Fermi Communications and Public Outreach
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The Sonoma State University (SSU) Education and Public Outreach (E/PO) group participates in the planning and execution of press conferences that feature noteworthy Fermi discoveries, as well as supporting social media and outreach websites. We have also created many scientific illustrations for the media, tools for amateur astronomers for use at star parties, and have given numerous public talks about Fermi discoveries.

1. PRESS CONFERENCES AND PRESS RELEASES

Beginning with the activities leading up to the launch of Fermi on June 11, 2008, there have been many press conferences, media telecons, press releases and news features that showcase the discoveries and news about Fermi. Table I summarizes the number of news releases and features issued each year since launch, as well as each year’s top stories that were showcased in press briefings or media telecons. Many of the press briefings occurred at scientific conferences including: the American Astronomical Society (AAS) winter and summer meetings, the American Physics Society (APS) April meeting, the AAS High Energy Astrophysics Division (HEAD) meeting, and the American Geophysical Union (AGU) annual meeting. For complete links see http://fermi.gsfc.nasa.gov/ssc/library/news/

1.1. Science Magazine Covers

Fermi discoveries in 2009 and 2014 were the subject of cover stories in Science magazine. Illustrations by Aurore Simonnet that depicted the discoveries were chosen for cover art. The 2009 publications featured Fermi observations of pulsars while the 2014 cover portrayed GRB 130427A, one of the brightest gamma-ray bursts ever seen. This GRB was observed by many experiments on Earth and in space, including Fermi. Figure 1 shows the Science cover art illustrating GRB 130427A.

1.2. Fermi Pulsar Interactive Explorer

Developed by SSU’s Kevin John, this interactive map illustrated the Fermi pulsar discoveries that were highlighted in a media telecon on 3 November 2011. For each pulsar observed by Fermi, the interactive provides the pulse rate, location and a user-friendly description of the pulsar’s significant observations. The pulsar videos in this interactive have been viewed more than 145,000 times to date. The pulsar interactive can be viewed at: http://www.nasa.gov/externalflash/fermipulsar/

Figure 1: Science magazine cover from 3 January 2014 illustrating GRB 130427A, a "shockingly bright" gamma-ray burst

1.3 YouTube and SVS Videos

NASA Goddard’s Scientific Visualization Studio (SVS) employs many talented animators and illustrators that help explain Fermi’s scientific discoveries to the public. Many press briefings, media telecons, press releases and news features include illustrations and video products that help to explain the extreme Universe that Fermi observations are revealing. Since launch, the number of views of Fermi videos on the SVS website (http://svs.gsfc.nasa.gov) has exceeded 3.4 million. Table II lists Fermi SVS videos with more than 100,000 views, along with viewing statistics and the SVS reference numbers.

Beginning in 2011, animated media products that were created to illustrate press releases and briefings have been uploaded to NASA’s YouTube channel. Table III lists Fermi YouTube videos with more than 50,000 views, along with viewing statistics and the YouTube reference codes.
2. PUBLIC OUTREACH

From the top of Mt. Tamalpais to seniors in Oakmont to amateur astronomers all across the USA, E/PO lead Lynn Cominsky has given dozens of public lectures about blazing galaxies, monstrous black holes and the extreme Universe as seen by Fermi. Other US Fermi team members who have given many public talks include LAT Principal Investigator Peter Michelson, Project Scientist Julie McEnery, Deputy Project Scientist David Thompson, and team member Roopesh Ojha.

The “make your own pulsar model” activity is one of Fermi’s most popular public engagements, and was originally featured on the back of the Fermi lithograph and in the Supernova Educator’s Guide, both developed by the SSU E/PO team. This shining model is suitable for kids of all ages, and teaches about pulsars as well as about simple circuit design, using a battery and an LED. It has been showcased at the American Astronomical Society student engagement events for the past three years, as well as at many public open house events, including the SLAC-KIPAC open house, school science fairs, and the North Bay Discovery Days. Figure 2 shows Lucy and Abby Dilbeck demonstrating the pulsar model at a recent SLAC-KIPAC Open House.

2.1. Epo’s Chronicles

From 2008 - 2013, the SSU E/PO team produced over 200 weekly “episodes” of Epo’s Chronicles, a web comic that illustrated the adventures of Alkina and her sentient spaceship Epo. Alkina and Epo traveled through the galaxy, learning about space science and searching for their origins. Translated from English into French, Italian and Spanish, these popular comic strips were viewed by thousands each month. During 2012 (the last complete year of the webcomic), over 80,000 unique IP addresses viewed the site. External evaluations of Epo’s Chronicles indicated that “Participants particularly liked the “Web 2.0” aspect of the comic, and the use of links to learn more and pursue various topics in a multimedia platform.” In addition, the “artwork was highly praised.” Figure 3 shows one of the comics related to Fermi.
2.2. Citizen Science through a Fermi-LIGO Collaboration

The collaboration between Fermi and the Laser Interferometer Gravitational-wave Observatory’s Einstein@Home project was advertised with a postcard-sized handout inviting participants to try to discover a gamma-ray pulsar using Fermi data. Several have been discovered by citizen scientists running the Einstein@Home program on their home computers as a screen saver. The postcard is shown in Figure 4.

2.3. Fermi Skymap Poster

The poster shown in Figure 5 was created in 2012 by Aurore Simonnet for distribution at the Fermi Symposium in Rome. Eight major Fermi discoveries are called out from the iconic image of the high-energy gamma-ray sky as seen by the Large Area Telescope through 2011. The discoveries that are illustrated include:

- CTA1, the first gamma-ray-only pulsar
- Nova V407 Cygni, the first gamma-ray nova
- Repeated gamma-ray flares from the active galaxy 3C454.3
- Resolved GeV gamma rays from the supernova remnant W44
- Giant gamma-ray lobes emanating from the center of the Milky Way now known as the Fermi bubbles
- Resolved extended gamma rays surrounding the active galaxy Centaurus A
- Flaring gamma-ray emission and changing x-ray emission from the Crab nebula, previously thought to be a constant “standard candle”
- GRB 090510A, the distant short gamma-ray burst that was used to set limits on the foamyess of spacetime
2.4. Amateur Astronomers

Public outreach is often conducted by amateur astronomers through star parties held nation-wide. The Fermi E/PO team co-sponsored the SUPERNOVA! toolkit for use by these passionate advocates for astronomy. Since 2008, when the toolkit went into national distribution, it has reached over 138,000 attendees through more than 1300 events. Of these events, 680 events reported including almost 25,000 minorities and over 39,000 women/girls.

2.5. Fermi Exhibits

The Fermi exhibit booth has undergone many transformations over the years. The most recent booth graphics feature the Fermi skymap silhouetted with an image of the satellite as shown in Figure 6. The exhibit booth is often accompanied by the Fermi banner stand, which features a blueprint style graphic that illustrates the project logo, the satellite, the flags of the participating countries, and the skymap. The exhibit booth and/or the banner have been used at venues including the AAS winter meetings, the USA Science and Engineering Festival, and the Goddard Jamboree.

The SSU E/PO team has a multi-mission exhibit booth drawn in the style of Epo’s Chronicles that includes images of Alkina and other characters from the web comic. This booth has been used extensively at educator and student events, including California Science Teachers Association annual meetings, Expanding Your Horizons, SSU Seawolf Day, and the North Bay Science Festival.

2.6. Social Media

Fermi’s presence in the world of social media includes a Facebook page and the Twitter feed @NASAFermi. Since launch, there have been 300 tweets from @NASAFermi, and the feed has over 35,000 followers. The Fermi Facebook page has over 30,000 likes and can be found at: http://www.facebook.com/nasafermi.

2.7. International Year of Astronomy

The year 2009 was the International Year of Astronomy (IYA). Public outreach events occurred throughout the world, and the Fermi E/PO team participated in many of them, including the creation of special illustrated lithographs featuring the objects of the month as explained by Alkina from the Epo’s Chronicles webcomic. Over 18,000 of these lithographs were distributed nationwide through amateur astronomy clubs through NASA’s Night Sky Network.

Another special creation was an Epo’s Chronicles podcast distributed through the 365 Days of Astronomy
website. This podcast was downloaded over 6000 times following its initial release on 16 September 2009.

SSU E/PO created a traveling exhibit of IYA images that circulated around the San Francisco Bay Area during 2009. This small exhibit was featured at 20 venues, with an estimated viewing by over 100,000 participants. A larger IYA exhibit appeared at the California Academy of Sciences and San Jose Tech Museum, with estimated viewing of 50,000 at each location.

2.8. Black Hole Shows

“Black Holes: The Other Side of Infinity” and the PBS NOVA show “Monster of the Milky Way” were produced in partnership with Swift, the National Science Foundation, the Denver Museum of Nature & Science, PBS NOVA and Tom Lucas Productions. Premiering in 2006, the planetarium show has been featured in over 30 venues and has reached millions of people world-wide. Narrated by Liam Neeson, this full-format digital dome show included state-of-the-art scientific visualizations of black holes and warped spacetime created by experts at the National Center for Supercomputer Applications at the University of Illinois Urbana-Champaign. The PBS NOVA show was initially seen by over 10 million viewers and has aired many times since then. It is still available for viewing on the PBS website. The black hole shows were initially seed-funded by Fermi E/PO and Lynn Cominsky served as a scientific director.

2.9. Printed Materials

Many printed materials were developed by the Fermi E/PO team for distribution to the general public. Table IV summarizes the number of these items that were handed out during 2000 - 2013. Prior to the renaming of the mission in late 2008, these products listed the satellite name as GLAST (Gamma-ray Large Area Space Telescope) rather than Fermi.

The Fermi sticker features a colorful image of the satellite on the front along with text describing the mission on the back. It is shown in Figure 7.

The Fermi lithograph features an illustration of the satellite on the front, and an explanation of the overall scientific objectives of the mission on the back. Instructions for the “make your own pulsar” activity are also included.

The Fermi fact sheet is a four-page color brochure that describes the science of the mission, as well as providing tables that summarize the instrumental parameters and the mission participants.

The Fermi brochure describes in detail the science that Fermi does and explains how it does it. The description includes the instruments, background information on gamma-ray astronomy and detection methods. It also describes pre-launch thinking about active galaxies, gamma-ray bursts, solar flares, gamma-rays from dark matter and other highly energetic sources seen in the Universe.
The Fermi paper model provides a short description of the scientific instruments on board the satellite, as well as links to other resources about its instruments. There is also a short description of how Fermi detects gamma rays with the Large Area Telescope as well as the Gamma-ray Burst Monitor detectors. The product includes three pages of parts that can be cut out and easily assembled using common household items.

The Fermi Race Card game challenges two teams of players to strategically maneuver to be the first to assemble the parts of the satellite and then use it to observe five astronomical objects. As players build their satellites they must overcome hurstes and obstacles thrown at them by their opponents while doing the same in order to slow their opponents down. To win, players must successfully have their operational Fermi satellite observe five gamma-ray emitting objects.

The black hole frequently-asked questions (FAQ) brochures answers eight of the most commonly asked questions about black holes, and explains how Fermi studies black holes. The FAQ brochures were distributed to attendees at many of the planetaria who experienced “Black Holes: the Other Side of Infinity.”

2.10. Tesla Coil Show

From 2000-2012, Fermi E/PO provided funding to support the Tesla Coil show put on by scientists and students from the University of California, Santa Cruz Institute for Particle Physics. These popular shows reached thousands of students annually.

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