Chance encounter hints at planetary origins

Alison Abbott, Munich

Results from the first experiments to be carried out aboard the International Space Station are being analysed — and have already sparked debate among plasma physicists about the processes behind the formation of planets.

ALISON ABBOTT

Greg Morfill celebrates the mistake that offered him fresh insight into how planets form.

The experiments, run by a German–Russian collaboration, involved the study of plasma crystals. Plasma is the most disordered form of matter. But order — in the form of crystallization — can be produced by injecting microspheres made of melamine formaldehyde into the system. These become negatively charged amid the electrons and ions that form the plasma, and their electrostatic interactions then cause them to arrange themselves in an ordered way.

Because this effect of the microspheres is disturbed by gravity, scientists designed a series of gravity-free experiments on the space station (see *Nature* **405,** 7; 2000).

At a workshop held in Garching, near Munich, last month, the researchers reported a result obtained purely by chance. On one occasion, a cosmonaut forgot to make the plasma before injecting the microspheres. Without a plasma, the microspheres should remain uncharged and just float about randomly, they say. But instead, the microspheres coagulated almost immediately.

"One hundred thousand particles coagulated in a matter of seconds," says Greg Morfill, a director of the Max Planck Institute for Extraterrestrial Physics in Garching, and joint chief investigator of the experiments. "We couldn't believe what we were seeing at first."

Uncharged particles would take a day to aggregate through a chance encounter, he says. Further experiments showed that the injected microspheres did in fact carry opposite, attractive, charges, and this produced a millionfold acceleration in the coagulation.

Morfill's team proposes that, in the absence of plasma, a negative charge is generated on some of the microspheres through the transfer of electrons from the metal of the grid through which the microspheres are injected. These negatively charged microspheres could then cause a redistribution of charge on newly injected, neutral spheres. For a split second, the side of the neutral microsphere closest to the approaching, negatively charged sphere would become positive. Then the particles would collide and shatter, leaving the resulting fragments differentially charged.

Morfill, a theoretical astrophysicist, suggests that this mechanism might help to explain an enduring mystery about how planets form. Scientists believe that planets emerge from the disks of gas and dust that surround new stars, as the swirling dust particles coagulate into ever-bigger particles. But as they aggregate they tend to be accelerated towards the star. The problem for theoreticians is how the particles ever reach the critical size of a metre or so that can resist the gravitational pull of the star. Calculations indicate that aggregation would occur too slowly to overcome the star's drawing power.

Morfill theorizes that the particles could become differentially charged by the same charge-redistribution mechanism and shattering that were seen in the failed plasma-crystal experiment. This could allow sufficiently fast coagulation to the critical size, he says.

The idea is likely to prove controversial among planetary scientists. Jürgen Blum, of the University of Jena in Germany, is principal investigator of another experiment planned for the space station, ICAPS (Interactions in Cosmic and Atmospheric Particle Systems), which will study the aggregation of dust particles in space. "I'm not sure that there could be an abundance of charge on particles this size," he says. "But any new experiments that indicate how planet precursors can be formed are very helpful."

Morfill's team will have a chance to explore his theory further in another batch of experiments scheduled to take place on the space station early next year. ■

UK changes policy on life insurance

David Adam, London

The British government has suspended the use of genetic test results to determine premiums for life insurance.

The five-year moratorium is an attempt to halt the trend of insurers using data from genetic tests to set policy rates. Such tests can indicate whether an individual is likely to develop certain life-threatening diseases.

Last year, the government gave insurers the right to use a test for Huntington's disease to set premiums for life and critical illness. This was the first such approval anywhere in the world, but it was based on the fact that Huntington's is a special case: anyone carrying the gene will develop the degenerative brain disorder.

But in February of this year it was revealed that some insurance companies were using results from three genetic tests that had not been approved — for early-onset Alzheimer's disease, and hereditary breast and ovarian cancers. The government's Genetics and Insurance Committee is currently considering whether insurers should be able to use these tests in policy assessments.

Health minister Philip Hunt described the voluntary moratorium as "breathing space" to work with insurance companies to get things right, but warned that the government would legislate if the industry did not comply.

Insurance companies can still use the test for Huntington's disease, but only for very large policies, such as life insurance of over £500,000 (US$730,000). Previously, the test was used for all levels of life insurance. Companies will also be able to use other tests when providing very high levels of cover, but only if the tests manage to get approval from the Genetics and Insurance Committee. ■