A Supernova at 150 Light Years: What Happened to the Earth?

Prof. Adrian Melott

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Prof. Melott will discuss recent results that have strongly confirmed that multiple supernovae happened at distances ~150 light years consisting of two main events: one at 1.7 to 3.2 million years ago, and the other at 6.5 to 8.7 million years ago. These events are said to be responsible for excavating the Local Bubble in the interstellar medium and depositing iron-60 on Earth and the Moon. Other events are indicated by effects in the local cosmic ray spectrum. Given this updated and refined picture, we ask whether such supernovae are expected to have had substantial effects on the terrestrial atmosphere and biota. In a first cut at the most probable cases, combining photon and cosmic ray effects, we find that a supernova at 150 light years can have only a small effect on terrestrial organisms from visible light and that chemical changes such as ozone depletion are weak. However, tropospheric ionization right down to the ground due to the penetration of ≥TeV cosmic rays will increase by nearly an order of magnitude for thousands of years and irradiation by muons on the ground and in the upper ocean will increase 20-fold, which will approximately triple the overall radiation load on terrestrial organisms. Such irradiation has been linked to possible changes in climate, increased wildfires, and increased cancer and mutation rates. This may be related to a minor mass extinction around the Pliocene-Pleistocene boundary and further research on the effects is needed.

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March 9, 2017
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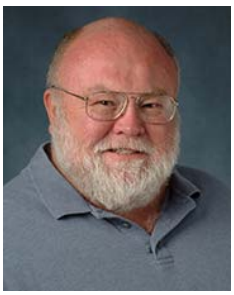

About Professor Adrian Melott:
Adrian Melott is currently Professor of Physics and Astronomy at the University of Kansas. He received his Ph.D. at the University of Texas in 1981. He was one of the pioneers in simulation of the formation of structure in a dark-matter dominated Universe. In 1996 he was named a Fellow of the American Physical Society "For groundbreaking studies of the origin and evolution of cosmic structure", and in 2002 received the APS Joseph A. Burton Forum Award "to recognize outstanding contributions to public understanding or resolution of issues involving the interface of physics and society." He was organizer and founder of Kansas Citizens for Science, which played a major role in restoring evolutionary biology to public science standards. Recently he shifted his research to "astrobiophysics", beginning with the possible role of gamma-ray bursts in terrestrial mass extinctions, as well as long-term biodiversity fluctuations. In 2007 he was named Fellow of the American Association for the Advancement of Science "For distinguished contributions to cosmological large-scale structure, for organizing public support for teaching evolution, and for interdisciplinary research on astrophysical impacts on the biosphere."

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Public Lecture

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