OBSERVATORY

Far Out Phoebe

By HENRY FOUNTAIN
Published: May 10, 2005

E-Mail This
Printer-Friendly
Reprints

There are two kinds of moons in this world: those that formed when their parent planet did, and those that were made elsewhere and captured later.

Planetary scientists have long suspected that Saturn's moon Phoebe is the made-elsewhere kind. For one thing, it has a retrograde orbit (viewed from the pole star, it rotates clockwise around Saturn), making it unlikely that it was formed from the same disk of gas and dust that created the planet.

NASA/Jet Propulsion Laboratory
Saturn's moon Phoebe was apparently not formed from the same materials as the planet.

New evidence presented in two papers published in Nature supports that conclusion. It comes largely from data obtained on the Cassini mission, which flew past Phoebe last June.

Dr. Jonathan I. Lunine, of the Lunar and Planetary Laboratory at the University of Arizona and an author of both papers, said the work involved determining Phoebe's composition, through calculating its density and analyzing spectroscopic data. Phoebe,

Related

More Columns: Observatory

Most E-Mailed Articles — The New York Times

Past 24 Hours | Past 7 Days

1. For Gay Men, an Attraction to a Different Kind of Scent
2. Internet Attack Called Broad and Long Lasting by Investigators
3. Op-Ed Contributor: This Is Your Brain on Motherhood
4. Paul Krugman: The Final Insult
5. Nicholas D. Kristof: Catholic Devotion, and Doubts

Go to Complete List

it turns out, is similar to bodies like Neptune's moon Triton, a captured object from far out at the edges of the solar system.

Dr. Lunine said Cassini's cameras gave researchers images they could use to precisely calculate Phoebe's volume. At the same time, other researchers were able to determine its mass. Density is simply mass divided by volume.

"Density tells you something about an object's composition, if you can make an assumption about what's going into it," Dr. Lunine said. "Fundamentally, the density of Phoebe is telling us the amount of rock versus the amount of ice."

That rock-ice ratio is much higher for Phoebe than it is for Saturn's regular moons, suggesting that Phoebe was formed far out in space - perhaps in the Kuiper Belt, a band of debris beyond Neptune. At some point, gravitational forces would have kicked Phoebe toward Saturn, where it would have been captured.

That would not have been an everyday event. "It's hard to get into a Saturn orbit," Dr. Lunine said. "So it's kind of a rare gem, but not an improbable one."

Tales a Bird's Beak Tells

The finches that Darwin studied on the Galápagos Islands are among the best-known examples of adaptive radiation, the process by which one species evolves into several, each exploiting a niche. The most obvious evolutionary feature of Darwin's finches were the beaks, which evolved differently depending on the birds' habitat and diet.

But a beak is not just for eating. Birds use them to preen their skin and feathers, cleaning off mites, lice and other parasites. A new study by Dr. Dale H. Clayton and colleagues at the University of Utah shows that beak shape can affect cleaning ability, and suggests that preening as well as feeding may play a role in adaptive radiation.

The researchers studied common rock pigeons, whose top beaks overhang their bottom ones by less than one-tenth of an inch. That overhang is important: when the beak is moved along the feathers, it results in a shearing force that damages the exoskeletons of parasites. Using high-speed video, the researchers found that the shearing effect is created when a bird moves its lower beak forward slightly -

which it does at a rate of about 30 times a second.

Trimming the overhang on a group of pigeons had no effect on feeding, the researchers found, but did noticeably affect preening - lice increased greatly, causing damage to feathers. The study appears in Proceedings: Biological Sciences, a publication of the Royal Society.

Using another group of birds with untrimmed beaks, the researchers also found that overhang length was important. If the overhang is too great, the chances of the top beak's breaking are much greater. So natural selection, the researchers say, seems to favor overhangs that are not too long or too short.

The Long Arms of Icebergs

Icebergs in the North Atlantic threaten ships, but even the large number of bergs present in the spring is nothing compared with what paleoclimatologists call a Heinrich event, a massive calving of icebergs from Northern Hemisphere ice sheets during the coldest parts of the last ice age.

Heinrich events have occurred about half a dozen times over the past 75,000 years. The effects on the Atlantic have been well documented; among other things, as the icebergs melt, the rubble and debris on their bottoms (accumulated as the glaciers scoured the landscape) drops to the ocean floor.

But a study by Dr. Julian P. Sachs of the Massachusetts Institute of Technology and Dr. Robert F. Anderson of Columbia shows that the events had effects far beyond the Atlantic. By analyzing sediment cores from the floor of the Southern Ocean, the researchers discovered signs of increased productivity of algae 1,000 to 2,000 years after Heinrich events. The study was published in Nature.

The researchers say they don't know why the events in the Northern Hemisphere should be linked to activity near Antarctica, but suggest a chain of occurrences. The sudden influx of large numbers of icebergs cooled the Atlantic and reduced its salinity, eventually affecting ocean circulation patterns worldwide. And the changing circulation could have caused upwelling or increased stratification in the Southern Ocean that would have affected algal growth.

Large and Lonely in Asia

A new salamander species has been discovered in South Korea, and it's a bit of a loner: it's the first member of the largest family of salamanders to be found in Asia.

The two-inch creature, named Karsenia koreana and known as the Korean crevice salamander, was described in Nature by South Korean and American zoologists. It is a plethodontid, or lungless, salamander, one of about 350 plethodontids out of a total of 535 species worldwide.

About 99 percent of plethodontids are found in North and Central America. K. koreana has no close relatives in North America, the researchers say, which suggests that it arrived in Asia long ago, perhaps across the polar seas. As they point out, those seas were significantly warmer 70 million to 90 million years ago, providing opportunities for salamander migration.

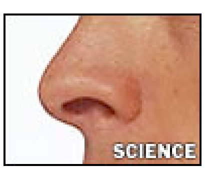
RELATED ARTICLES

A Planet Eases Into View: The Occultation of Saturn (September 30, 1997) $

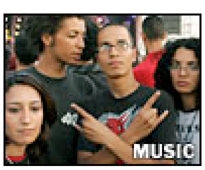
RELATED TOPICS

Saturn (Planet) | Moon | Birds | Oceans

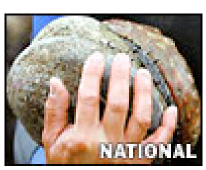
INSIDE NYTIMES.COM



Gay Men's Scent of Attraction



Christian Rock for Muslims



Risking Life for Abalone

Two Authors Ask About 'Ask Not'

Low Cholesterol? Don't Brag Quite Yet

 | Home | Privacy Policy | Search | Corrections | RSS | Help | Contact Us | Back to Top