Stellar baby boom and Life on Earth

The stellar baby boom period of the Milky Way sparked a flowering and crashing of life here on Earth, a new study suggests. Some 2.4 billion years ago when the Milky Way started upping its star production, cosmic rays--high-speed atomic particles--started pouring onto our planet, causing instability within the living. Populations of bacteria and algae repeatedly soared and crashed in the oceans. The researchers counted the amount of carbon-13 within sedimentary rocks, the most common rocks exposed on the Earth's surface. When algae and bacteria were growing in the oceans, they took in carbon-12, so the ocean had an abundance of carbon-13. Many sea creatures use carbon-13 to make their shells. If there is a lot of carbon-13 stored in rocks, it means life, the origin of which is still unknown, was booming. Therefore, variations in carbon-13 are a good indicator of the productivity of life on Earth. The researchers found that the biggest fluctuation in productivity coincided with star formation, which had an affect on Earth's climate and therefore on the productivity of life on our planet. According to one theory, when a star explodes far away in the Milky Way, cosmic rays penetrate through the Earth's atmosphere and produce ions and free electrons. The released electrons act as catalysts and accelerate the formation of small clusters of sulphuric acid and water molecules, the building blocks of clouds. Therefore, cosmic rays increase cloud cover on Earth, reflecting sunlight and keeping the planet relatively cool. Although cold and icy times are generally considered unfriendly to life, the data reveals that biological productivity kept oscillating between very high and very low. The reason, the researchers suggest, is that stronger winds during icy epochs stirred the oceans and improved the supply of nutrients in the surface waters. "The odds are 10,000-to-1 against this unexpected link between cosmic rays and the variable state of the biosphere being just a coincidence, and it offers a new perspective on the connection between the evolution of the Milky Way and the entire history of life over the last 4 billion years," said the study author Henrik Svensmark of the Danish National Space Center.

Mercury may have molten fluid inside

The finding helps explain the unexpected discovery several years ago that Mercury has a small magnetic field. The discovery of the magnetic field by the Mariner 10 spacecraft puzzled scientists, who believed that because of its small size the planet's core had long ago solidified. But the most common explanation for a magnetic field is a molten interior, such as on Earth. The Moon and Mars, for example, show evidence only of ancient magnetic fields. The Messenger spacecraft is on its way to Mercury and is expected to arrive next year, but in the meantime researchers led by Jean-Luc Margot, an assistant professor of astronomy at Cornell University, launched their own attempt to learn about the planet's core. Cooks wondering if an egg is raw or has been cooked have used a simple trick for many years --- spin the egg. A hard-boiled egg with a solid interior will spin smoothly, a raw one with a liquid center will wobble. Of course, Mercury may be small, but they obviously couldn't spin it themselves. Instead, they closely studied its movements using telescopes in California, Puerto Rico and West Virginia. They sent powerful radar signals at the planet, and then received the echo, which appeared as a unique pattern of speckles reflecting the roughness of the planet's surface, at widely separated locations. By measuring how long it took for a particular speckle pattern to reproduce at different locations they were able to calculate Mercury's spin rate with an accuracy of one part in 100,000. The observations, conducted over five years, allowed the scientists to calculate twists in Mercury's spin, called librations, caused by the effect of the sun's gravity. The magnitude of the librations was twice what would be expected for a completely solid body, they concluded. But it matched what would be expected for an object whose outer core is molten and not forced to rotate along with its shell. Sean C. Solomon of the Carnegie Institution of Washington, who was not part of the research team, said in a commentary that the measurements "constitutes a triumph" of theoretical ideas developed in the past.

Dans la grande famille des phénomènes électromagnétiques, l'un d'eux vient d'être remis sur le devant de la scène par une équipe française et américaine. Son nom ? La « magnétorésistance anisotrope »! Observée pour la première fois en 1857 par le grand physicien britannique William Thomson, elle est la caractéristique de certains matériaux magnétiques qui voient leur résistance électrique varier lorsque l'on change l'angle entre l'aimantation et le courant électrique. Très à la mode dans les années soixante-dix et autre-vingt, elle avait été supplantée par la «magnétorésistance géante» qui est aujourd'hui largement exploitée dans les têtes de lecture pour disque durs d'ordinateurs.