Asteroids formed early on in solar history

Bits of dust and gas gathered into clumps, and boulder-size bodies careened into each other, forming asteroids and ultimately planets. A lot went on in the infant solar system, and new research suggests that some of it happened in a hurry.

A study published this week supports theoretical models in which some planetesimals—asteroids and other building blocks of planets—had already formed, heated up, and partially cooled a mere 5 million years after the birth of the solar system. The analysis identifies the radioactive isotope aluminum-26 as the heat source that melted these primitive rocks.

A highly accurate method for radioactive dating of meteorites underlies the findings. Gopalan Srinivasan and his colleagues at the Physical Research Laboratory in Ahmedabad, India, describe their work in the May 21 SCIENCE.

The researchers focused on a meteorite called Piplia Kalan, named for the village in western India where it crashed 3 years ago. The rock belongs to a group of meteorites known as eucrites and considered to be fragments chipped from the giant asteroid 4 Vesta.

To study processes in the early solar system, Srinivasan and his colleagues needed to trace a radioactive isotope with a half-life shorter than 1 million years, so they chose aluminum-26. Theorists have long suspected that the heat emitted by this isotope could have melted some of the solar system's first solid bodies.

Srinivasan and his colleagues wanted to determine when in the solar system's history a fragment of Piplia Kalan had cooled enough to solidify. To do so, they compared the rock's aluminum-26 abundance with that in the solar system's oldest known solids, primitive grains found on some meteorites. Although the aluminum-26 present in the early solar system has by now disappeared, researchers can infer its presence by measuring its decay product, magnesium-26.

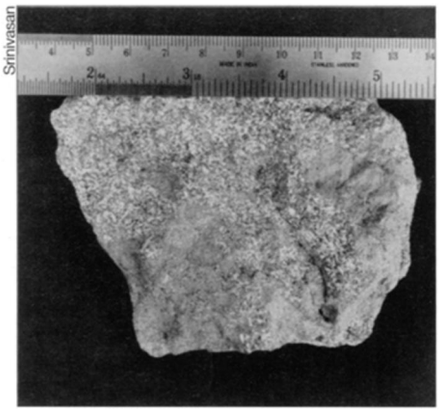
The team calculated that the fragment of Piplia Kalan they analyzed contained about one-hundredth the abundance of aluminum-26 in the ancient grains. This result, along with the half-life of aluminum-26, allowed them to determine that the meteorite's parent asteroid—most likely Vesta—assembled, melted, and at least partially cooled within 5 million years of the solar system's formation.

As the third-largest asteroid known, Vesta would have taken a long time to even begin cooling and so must have formed considerably earlier than the 5-million-year benchmark.

That conclusion supports models that theorists have recently developed. They propose that bits of dust within the disk of material that surrounded the infant sun assembled "into planetesimals many kilometers across over a time interval of order 1 million years or less," says Jack J. Lissauer of NASA's Ames Research Center in Mountain View, Calif.

Alan P. Boss of the Carnegie Institution of Washington (D.C.) notes that the findings corroborate the results of previous, less precise radioactive-dating studies, which relied on isotopes of manganese and chromium. The presence of aluminum-26 in a meteorite whose parent asteroid is known to have undergone early melting "helps buttress the case for aluminum-26 having been a major source of energy for planetesimal heating," he adds.

Other eucrites show no evidence of aluminum-26. Harry Y. McSween Jr. of the University of Tennessee in Knoxville says these may have originated from parts of Vesta that took many millions of years to cool, so they didn't crystallize until long after the isotope had decayed. —*R. Cowen*



Fragment of the meteorite Piplia Kalan.

Common cold virus is foiled by a decoy

No one is claiming victory yet, but scientists have won a skirmish in the war against the common cold. By giving a drug that mimics a molecule that cold viruses use to invade cells, researchers have reduced cold symptoms in some people and prevented colds in others.

A cure for the common cold has been so elusive that it has become a 20th-century symbol of futility. As funding for cold research dropped sharply in the past decade, many researchers gave up on finding a successful treatment. Nonetheless, colds continue to be more than an annoyance. They can lead to ear infections in children, aggravate asthma attacks, and spawn sinus infections.

For 15 years, scientists have known that the rhinovirus, which causes roughly half of all colds, latches onto cells at a surface molecule called ICAM-1. This molecule provides the virus with a means to enter the cell. Once inside, rhinovirus commandeers the cell's machinery and replicates itself.

To turn this exploitation to peoples' advantage, scientists at Boehringer Ingelheim Pharmaceuticals in Ridgefield, Conn., devised a truncated version of ICAM-1. The virus latches onto this decoy, called tremacamra, reducing the likelihood of infecting a cell.

After the approach succeeded in chimpanzees scientists tried it on 177 volunteers aged 18 to 60. Each received nose drops containing rhinovirus and remained isolated in a hotel room for 8 days to limit contact with other viruses.

Among the 81 people who also received tremacamra—in capsules or a nose spray—six times a day for 7 days, less than half developed a cold, the researchers report in the May 19 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION (JAMA).

Of 96 people getting an inert substance while exposed to the same virus, two-thirds came down with a cold within a week, says coauthor Frederick G. Hayden of the University of Virginia School of Medicine in Charlottesville. During the test, volunteers and researchers didn't know which treatments were placebos.

Some participants were exposed to the virus shortly before getting the drug; some, 12 hours afterward. It didn't matter greatly. During the first week after exposure, people getting a placebo recorded roughly double the severity of cold symptoms—such as chills, cough, headache, and sore throat—as the people in the treated group did. Participants also collected their mucus-laden tissues in sealed containers, which revealed that untreated participants produced about twice as much mucus as those getting tremacamra did.

Side effects of the medication were limited to nasal irritation in some participants.

Tests on the participants' mucus discharge revealed less interleukin-8, an immune-system protein, in the treated group. Interleukin-8 rushes to the site of rhinovirus infections as a helper, but it actually can lead to some cold symptoms, such as the inflammation associated with sore throats. Reduction in interleukin-8 lessened such inflammation and indicated that the virus was replicating less extensively, Hayden says.

Of course, the study doesn't precisely mirror reality. These people took medication within a day of being exposed to the virus. Normally, a person doesn't know a cold virus has struck until symptoms arise, which can take several days.

While the study offers hope, "it remains to be seen whether tremacamra will have effects when given after symptoms have started, particularly in naturally occurring colds," says Kenneth McIntosh of Children's Hospital in Boston, also writing in JAMA. "Despite the encouraging findings," he concludes, "it is clear that the cure for the common cold is not yet in hand." —*N. Seppa*