Welcome to the FIG SAG Workshop at Michigan Tech!

This packet contains the list of participants, contact information, Code of Conduct, the schedule of activities, and abstracts. Please read it carefully; we will go through some of the material during the first day of the Workshop, but please keep this information for future reference.

Table of Contents

Sponsors

This meeting has been generously sponsored by:

The Office of the Vice President of Research

The Earth, Planetary and Space Sciences Institute

The Office of the Dean of the College of Sciences and Arts

The Elizabeth and Richard Henes Center for Quantum Phenomena

at **Michigan Technological University**

Special thanks to V.P. David Reed, Prof. Petra Huentemeyer, Dean. Ravindra Pandey, and Dept. Chair Jacek Borysow, in addition to Megan Johnson and Claire Wiitanen for making this meeting possible.

Logistics

Transportation, etc Contact

Slack is probably going to be a faster way to get in touch than email for Tiffany and students, but you can also send emails to any of the chairs. Drivers are Daniel Barr, Rhiannon Turner, Daniel Watson, Sam Groetsch, & Richard Petarius III.

We organized transportation through the university due to the limited number of local taxis and rental cars. Uber does not operate here. There is a Lyft driver and a few Doordash delivery people. Walmart also makes deliveries, but there is a longer wait time because the store staff fill the order and then pass it to a delivery contractor. Downtown is very walkable.

Airport Arrivals

We anticipate that most people will arrive via the airport. On Sunday 23 June, there will be a van with a capacity of ~10 people to shuttle attendees from the airport to their respective hotels. Per the numbers on the registration form, there is an undercount, and we were not sure if people found other solutions or if they will also want to partake in the shuttles provided by the meeting. So, there is some possibility of the van needing to make multiple trips. The astrophysics students who are driving appreciate your patience.

If you are planning to arrive late in the evening in the middle of the week, Tiffany Lewis can pick you up. If you are arriving during the day in the middle of the week, you can ping Tiffany anyway, but you'll probably be met by a student.

Daily Shuttles

There will be 3 vans circulating between the different hotels and MTU's campus each morning and evening. There are also 1-2 "on call" vans in case you need to return to the hotel urgently or during a break. Several of the hotels are also walking distance from campus. Some of the student drivers may be willing to drive you to dinner if they can join you - you'll have to ask them. Most of the restaurants are within walking distance of most of the hotels.

Airport Departures

We have one shuttle going to the airport on Friday and one on Saturday. If you are departing on Sunday, Prof. Robert Nemiroff has agreed to drive you, but you should introduce yourself in order to coordinate the pickup.

For people departing on Friday, we ordered box lunches so that you can take them with you if you need to leave before you finish.

If you are planning to depart during the day in the middle of the week, ping Tiffany to send a student. If you are departing early, in the middle of the week, also please let Tiffany know.

Daily Food & Beverages

Each day, we will provide coffee in the morning, coffee and water in the afternoon, as well as a boxed or buffet lunch. There should be options for any dietary restrictions that were reported through the registration by the deadline. We over-ordered the vegetarian options in most cases, so if you didn't tell us you were vegetarian and like produce, feel free to help yourself. For our gluten free friends, the catering staff will keep prepackaged gluten free products off to the side for you - you may need to ask for them.

Conference Dinner

The Conference Dinner will be at 6:30pm in the Lobby of the Rozsa Center for the Performing Arts. Shuttles will be available. In this case, the caterer suggested holding separate plates for vegetarian entrees, so if you registered requesting a vegetarian or vegan meal, the catering staff will have your plates. Again, we ordered extra veggies for everyone, so feel free to help yourself to anything on the buffet. There will be a cash bar from 6-8pm, so feel free to arrive early and mingle with a beer or a cocktail (they also have soft drinks). There will also be non-alcoholic beverages provided through the buffet.

Restaurant Recommendations

There are a number of restaurants across Houghton and Hancock, each with their own cuisine and character. The 'local food' is nordic cardamom bread, which you can get as french toast at Suomi's for breakfast if you want to take a break from the hotel food. Additionally, Pasty's were popularized by the miners who would hold onto the crust so as not to get their work on their lunch. Roy's has several options for pasties, pastries, and sandwiches, including vegan & vegetarian options, but if you want the latter, you should call ahead because they do run out.

The Bonfire occasionally has live music and along with the Ambassador, the Den, and several other places will serve standard American fare. If you're seeking Italian, keep in mind that it is often midwesternized here, meaning extra cheddar cheese. We get pretty good shipping for fish if you're inclined to try Joey's or any other seafood. Milly's, La Cantina, and the Forge are all excellent options in Hancock, but unless you want a longer walk, you might try inviting one of the students with van keys to join you.

If you rented a car and want to venture further out, Fitzgeralds is a chef owned restaurant about an hour north, on the beach of Lake Superior.

Things to Do and See

The Tech Trails are just off campus and comprise >50 miles of multiuse trail. Some students offered to organize a walk along the Nara Nature trail.

The Houghton Waterfront Park stretches along Portage Lake, just one block down from the main street. Portage Paddle Sports rents kayaks, paddle boards and bicycles. The beach on the Houghton side is at Chutes & Ladders Park.

This area is known for its minerals, especially copper. The Mineral Museum is on the south side of campus, and the Director is a physics professor.

List of participants

Full Name	Affiliation
Bahrudin Trbalic	SLAC
Chris Fryer	LANL
Colleen Wilson-Hodge	NASA/MSFC
David Palmore	Louisiana State University
Francesca Civano	NASA GSFC
Hao Zhou	Tsung-Dao Lee Institute, Shanghai Jiao Tong University
Haocheng Zhang	UMBC/CRESST II/NASA GSFC
Jeremy Perkins	NASA/GSFC
John Tomsick	UC Berkeley
Joshua Wood	MSFC
Jung-Tsung Li	Ohio State University
Judy Racusin	NASA/GSFC
Justin Finke	US Naval Research Laboratory
Kirsten Tollefson	Michigan State University
Kristi Engel	University of Maryland CP
Liz Hays	NASA GSFC
Mehr Un Nisa	Michigan State University
Michela Negro	LSU
Michelle Hui	NASA MSFC
Milena Crnogorcevic	Stockholm University
Ogetay Kayali	Michigan Technological University
Oindabi Mukherjee	Michigan Technological University
Petra Huentemeyer	Michigan Tech
Regina Caputo	NASA GSFC
Rhiannon Turner	Michigan Technological University
Richard Petarius III	Graduate Student at Michigan Tech
Rishi Babu	Michigan State University
Rita Sambruna	NASA GSFC
Robert Nemiroff	MTU
Roberto Guenzani	NASA RCN-NOW

Tonia Venters	NASA Goddard Space Flight Center
Tom Shutt	SLAC
Tulun Ergin	Michigan State University
Xiaojie Wang	MTU
Zorawar Wadiasingh	University of Maryland / NASA GSFC
Konstantinos Kalapotharakos	NASA GSFC
Marcos Santander	University of Alabama

FIG-SAG Leadership & Contact Information

FIG SAG chairs are Chris Fryer (LANL) and Michelle Hui (NASA MSFC). The co-chairs are Paolo Coppi (Yale University), Milena Crnogorčević (Stockholm University/Oskar Klein Centre), Tiffany Lewis (Michigan Technological University), Marcos Santander (University of Alabama), and Zorawar Wadiasingh (University of Maryland/NASA GSFC). Please feel free to contact us (individually, or as a group) via Slack or e-mail if you have any concerns or comments during (or after) the workshop.

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Code of Conduct for the FIG-SAG Workshop

The FIG-SAG workshop held at Michigan Technological University from June 24–28, 2024, is a professional forum dedicated to fostering free discussion and exchange of ideas among participants. All interactions, whether with fellow attendees, or staff (including administrative, technical, or support personnel), must be conducted with respect and consideration.

Guidelines for Participants

1. **Professional Conduct**: Participants are required to conduct themselves professionally and treat others with respect. This applies to all workshop-related activities and interactions across all formats, including video, audio, text, and chat communications. Discussions should focus solely on the scientific merits of ideas and results; personal attacks are unacceptable.
2. **Language and Behavior**: All communications should employ appropriate and respectful language. Participants should remain aware and respectful of the cultural differences that exist among attendees.
3. **Consent for Sharing Content**: Before sharing any recordings or presentation materials (e.g., slides, video clips) on external media or platforms, explicit consent must be obtained from both the speaker and the workshop organizers. Posting slides or excerpts on social media platforms is encouraged to promote scientific dialogue, provided the speaker has not expressed opposition to such sharing at the start of their presentation.
4. **Inclusivity and Non-Discrimination**: Discriminatory behavior or harassment based on gender, gender identity, race, ethnicity, national origin, religion, political affiliation, age, marital status, sexual orientation, disability, or any other characteristic is strictly prohibited. All participants are expected to contribute to a respectful and inclusive environment.
5. **Reporting Violations**: Should any participant witness or experience a breach of this Code of Conduct, they are encouraged to report it directly to the workshop organizers (i.e., the FIG-SAG leadership). For information on how to report via the Michigan Technological University resources, visit this link. The workshop organizers are committed to ensuring a productive and safe experience for all attendees. Violations of this Code of Conduct may result in disciplinary actions, including warnings or revocation of access to the workshop platforms.

Guidelines for Presenters

1. **Preparation and Timing**: Presenters must adhere to their allocated speaking times to ensure fairness and full participation in the Q&A sessions. Overrunning your allotted time may result in a reduction of the time available for questions.
2. **Presentation Accessibility and Style**: Use a plain or uniform background and a sans-serif font (e.g., Arial or Helvetica) that is accessible to those with color vision deficiencies. All essential content should be communicated verbally during the presentation to accommodate visually impaired attendees.
3. **Respectful Communication**: Language used in presentations and during Q&A sessions must be respectful and professional. Focus critiques on ideas rather than individuals. Clearly indicate at the beginning of your presentation if you do not consent to the public sharing of your slides on social media.
4. **Projecting & Zoom**: Since the meeting is small, you are welcome to use your own computer. We have HDMI from the podium to project onto the screen. There is also a desktop on the podium that we can use to project presentations and share them on Zoom. If you use your own computer, you will need to be on zoom and share your screen. The ambient mic will pick up your personal computer's audio, so you should silence your personal mic and speakers. The ambient mic has limited range, so people online will not be able to hear questions - it is helpful if you as the presenter can repeat them before answering.
5. **Uploading Slides**: Slides may be uploaded to Google Drive. If you intend to use the desktop for your presentation, you may prefer .ppt or .pdf file types to prevent unexpected formatting changes - it is a Windows machine. Presentations

These guidelines are designed to ensure that the FIG-SAG workshop is a productive and respectful environment for all participants, fostering scientific advancement and collaboration. This Code of Conduct has been adapted from other workshops and conferences (in particular, ESA, AAS, and APS) for the FIG-SAG Workshop.

Workshop 2024 Schedule

Below is a day-by-day itinerary for the duration of the Workshop. The Google Sheet schedule may be found here Block Schedule.

Monday, June 24, 2024

W E L C O M E C O F F E E **Fisher Hall Lobby**	
Session A1, 10:00 AM – 12:10 PM (Fisher Hall 139)	
10:00 -- 10:10 AM	FIG-SAG: Workshop Introduction
10:10 – 10:30 AM	Liz Hays: Paths to the gamma-ray future
10:30 – 10:50 AM	Chris Fryer: Decadal Overview
10:50 – 11:10 AM	Kristi Engel: Gamma-ray Astronomy & Astrophysics in the Snowmass and P5 Processes
11:10 -- 11:30 AM	Aimee Hungerford: Atomic Decadal Survey
11:30 -- 11:50 AM	Amitava Battacharjie: Plasma Physics
11:50 -- 12:10 PM	Justin Finke: Physics of the Cosmos Technology and Science Gaps
L U N C H **Fisher Hall Lobby**	
Session A2, 1:30 PM – 3:30 PM (Fisher Hall 139)	
1:30 – 1:47 PM	Janeth Valverde: AGN
1:47 – 2:04 PM	Steve Boggs: Gamma-ray lines
2:04 – 2:21 PM	Michela Negro: Magnetar Giant Flares and Fast Radio Bursts
2:21 – 2:38 PM	Kostas Kalapotharakos: Gamma-ray Pulsars: Mastering the Known, Unraveling the Unknown, and Shaping the Future
2:38 – 2:55 PM	Milena Crnogorčević: WIMPs, WISPs, Gammas, and Else

2:55 – 3:12 PM	Dan Kocevski: GRBs
C O F F E E B R E A K **Fisher Hall Lobby**	
Session A3, 4:15 PM – 5:30 PM (Fisher Hall 139)	
4:15 – 4:30 PM	Xianjie Wang: PeVatrons
4:30 – 4:45 PM	Jung-Tsung Li: The Solar Gamma Rays as A New Probe of Galactic Cosmic-Ray Transport and Solar Magnetism
4:45 – 5:30 PM	PhysCOS Panel
DAY 1 END	

Tuesday, June 25, 2024: Science Focus Day

Session B1, 9:00 AM – 10:30 AM (Fisher Hall 139)	
9:00 -- 9:18 AM	Haocheng Zhang: Scientific Potentials of MeV Polarimetry
9:18 -- 9:36 AM	Tulun Ergin: MeV to TeV Gamma-ray Emission from Novae and Star Clusters in the Galaxy
9:36 -- 9:54 AM	Zorawar Wadiasingh: Gamma-ray Emission from Pulsar Binaries, Magnetars, and other interesting ideas
9:54 -- 10:12 AM	Mehr Un Nisa: Synergies with Neutrino Astronomy
10:12 -- 10:30 AM	Michela Negro: AXIS talk
C O F F E E B R E A K **Fisher Hall Lobby**	
Session B2, 11:00 AM – 12:30 PM *Breakout*	
Science topics primed for discovery: (B2-Science Breakout 1) **Extragalactic (Fisher Hall 127)** **Galactic (Fisher Hall 129)**	
L U N C H **Fisher Hall Lobby**	
Session B3, 2:00 PM – 3:30 PM *Breakout*	
Current challenges & science gaps: (B3-Science Breakout 2) **Continuous (Fisher Hall 127)** **Time Domain (Fisher Hall 129)**	
C O F F E E B R E A K **Fisher Hall Lobby**	
Session B3, 4:00 PM – 5 PM *Discussion of breakouts* (Fisher Hall 139)	
DAY 2 END	

Wednesday, June 26, 2024: Missions Focus Day

Session C1, 9:00 AM – 10:30 AM (Fisher Hall 139)	
9:00 -- 9:18 AM	Judy Racusin: Towards a Fleet of New Great Observatories
9:18 -- 9:36 AM	John Tomsick: COSI
9:36 – 9:56 AM	Tom Shutt: GammaTPC
10:00 – 10:30 AM	Breakout Primer
C O F F E E B R E A K **Fisher Hall Lobby**	
Session C2, 11:00 AM – 12:30 PM *Breakout*	
Recent info & expectations from missions in development: **Polarimetry (Fisher Hall 127)** **Imaging (Fisher Hall 129)**	
L U N C H **Fisher Hall Lobby**	
Session C3, 2:00 PM – 3:30 PM *Breakout*	
Complementarity with ground-based gamma rays: **Extragalactic (Fisher Hall 127)** **Galactic (Fisher Hall 129)**	
C O F F E E B R E A K **Fisher Hall Lobby**	
Session C3, 4:00 PM – 5 PM *Discussion of breakouts* (Fisher Hall 139)	
DAY 3 END	

Thursday, June 27, 2024: Technology Focus Day

Session D1, 9:00 AM – 10:30 AM (Fisher Hall 139)	
9:00 -- 9:18 AM	Bahrudin Trbalic: GAMPix
9:18 -- 9:36 AM	Regina Caputo: AstroPix: Monolithic CMOS Silicon Detectors for Future Gamma-ray telescopes
9:36 -- 9:54 AM	Josh Wood: The impact of scintillator and photosensor choices on wide field-of-view GRB missions
10:00 – 10:30 AM	Breakout Primer
C O F F E E B R E A K **Fisher Hall Lobby**	
Session D2, 11:00 AM – 12:30 PM *Breakout*	
Technologies Needed (hardware focus): **Extragalactic (Fisher Hall 127)** **Galactic (Fisher Hall 129)**	
L U N C H **Fisher Hall Lobby**	
Session D3, 2:00 PM – 3:30 PM *Breakout*	
Software Needs: **High level data products (Fisher Hall 127)** **Low level data products (Fisher Hall 129)**	
C O F F E E B R E A K **Fisher Hall Lobby**	
Session C3, 4:00 PM – 5 PM *Discussion of breakouts*	
CONFERENCE DINNER - Rozsa Center Lobby **Cocktails from 6PM - cash bar** **Dinner 6:30-8:30PM**	
DAY 4 END	

Friday, June 28, 2024: Synergies with other facilities

C O F F E E C H A T **Fisher Hall Lobby**	
Session E1, 10:00 AM – noon (Fisher Hall 139)	
10:00 – 10:23 AM	Petra Huentemeyer: SWGO
10:23 – 10:46 AM	Colleen Wilson-Hodge: STROBE-X
10:46 – 11:09 AM	Tonia Venters: POEMMA, EUSO-SPB2, and PBR
11:09 – 11:32 AM	Multi-messenger Discussion
11:32 – 11:55 AM	Closing Remarks
B O X L U N C H **Fisher Hall Lobby**	
DAY 5 END. SAFE TRAVELS!	

Abstracts

Paths to the gamma-ray future
Liz Hays

What does the future of gamma rays look like and how do we get there? Our field has rarely answered the questions we have pursued precisely as originally imagined. Often we have encountered answers to questions we did not even think to ask. While we consider key questions that will help define a shared vision for the next stages of space-based gamma-ray astrophysics, I propose that we also consider how to design that program in a way that actively enables opportunities for new and unexpected discoveries.

Gamma-ray Astronomy & Astrophysics in the Snowmass and P5 Processes
Kristi Engel

The Snowmass Community Planning Process and the subsequent P5 Process together determine the priorities of the particle physics community for the coming decade and put them forward as a cohesive recommendation to the NSF Physics and DOE funding agencies. In this most recent cycle from 2020–2023, gamma-ray astronomy & astrophysics were represented more explicitly than ever before, with significant community involvement. However, there is still much progress to be made. We present an overview of the Snowmass and P5 processes, the role gamma-ray astronomy & astrophysics played within those processes, and the outcomes of both the 2021 Snowmass Report and the 2023 P5 Report. We will also discuss lessons learned from this cycle of Snowmass and P5 so that future advocacy efforts can be more impactful and effective.

Physics of the Cosmos Technology and Science Gaps
Justin Finke

I will discuss NASA's Physics of the Cosmos Technology and Science Gaps. Technology gaps represent technologies important for strategic missions where more investment is needed. Science gaps represent scientific research that can enhance the return from existing missions, and inform the design of future missions.

Magnetar Giant Flares and Fast Radio Bursts
Michela Negro

Among the magnetars' repertoire of cosmic fireworks, Giant Flares stand out as spectacular events, releasing a huge amount energy a fraction of a second. Concurrently, at th do-posit side of the electromagnetic spectrum, the enigma of Fast Radio Bursts (FRBs), brief and intense bursts of radio waves, have been puzzling the community since their discovery. Recent observations have begun to unveil a compelling connection between magnetars transient activity and some types of FRBs, suggesting that magnetars could be one of the potential progenitors of FRBs. In this talk I will discuss the status of recent analyses and models investigating possible MGF-FRB connections.

The Solar Gamma Rays as A New Probe of Galactic Cosmic-Ray Transport and Solar Magnetism
Jung-Tsung Li

The Sun is a bright, continuous source of gamma rays in the GeV-TeV range. Emissions from the solar disk are attributed to hadronic interactions of Galactic cosmic rays (GCRs) with solar gas at the chromosphere and photosphere layers, while emissions from the solar halo originate from the inverse-Compton scattering of electron GCRs off solar photons. These GeV-TeV gamma rays from the Sun provide indirect measurements of photospheric magnetism and interplanetary magnetic fields at various solar latitudes, which are otherwise inaccessible through in situ measurements. In this talk, I will provide an overview of the solar disk and halo observations from Fermi-LAT and HAWC. I will identify the crucial scientific questions that gamma-ray data can resolve in solar research. I will discuss how future solar gamma-ray observation can advance our understanding of photospheric magnetism and GCR transport in the inner heliosphere.

Scientific Potentials of MeV Polarimetry
Haocheng Zhang

Magnetic field plays an essential role in the plasma dynamics and particle acceleration in high-energy astrophysical systems. Polarization offers a direct view of the magnetic field morphology and evolution in these systems. A regime yet to be explored is the

high-energy polarimetry. MeV polarimetry offers unique insights into the origin of extragalactic cosmic rays and neutrinos, as well as extreme particle acceleration processes therein.

MeV to TeV Gamma-ray Emission from Novae and Star Clusters in the Galaxy
Tulun Ergin

We will introduce two categories of gamma-ray sources that stand to gain from a wide field of view and an enhanced sensitivity that could be offered by a forthcoming space-borne gamma-ray observatory operating within the MeV-GeV energy range and with an improved angular and energy resolution compared to its predecessors. This future observatory, working alongside observatories like HAWC and CTA for TeV energies and for X-rays (e.g. e-ROSITA), would play a crucial role in advancing our understanding in these areas.

The first of these source types are novae, which usually happen in binary systems consisting of a white dwarf and a companion star, where particles are accelerated while shocks form in the nova ejecta and interact with the dense circumstellar stellar wind of the companion star. RS Oph is a good example of such novae, which was detected as a point-like source in GeV and TeV energies by Fermi-LAT and MAGIC within a short period of time. However, the number of detected novae in gamma-ray energies has been limited so far.

Contrary to novae, star clusters are persistent extended gamma-ray sources. Acceleration of cosmic rays (CRs) take place near massive stars or within superbubbles formed by the combined activity of these stars. Multiple shocks in these regions can boost the maximum energy of CR protons beyond 1 PeV. Star clusters, such as Cyg OB2, associated with the Cygnus Cocoon, and Westerlund 1 and 2 are complex regions requiring deeper investigations in the emissions ranging from MeV to TeV energies. In addition, it is essential to detect new sources within this energy range to effectively delineate various evolutionary phases of star clusters.

Towards a Fleet of New Great Observatories
Judy Racusin

Astrophysics is inherently multiwavelength and multimessenger requiring a wide range of facilities to observe and understand complex phenomena over timescales from milliseconds to years. Planning for future NASA observatories must be done among and

across different communities recognizing that we are greater than the sum of our parts. We should define a new set of great observatories that are great, not because they are expensive, but because they are designed to operate concurrently and complementarily. They would require coordination, especially for observations of variable and transient phenomena, and sufficient ground-based infrastructure for communications, transient alerts, archives, and target of opportunity coordination. We propose a path forward for a fleet of medium to large missions (e.g. Probes) that would fulfill this vision, with the gamma-ray community leading the way.

The Compton Spectrometer and Imager
John Tomsick

The Compton Spectrometer and Imager (COSI) is a NASA Small Explorer (SMEX) satellite mission in its implementation phase with a planned launch into low-Earth orbit in 2027. COSI is a wide-field gamma-ray telescope designed to survey the entire sky at 0.2-5 MeV. It provides imaging, spectroscopy, and polarimetry of astrophysical sources, and its germanium detectors provide excellent energy resolution for emission line measurements, including the positron annihilation line at 0.511 MeV and nuclear lines. The instantaneous field of view for the germanium detectors is >25% of the sky, and they are surrounded on the sides and bottom by active shields, providing background rejection as well as allowing for detection of gamma-ray bursts and other gamma-ray transients over most of the sky. This presentation is intended to provide information about the current plans for near-term gamma-ray missions to set the stage for discussions about future missions.

GammaTPC
Tom Shutt

I will talk about GammaTPC, a new gamma ray detector concept based on liquid argon time projection chamber technology. This promises to allow a very large and sensitive detector over the 100 keV to 100 MeV energy range at modest cost.

GAMPix
Bahrudin Trbalic

We introduce GAMPix (Grid-Activated Multi-scale Pixel readout), a novel charge readout system for TPCs, that is designed to enhance the accuracy of electron track

reconstruction to the sub-millimeter level, while also ensuring high energy reconstruction accuracy with a low power consumption. The GAMPix system operates using coarse wire grids paired with pixel planes. The signal generated from the induction wire plane activates the pixel plane and the analog front end of a new, rapidly power-cycled ASIC. Our initial analysis indicates that GAMPix fulfills the stringent demands for GammaTPC, a proposed MeV gamma ray detector instrument concept relying on LArTPC technology. Beyond this, GAMPix showcases significant promise for broader applications, including use in the DUNE Phase 2 and similar cutting-edge experiments.

AstroPix: Monolithic CMOS Silicon Detectors for Future Gamma-ray telescopes
Regina Caputo

AstroPix is a CMOS active pixel sensor that has been developed and is being implemented for use in future gamma-ray telescopes. Based on detectors designed using the HVCMOS process which has been developed over the past decade at the Karlsruhe Institute of Technology, AstroPix has the potential to maintain the high energy and angular resolution required of a gamma-ray telescope while reducing power and noise with the dual detection-and-readout capabilities of a CMOS chip when compared to current baseline technology. These detectors have potential broad application in different kinds of high energy telescopes and their baseline requirements and current status will be discussed.

The impact of scintillator and photosensor choices on wide field-of-view GRB missions
Joshua Wood

Scintillating materials like NaI(Tl) have remained a common choice for wide field-of-view GRB instruments since the 1960s. Typical designs for GRB missions consist of a single scintillating crystal coupled to a photosensor. In this talk I will explore how modern scintillator and photosensor technologies impact key instrumental performance metrics for GRB science, including the energy threshold and timing resolution of the instrument. I will also discuss the potential benefits of coupling multiple scintillating materials to a single photosensor, known as a phoswich configuration.

The Southern Wide-Field Gamma-Ray Observatory
Petra Huentemeyer

The Southern Wide-field Gamma-ray Observatory (SWGO) is a next-generation ground-based gamma-ray-survey instrument to be constructed in South America. The SWGO will provide wide field-of-view coverage with a high duty cycle for a large portion of the southern sky and complement and inform observations of the Cherenkov Telescope Array and other facilities on the ground and in space, including the IceCube Neutrino Observatory, the Fermi Space Telescope or future missions like COSI. Recent discoveries by HAWC and LHAASO, for example TeV gamma-ray halos associated with pulsars, >30 TeV gamma-ray emission from binary systems, tens of PeVatron candidates, and last but not least multi-TeV gamma-ray emission from a GRB underscore the need for a facility like the SWGO in the Southern Hemisphere. In my presentation, I will describe the science drivers of the project, the progress in the selection of a suitable observatory site and detector design, and the project timeline, and potential synergies between the SWGO and NASA missions.

Gamma-ray Pulsars: Mastering the Known, Unraveling the Unknown, and Shaping the Future
Konstantinos Kalapotharakos

Pulsars are a special class of astrophysical objects that host a wide array of dynamic processes within their environments. The Fermi LAT has revolutionized our understanding of gamma-ray pulsars, enabling significant advancements in theoretical modeling. These models are crucial for various fields, including the study of magnetars, FRBs, blazars, merging neutron stars, cosmic rays, gravitational waves, magnetic field evolution, population synthesis, stellar evolution, and dense matter states. The recent discovery of TeV pulsed emission by HESS II has further constrained and solidified these theoretical models. This talk will provide a theorist's perspective, discussing current models, their predictions, unanswered questions, and the vision for future observations that can further constrain these models. A key focus will be on the potential existence of an undetected population of MeV pulsars, emphasizing the significance of upcoming MeV space telescope missions such as AMEGO-X. The necessity of polarization data to enhance our understanding will also be highlighted. By addressing why more pulsars must be detected across broader wavelengths and with better time resolutions, we aim to pave the way for future discoveries and advancements in gamma-ray astrophysics.