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Of Cosmic Rays and Dangerous Days

By Phil Berardelli
ScienceNOW Daily News
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Researchers may have uncovered the reason why Earth's biodiversity mysteriously plummets periodically. They have found that a rollercoaster-like wobble in the sun's orbit around the center of the Milky Way galaxy regularly moves Earth closer to a source of dangerous intergalactic cosmic rays.

Over the last 500 million years or so, the number of species on Earth has tended to dip regularly about every 62 million years. The last time this happened, about 55 million years ago--or about 10 million years after the great K-T extinction event that wiped out the dinosaurs--biodiversity sank by about 10%; around 115 million years ago, it dropped by a similar amount. So far, evolutionary biologists have only been able to establish that the phenomenon seems cyclical, but they haven't isolated a cause.

Now, researchers from the University of Kansas in Lawrence think they have found a possible answer. Physicist and co-author Adrian Melott says that he began suspecting a galactic cause after noticing a 2005 paper that calculated that the drop in species diversity occurs regularly on a time scale of tens of millions of years, which—for a cyclical event--is too long for something happening within the solar system. So he and Kansas colleague Mikhail Medvedev began examining the possibilities. At about the same time as the drops in biodiversity, the researchers determined, the sun reaches the highest point in its orbit relative to the galactic plane, where most Milky Way stars reside. At that point, the scientists report in the 1 August *Astrophysical Journal*, the solar system is closest to an incoming source of potentially lethal cosmic rays created by interactions between the Milky Way's magnetic field and radiation generated by a cluster of nearby galaxies.

These galaxies are located in the direction of the constellation Virgo, and the radiation consists of particles called muons, which are so powerful they can penetrate about 2.5 kilometers of sea water or 900 meters of rock--enough to reach just about every living thing on Earth and damage its DNA. Because the zenith of the Sun's oscillations match almost exactly with the times of the dips in the fossil record, the researchers found, "we've noticed an incredible coincidence," Melott says.

Physicist Richard Muller of Lawrence Berkeley Laboratory in California calls the paper's hypothesis "intriguing" and something that should be "of great interest" to both the astrophysics and evolutionary biology communities. The problem, says Muller, who co-wrote the 2005 paper in *Nature* that piqued Melott's interest, is that killer cosmic rays may not have been the direct cause of the drops in biodiversity. There could be other candidates, such as significant climate change. "We've got to try to understand the mechanism better," he says.

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