up observations and by using archival data we were able to associate a counterpart to most of these high energy emitters: 59% are extragalactic objects, 20% are Galactic objects and 9% are known soft X-ray emitters whose nature has not been determined yet. We compare our catalogue with those obtained from the INTEGRAL-ISGRI data and with the gamma-ray sky as seen by Fermi.

Poster - Session 7
Swift follow-up of gamma-ray flaring AGNs in the Fermi era

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Since its launch in 2008 June, the *Fermi* Gamma-ray Space Telescope has opened a new era in highenergy astrophysics. The unprecedented sensitivity, angular resolution and effective area of the Large Area Telescope onboard *Fermi*, together with the nearly continuous observation of the entire gamma-ray sky assures a formidable opportunity to find flaring episodes from gamma-ray emitting AGNs of various types. In this context the *Swift* satellite, thanks to its broad band coverage and scheduling flexibility, creates a perfect synergy with *Fermi*. The rapid *Swift* follow-up of gamma-ray flaring AGNs detected by *Fermi*-LAT were fundamental for a firm identification of the gamma-ray sources by means of correlated variability in optical, UV, and X-rays. In addition *Swift* and *Fermi* simultaneous observations allowed us to build time-resolved spectral energy distributions from optical to gamma rays and to constrain the emission mechanisms at work in these objects. A review of the most interesting results obtained from *Fermi*-LAT and *Swift* observations of gamma-ray flaring AGNs in the first three years of *Fermi* operation will be presented.

Oral - Session 9.4.2
Rare thermonuclear X-ray bursts caught by Swift

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When matter is accreted onto a neutron star, it can undergo unstable thermonuclear burning that results in a sudden, bright flash of X-ray emission. Such *thermonuclear X-ray bursts* usually have a duration of a few seconds/minutes and a radiative output of $\sim 10^{39}$ erg. Occasionally, however, more energetic events with an energy output of $\sim 10^{40-41}$ erg and a duration of tens of minutes, up to hours, have been observed. These *intermediately long* thermonuclear bursts are thought to result from the ignition of a thick layer of helium and their host systems trace an unusual accretion regime ($< 1\%$ of Eddington). These rare events can further our understanding of thermonuclear burning on accreting neutron stars and put important constraints on the properties of the neutron star crust and core.

Owing to its unique set-up, combining the wide field of view of the BAT, unprecedented slewing flexibility and the XRT's sensitive coverage in the 0.5–10 keV energy range, *Swift* is an ideal tool to capture these unusual thermonuclear X-ray bursts and study them in great detail. I will review how important *Swift*'s contribution has been in this research field: it allowed the identification of low-luminosity X-ray binaries that would otherwise have remained unclassified or undetected, and has provided unique observational insight into thermonuclear burning and the physics of accreting neutron stars. Furthermore, I will outline the important role that *Swift* can play in the future in solving some of the key questions in this research field.

Poster - Session 9
Understanding gamma-ray binaries with *Swift*/XRT monitoring observations.

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Gamma-ray binaries are rare, puzzling systems, emitting copious high energy (GeV and TeV) gamma rays due to the interaction of a massive star's wind with a relativistic particle outflow powered by a compact object. *Swift*/XRT has been instrumental in characterizing the soft X-ray properties of such sources, yielding important clues on their nature. The first system that we studied with *Swift*/XRT was LS I +61° 303. A monitoring campaign allowed us to assess the overall modulation of the X-ray flux at the 26.5 days orbital period, as well as to study a peculiar variability on a much shorter ($\sim$ 1 hr) time scale. Interesting results have been obtained for 1FGL J1018.6–5856, the last entry in the X-ray binary family, recently discovered in *Fermi*-LAT data. The X-ray counterpart of such system, singled out by Swift, displays a strong, stable modulation at the orbital period (16.6 days), with a sharp, flare-like peak coincident with maximum gamma-ray emission. We will discuss the overall similarities (and the surprising differences) of LS I +61° 303, 1FGL J1018.6–5856 and of LS 5039, a further system which have also been extensively studied with *Swift*/XRT.

Poster - Session 9
INTEGRAL and *Swift* observations of X-ray binaries with very-faint luminosity

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In the last years a new generation of high sentitivity X-ray telescopes combined with wide-field hard X-ray telescopes have allowed the discovery of a new class of X-ray binaries: the Very Faint X-ray Transients (VFXTs). VFXTs reach outburst peak luminosities from 1E34 up to few 1E36 erg/s (in 2-10 keV), which are almost two/three orders of magnitude fainter than the brighter systems. To date, about 30 members are known and they very likely form a non-homogeneous class of objects. A significant fraction (about 1/3) of the VFXTs exhibited type-I X-ray bursts and can thus be identified with neutron stars accreting matter from a low-mass companion. It is likely that the Beppo-SAX so-called "burst-only" sources are linked to the class of VFXTs. However, little is known about the mechanism which drives their very low accretion rate. We review on VFXTs and present latest results on sub-luminous X-ray bursters, as observed by INTEGRAL and Swift.

Poster - Session 4
X-ray emission from an asymmetric blast wave and a massive white white dwarf in the gamma ray emitting nova V407 Cyg

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Classical nova events in symbiotic stars, although rare, offer a unique opportunity to probe the interaction between ejecta and a dense environment in stellar explosions. To explore such an interaction, we use X-ray data obtained with a deep Suzaku poiting and a long Swift campaign triggered by the recent classical nova outburst in V407 Cyg. We find evidence of both equilibrium and non-equilibrium ionization plasmas at the time of peak X-ray brightness, indicating a strong asymmetry in the density of the emitting region. Comparing a simple model to the data, we find that the X-ray evolution is broadly consistent with nova ejecta driving a forward shock into the dense wind of the Mira companion. We detect a highly absorbed soft X-ray component in the spectrum during the first 50 days of the outburst that is consistent with supersoft emission from the nuclear burning white dwarf. The high temperature and short turn off time of this emission component, in addition to the observed breaks in the optical and UV lightcurves, indicate that the white dwarf in the binary is extremely massive.

Poster - Session 2
Hard X-ray Emission from Transient Magnetars during Outbursts

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Soft Gamma Repeaters (SGRs) and Anomalous X-ray Pulsars (AXPs) are a peculiar subclass of neutron stars, all showing slow rotation periods ($P\sim$ 2–12 s) and high spin-down rates ($\dot{P} \sim 10^{-12}$ s s^{-1}) (e.g., Kouveliotou, Nature 393, 1998) . About 20 magnetars have been recognized in our Galaxy and Magellanic Clouds so far, mainly emerging in the X-ray frequency. Since the calculated release of their rotational energies fall ∼2 orders of magnitude short of their relatively high soft X-ray luminosity ($\sim 10^{35}$ erg s^{-1}), and because the measured P and $\dot{P}$ suggest that these objects have unusually high dipolar magnetic field reaching $B \sim 10^{14}$–10^{15} G, they are thought to be powered by dissipation of their huge magnetic energies, and called "magnetars" (Thompson & Duncan, MNRAS, 275, 1995).

In addition to the well-known quasi-thermal soft X-ray component with $kT \sim 0.5$ keV, the INTEGRAL satellite discovered that another hard power-law component appears above 10 keV in some persistently bright magnetars, which extends at least up to ∼100 keV with an extremely hard photon index $\Gamma \sim 1$ (Kuiper et al., ApJ 645, 2006). The Japan/US Suzaku X-ray observatory also confirmed this hard X-ray emission from several magnetars (e.g., Enoto et al., PASJ, 387, 2011). Since the soft and hard X-rays can be simultaneously observed using a wide energy coverage of Suzaku (0.3–600 keV), we recently found that a broad-band (0.8–70 keV) spectra of known magnetars systematically change depending on their characteristic age and magnetic field; the hard X-ray component becomes weaker relative to the soft component, and harder towards sources with older characteristic ages (Enoto et al., ApJL 722, 2010).

In order to investigate the X-ray emission in detail, one of important progress in recent years is the growing number of transient magnetars, most of which have been discovered by Swift/BAT through detection of short burst activities. During such a burst-active period, the soft X-ray intensity of magnetars also increases by 1–2 orders of magnitude, and then gradually decays within a couple of month (e.g., Rea et al., MNRAS, 396, 2006). Interestingly, during the outburst of transient magnetars, the above hard X-ray component were also detected, presumably becoming bright as the soft X-ray component. From recent Suzaku follow-up observation, the hard X-rays were successfully detected from two transient magnetars so far, SGR 0501+4516 (Enoto et al., ApJ 715, 2010) and 1E 1547.0-5408 (Enoto et al., PASJ, 62, 2010). There are also a sign of the hard X-ray detection from SGR 1833-0832.

Since the typical hard X-ray flux is weaker compare to the current sensitivity of most existing detectors, the high sensitivity of Hard X-ray Detector (HXD) on board Suzaku is effective in the ToO observations of transient magnetars. Based on our recent experiences of SGR 0501+4516, 1E 1547.0-5408, SGR 1833-0832, and SWIFT J1822.3-1606, in order to trigger Suzaku ToO observations, Swift burst detections and following X-ray monitoring are essential to discover new magnetars and to estimate the feasibility of the hard X-ray detection. In our previous cases, we tried to trigger Suzaku ToO observations if the soft X-ray flux is brighter than $\sim 10^{-11}$ erg s^{-1} cm^{-2}. A possible spectral change in the hard X-rays during the decay phase of transient magnetars could be especially important to resolve the emission mechanism of magnetars.

Poster - Session 10
Swift monitoring of the central X-ray source in RCW 103

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The X-ray source 1E 161348–5055 (1E 1613) lies at the centre of the 2-kyr-old supernova remnant RCW103. While most interpretations favour a neutron star scenario (in which the star is either isolated or in a binary system), owing to its 24-ks modulation, orders-of-magnitude flux variability over a few months/years and lack of an obvious optical counterpart, 1E 1613 defies assignment to any known class of X-ray sources. Starting from 2006 April, *Swift* observed 1E 1613 with its X-Ray Telescope for about 2 ks approximately once per month. The long time-span of the *Swift* data makes it possible to obtain a phase-coherent timing solution, encompassing also *Chandra* and *XMM*-Newton archival observations. This allowed us to obtain an accurate measure of the period of 1E 1613 [P = 24030.42(2) s] and to derive the first upper limit on its period derivative ($|\dot{P}| < 1.6 \times 10^{-9}$ s/s at 3σ). In the case that 1E 1613 is a binary system, our upper limit on the period derivative is non-constraining, but if 1E 1613 is an isolated magnetar surrounded by a fossil disc, then it must be either a propeller or an accretor at present, and our limit makes the propeller option rather unlikely.

Oral - Session 13.2.5
Swift Observations of the Newest TeV emitting X-ray Binary: HESS J0632+057

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HESS J0632+057 is a TeV object that was previously categorized as unidentified; i.e. with no known counterpart at other wavelengths. XMM observations showed that there is a variable X-ray source at the position of the HESS point source and that the X-ray and TeV emission were coincident with a Be star. A binary nature was hypothesized for the source. If this was true, then HESS J0632+057 would be one of just a few such sources, and the TeV emission would imply very high energy processes in the vicinity of the X-ray binary. To confirm this binary hypothesis, it would be necessary to either measure radial velocity shifts or to measure a binary orbital period. Swift began a campaign on this source to elucidate the nature of the source, and in particular, to search for periodicity. By finding a 321 +/- 5 day orbital period, Swift has confirmed the binary nature of this exciting emitter of TeV gamma rays. Further work to study the characteristics of this source and the potential acceleration mechanisms is ongoing.

Oral - Session 3.2.4
A Diverse Population of Short Gamma-Ray Burst Environments

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While the progenitor model of long GRBs is widely accepted, the progenitors of short GRBs are not well understood. With potential gravitational wave detections a few years out, observations of short GRB local and galactic environments currently provide the most direct probe into the nature of their progenitors. Here, I present the most current demographics of short GRB environments in terms of host morphologies and burst locations with respect to their host galaxies. I will show that short GRBs not only originate from a diverse population of hosts, but also that $\sim 25\%$ of well-localized bursts have no coincident host galaxies down to deep optical limits. I analyze these demographics in terms of what we expect for a variety of short GRB progenitor models.

Oral - Session 7.4.2
The role of *Swift* in the discovery of γ-ray emission from Narrow-Line Seyfert 1 Galaxies

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In 2008, the *Fermi* satellite discovered variable high-energy γ rays ($E > 100$ MeV) from some Narrow-Line Seyfert 1 Galaxies (γ-NLS1s). The *Swift* satellite, particularly with its instruments XRT and UVOT, played a very important role both in establishing the early characteristics of the broad-band electromagnetic emission from the first γ-NLS1 (PMN J0948+0022) and in confirming the association of the γ-ray source with the NLS1 through a MW campaign. *Swift* contributed also in the early studies on other γ-NLS1s, specifically on PKS 1502+036 and 1H 0323+342, the latter being the first NLS1 to be detected with BAT at hard X-rays ($20 - 100$ keV). A summary of the *Swift* contribution to this research field is presented.

Oral - Session 10.3.2
The VERITAS Extragalactic Sky: Contemporaneous Modeling of Very High Energy Blazars with Constraints from *Swift*

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In the past decade, remarkable progress has been made in very high energy (VHE; E$\geq$ 100 GeV) gammaray astrophysics. The VHE source catalog currently contains 48 extragalactic objects. VERITAS has detected 23 of these, including 10 VHE blazar discoveries, and many of the detected blazars have exhibited significant VHE variability. TeV blazars have spectral energy distributions (SEDs) with a synchrotron peak in the X-ray/UV/optical bands and a second peak at GeV energies, often thought to be due to inverse Compton emission. Each VERITAS blazar discovery, as well as each observed VHE flaring episode, was promptly followed up with Swift target-of-opportunity observations. These data allow the investigation of flux and spectral variability patterns of the highest energy particles, strongly constrained by the Swift XRT and UVOT exposures. Broadband SED modeling of these data has provided insights into the the energetics and timescales of particle acceleration and cooling, which are critical to understanding the physics of jets in these VHE blazars.

Oral - Session 1.1
Opportunities for *Swift*

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No abstract received

Poster - Session 7
The spectral energy distributions of quasars with simultaneous optical and X-ray data from *Swift*

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We have defined a sample of 843 optically-selected quasars from the Sloan Digital Sky Survey that were observed by *Swift*, including 637 with simultaneous coverage (345 with detections) by both UVOT and XRT. This is the largest sample to date of quasars with simultaneous multiwavelength data, spanning redshifts from 0.01 to 4.6 and over three orders of magnitude in luminosity. The *Swift* data, supplemented with photometry from SDSS and 2MASS, are used to constrain models of both the X-ray spectra and the broadband spectral energy distributions (SEDs). In addition, we measure the emission line parameters from the SDSS spectra and use these to estimate the black hole masses. We then test for correlations between the measured parameters. By using simultaneous multiwavelength data to anchor the SEDs, we mitigate the impact of variability. We confirm previous claims of a correlation between the relative power in the UV and X-ray bands (α_{ox}) and the UV luminosity, but compared to earlier studies, these data provide a stronger correlation with reduced scatter. We also find a weak correlation between the Eddington ratio and the UV spectral slope. However, unlike some previous studies, we do not find significant correlations between the X-ray and UV spectral slopes, nor between either of these and α_{ox}. We also find no evidece of cosmological evolution in these parameters. We will also present a first look at our upcoming study of multiwavelength variability in these AGN, in which we will measure lags between the XRT and UVOT light curves.

Oral - Session 7.3
Active Galactic Nuclei – Blazars

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No abstract received

Oral - Session 13.1
Combining Swift and GROND observations

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I will discuss three different science investigations which were (and are) only possible due to the combination of Swift and ground-based optical/NIR coverage, in particular GROND:

- Dense monitoring of GRB afterglows not only at X-rays, but also in the optical/NIR reveals many surprises which we typically ignore by fitting over data gaps. I'll show examples where we actually are X-ray starved.
- The GRB-SN connection. I will argue that the restriction to "interesting" bursts in the last years has let a number of BAT-triggered, seemingly nearby (z¡0.5) GRBs slip through without spectroscopic ID, which were recovered due to systematic GROND follow-up until late-times. Thus, BAT triggers and XRT/UVOT follow-up needs to continue, as it provides important, but largely unexplored territory.
- Simultaneous UVOT and GROND observations provide a unique wavelength coverage which proves extremely useful in various applications where spectral energy distributions (SEDs) are crucial, among others for photo-z estimates of Fermi-detected blazars or identification of X-ray transients.

Oral - Session 7.2.2
Rapid, Correlated UV and X-ray Continuum Variability in PKS 0921-213

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We have carried out a monitoring campaign of the broad-line radio galaxy PKS 0921-213 with the Swift XRT and UVOT+UVM2 filter simultaneously with optical spectroscopy from the CTIO 1.5m telescope. This object is known for its double-peaked Balmer emission lines which are characteristic of emission from an accretion disk. Therefore, our goals included probing correlations between the variability of the optical Hα line and the X-ray and UV continuum and searching for variability of the optical line profiles on a time scale comparable to the dynamical time in the line-emitting portion of the accretion disk (at a few thousand gravitational radii from the center). The campaign spanned two seasons: The first one starting in October 2009 ending in July 2010 and the second one between January and July 2011. The typical cadence for this project was every 4 days for 1 ks each when M2 was filter of the day. Simultaneous spectroscopy from the CTIO 1.5m telescope was obtained approximately once every 10 days. Here we present the first results on correlated continuum variability in the UV and X-ray bands. The variations in the UV band appear to lag those in the X-ray band with a delay of approximately 2 weeks. In the second season of our campaign, PKS 0921-213 showed a very sharp X-ray flare in April 2011 with an (unresolved) rise time of < 8 days and a more gradual (resolved) decay time of approximately 2 weeks. The corresponding UV light curve shows a flare which rises equally quickly but decays more gradually, over a time scale of 4 weeks. Taken together, the above variability properties suggest that the UV continuum is the result of reprocessing of the X-ray continuum in the same region of the disk where the optical emission lines originate. We quantify these results by computing the continuum transfer function of the UV-emitting region of the disk. We also compare the geometry of the UV-emitting region with that of the optical line-emitting region, as inferred from the profile of the Hα lines. A Cross-correlations function analysis shows that the UV is trailing the X-ray variability by about 12 days. Although Swift has monitored many AGN, PKS 0921-213 is probably the best example showing a clear connection between the variability seen in X-rays and the UV.

Poster - Session 7
Swift and XMM monitoring of the Narrow-Line Seyfert 1 Galaxies WPVS 007 and Mkn 335

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The X-ray transient NArrow Line Seyfert 1 galaxy (NLS1) WPVS 007 was an X-ray bright source during the ROSAT All-Sky Survey, but basically disappeared from the X-ray sky for almost two decades. FUSE observations in 2003 revealed the nature of this disappearance: strong absorption. FUSE spectra showed deep absorption line troughs in the UV spectrum of WPVS 007. These findings make this AGN a direct link between NLS1s and Broad Absorption Line QSOs which are both thought to be high $L/L_{\rm Edd}$ AGN. Since October 2005 Swift has monitored WPVS 007 at least on a monthly basis. In the recent year Swift was able to detect WPVS 007 in X-ray at relatively bright states several times, suggesting that the absorber may have started to disappear In some ways similar is the NLS1 Mkn 335 which has been observed in X-ray in a bright state over decades, but was found by Swift in an extremely low state in May 2007. Our XMM observation from June 2009 suggest the presence of a strong ionized partial covering absorber in the X-ray data of Mkn 335. Our monitoring of Mkn 335 with Swift showed that it has gone into a very low X-ray flux state again recently. **Poster - Session 7**

Multi-variate Analysis of a Sample of bright AGN observed by Swift

Dirk Grupe[1]

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I will report on the statistical analysis of a sample of about 100 Active Galactic Nuclei (AGN) with simultaneous UV and X-ray observations with Swift. I found clear correlations between the X-ray spectral slope α_x, the UV slope α_{UV}, and the optical-to-x-ray spectral slope α_{ox} with the Eddington ratio L/L_{Edd}. A major aspect of the statistical analysis will be multi-variant analysis statistical tools such as the Principal Component Analysis (PCA) and cluster analysis. This analysis shows that the main driver of the AGN properties in this sample is the Eddington ratio L/L_{Edd}. Although separating Seyfert 1s into Narrow Line Seyfert 1s and Broad Line Seyfert 1s is still a good classification, with the 2000 km s^{-1} cutoff line it is still arbitrary. The cluster analysis of this AGN sample suggests that we can separate AGN into those with high and low Eddington ratios and that they form physically distinct groups.

Swift has been extremely important for studying the spectral energy distributions of AGN, because AGN are highly variable objects that require simultaneous observations in the Optical/UV and at X-ray energies. Only Swift is able to obtain this type of observation for statistically relevant samples.

Oral - Session 13.2.1
A LIGO-Virgo gravitational wave search using low-threshold *Swift* GRB triggers

Emelie Harstad for the LIGO Scientific Collaboration and the Virgo Collaboration[1], Jay Cummings[2], Hans Krimm[3], & David Palmer[4]

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The LIGO-Virgo network of advanced laser interferometer (IFO) gravitational wave observatories is provided with interesting targets for coincident gravitational wave searches by the *Swift* satellite. Having the GRB event time and sky-location makes it possible to use a coherent multiple-IFO network model-independent burst search that results in a 2-fold increase in sensitivity compared to similar all-sky search methods [5]. During LIGO's 5th science run (S5 - spanning November 2005 to September 2007), and Virgo's first science run (VSR1), the *Swift Burst Alert Telescope* detected a majority of the 137 GRBs used in the LIGO/VIRGO GRB-GW burst search analysis. While no detection was made, upper limits on GW amplitude and lower limits on GRB distance were set for each event [6].

Here we begin by reviewing the results of the main S5 GRB analysis, and propose an expanded S5 GW search with potential GRB triggers obtained by effectively lowering the *Swift* detection threshold. The events used in the search are those for which the SNR of the image peak detected in the *Swift BAT* are below the threshold nominally used for announcing a GRB and performing follow-up observations.

Lower SNR *BAT* detections are interesting triggers for a gravitational wave search for two main reasons: (1) Gravitational wave strength does not necessarily scale with GRB peak amplitude (short GRBs, although electromagnetically fainter than long GRBs, are expected to be stronger in GW, with more isotropic GW emission than EM) [7], and (2) New research suggests a relatively nearby population of under-luminous long GRBs [8].

Trigger selection for this analysis requires an understanding of the *Swift* data set as well as the *BAT* detection methods and criteria. We describe progress made so far on compiling the final set of events to use in the expanded search. We explain the process of selecting a new lowered threshold and eliminating uninteresting *BAT* triggers in order to maximize the estimated purity of the sample.

[5] P. J. Sutton et al 2010 New J. Phys. 12 053034 [6] B. P. Abbott et al. 2010 ApJ 715 1438 [7] S. Kobayashi, & P. Meszaros, 2003, ApJ, 589, 861, astro-ph/arXiv:0210211 [8] R. Chapman, N. R. Tanvir, R. S. Priddey, A. J. Levan 2007, astro-ph/arXiv:0708.2106

Oral - Session 5.2.1
Ultraviolet Properties of Nearby Galaxies with *Swift* UVOT

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We present UVOT imaging of a sample of 25 nearby star forming galaxies. Most of these galaxies are included in the Spitzer Infrared Nearby Galaxies Survey (SINGS) and have been observed by Spitzer in the Infrared as well as at optical wavelengths. We use the UVOT near ultraviolet imaging in conjunction with ground based optical data to investigate the recent star formation in these galaxies as a function of galaxy properties. Additionally, given the color resolution UVOT provides in the near UV we are able to constrain the stength of the 2175 Å dust bump in these galaxies. We investigate variations of the bump strength as a function of the physical properties of the galaxies, as well as spatial variations within the galaxies.

Oral - Session 1.1
The *Swift* Guest Investigator Program

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Entering its 8th cycle, the *Swift* Guest Investigator (GI) Program has solicited proposals from all areas of science from the worldwide community and added exciting new science projects to the *Swift* mission science program. In this presentation I will discuss the previous performance of the GI Program and focus on future challenges and new directions and opportunities for investigators to further broaden the range of *Swift* science.

Poster - Session 7
Multiwavelength Spectral Studies Of Fermi-LAT Blazar

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We present the most up-to-date gammay-ray, x-ray, and optical (both photometric and polarimetric in the R band) lightcurves of Fermi-LAT blazar, 3C279, that is part of the Boston University multiwaveband polarization monitoring program. The data have been compiled from observations with *Fermi*, *Swift*, *RXTE*, the *VLBA*, and various ground-based optical and radio telescopes starting in August 2008. We simulate the dynamic spectral energy distributions (SEDs) of 3C279, in quiescent and flaring states, within the framework of a multi-slice, time-dependent leptonic jet model for blazars, with radiation feedback, in the internal shock scenario. We use the physical jet parameters obtained from the VLBA monitoring to guide our modeling efforts. We discuss the role of intrinsic parameters and the interplay between synchrotron and inverse Compton radiation processes responsible for producing the resultant SEDs.

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Poster - Session 9
CXOM31 J004253.1+411422: The first ultraluminous X-ray transient in M 31

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We report on *Chandra*/*Swift*/XMM-Newton observations of an ultraluminous X-ray (ULX) source in M 31 discovered by *Chandra*-HRC-I on December 17, 2009. The light curve was established using follow up observations with *Swift*-XRT and XMM-Newton. The X-ray spectrum is best fit by a combination of a thermal component with kT $\sim$ 1 keV and a non-thermal component (single powerlaw) with photon index $\sim$ 2.6. The maximum unabsorbed total luminosity derived from this data is 3.8 x 10^{39} ergs/s, and subsequently decreased to 0.6 x 10^{39} ergs/s on a time scale of one month. The luminosity exhibits a FRED (Fast Rise Exponential Decay) pattern with an exponential time constant of 32 days. The underlying source for this ULX is likely a 14 $M_{\odot}$ black hole, accreting near the Eddington limit.

Poster - Session 9
VLT/X-shooter spectroscopy of the candidate black hole X-ray binary MAXI J1659-152

Ramanpreet Kaur[1], L. Kaper[1], L. E. Ellerbroek[1], D. Russell[1], D. Altamirano[1], R. Wijnands[1], Y. J. Yang[1], M. van der klis[1] & GRB X-shooter collaboration.

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MAXI J1659-152 which was discovered using *Swift* as a Gamma-ray-burst, was later on confirmed as a Galactic black-hole X-ray binary. The source was intensively followed up by *Swift* and *RXTE* during its X-ray outburst and was revealed as a shortest period (2.4 hrs) black-hole binary. Following the X-ray outburst, we triggered the ESO-Very Large Telescope and obtained the optical and the near-infrared spectra of the source with the X-shooter spectrograph. The spectrum includes many broad double peak hydrogen and helium emission features. Two important results of our observations include the linear trend seen in the peak seperation of the H lines with respect to the energy of their upper transitional levels and the considerable variability seen in the red-wing of the spectral line profiles between the two subsequent exposures. Using the radial velocity of the interstellar lines, we measured distance to the source as $\sim$ 4 $\pm$ 1 kpc. We also estimated the optical extinction from the broad spectral energy distribution which includes Swift-UVOT photmetric observations also. We would like to discuss our results in the context of the accretion flows in the compact black hole X-ray binaries.

Oral - Session 9.4.1
MAXI Observations of X-ray transients

Author N. Kawai[1] on behalf of the MAXI Team

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We present the latest scientific results obtained by MAXI, the X-ray all-sky monitor on the ISS. Some of the MAXI-detected transients have been successfully followed up by *Swift*. The latest example is MAXI J1836−194, a black hole binary candidate that was discovered by MAXI on August 30, 2011. *Swift* made a prompt TOO observations of this source and reported precise localization and discovery of a bright optical source. *Swift*'s localization enabled multiwavelength including detection of a radio source. In addition to black hole binaries mentioned above, we present results on accretion-powered pulsars, stellar flares, gamma-ray bursts, and some AGNs.

Poster - Session 3
Photometry of some recent gamma-ray bursts' afterglow based on P60 and Swift data.

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We present photometry of some recent gamma-ray bursts' optical afterglow. The data were obtained by the 60 inch automated Palomar telescope in rpr, ipr, zpr colors and by the Swift UVOT telescope. The determination of the grb OT astrophysical parameters are ongoing.

Oral - Session 9.3
The Swift View of Galactic X-ray Transients

Jamie A. Kennea[1], Patrizia Romano[2], Vanessa Mangano[2], Phil A. Evans[3], Andrew P. Beardmore[3], Peter A. Curran[4], Hans A. Krimm[5], Kazutaka Yamaoka[6], Hitoshi Negoro[7]

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Swift brings unique capabilities to the search for and understanding of Galactic transient sources, such as black hole (BH) and neutron star binary systems, millisecond pulsars, Super-Fast X-ray Transients and Be/X-ray binaries. BAT's hard X-ray wide sky coverage is an effective locator of Galactic transients with hard X-ray tails such as black-hole binaries and super-fast X-ray transients. The XRT and UVOT provide excellent broad band spectral coverage of outbursts, as well as accurate localizations of less than 2 arc-seconds error in X-ray, and even better if an optical counterpart is detected by UVOT. However, it is *Swift*'s scheduling flexibility, automated observing and rapid follow-up capabilities that give its unique ability to study and understanding X-ray transients. In this talk, we examine several cases where *Swift* provides unique insight into the transient, for example the shortest period BH binary, MAXI J1659−154, where BAT triggered on the outburst, allowing rapid, high cadence and X-ray and optical follow-up of the first few days of the outburst that remain an unparalleled dataset on the early outburst of a black hole binary. We discuss the future of *Swift* in this era, and how in the post-*RXTE* era it can both replace and differentiate itself from that mission, and how collaborations with other missions such as *MAXI* are increasing the rate of new discoveries.

Poster - Session 3
Photometry of four gamma-ray bursts' afterglow - observational evidence for the connection between the lightcurve break and SED temporal evolution

J. Kóbori[1], J. Kelemen[1] & P. Veres[2]

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We present the data reduction of four gamma-ray bursts' optical afterglow. The lightcurves are fitted with power-law function, and spectral energy distributions are constructed. Using the temporal and spectral slopes the main parameters (e.g. ambient medium type, electron energy distributions, host galaxy extinctions) of the bursts' are determined. We found observational evidence for connectin between the lightcurve break and SED temporal evolution. The data were taken from the literature (GCN, for ground-based observations) and from the Swift UVOT archive.

Poster - Session 1
On The Lack of Time Dilation Signatures in Gamma-ray Burst Light Curves

Daniel Kocevski[1] & Vahe Petrosian[2]

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We examine the effects of time dilation on the temporal profiles of gamma-ray burst (GRB) pulses. By using prescriptions for the shape and evolution of prompt gamma-ray spectra, we generate a simulated population of single pulsed GRBs at a variety of redshifts and observe how their light curves would appear to a gamma-ray detector here on Earth. We find that the observer frame duration of individual pulses does not increase as a function of redshift as one would expect from the cosmological expansion of a Friedman-Lemaître-Robertson-Walker Universe. In fact, the duration of individual pulses is seen to decrease as their signal-to-noise falls with increasing redshift, since only the brightest portion of a high redshift GRB's light curve is accessible to the detector. The results of our simulation are consistent with the fact that a systematic broadening of GRB durations as a function of redshift has not materialized in either the *Swift* or *Fermi* detected GRBs with known redshift. We show that this fundamental duration bias implies that the measured durations and associated $E_{\rm iso}$ estimates for GRBs detected near the instrument's detection threshold should be considered lower limits to the true values. We conclude by suggesting that average peak-to-peak duration for a large number of multi-pulsed GRBs as a function of redshift may eventually provide the evidence for time dilation that has so far eluded detection.

Oral - Session 9.1
Tidal Disruption of Stars by Supermassive Black Holes – Theory and Observations

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Stars closely approaching a supermassive black hole (SMBH) will be torn apart by the tidal forces exerted by the SMBH. A significant fraction of the stellar material will subsequently by accreted, producing a luminous flare of electromagnetic radiation. These tidal disruption events (TDEs) are a signpost of SMBHs at the cores of (non-active) galaxies, out to high redshifts. They represent a new probe of strong gravity, and have opened up a new window of studying accretion physics and perhaps jet formation when a new accretion disk forms rapidly. The rate of TDEs is an excellent tracer of the stellar dynamics in the core regions of galaxies, and of the presence of binary SMBHs, while single off-nuclear tidal flares will uniquely point us to recoiling SMBHs. I provide a review of the underlying theory, and of previous observations of TDEs, with an emphasis on the important role played by *Swift* in discovering new flares, and performing rapid follow-ups of TDEs first detected in X-rays or at other wavelengths.

Oral - Session 4.1
Soft Gamma-Ray Repeaters

Chryssa Kouveliotou[1]

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No abstract received

Poster - Session 10.3.1
The *Swift*/BAT Hard X-ray Transient Monitor: Past, Present and Future

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The *Swift*/Burst Alert Telescope (BAT) hard X-ray transient monitor provides near real-time coverage of the X-ray sky in the energy range 15-50 keV. This monitor was first announced in 2006. Five years later, it continues to operate and provides near real-time light curves of more than 900 astrophysical sources. The BAT observes ≈75% of the sky each day with a 3σ detection sensitivity of 7 mCrab for a full-day observation and a time resolution as fine as 64 seconds. The three main purposes of the monitor are (1) the discovery of new transient X-ray sources, (2) the detection of outbursts or other changes in the flux of known X-ray sources, and (3) the generation of archival light curves spanning nearly seven years. The primary interface for the BAT transient monitor is a public web page. The transient monitor has been extremely productive, with nearly 100 Astronomer's Telegrams generated announcing new or outburst sources. In total, 218 sources have been detected in the monitor, 145 of them persistent and 73 detected only in outburst. From 2006-2011, eleven new sources have been discovered by the BAT transient monitor. We have recently completed a number of improvements to the transient monitor and have reprocessed the monitor data back to the start of the mission. The transient monitor will continue to run and provide discoveries as long as *Swift* is operating.

Poster - Session 10
A search for heavily obscured AGN in the 2nd Palermo BAT catalogue

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Thanks to its peculiar observing strategy and to its large field of view, Swift-BAT has produced the most complete to date survey of the sky in the 15-150 keV band. It covers the whole sky achieving a nearly uniform limiting flux of $\sim 10^{-11}$ erg s^{-1} cm^{-2} in 54 months of observations. The 2nd Palermo BAT Catalogue, derived from the first 54 months of survey, contains 1256 sources, and is the largest collection of hard X-ray emitters produced till now, providing the possibility of population studies on large samples of sources. We are using the 2PBC subsample of extragalactic objects to study their spectral properties, focusing on their obscuration characteristic. Using their position on a flux ratio/column density plot, we identify some heavily absorbed objects, that will be the subject of a broad-band study, combining the Swift XRT (0.2-10 keV) and Swift-BAT (15-150 keV) spectra.

Oral - Session 2.1
GRB Theory

Andrew MacFayden[1]

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No abstract received

Oral - Session 3.2.2
GRBs and SNe: exploiting the unique Swift capabilities at the frontier of time domain astronomy

Raffaella Margutti[1,2], A. Soderberg[1], G. Chincarini[2,3], E. Zaninoni[2], G. Bernardini[2], D. Burrows[4], J.P. Osborne[5], N. Gehrels[6]: on the behalf of the Swift-XRT team

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The fast repointing and multi-wavelength capabilities make *Swift* a perfect machine to explore the transient sky, from GRBs to SN explosions.

I present the latest results from the **new** *Swift*-XRT catalog of GRBs comprising more than 600 events. The very large sample size allows us for the first time to address the *rest frame* properties of GRBs from a statistical perspective. This study revealed the presence of a set of relations that directly link the prompt to the X-ray afterglow properties, (both from the spectral and temporal point of view), towards a unifying picture of the GRB phenomenology. Particular attention will be devoted to short GRBs to understand how and if their properties fit in the emerging picture.

Finally I describe how our PanSTARRS-*Swift* multi-wavelength program uniquely capitalizes on *Swift* capabilities in the exploration of a new transient phase-space: a phase-space populated by exotic transients, ultra-luminous supernovae and tidal disruption events.

Oral - Session 10.1
X-ray and UV Surveys of Compact Objects

Jon M. Miller[1] & Mark Reynolds[1], on behalf of a larger collaboration

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Swift is an accretion *machine*. It can deliver frequent, simultaneous X-ray and UV observations of accreting and solitary compact objects – ideal for studies of thermal spectra. A prior study of the black hole candidate XTE J1817-330, for instance, revealed that the UV flux was dominated by reprocessed hard X-ray emission, not thermal emission from the disk. Inspired by these results, we have undertaken a systematic study of black holes observed with Swift. The results provide a uniquely comprehensive look at accretion disks, particularly in the low/hard state. We have also undertaken a study of the Galactic Plane in X-rays and UV through a fill-in program. Tiling 240 square degrees, this marks the first broad survey of the plane in 2-10 keV X-rays with arcsecond spatial resolution, and the first true UV survey of the plane. Theoretical predictions suggest that this survey should accumulate hundreds of new compact objects. This talk will briefly describe both survey efforts and early results from each.

Oral - Session 5.1
The virial radius in galaxy clusters: an opportunity for the XRT

Alberto Moretti[1], Fabio Gastaldello [2], Stefano Ettori [3], & Silvano Molendi[2],

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Galaxy clusters are excellent tools for cosmology, providing constraints that are independent from those based on supernovae, galaxy surveys and CMB radiation. From this point of view, improving the knowledge of physical processes acting in clusters is mandatory. In particular spatially resolved X-ray spectroscopy is essential for mapping the distribution of mass, intracluster plasma (ICM) and heavy elements. Although Chandra and XMM-Newton have been providing a wealth of information on these quantities in the cluster cores, little is known about their outer regions, at radii greater than half of the virial radius. Indeed these are the regions where the intergalactic medium, flowing along the giant filaments of the Cosmic Web, meets the intracluster gas. Physical processes in those regions hold the key to a number of important astrophysical and cosmological questions. Cluster emission from vicinity of the virial radius is difficult to observe efficiently because of its extremely low surface brightness. Nowadays, the only telescope providing some insights into these regions is the XIS telescope on board the Suzaku satellite. The purpose of this talk is to show that the Swift XRT, among currently operating telescopes, is the only potentially able to improve the current accuracy in ICM physical parameter measurements at the edge of the cluster potential. This will be true until a new generation of low-background and large eld of view telescopes, aimed to the study of galaxy clusters, will operate. In this respect Swift observations of cluster outskirts would be of great importance in developing the observing strategy for such missions.

Poster - Session 3
`RATE GRB-`z: Ranking High-z GRB Candidates using Random Forest Classification on Early-Time *Swift* Metrics

Adam N. Morgan[1], James Long[2], Joey W. Richards[2], Tamara Broderick[1], Nathaniel Butler[3,1], & Joshua S. Bloom[1],

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The growing number of observed Gamma-ray Bursts (GRBs) necessitates a more efficient use of follow-up resources in order to maximize the expected scientific returns. Studying the most distant (highest redshift) events, for instance, remain a primary goal for many in the field. Toward this goal of optimal resource allocation, we have created the Random forests Automated Triage Estimator for GRB redshifts (`RATE GRB-`z) to identify high-redshift ($z > 4$) candidates using rapidly available metrics from the *Swift* satellite. Using a training set of 135 GRBs with secure redshifts, 18 of which are high-z, our cross-validated performance metrics suggest that following up on just 20% of the GRBs will yield roughly 55% of all high-redshift events.

Poster - Session 10
The population of cataclysmic variables in the BAT survey

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We present a population study of the 52 cataclysmic variables (CVs) that have been detected in the 58-month *Swift*-BAT hard X-ray (14–195 keV) survey. The majority of these belong to the intermediate polar (IP) subclass of magnetic CVs. We derive the logN-logS plot and the Galactic distribution of these objects. We can place statistical constraints on the X-ray luminosity function and the space density of IPs, because the BAT survey has a relatively uniform sky coverage. We also show that an increasing number of other subtypes of CVs are being detected near the current completeness limit of the BAT survey, and discuss implications. As the BAT survey depth improves over time, CVs of subclasses other than IPs will likely become an important source class.

Withdrawn - Speaker unable to travel
Wide-Band Spectra of Magnetar Burst Emission

Yujin E. Nakagawa[1], Kazuo Makishima[2], Teruaki Enoto[3] & Takanori Sakamoto[4]

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Soft gamma repeaters (SGRs) and anomalous X-ray pulsars (AXPs) are phenomenologically defined to be highly magnetized neutron stars with field strengths greater than the quantum critical level 4.4×10^{13} G – so-called "magnetars" (Thompson & Duncan 1995).

Using data from the 5th Japanese X-ray astronomy satellite "Suzaku", we found that spectra of weak burst (SGR 0501+4516, Nakagawa et al. 2011; AXP 1E 1547.0−5408, Enoto et al. in prep.) and X-ray persistent emission (e.g., Enoto 2010) are both consist of a thermal component below 10 keV and a hard X-ray component above 10 keV. The later hard X-ray component was discovered in the persistent emission by INTEGRAL (e.g., Kuiper et al. 2006). The thermal and hard X-ray components are well described by a two blackbody function (e.g., Nakagawa et al. 2007; Tiengo et al. 2008; Nakagawa et al. 2009) and a power-law model (e.g., Kuiper et al. 2006; Enoto et al. 2010; Nakagawa et al. 2011; Enoto et al. in prep.), respectively. Bolometric luminosities of the thermal component are correlated with luminosities of the hard X-ray component over a few orders of magnitude (Nakagawa et al. 2011). These results suggest a common radiation mechanism between the bursts and persistent emission, further leading to a possibility that the persistent X-ray emission may consist of numerous micro bursts (Nakagawa et al. 2009; Nakagawa et al. 2011).

Thanks to burst detections and following flux monitorings by Swift, we successfully performed Suzaku ToO observations of some magnetars including above-mentioned SGR 0501+4516 and AXP 1E 1547.0−5408 as well as recently activated AXP 4U 0142+614. Swift ToO observations for AXP 4U 0142+614 gave a decisive factor to trigger the Suzaku ToO observation on 7 September 2011. Given this, the Swift observations are really essential in order to perform further studies of magnetar emission with Suzaku.

The hard X-ray component was not seen in bright bursts ($\sim10^{-6}$–10^{-7} erg cm^{-2} s^{-1}), while we discovered it in the weak bursts (10^{-8} erg cm^{-2} s^{-1}). In order to examine effects of the hard X-ray component on bright burst spectra, we re-analyzed 55 bright bursts from SGR 1806−20 and SGR 1900+14 detected by HETE-2. Consequently, some bursts can be fitted by the two blackbody function plus the power-law model.

In this talk, we will discuss the wide-band burst spectra and the luminosity correlation.

Poster - Session 2
Radiation from accelerated particles in shocks and reconnectiions

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Plasma instabilities are responsible not only for the onset and mediation of collisionless shocks but also for the associated acceleration of particles. We have investigated particle acceleration and shock structure associated with an unmagnetized relativistic electron-positron jet propagating into an unmagnetized electron-positron plasma. Cold jet electrons are thermalized and slowed while the ambient electrons are swept up to create a partially developed hydrodynamic-like shock structure. In the leading shock, electron density increases by a factor of about 3.5 in the simulation frame. Strong electromagnetic fields are generated in the trailing shock and provide an emission site. These magnetic fields contribute to the electrons transverse direction and, more generally, relativistic acceleration behind the shock. We have calculated, self-consistently, the radiation from electrons accelerated in the turbulent magnetic fields. We found that the synthetic spectra depend on the Lorentz factor of the jet, its thermal temperature and strength of the generated magnetic fields. We are currently investigating the specific case of a jet colliding with an anti-parallel magnetized ambient medium. The properties of the radiation may be important for understanding the complex time evolution and/or spectral structure in gamma-ray bursts, relativistic jets in general, and supernova remnants.

Oral - Session 14.1
Conference Wrap-up

John Nousek[1]

[1] Department of Astronomy and Astrophysics, Penn State University, University Park, USA

I will summarize the presentations given during the Workshop, attempting to identify the highlights of *Swift* achievements so far, and where we can project future discoveries that we can highlight in the upcoming 2012 NASA Senior Review.

Oral - Session 3.3
Multi-wavelength observations of GRBs: the past, present and future

Paul O'Brien[1]

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The *Swift* satellite has observed an extraordinary variety of phenomena in Gamma-Ray Bursts and continues to find surprising behaviour. These data combined with multi-wavelength data from other facilities are unravelling the physics of the relativistic jet and the bright afterglow. I will discuss the constraints *Swift* has placed on the jet physics of GRBs and how future work, particularly utilising correlated observations with other facilities, will enable us to better understand how and where the emission arises.

Withdrawn - Speaker unable to travel
Swift observation of symbiotics emitting supersoft X-rays

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A few symbiotic systems host a white dwarf (WD) that is a luminous supersoft X-ray source. There is strong evidence that most, or all, white dwarfs in symbiotic do have a WD that is burning accreting hydrogen in a shell, but the symbiotic wind and circumstellar nebula absorb the supersoft emission, which is thus often undetectable. With *Swift* we started monitoring a few of these systems regularly, to derive the duty cycle of hydrogen burning and to understand whether we are observing a post-nova thermonuclear flash or instead steady thermonuclear burning. The results will have important implications to understand the progenitors of type Ia supernovae.

Poster - Session 1
Improvements to the BAT On-Board Science Software

David M. Palmer[1]

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The on-board data analysis software for the *Swift* Burst Alert Telescope (BAT) has recently received two scientifically relevant upgrades.

BAT can now trigger pointed follow-up observations based on the fluence of an event from a known source. This lets us distinguish ordinary X-ray bursts from neutron stars—which reach Eddington luminosity for a few seconds and have occurred hundreds of times over the course of the mission—from superbursts that have the same peak luminosity but last for hours.

The other improvement is a mode where the BAT drives the spacecraft to tile an extended region with the narrow field instruments. This allows allows a broad search of larger error boxes from instruments such as neutrino or gravitational wave observatories.

Poster - Session 3
Very High Energy Observations of Gamma-ray Bursts

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Observing gamma-ray bursts (GRBs) with ground-based imaging atmospheric Cherenkov telescopes (IACT) is a challenging endeavor due to the relatively small field of view (3-5 degrees) and low slew rate (on the order of 1 degree/s). However, because of their large effective area (several orders of magnitude greater than space-based gamma-ray detectors such as the BAT or the LAT), IACTs may be sensitive to the highest energy component of GRBs. With VERITAS, a four-telescope IACT array, the highest priority is given to observing GRBs detected by the BAT or the GBM. Follow-up observations of these bursts by VERITAS have so far not yielded a detection; the upper limits (above 100 GeV) are among the best yet obtained and constrain some models of afterglow emission. VERITAS will undergo an upgrade in the summer of 2012 which will improve the detector sensitivity, especially at the lowest energies. Additionally, work is ongoing to increase the slew rate of the telescopes by up to 50%, which will increase the probability of observing a GRB in the prompt phase.

Oral - Session 7.1
Active Galactic Nuclei – Seyferts

Brad Petersen[1]

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No abstract received

Oral - Session 3.2.1
GRBs in the Era of Swift and Fermi

Judith Racusin[1], **Eleonora Troja**[1,2], **Julie McEnery**[1], **on behalf of the Fermi Large Area Telescope Collaboration**

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Utilizing both *Swift* and *Fermi* to study GRBs provides us with a unique broad spectral and temporal window into both prompt emission and afterglow studies. *Swift* has provided key information from GRB follow-up of LAT detected bursts, that has led to ground-based redshift measurements and afterglow broadband light curves and SEDs. We study the X-ray and optical afterglows of *Fermi*-LAT detected bursts in the context of the hundreds of GRBs discovered by Swift over the last 7 years, in order to better understand the origin of the high-energy gamma-rays. We also briefly describe the efforts to best facilitate joint *Swift-Fermi* observations. These initial results demonstrate the synergy between *Swift* and *Fermi*, and hint at the many interesting discoveries to come.

Oral - Session 9.2.1
Stellar Disruption in The Swift Era

Enrico Ramirez-Ruiz[1]

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Most galaxies contain much larger super-massive black holes at their centers. Such a central black hole becomes detectable only through interactions with its environment. Gas that is lost from nearby stars, or even stars plunging into such a massive black hole, can produce detectable signatures. The flares resulting from a disrupted star could be the clearest diagnostic of a black holes presence. The discovery of flaring black hole candidates in nearby galaxies by Swift will help elucidate the demography of the AGN population. It will also enable us to confront theoretical models of numerical simulations of tidal disruption with observations.

Oral - Session 9.5.1
From hours to years: Swift's revolutionary view of SFXTs

P. Romano[1], D.N. Burrows[2], G. Cusumano[1], P.A. Evans[3], R. Farinelli[1], N. Gehrels[4], J.A. Kennea[2], H.A. Krimm[4,5], V. La Parola[1], V. Mangano[1], C. Pagani[3], L. Ducci[6], P. Esposito[7], & S. Vercellone[1]

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Bright hard-X-ray flares of Supergiant Fast X-ray Transients (SFXTs) have been triggering the BAT since early after the *Swift* launch; our *Swift* SFXT Project has taken advantage of *Swift*'s unique capabilities– automatic fast-slewing and broad-band energy coverage that make it the only observatory which can detect outbursts from SFXTs from the very beginning and observe their evolution panchromatically– to actively investigate the SFXT phenomenology. Since 2008, in particular, the *Swift* Team enabled automatic rapid slews to these objects following detection of flares by the BAT, as is done for GRBs, thus ensuring simultaneous NFI data. This strategy has quickly tripled the available sets of broad-band data of SFXT outbursts. Furthermore, *Swift*'s flexible scheduling has allowed us to study SFXTs through monitoring campaigns while in the less striking manifestations of their activity, i.e., outside the outbursts, where the very high sensitivity of XRT can be best exploited. We present a review of the *Swift* outburst follow-ups and monitoring campaigns, which has led us to a broad-band spectral caracterization, an assessment of the fraction of the time these sources spend in each phase, and their duty cycle of inactivity.

Oral - Session 11.1
Future GRB Missions: A Discussion

Peter Roming[1]

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As *Swift* and *Fermi* continue to age, the question asked more and more frequently is: "What is the next mission for GRB science?" In the most recent NASA Explorer round neither "GRB" mission, JANUS or *Lobster*, was selected. Likewise, *Xenia* and EDGE were not selected. The future of SVOM is also currently uncertain. What then is the future of GRB science? During this discussion period, I will briefly highlight the current concept and status of these missions and speculate on future prospects. I will then open up for discussion the following questions: should the next mission be GRB-focused or GRB-facilitated, what aspects of the mission are critical, how will large ground-based surveys like LSST effect the mission design, and how do we convince the community that a "GRB" mission is needed?

Poster - Session 1
Testing the Spectral cross-calibration of the Swift/BAT and the RXTE/PCA by the simultaneous observation of Crab

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We report the spectral cross-calibration test of the Swift BAT and the RXTE PCA using simultaneous observation of Crab, which were taken on August 3, 2011 and provided 970 sec of completely overlapping data. Given the complementary energy band coverage of the Swift BAT (15-150 keV) and RXTE PCA (3-50 keV), the observation will help us understand and improve the cross-calibration between the instruments. We present the joint spectral fit results and discuss the remaining cross-calibration uncertainties.

Poster - Session 13
Searching for a Hard X-ray Emission of a Supernova Using the Swift BAT Survey Data

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The GRB-supernova connection has been established for several GRBs in the past years. While five gamma-ray bursts have been detected which have a confirmed association to supernovae beyond any doubt for all missions, it is not clear whether there is associated hard X-ray emission around the on-set time of the majority of supernovae which have been discovered by optical survey. We analyze the Swift BAT survey data around the on-set time of 128 type Ibc and IIp supernovae which have previously been identified by optical data. Our analysis will provide the most sensitive search for hard X-ray emission around the on-set time of supernovae thanks to a wide field of view and an excellent hard X-ray sensitivity of the BAT instrument.

Poster - Session 4
Classifying the X-ray Afterglow Light Curves Based on the Pulse Structure of the GRB Prompt Emission

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After the launch of *Swift*, we realize the complexity in the shape and the brightness of the gamma-ray burst (GRB) X-ray afterglow light curves. To investigate whether the complexity in X-ray afterglow is correlated with the GRB prompt emission properties, we classify *Swift* known redshift GRBs based on the pulse structure of the light curve in the GRB prompt emission observed by BAT with following three classes: 1) single pulse event, 2) multi-pulse event and 3) well time-separated event (two burst episodes are separated more than 100 sec). Then, we look into trends in the X-ray afterglow light curves observed by XRT based on these classifications. We found that the luminosity of the X-ray afterglow tends to be higher for the multi-pulse events comparing to that of the single pulse events. Our finding might expand the variability-luminosity relation found in the GRB prompt emission into the X-ray afterglow regime. We also show various correlation studies in the observed properties between the prompt emission and X-ray afterglow for these three classes.

Poster - Session 13
Searching for the X-ray and Optical Counterpart of Millisecond Pulsars

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We report the result of our *Swift* fill-in program for searching X-ray and optical counterpart of millisecond pulsars (MSP). We select 19 MSPs (2 MSPs in AF-2 and 17 MSPs in AF-6 fill-in opportunity) which have none of the pointing observations by previous and currently operating X-ray telescopes (*RXTE*, *ASCA*, *BeppoSAX*, *Chandra*, *XMM*, *Swift* and *Suzaku*). Majority of our samples have a detection of GeV emission by the *Fermi*/LAT. Up to now, 47% (9 MSPs) of our sample has completed the search. There is no detection of X-ray counterpart for 9 MSPs in 10 ksec observation by XRT (UVOT analysis is ongoing). Our survey constrains an upper limit in X-ray flux of $\sim 1 \times 10^{-13}$ erg cm^{-2} s^{-1}. We investigate the difference between X-ray bright MSPs and our sample by correlating various pulsar parameters. Furthermore, we show the observed properties between GeV and X-ray emission of our sample.

Oral - Session 3.4.1
A complete sample of bright long GRBs discovered by *Swift*

Author R. Salvaterra[1] on behalf of a larger collaboration

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The *Swift* mission has represented a breakthrough for the detection of GRBs from the local Universe up to the highest redshifts. However, statistical studies of their rest-frame properties and their evolution with cosmic time are still hampered by the fact that most of the observed GRBs lack of redshift measurements. Here we present a new sub-sample of *Swift* long GRBs constructed by considering: i) burst with favorable observing conditions for ground-based follow-up optical/NIR observations and ii) GRBs are bright in the 15-150 keV *Swift*/BAT band. The sample is composed by 58 bursts with a redshift completeness level of 91% (95% is reached by considering also available redshift constraints). In the light of this complete sample, we will discuss the properties of long GRBs and their evolution with cosmic times, focusing in particular on the GRB luminosity function, the prompt emission spectral-energy correlations and the nature of dark bursts.

Oral - Session 4.3
Surprising results from Swift X-ray/UV monitoring of novae in outburst

Greg Schwarz[1], Jan-Uwe Ness[2], J.P. Obsorne[3], K.L Page[3], Fred Walter[4], Charles E. Woodward[5], Mike Bode[6], Sumner Starrfield[7], Jeremy J. Drake[8], & the *Swift* nova/CV group

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Swift has been an excellent facility for studying novae. Its rapid response time and sensitive X-ray detector provides an unparalleled opportunity to investigate the previously poorly sampled evolution of novae in the X-ray regime. In the last seven years *Swift* has observed over 50 Galactic/Magellanic Cloud novae, including 19 new novae observed in the Super Soft Source phase, more than doubling the previous sample size. The *Swift* data set has shown that novae are surprisingly variable in the X-rays in all phases and sometimes the X-ray light curves are correlated or anti-correlated with the UV light curves. The X-ray durations for the total Galactic/Magellanic sample are very short with 89% of the novae turning off in less than three years from the outburst start. In addition, we find no obvious correlation between these turn off times and simple observable parameters such as the decline time, expansion velocity of the ejecta, or orbital period. However, with the diversity of behaviors observed by *Swift* we do not yet have a large enough nova sample to effectively explore the full parameter space. Our continuing goals are to further build the *Swift* sample, particularly with novae types that are not currently well represented, and fully exploit the capabilities of the UVOT instrument, e.g. utilizing co-incidence loss UV photometry in the monitoring campaign of the bright recurrent nova, T Pyx.

Poster - Session 7
Echo-mapping of continuum emission regions in distant AGN: gravitationally lensed double quasar Q0957+561

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An optical monitoring of the double imaged quasar Q0957+561 ($z = 1.41$) allowed us to detect a very prominent increase in the brightness of the leading A image between late 2008 and the middle of 2009. Taking into account the $\sim$ 14-month delay between both images, we predicted that a repetition of this event would occur in the trailing B image in the first half of 2010, and thus organized a multiwavelength monitoring to follow-up the variability of the distant AGN. Here we present X-ray (Chandra), ultraviolet (Swift/UVOT; U band) and optical-infrared (Liverpool Telescope; $griz$ bands) continuum light curves of Q0957+561. A cross-correlation analysis of the light curves shows that the U-band fluctuation leads the other variations at higher and lower energies. This study constrains the geometry of the continuum emission regions in a distant radio-loud AGN for the first time. We note that our work opens a new window in echo-mapping of high-z AGN with the use of lensed quasars, since the variability of some of the images of a given multiply imaged quasar can be predicted in advance based on a modest optical follow–up of the system. We also remark the key importance of UV observations from Swift/UVOT or another state-of-the-art UV space telescope. Our NUV (U-band) observations correspond to FUV emission from the vicinity of the supermassive black hole, and as mentioned above, this FUV radiation seems to lead the other continuum emissions. There is also evidence of an EUV central driving source, although it is unfortunately unobservable in Q0957+561.

Oral - Session 5.2.3
Hot Stars, Stellar Populations and UVOT

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In general, the ultraviolet light of star clusters and normal galaxies tends to be dominated by a handful of stellar types — either young unevolved main sequence stars or old evolved blue horizontal branch, white dwarf and post-asymptotic giant branch stars. These UV-bright stars are not only intriguing objects for individual study, but the number, brightnesses, colors and kinds of UV bright stars in any part of the universe are directly related to the population of stars that produced them. Despite intensive study, the exact properties of UV-bright stars remains both theoretically and empirically uncertain. Understanding the properties of UV bright stars and the connection between those properties and the underlying stellar populations is critical to UV studies of more distant objects, the unresolved stellar populations of which can only be constrained from their combined integrated light. We present the first results of a new program that uses the Swift Ultraviolet Optical Telescope to study the UV properties of white dwarfs, extreme horizontal branch stars, PAGB stars and young main sequence stars in the nearby Universe. We identify and characterize both isolated and 'hidden' white dwarfs from NUV photometry. We present wide-field NUV photometry of hot stellar populations in open clusters, globular clusters and nearby galaxies and compare their properties to theoretical isochrones. Finally, we show how this forms the basis for the study of unresolved stellar populations in more distant objects.

Oral - Session 13.2.4
Galactic Source Studies with VERITAS and Swift

Andrew Smith[1]

[1] University of Utah

Since the commissioning of the full 4 telescope VERITAS IACT array in 2007, collaboration between VERITAS and Swift has proved to be extremely valuable in the study of galactic particle accelerators. In particular, simultaneous observations of variable galactic sources (such as HMXBs) have yielded new insights (and further questions) into the nature of the emission mechanisms at work in these local targets. In this talk I will review the joint measurements made with the two instruments over the last 4 years, and what can be accomplished through continued collaboration.

Oral - Session 6.1
Supernovae

Alicia Soderberg[1]

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No abstract received

Oral - Session 13.2.2
Exploring New Frontiers in Time Domain Astrophysics with *Swift*: The Gamma-Ray Burst Temporal Analysis Consortium (GTAC)

Michael Stamatikos[1,2], Raffaella Margutti[3] and Tilan Ukwatta[4] on the behalf of GTAC

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The Gamma-Ray Burst Temporal Analysis Consortium (GTAC) is comprised of theorists and experimentalists from multiple satellite missions who strategically focus upon the spectral variation of GRB light curves. Here we report on several key results from our comprehensive effort dedicated towards the systematic study of spectral lag and temporal variability. First, the (time-dilation corrected) spectral lag - (isotropic peak) luminosity relation (LLR) is shown to be consistent with the BATSE result using 31/43 *long Swift*-BAT GRBs with known redshifts in the observer/source-frame. In the observer-frame, the mean value of the correlation coefficient for various canonical *Swift*-BAT channel combinations is -0.68 with a chance probability of $\sim 0.7 \times 10^{-3}$, while the mean value of the power-law index is -1.4 ± 0.3. Our analysis indicates a higher degree of correlation: -0.82 ± 0.05 in the (GRB) source-frame energy bands of 100-150 keV and 200-250 keV, with a chance probability of $\sim 5.5 \times 10^{-5}$ and a best-fit power-law index of -1.2 ± 0.2. Second, the analysis of 9 bright X-ray flares in *long* GRBs observed by *Swift*-XRT reveals that the flare phenomenology is strictly analogous to the prompt γ-ray emission. Specifically, like prompt pulses, X-ray flares in long GRBs now extend the LLR to ~ 5 decades in both time and energy, with a best-fit power-law index of -0.95 ± 0.23, thus suggesting a common origin. A comparative study of 8 *short* GRB flares reveals that they fall off the LLR, in strict analogy to their prompt pulses. Third, a power spectrum analysis of time in the time domain (TTD) has been utilized to study the rms variations at different timescales for the (15-150 keV) light-curves of ~ 500 *Swift*-detected events to reveal the existence of three different classes of GRBs. Moreover, when the cosmological time dilation effect is considered, the distribution of GRB characteristic variability time scales is found to cluster around 0.6-1 seconds. GRB 080319B will serve as a case study for the TTD analysis, since the prompt emission phase consisted of two characteristic variability time scales, which both underwent strongly energy dependent evolution. Lastly, ongoing and future GTAC efforts will be discussed.

Withdrawn - Speaker unable to travel
Hydrodynamic Studies of the Evolution of Recurrent, Symbiotic, and Dwarf Novae: The White Dwarf Components are Growing in Mass

S. Starrfield[1], F. X. Timmes, C. Iliadis, W. R. Hix, W. D. Arnett, C. Meakin, & W. M. Sparks

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We have begun a new study of the evolution of thermonuclear runaways (TNRs) in the accreted envelopes of WDs using a variety of initial WD masses, luminosities, and mass accretion rates. We use our 1-D hydro code, NOVA, which includes the new convective algorithm of Arnett, Meakin, and Young, the Hix and Thielemann nuclear reaction solver, the lliadis reaction rate library, the Timmes equation of state, and the OPAL opacities. We assume a solar composition (Lodders abundance distribution) and do *not* allow any mixing of accreted material with core material. This assumption strongly influences our results.

We will report (1) that the WD grows in mass for all simulations so that "steady burning" does not occur, (2) that only a small fraction of the accreted matter is ejected in some (but not all) simulations, and (3) that the accreting systems, before thermonuclear runaway, are too cool to be seen in X-ray searches for SN Ia progenitors with the current X-ray satellites.

Oral - Session 3.1
GRB Observations

Nial Tanvir[1]

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No abstract received

Poster - Session 3
Millimetre Observations of Gamma-ray Bursts at IRAM

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The fact that the synchrotron GRB afterglow spectrum peaks in the millimetre range, proves the importance of studying GRBs (the most energetic events in the Universe) at these wavelengths. This has allowed in a few cases to detect the host galaxies of dark GRBs and to compare the time evolution of the mm emission for events spanning two orders of magnitude in z with observables at other wavelengths (X-rays and optical) determining the characteristic frequencies of the afterglow spectrum, and to trace their evolution, allowing to derive the physical parameters of the circumburst medium.
Since 1997, and following our detection of the first mm afterglow (GRB 970508), we have followed-up 58 gamma-ray bursts (GRBs), mainly with the IRAM's Plateau de Bure Interferometer, 45 of these detected by *Swift*.
The number of follow-ups amounted to 58, with 52 observed at 3 mm, and 19 Of them being detected. Redshifts for the GRB afterglows lie in the range z = 0.03-8.3, with measured flux densities (at 3mm) varying between 0.25 and 60 mJy (but usually < 1.5 mJy) with first observations taking place around 1-2 days after the GRB.

Poster - Session 3
Broadband study of GRB091127: a sub-energetic burst at higher redshift?

E. Troja[1,2], T. Sakamoto[1], C. Guidorzi[3]

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GRB091127 is a bright gamma-ray burst at z=0.49 associated to SN2009nz. We present the broadband analysis of the GRB prompt and afterglow emission and study its high-energy property in the context of the GRB/SN association. The low gamma-ray energy release ($<10^{49}$ erg), the bulk of energy coupled to slower ejecta, and the unusual spectral lag connect this burst to the class of sub-energetic bursts rather than typical long GRBs. We finally discuss the suppression of HE emission in this burst, and investigate whether this behavior could be connected with the sub-energetic nature of the explosion.

Oral - Session 3.2.3
Joint Swift/Fermi observations of GRBs: constraining the origin of the HE emission

E. Troja[1,2], J. Bregeon[3], N. Omodei[4], D. Gruber[5], G. Vianello[4], on behalf of a larger collaboration

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[4] SLAC
[5] MPE

A delayed, long-lived GeV emission is a common feature of LAT bursts. A multi-wavelength approach, correlating the properties of the low- and high-energy components, holds the key to unravel the nature of the observed GeV emission. We briefly summarize the current status of joint *Swift*/ LAT observations, and then focus on the most recent case of GRB 110731A. GRB 110731A, detected by *Swift* and *Fermi*, is the best case to date of a simultaneous, broadband coverage of both the prompt and afterglow phases, offering us an exquisite dataset to test model predictions. We report our preliminary results, discuss the implications and future perspectives.

Oral - Session 10.2
Swift/BAT Selected AGN, What Can We Learn from Them?

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The Swift Survey has produced a uniform all-sky survey with >700 AGN. We will summarize some of the exciting results about the properties of the host galaxies of the BAT AGN which has significantly different properties than optically selected AGN. The large Swift selected sample of AGN allows accurate measurement of LogN LogS and luminosity functions for interesting subpopulations with adequate statistics to examine the differences in luminosity between optically selected Sy1 and Sy2 in detail. In addition, we will examine a sample of nearby optically selected AGN that were not detected by BAT.

Poster - Session 7
The X-ray and γ-ray properties of the blazar 3C 454.3

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3C 454.3 is the most variable and intense extragalactic γ-ray blazar detected by AGILE and *Fermi* during the last 4 years. This remarkable source shows extreme flux variability (about a factor of 20) on a time-scale of 24–48 hours, as well as repeated flares on a time-scale of more than a year. The dynamic range, from the quiescence up to the most intense γ-ray super-flare, is of about two orders of magnitude. We present the results of about four years of monitoring in the X-ray and γ-ray energy bands by means of the *Swift* and AGILE satellites, comparing both the characteristics of flares at different levels and their multi-wavelength behaviors. Moreover, an interpretation of both the long- and short-term properties of 3C 454.3 is reviewed, with particular emphasis on the two γ-ray super-flares observed in 2009 and 2010, when 3C 454.3 became the brightest source of the whole γ-ray sky.

Withdrawn - Speaker unable to travel
Long Duration Gamma-Ray Transients from the Collapse of Massive Stars

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In the collapsar model for common gamma-ray bursts, the formation of a centrifugally supported disk occurs during the first $\sim$10 seconds after the collapse of the iron core in a massive star. However, this only occurs in a small fraction of massive stellar deaths and requires unusual conditions. A much more frequent occurrence could be the death of a star that makes a black hole and a weak or absent outgoing shock, but in a star with too little angular momentum in its interior to form a disk quickly. A significant fraction of these dying stars may still have sufficient angular momentum in their outermost layers to form a disk. We consider several cases where this is likely to occur - blue supergiants with low mass loss rates, tidally-interacting binaries involving either helium stars or giant stars, and supermassive pair-instability supernovae. These events have in common the accretion of a solar mass or so of material through a disk over a period much longer than the duration of a common gamma-ray burst. A broad range of powers is possible, 10^{47} to 10^{50} erg s^{-1}, and this brightness could be enhanced by beaming. Such events were probably more frequent in the early universe where mass loss rates were lower. Indeed this could be one of the most common forms of gamma-ray transients in the universe and could be used to study first generation stars. Several events would be active in the sky at any one time. A recent example of this sort of event may have been the SWIFT transient Sw-1644+57.

Poster - Session 10
Black Hole Accretion at Very Low Luminosities: Example From MAXI J1659-152

Yi-Jung Yang[1] & Rudy Wijnands[1]

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Utilizing *Swift* XRT/UVOT, we have studied the black hole candidate X-ray transient MAXI J1659-152 near the end of its 2010/2011 outburst at very low luminosities down to Lx$\sim 10^{32} - 10^{33}$ erg/s (assuming a distance of d=1.6-4.2 kpc). At very low luminosities, the accretion is thought to be radiative inefficient (e.g., through an ADAF) in contrast to the brighter radiative efficient state in which a thin accretion disk is present. In addition, ADAF models predict a gradual spectral softening as the luminosity decreases. Due to the lack of high quality data of black hole systems at such low luminosities, the models can not yet be well constrained. In this talk, I will present the long-term intensity variability and the energy spectral evolution of MAXI J1659-152 especially at low X-ray luminosities, and discuss the possible interpretations for these types of models.

Poster - Session 9
Swift J2058+0516: evidence for a spinning supermassive black hole

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Swift J2058+0516 is an extragalactic X-ray transient detected by Swift in May 2011. We show evidence that it hosts a spinning, supermassive black hole, making it a unique event with important implications in understanding dormant supermassive black holes as well as other important problems in astrophysics.

Oral - Session 9.2.4
Birth of a Relativistic Outflow: Radio Observations of Swift J1644+5734

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The discovery of multiple γ-ray flares from Swift J1644+57/GRB110328A established an unexpected class of new γ-ray transients, resulting from the tidal disruption event (TDE) of a star by a supermassive black hole (SMBH). We summarize our discovery of millimeter (SMA/CARMA) and centimeter (EVLA) radio emission coinciding with the nucleus of a previously inactive galaxy at z=0.354 and indicating transient accretion onto a $\sim 10^6$ $M_\odot$ SMBH and the birth of a relativistic jet. We present data from our ongoing seven month monitoring program and discuss the implications of this data in the context of a TDE + jet model. Armed with an understanding of the unusual signature in the data, there is reason to believe that additional TDEs may be discovered by *Swift*.

Oral - Session 9.2.2
Tidal disruption jets: black hole spin at play

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Recently a hard X-ray transient event, Sw J1644+57, was discovered by the Swift satellite. It marks the onset of a relativistic jet from a supermassive black hole, possibly triggered by a tidal disruption event. Another candidate in the same category, Sw J2058+05, was also reported. The low event rate suggests that only a small fraction of TDEs launch relativistic jets. A common speculation is that these rare events are related to rapidly spinning black holes. We attribute jet launching to the Blandford-Znajek mechanism, and use the available data to constrain the black hole spin parameter for the two events. It is found that the two black holes indeed carry a moderate to high spin, suggesting that black hole spin is likely the crucial factor behind these TDE jet events.