**WHEN STARS ATTACK! EVIDENCE FOR A NEAR-EARTH SUPERNOVA EXPLOSION IN THE GEOLOGICAL, ASTRONOMICAL, AND LUNAR RECORDS.** B. D. Fields, Departments of Astronomy and of Physics, University of Illinios, 1002 W. Green St, Urbana IL 61801, bdfields@illinois.edu

Supernova explosions mark the deaths of the most massive stars. These spectacular events are crucial for life because the explosions are the main cosmic source of elements heavier than helium. Heavy elements, dominated by species from carbon through the iron peak, are forged in nuclear reactions deep in the star before and after its death.

Yet while supernovae synthesize the atoms needed for life, when an explosion is too close it takes a sinister shade. The blast produces ionizing radiation in the form of promt photons (X rays and gamma rays) as well as cosmic rays which come afterwards. These damage the Earth's atmosphere, destroying stratospheric ozone. If the supernova is close enough, the damage to the biosphere can be significant and even catastrophic.

How would we know if a supernova exploded near Earth in the geologic past? If the explosion is close enough, supernova debris is delivered to Earth and literally rains down, accumulating in natural archives such as deep-ocean sediments. To confirm the supernova origin of such debris, one must look for live (undecayed) radioactivity, for species too short-lived to have survived from the birth of the Earth 4.6 Gyr ago.

We will review predictions for supernova-produced radioisotopes deposition on the Earth and Moon, with special emphasis on the radioisotope $^{60}$Fe (half-life 2.6 Myr) [1,2]. Our has calculated the time history of the signal, and examined the distribution of material on surface of Earth and on the Moon.

We will then review recent geological, lunar, and astronomical data on $^{60}$Fe, taken by several groups. These data confirm the existence of at least one supernovae in the past 3 Myr, and hint at more. We will interprent these data in light of our models. Finally, we will comment on surprises in the long (~1 Myr) timescale over which the debris was deposited, and the implications for astrobiology.

This talk will highlight recent work by our group and references therein [1-2], updated to interpret recent data.

[1] Fry, B. J., Fields, B. D., and Ellis, J. (2015) *Astrophys. J.* 800*, 71*. [2] Fry, B. J., Fields, B. D., and Ellis, J. (2016), *Astrophys. J*. 847, 28.