

When Stars Attack! Live Radioisotopes as Signatures of Near-Earth Stellar Explosions. B. D. Fields¹, B. J. Fry², and J. Ellis³. ¹Departments of Astronomy and of Physics, University of Illinois, ²Department of Astronomy, University of Illinois, ³Theoretical Physics and Cosmology Group, Department of Physics, King's College London, London WC2R 2LS, UK, and Theory Division, Physics Department, CERN, CH-1211 Geneva 23, Switzerland

Some stars end their lives in explosions such as supernovae that violently eject much of the star's interior. Most explosions are distant and benign, but nearby events can occur and would pose a grave threat to the biosphere. We will discuss these cosmic insults to life, and geological signatures that would provide "fossil" evidence that one or more nearby explosions occurred over the course of the Earth's existence. Namely, the presence of live (undecayed) radioactive nuclides with lifetimes less than the age of the Earth strongly argues for an extraterrestrial source. We will then present recent evidence that a star exploded near the Earth about 3 million years ago. Radioactive iron-60 atoms have been found in ancient samples of deep-ocean material, and are likely to be debris from this explosion. Recent data confirm this radioactive signal, and for the first time allow sea sediments to be used as a telescope, probing the nuclear reactions that power exploding stars. Furthermore, an explosion so close to Earth was probably a "near-miss," which emitted intense and possibly harmful radiation. The resulting environmental damage may even have led to extinction of species which were the most vulnerable to this radiation.

This talk will highlight recent work by our group and references therein [1-3].

[1] Fry, B. J., Fields, B. D., and Ellis, J. (2015) *Astrophys. J. in press*, arXiv:1405.4310.
[2] Athanassiadou, T. and Fields, B. D. (2011) *New Astron.*, 16, 229. [3] Fields, B.D., Athanassiadou, T., and Johnson, S. R. (2008) *Astrophys. J.*, 678, 549.