

Grant Title: Short Gamma-Ray Bursts Arising From Misaligned Structured Jets in the Dawn of Gravitational Wave Astronomy

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When two neutron stars collide they produce both gravitational waves and light. Last year, for the first time in history, this amazing collision was detected by a large number of observatories. This NSF-funded project aims to study the light emitted as two neutron stars collide. Interestingly, a very narrow and energetic beam of plasma expelled soon after the collision, called a “jet,” emits this light. We propose to model and calculate the light from this jet from every possible direction, since the jet does not necessarily have to point directly at us on Earth. With our work we will explain last year’s monumental detection and will also predict future observations.

As the two neutron stars collide, a black hole is formed. We will carry out large-scale computer simulations using realistic initial black hole conditions and gas profiles close to the collision site to determine the specific structure of the jet. The work will be complemented by analytical studies of the jet and multi-wavelength emission calculations.

This is a collaborative NSF project between Sac State, Northwestern University and Purdue University. At Sac State, we expect to involve at least 6 undergraduate students. The

research team will also broaden participation in science and public literacy with a series of public lectures at the soon-to-be opened Sac State planetarium. We will also host several public solar viewing parties to involve Sac State and the Sacramento community.

