prop_num	pi_lname	Title	Abstract
111001	METZGER	PARTICLE ACCELERATION AT RADIATIVE SHOCKS IN GAMMA-RAY NOVAE	The discovery by Fermi LAT of GeV gamma-rays from classical novae illustrates the importance of shocks and relativistic particle acceleration in these events. The correlation between optical and gamma-ray light curves in ASASSN-16ma shows that the shocks can be radiative, i.e. the post-shock cooling timescale is much shorter than the flow time. Using 2D/3D hydrodynamic simulations, we will explore the impact of the non-linear thin shell instability on the geometry of the shock front, the thermodynamic conditions of the post-shock gas, and the resulting thermal/non-thermal emission. The distribution of shock obliquity relative to the upstream magnetic field will be combined with hybrid PIC simulations to quantify the ion acceleration efficiency and compare to LAT-detected novae.
111011	MASSARO	THE OPTICAL SPECTROSCOPIC CAMPAIGN OF GAMMA-RAY BLAZAR CANDIDATES: 10 YRS AFTER THE FERMI LAUNCH	One of the main scientific objectives of the Fermi-NOAO Cooperative Arrangement is: studying candidate counterparts, including redshift determination of previously unknown BL Lacs and high-redshift blazars. We propose to extend our optical spectroscopic campaign, already approved in Fermi Cycle 6, 9 and 10, to reveal the nature of all the blazar candidates of uncertain type (BCUs) and all the blazar-like objects, potential counterparts of the unidentified gamma-ray sources (UGSs) selected according to our methods based on the IR colors, to the Fermi 8 year source list. Our legacy project is crucial to prepare the future releases of the Fermi catalogs and to improve our knowledge of the blazar population.
111012	PETROPOULOU	GAMMA-RAY VARIABILITY POWERED BY MAGNETIC RECONNECTION IN BLAZARS	A wealth of information on blazar variability above 100 MeV is available thanks to the Fermi-LAT. However, there is still no concrete theoretical model that can explain, from first principles, the multi-scale variability of blazars. We propose to bridge the gap between theory and observations by developing a model for gamma-ray variability from first principles. To do so, we will combine radiative transfer calculations with particle-in-cell simulations of magnetic reconnection to compute gamma-ray light curves from reconnection events in blazar jets. Using various diagnostics we will compare, on different timescales, our simulated light curves with those of Fermi monitored blazars. With the proposed research, we will be able to shed light on the origin of blazar gamma-ray variability.

111013	RAJAGOPAL	HUNTING HIGH-REDSHIFT BL LACERTAE OBJECTS	We will perform 10-filter photometry, using Swift and SARA-CT, with the goal of measuring photometric redshifts for the Fermi BL Lacs (unknown z) visible from Chile. SARA+UVOT coupling allows us to determine accurate photo-z in the 1.3--8.0 range. We will target 50 objects and expect to find ~5 of them at z>1.3 thus increasing the current sample size of 24 such sources by 21%. While undoubtedly rare, these detections represent a major achievement as high-z BL Lacs probe the UV-optical radiation field and allow us to understand the evolution of the blazar family. This program will provide high-quality nIR-to-UV data that will be released to the general public.
111022	CAPRIOLI	GAMMA-RAY EMISSION FROM SUPERNOVA REMNANTS EXPANDING IN PARTIALLY-NEUTRAL MEDIA	The hadronic gamma-ray emission detected from many supernova remnants (SNRs) strongly supports the idea that SNRs are the sources of Galactic cosmic rays (CRs). GeV-bright SNRs typically expand into partially-neutral gas and/or are associated with dense molecular clouds (MCs); in the presence of neutral hydrogen, the shock dynamics and the CR-magnetic field coupling are radically different than in fully-ionized plasmas, but such effects are usually neglected in calculations of CR acceleration and propagation. We will use novel kinetic simulations of shocks in partially-neutral plasmas to study self-consistently the impact of charge exchange, ionization, and ion-neutral damping on shock dynamics and CR acceleration, in order to better characterize hadronic gamma-rays from SNR/MC systems.
111024	HARDING	GAMMA-RAY LIGHT CURVE FITTING OF NICER PULSARS	The Neutron Star Interior Composition Explorer (NICER), launched in June 2017, will observe neutron stars at X-ray energies of 0.2 12 keV. Their main science goal is to reveal the properties of dense matter through precise measurement of neutron star radii and mass-to-radius ratios by fitting thermal emission profiles of millisecond pulsars (MSPs). We propose to perform fitting of Fermi gamma-ray light curves of MSPs to provide the most accurate possible values of magnetic inclination and viewing angles for NICER radius and mass-to-radius measurements. Improved fits of Fermi light curves will result from use of the absolute magnetic pole phase determined from NICER light curves as a fit prior, and use of the newest gamma-ray emission models from global magnetosphere simulations.

111025	HURLEY	MAINTAINING THE FERMI GBM IN THE INTERPLANETARY NETWORK	We propose to maintain the Fermi GBM in the 3rd Interplanetary Network of Gamma-Ray Burst detectors in AO-11, to 1) facilitate identification of gravitational radiation and associated with GRBs, 2) reduce the sizes of ~75 GBM error circles by several orders of magnitude, 3) enable the identification of GRB sources with objects found by ground- and space-based observatories at other wavelengths, from the radio to very high energy (VHE) gamma-rays, 4) reduce the uncertainties in associating ~4 LAT detections of high energy photons with GBM bursts, 5) discover and monitor sources of magnetar bursts, and 6) assist the Fermi team in understanding and reducing their systematic localization uncertainties for ~30 short bursts. We will make our results public as soon as they are available.
111044	BARING	GENERATING THE CRAB NEBULA FLARES WITH EMISSION FROM TURBULENT MAGNETIC ISLANDS	A legacy discovery of Fermi-LAT is the variability of the Crab nebula at 100 MeV - 1 GeV energies. This has called into question whether the pulsar wind termination shock (PWTS) is the site of energetic lepton injection for the surrounding nebula. This proposal examines the ability of acceleration in the PWTS proximate to turbulent fields to explain the Crab flares. A kinetic simulation of electron transport in prescribed long-wavelength field fluctuations and concomitant synchrotron radiation will be developed, injecting non-thermal electron distributions obtained from simulations of diffusive acceleration in relativistic shocks. The penetration of electrons into magnetic islands will be explored, and the flux, frequency, variability and polarization of the emission will be obtained.
111046	LISTER	WIYN 3.5 M SPECTROSCOPY OF RADIO-LOUD FERMI AGN	We propose a WIYN 3.5m multi-object spectroscopic program to observe radio-loud AGN in the LAT FL8Y catalog. Optical spectra of the target and up to 60 nearby galaxy cluster candidates will be obtained simultaneously, increasing the chances of determining a cluster redshift for lineless BL Lacs. Priority will be given to high energy flux, compact radio AGN with g mag. > 19 and no prior spectroscopy. These data will enhance Fermi science by establishing AGN classifications, line luminosities, rest frame synchrotron peak frequencies, and jet speeds. By increasing the fraction of LAT-detected blazars with known redshifts, complete samples will be assembled to fainter flux levels, improving the the measured luminosity functions of blazar sub-classes and our understanding of the EGRB.

111049	CHRISTIAN	SIMULTANEOUS SPACE-BASED OBSERVATIONS OF TERRESTRIAL GAMMA-RAY FLASHES AND LIGHTNING OPTICAL EMISSIONS	Since the launch of the Geostationary Lightning Mapper (GLM) in late 2016, and its validation in 2017, valuable observations of lightning optical emissions over north and south America and adjacent oceans became available. These observations can be used along with TGFs detected by the Gamma-ray Burst Monitor (GBM) to study the production mechanism of TGFs. The important parameters that can be estimated using these observations are the relative time between TGF and lightning and charging/discharging frequencies in thundercloud cells that produce TGFs. These parameters will help to understand the TGF production mechanism and identify the characteristics of thundercloud cells that produce TGFs.
111062	LAZZATI	PROMPT GAMMA-RAY EMISSION FROM COCOON INTERNAL SHOCKS IN BINARY NEUTRON STAR MERGERS	The detection of a gamma-ray transient associated with GW170817 heralded the new era of multi-messenger astrophysics. However, its origin has yet to be fully understood. The timing and energetics of the gamma-ray transient were consistent with a simple cocoon model, but the spectrum showed signs of dissipation and pair saturation. A shock breakout can explain the spectrum but requires the presence of ad-hoc ejecta from the merger and an uncomfortable fine-tuning between the collapse-to-jet delay and the jet transit time. We argue that an unsteady central engine drives multiple cocoon shells whose collisions create a natural shock breakout. We propose to derive the breakout properties analytically and perform numerical simulations to confirm the validity of the most interesting cases.
111064	BARING	MULTI-ZONE EMISSIONS MODELS AND SHOCK ACCELERATION IN BLAZAR JETS	Blazar science has been profoundly refined in the Fermi-LAT era, including improved spectroscopy and concerted multi-wavelength (MW) campaigns on various sources. Our group has recently combined Monte Carlo simulation results of shock acceleration with MW modeling of Mrk 501, BL Lac and AO 0235+164, determining that the data can be explained only if the diffusion length of leptons is a strongly increasing function of momentum. This proposal explores how this can arise using Monte Carlo and plasma simulations plus analytic theory of turbulent transport of charges in fluctuating E/M fields. The study will characterize diffusion parameters in terms of the power spectra of MHD turbulence, and then perform MW modeling of select Fermi-LAT blazars to constrain the turbulence properties.

111068	ROMANI	OPTICAL COUNTERPARTS FOR TOP LAT MSP CANDIDATES	We propose a program of optical imaging and spectroscopy to study counterparts for the best and brightest LAT unidentified sources. These are likely extreme (short period/strong wind) binary millisecond pulsars and the data will constrain the orbital properties, enabling a meaningful search for pulsations directly in the LAT gamma-ray data. We augment this with narrow band images of Halpha bow shocks around these sources and known high power LAT pulsars. A combination of 4m SOAR discovery observations, 2m LCO follow-up queue photometry and 8m GMOS follow-up queue spectroscopy deliver accurate orbital parameters enabling LAT pulse discovery. The measurements also probe binary heating and spindown energetics to constrain the pulsar physics.
111072	SCHINZEL	ENHANCING THE VALUE OF THE FERMI/LAT FOURTH SOURCE CATALOG THROUGH A DEDICATED RADIO SURVEY WITH VLA AND VLBA	Understanding the nature of Fermi gamma-ray sources largely relies upon identifications at other wavebands. The latest Fermi gamma-ray catalog based on 8 years of observations (4FGL) has 37% unidentified sources making the gamma-ray sky the least understood in all of astronomy. We propose to enhance the 4FGL with a dedicated radio counterpart search in order to identify Fermi/LAT sources from 4FGL and to provide statistically complete information for all 4FGL point sources >-40 deg. decl. This will allow for tests for populations of gamma-ray emitters associated with radio quiet AGN, or a population of gamma-ray objects entirely devoid of radio counterparts. In addition, we add radio observations to improve positional accuracies from >2 arcsec to mas of known gamma-ray counterparts.
111073	SAZ PARKINSON	SEARCHING FOR RADIO PULSARS IN FERMI LAT SOURCES USING THE FIVE-HUNDRED-METER APERTURE SPHERICAL RADIO TELESCOPE (FAST)	Since its launch in 2008, the Fermi Large Area Telescope (LAT) has detected over 200 gamma-ray pulsars. Roughly half of these were discovered by radio telescopes targeting pulsar-like LAT sources, as part of the Pulsar Search Consortium (PSC). The Five-hundred-meter Aperture Spherical Radio Telescope (FAST), currently in its commissioning phase, is the largest and most sensitive single-dish radio telescope in the world, and recently joined the PSC. We propose a coordinated program of pulsar searches with FAST, in conjunction with Fermi, to discover new radio and gamma-ray pulsars, making use of the recently-released 8-year Point Source List (and upcoming 4FGL). Finally, we will carry out the deepest searches yet for radio pulsations from the current population of radio-quiet pulsars.

111098	CENKO	THE ENERGETICS AND PROGENITORS OF FERMI-LAT GAMMA-RAY BURSTS	We propose here to continue our successful program to provide complementary multi-wavelength observations of well-localized gamma-ray bursts (GRBs) detected by the Fermi Large Area Telescope. Specifically, our program is designed to 1) identify long-wavelength (optical, X-ray, and radio) counterparts, 2) obtain spectroscopic redshifts, and 3) measure beaming-corrected energies (burst plus afterglow) of Fermi-LAT GRBs. This study will provide us with new insights into the least understood aspect of GRBs -- the central engines -- by constraining the maximum energy available for progenitor models (e.g., magnetars and black holes).
111099	LI	FERMI TOO OBSERVATIONS OF BRIGHT GALACTIC NOVAE	14 Galactic novae have been detected in GeV with the LAT in the last 10 years. This unexpected discovery highlights the complexity of the mass ejection process and the importance of shocks in novae. Since the shock velocities are modest and the densities are high compared to other classes of accelerators, and since rich multi-wavelength data can be acquired for bright novae, novae have become an important class for the studies of astrophysical shocks and particle acceleration. Further progress depends on discovery of more LAT-detected novae backed up by multi-wavelength observations. We therefore propose to continue our LAT monitoring campaign on novae, approved in Cycle 10, for TOO observations of nova eruptions during the Cycle 11 period.
111104	KAZANAS	THE FERMI BUBBLES AS PAIR HALOES	The limited span of the energy range of the Fermi bubbles, in particular the apparent dearth of photons below 100 MeV and above 100 GeV and their sharp gamma-ray emission edges hint of a process unlike those of the typical AGN jets. We propose that the electrons responsible for the gamma-ray Fermi bubble emission are injected by photon-photon pair production of high energy gamma-rays produced at an earlier, active phase of the Galactic Center black hole, i.e. the Fermi bubbles are Galactic ``pair haloes". Simple first estimates are consistent with observation. We propose to produce more detailed calculations of their spectra and of the dynamics of the Galactic halo ISM, induced by the momentum deposited by the black hole gamma-rays.

111105	THOMPSON	INCREASING THE DISCOVERY POTENTIAL OF FERMI-LAT THROUGH MIDTERM AND LONG-TERM TIME DOMAIN ANALYSIS	We propose to apply interdisciplinary time-series analysis methods to Fermi-LAT light curves data of selected sources of the Third Fermi-LAT Catalog of High-Energy Sources (3FHL) and sources from the forthcoming Fourth LAT catalog (4FGL) once it is released. Based on this time-series analysis of selected blazar-like, unassociated and Galactic γ-ray sources we aim to extract improved knowledge and infer discovery potential, capitalizing on the observing strategy and characteristics of the Fermi survey mission. Once built, the γ-ray light curves will be analyzed with different and complementary techniques detailing the variability properties and the underlying physics, searching for potentially new and interesting temporal features.
111107	AJELLO	THE GUARANTEED CONTRIBUTION OF STAR-FORMING GALAXIES TO THE NEUTRINO AND GAMMA-RAY BACKGROUNDS	The high-energy emission of star-forming galaxies is predominantly powered by the inelastic collisions of CR nucleons with interstellar gas. As such, galaxies are poised to contribute to both the extragalactic gamma-ray background and the IceCube neutrino flux. Recent works have shown that only galaxies with a hard spectral index at gamma-rays can provide a sizable contribution to the IceCube signal. Motivated by our preliminary discovery of a population of star-forming galaxies with hard indices we will evaluate the contribution of star-forming galaxies to both the extragalactic gamma-ray background and the IceCube neutrino flux.
111112	ZHANG	HUNTING FOR RECONNECTION SIGNALS IN BLAZARS WITH MULTI-PHYSICS MODELING AND MULTI-WAVELENGTH POLARIZED OBSERVATIONS	Magnetic reconnection is a promising mechanism that can unleash the magnetic energy to efficiently accelerate particles by reorganizing magnetic topology, which may account for recent observations of fast variability and polarization signatures. However, PIC simulations cannot directly model the entire emission region due to limited computing power, and lack systematic studies of observable signatures. We propose to study the radiation signatures of reconnection using an integrated multi-physics polarized radiation transfer toolset, including plasma dynamics based on MHD simulations with injected energetic particles derived from PIC simulations, and directly compare to multi-wavelength light curves and optical polarization signatures, so as to quantitatively test the reconnection scenario.

111123	KERR	FINDING EXTREMELY COMPACT PULSAR BINARIES USING GAMMA-RAY ECLIPSES	About 70 bright, pulsar-like Fermi sources remain unidentified. We argue that they are likely to be millisecond pulsars in compact binaries and thus difficult to find using traditional pulsation searches. We propose a sensitive search for narrow gamma-ray eclipses in order to identify the orbital period and bootstrap a pulsation search. The rate is such that we expect to detect a few eclipses in our sample, and will derive useful constraints on inclination angle for the remainder. These systems are likely to harbor the heaviest neutron stars, so finding even one in an edge-on configuration is of great value in probing the neutron star equation of state.
111125	MARGUTTI	MAPPING EXTREME MASS LOSS FROM MASSIVE STARS WITH FERMI AND THE VLA	Building on the GeV detection of SN iPTF14hls at d=150 Mpc, we propose a systematic search for GeV emission from nearby (d<150 Mpc) SN shocks interacting with a dense environment. GeV emission is predicted to originate as the SN ejecta crash into dense shells of material previously ejected by the progenitor star. We capitalize on Fermi/LAT and VLA observations with three goals: (i) Test the supernova shock breakout through a dense wind model using GeV observations. (ii) Constrain the cosmic rays acceleration at shocks formed by the collision between the SN ejecta and the CSM shell. (iii) Deliver the first predictions of the neutrino emission associated to ordinary interacting SNe and super-luminous SNe. This study opens up a new window of investigation on the most extreme mass-loss.
111127	OMODEI	FOLLOW UP GRAVITATIONAL-WAVE CANDIDATES WITH THE FERMI LAT DURING O3	With the detection of Gravitational Waves in coincidence with the GBM detection of GRB170817A a new era in multi-messenger astronomy has begun. With the new upcoming observing cycle "O3" the expectations for new detections are extremely high. The Fermi Large Area Telescope has the unique capability to observe high-energy radiation from GRBs, which is only possible if a large boosting factor is in the equation. In other words, a LAT detection would prove the existence of a highly-relativistic jet. Conversely, a non-detection at high energy can set very constraining limits on the emission mechanisms. We propose to continue our successful follow-up program, identifying areas to improve, and plan a fast response to accompany the public release of GW alerts.

111128	MARCHESI	TOWARDS A FULL 3D MAPPING OF THE >10 GEV EXTRAGALACTIC SKY: A SPECTROSCOPIC FOLLOW-UP CAMPAIGN OF UNIDENTIFIED 3FHL SO	The newly developed 3FHL catalog, the largest catalog of sources detected at >10 GeV, is the deepest look at the very high energy sky and will remain unrivaled for years to come. However, at the present day the catalog spectroscopic completeness is rather low (<50% of ~1500 sources), thus limiting its scientific applications. Following the Fermi-NOAO Cooperative Arrangement guidelines, we propose for Gemini (-N and -S) spectroscopic follow-ups of 50 new, unclassified 3FHL sources with a bright Swift-XRT counterpart, which are likely to be blazars. Characterizing a significant part (~25%) of the population of these new, unidentified 3FHL sources, this legacy project will both improve our knowledge of the blazar population and prepare the ground for future facilities, such as CTA.
111132	FALCONE	SYSTEMATIC SEARCH FOR X-RAY COUNTERPARTS OF FERMI-LAT UNASSOCIATED SOURCES USING SWIFT: NEW BLAZARS, PULSARS, AND MORE	We propose to use Swift to search for X-ray and UV/optical counterparts of unassociated FL8Y/4FGL Fermi-LAT sources. Prior programs led to Swift observations of 261, 199, & >522 Fermi unassociated sources from the 1,2, & 3FGL catalogs respectively. Possible x-ray counterparts are found in ~1/3 of these. We propose >200 new observations of 4FGL unassociated sources. These new data will determine the properties (with ~5 arcsec positions) of all detected X-ray sources in the LAT regions, contributing to identification, classification, and follow-up. This proposal supports the large analysis and interpretation task, which will require additional data reduction software. The Swift PI and Exec Committee commit to the Swift observing time. Reduced data will be made publicly available to everyone.
111133	KERR	VLBI PARALLAXES FOR FERMI PULSARS: LUMINOSITY FUNCTIONS AND PULSAR PHYSICS	Fermi has now found pulsations from more than 230 neutron stars, half of which are millisecond pulsars. This bonanza has outstripped efforts to gather the multi-wavelength data needed to take full advantage of the gamma-ray discoveries. Distances to pulsars, in particular, are fundamental to understanding the pulsar luminosity function and the gamma-ray emission mechanism. We propose to use very long baseline-interferometry (VLBI) to obtain parallax measurements of 10 young, energetic pulsars and 10 millisecond pulsars, nearly doubling the number of Fermi pulsars with a gold standard distance.

111136	HARTMANN	COSMOLOGY WITH FERMI-LAT	We propose to measure basic cosmological parameters (Omega_m and H_0) using LAT observations of the extragalactic background, EBL(z), with a competitive level of accuracy to standard methods. The methodology employed for LAT-cosmology breaks the existing degeneracies between various methods and thus offers a valuable new tool for modern observational cosmology. We have established the feasibility of the LAT-EBL method and propose to investigate systematic effects that stem from theoretical uncertainties in the EBL(z) model. Utilization of high quality LAT data from the full period of the mission to date will allow us to rigorously establish the prospect of gamma-ray cosmology with Fermi-LAT.
111142	WILSON-HODGE	GBM EARTH OCCULTATION MONITORING IN CYCLE 11	We propose to use software developed for Fermi GBM Earth occultation analysis to search for extended duration emission from multi-messenger events. We will continue to monitor a catalog of sources, providing automatically updated light curves (plots, ASCII files, and FITS files) and hardness ratios or energy spectra for select requested sources as a service to the community via our website and FITS files via the FSSC. We propose to continue to characterize hard X-ray variations in the Crab Nebula and their potential relationship to GeV flares, and to serve the community by providing alerts about transient outbursts and source state changes, and by participating in multi-wavelength campaigns.
111150	KOCEVSKI	IMPROVING THE TARGETED SUB-THRESHOLD SEARCH OF GBM DATA FOR ELECTROMAGNETIC COUNTERPARTS TO GRAVITATIONAL WAVE DETECTION	The joint detection by LIGO/Virgo and Fermi GBM of merging neutron stars has ushered in the era of multi-messenger astronomy. GBM is the most prolific detector of SGRBs, making it an effective instrument to detect additional electromagnetic counterparts to LIGO/Virgo triggers. We propose to improve upon the targeted sub-threshold search of GBM data by leveraging information gained from the detection of GRB~170817A. These improvements will allow us to increase the GBM sensitivity, and hence the gamma-ray horizon, to weak electromagnetic counterparts to gravitational wave detections. We propose to use the improved search to provide follow-up of LIGO/Virgo detections through O3. All potential GBM candidates and their localization contours will be made available to the follow-up community.

111161	TROJA	RAPID FOLLOW-UP OF FERMI LAT GAMMA-RAY BURSTS	GRBs with high-energy emission opened up a new realm of phenomena, from the physics of GRBs and their central engines to theories of quantum gravity, and constraints on the extra-galactic background light. Here we propose to continue our successful follow-up program of LAT detected GRBs aimed at providing rapid and accurate localizations, photometric redshifts, and multi-color afterglow observations.
111162	PETER	ILLUMINATING INNER HELIOSPHERE COSMIC RAYS WITH GAMMA RAYS	Though gamma rays from the disk of the Sun are sourced by hadronic Galactic cosmic-ray (GCR) interactions in the solar atmosphere, the only existing theoretical model breaks down. We recently found that the flux saturates the maximum allowed for an interstellar GCR density, and is strongly equatorial during the last solar minimum. Does the model fail to describe the GCR (the beam) or the interactions (the target)? We propose a new measurement of the beam, revealing the spatially resolved inverse Compton emission of GCR electron interactions with solar photons using ten years of LAT data. Thus, we can track GCRs through the poorly understood coronal magnetic fields, and build a new model for solar gamma rays, which may be confirmed by LAT observations of the Cycle 25 solar minimum.
111171	MEYER	SEARCH FOR SHORT GAMMA-RAY BURSTS FROM CORE-COLLAPSE SUPERNOVAE INDUCED BY AXIONLIKE PARTICLES	Axionlike particles (ALPs) are well motivated dark-matter (DM) candidates that would be copiously produced during a core-collapse supernova (SN). They would subsequently decay or oscillate into gamma rays, inducing a gamma-ray burst lasting tens of seconds that would arrive simultaneously with the SN neutrinos. We propose a novel search for such a signal from extragalactic SNe using data collected with the Gamma-ray Burst Monitor and the Large Area Telescope on board the Fermi satellite. As neutrino detectors lack the sensitivity to detect neutrinos from such events, the SN explosion times will be estimated using optical light curves. By combining results for dozens of SNe, the proposed research will open a new possibility in the search for ALP DM.

111175	MEYER	PROBING THE EMISSION MECHANISM IN X-RAY ANOMALOUS QUASARS WITH FERMI OBSERVATIONS	The unexpected (but now routine) detection of X-rays from powerful AGN jets on kpc scales with high-resolution Chandra imaging has raised a debate as to their origin which has remained open for over a decade. Two different physical processes have been advanced to explain these X-rays, with important implications for our understanding of jet physics, and the impact of jets on their environments. We propose a unique use of Fermi observations to conclusively confirm or rule out one of these mechanisms for over a dozen X-ray detected jets, following on the success of a recent application of this method to the well-known jets in 3C 273 and PKS 0637-752.
111179	RANSOM	HIGH-PRECISION SINGLE-PHOTON PULSAR TIMING WITH FERMI	We are developing a better way to time gamma-ray pulsars using individual photons. Leveraging new timing software (PINT) and MCMC, our "beta" code can time LAT pulsars that were previously impossible. Using each photon allows us to detect short-term effects (like orbital Shapiro Delay) which traditional methods average out. We propose to develop and extend these techniques and make the code available to the community. This work will improve gamma-ray detections for pulsars with short radio timing baselines or significant timing noise, will measure new proper motions, and may allow us to incorporate the best MSPs into gravitational wave searches. We will update our existing LAT timing pipeline (doubling the number of timed pulsars) and provide updated timing models to the community.
111180	MURASE	HIGH-ENERGY EMISSION AS PROBES OF THE CONNECTION BETWEEN SHORT GAMMA-RAY BURSTS AND NEUTRON STAR MERGERS	Short gamma-ray bursts (SGRBs) are believed to originate from relativistic jets launched by neutron star mergers. The discovery of GW170817 and GRB 170817A raised a new question in their standard paradigm. The observations have led to the development of models that involve a structured jet and a cocoon, which is different from previous models with only jet contributions. We propose to study high-energy gamma-ray and neutrino emissions produced via leptonic and hadronic interactions with a focus on the jet-cocoon paradigm for SGRBs. Accomplishing this project will enable us to use high-energy emissions as new probes of the connection between SGRBs and neutrino star mergers like GW170817.

111196	BURNS	SEARCHING FOR GAMMA RAY COUNTERPARTS TO SUPERNOVA EXPLOSIONS WITH FERMI GBM	Some core-collapse supernova explosions (SNe) power long gamma ray bursts (LGRBs). This is known from about a dozen associations, largely found in follow-up of well-localized bursts from the Neil Gehrels Swift Observatory. It is difficult to do this with LGRBs detected by the Fermi GBM due to the large localization uncertainties (~deg). Dedicated SNe discovery surveys, such as ASAS-SN, have vastly increased the number of known SNe. We propose to associate GBM LGRBs with the relevant SNe identified by these surveys in both archival and future observations. We will include GBM analysis in the broadband modeling of interesting transients. Additionally, this work will inform on possible gamma ray signatures from choked GRBs, which are promising sources for astrophysical neutrinos.
111197	EAGLE	CHARACTERIZING A SHOCK-CLOUD INTERACTION ON THE WESTERN EDGE OF THE VELA SUPERNOVA REMNANT	Very High Energy (VHE, >50 GeV) gamma rays provide a direct view of the most extreme environments in our Galaxy and are an excellent probe of non-thermal astrophysical processes. Studies of the non-thermal Galactic source population are essential to understand where and how the bulk of the cosmic rays (CRs) are accelerated in our Galaxy. We propose for a combined narrow-band imaging and spectroscopic follow-up with the Gemini-South GMOS instrument of an intriguing VHE source, 2FHLJ0826.1-4500, a candidate shock-cloud interaction located on the Western edge of the Vela supernova remnant. We aim to characterize the shock emission mechanisms, measure its velocity and elemental composition, and to determine if 2FHLJ0826.1-4500 is a source of CRs, either freshly accelerated or re-accelerated.
111201	VIANELLO	THE LAT TRANSIENT FACTORY: PROVIDING 10 YEARS AND MORE OF LAT GRBS AND SHORT-DURATION TRANSIENTS	Fermi/LAT has already observed > 170 GRBs, with more coming, providing an unprecedented opportunity to solve outstanding modeling issues, especially regarding emission processes. We will run our detection and characterization procedure on all new GRBs and gather the results for all archival bursts as well. We will set up a web portal where the community will be able to access all the results (spectra, TS maps, light curves...) for every burst, as well as summary tables and plots, in a format ready to use for follow-up studies. We will also characterize the VHE spectrum of the LAT GRBs (2-3/yr) observed by HAWC. We will as well continue operating our blind search that detects short-duration transients (< 6 h) that other methods (ASP, FAVA) are not sensitive to, and disseminate its results.

111202	VIANELLO	AN EASIER AND MORE POWERFUL WAY OF ANALYZING FERMI/LAT DATA: FERMIPY	Fermipy is a widely-used high-level wrapper around the Fermi Science Tools simplifying the analysis of LAT data and providing new functionalities, thereby enhancing the scientific return of Fermi across the board. It has been already used for several scientific publications both from within and from outside of the Fermi collaboration. In this work, we will maintain and enhance Fermipy, support it with bug fixes, keep it up to date with the Science Tools, and review and manage inputs and contributions from the community through the GitHub interface. We will also implement new features, such as full-sky analysis for diffuse emission and the "bracketing IRFs" method to assess systematic uncertainties on model parameters.
111204	BUSON	BRIDGING THE GAP IN THE CENSUS OF GAMMA-RAY VARIABLE SOURCES	After almost ten years of data collected, the Fermi Large Area Telescope (LAT) has dramatically improved our knowledge of the high-energy Universe, enriching the census of the known gamma-ray sources. The plethora of sources hosted in the Fermi LAT catalogs represents the current best, most exhaustive description of the persistent gamma-ray sky. Short timescale variable sources (seconds/hours) have been extensively searched and are reported in the GRBs catalogs. We propose to bridge the gap between the persistent and the short-term gamma-ray variable sky searching the LAT data for the <1 month-timescale variable transients.
111211	SINGER	ZWICKY TRANSIENT FACILITY AND FERMI GBM: A SHORT GRB FACTORY	The joint detection of the binary neutron star merger on 2017 August 17 in GWs with LIGO and Virgo, in gamma-rays by Fermi and INTEGRAL, and from X-rays to radio by scores of telescopes, will stand among the most significant breakthroughs in astrophysics of our century, comparable to SN1987A in the last. It finally proved that (at least some) short GRBs are powered by neutron star mergers. The Fermi GBM will drive the next leap forward in our understanding of SGRBs thanks to its large FOV. We propose a targeted search for optical counterparts of Fermi SGRBs with the Zwicky Transient Facility, an optical survey whose centerpiece is a new 47 deg2 camera on the Palomar 48-inch Oschin telescope. In one year of ZTF, we expect to follow up 12 SGRBs and detect 1-4 optical counterparts.