



The Artemis II crew captured this breathtaking photo of our galaxy, the Milky Way. Image Courtesy: NASA



Universities
Space Research
Association

ASTRONOMY & ASTROPHYSICS

Fermi Gamma-Ray Bursts

USRA Scientists are part of the science team for the Fermi Gamma-ray Burst Monitor (GBM) which redefined the study of transient gamma-ray phenomena detecting more than 3,000 gamma-ray bursts enabling landmark discoveries. Its pivotal role in the 2017 observation of GW170817 confirmed neutron star mergers as the source of short gamma-ray bursts and helped inaugurate the era of multimessenger astronomy. In recognition of these advances, the European Physical Society awarded its highest astroparticle physics distinction, the Cocconi Prize, jointly to the Fermi GBM and Fermi LAT collaborations. The achievement reflects decades of coordinated work by scientists and engineers across Europe, the United States, and international partner institutions, whose combined expertise continues to expand and reshape our understanding of the high energy universe.



This image of GW170817 captures phenomena observed over the course of nine days following the neutron star merger. As neutron stars collide, some of the debris moves away at nearly the speed of light, producing a brief burst of gamma rays.

Image Courtesy: NASA's Goddard Space Flight Center/CI Lab

Advancing Scientific Discovery and Societal Impact

Based in Huntsville, Alabama, the Science and Technology Institute (STI) supports NASA's Marshall Space Flight Center through cutting-edge research in Earth science, astrophysics, heliophysics, and data science. From improving weather forecasting and environmental resilience with satellite observations to enabling next-generation gamma-ray and X-ray astronomy, multimessenger astrophysics, and space environment modeling, STI drives innovation that strengthens NASA's mission and benefits society. Through leadership in open-source science, AI/ML research, advanced data systems, and workforce development programs including internships and postdoctoral opportunities, STI is cultivating the next generation of scientific talent. Together, these efforts expand the reach of NASA missions, accelerate discovery across government, academia, and industry, and empower better decision-making for a rapidly changing world.

USRA's Portal to the Universe prototype unifies data from NASA's Fermi GBM, NSF's LIGO/Virgo gravitational wave detectors, and the Zwicky Transient Facility. Image Courtesy: NASA/ Caltech-IPAC/Robert Hurt



New Insights into the Structure of Black Hole Coronas

USRA researchers are also helping redefine black hole physics through NASA's Imaging X-ray Polarimetry Explorer (IXPE). By measuring X-ray polarization in some of the universe's most extreme environments, IXPE has produced the first detailed insights into the structure of black hole coronas, revealing how these systems generate and release energy. The findings represent a significant advance in astrophysics and in our ability to study phenomena beyond the reach of direct imaging.

With IXPE's ability to study objects too distant and compact to image directly, scientists can now refine models of how black holes behave across vastly different scales.



An illustration of material swirling around a black hole highlights a particular feature, called the "corona," that shines brightly in X-ray light. In this depiction, the corona can be seen as a purple haze floating above the underlying accretion disk and extending slightly inside of its inner edge. Image Courtesy: NASA