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UFO UpDates Mailing List

Scientists Make Frog Float In Mid-Air

From: **UFO UpDates - Toronto** <updates@globalserve.net>
Date: Tue, 15 Apr 1997 01:17:59 -0400
Fwd Date: Tue, 15 Apr 1997 01:17:59 -0400
Subject: Scientists Make Frog Float In Mid-Air

From: Stig_Agermose@online.pol.dk (Stig Agermose)
To: updates@globalserve.net
Date: Tue, 15 Apr 1997 04:20:47 +0200
Subject: Re: Scientists Make Frog Float In Mid-Air

Here are excerpts from the webpage of Nijmegen High Field Magnet Laboratory - <http://www-hfml.sci.kun.nl/hfml/levitate.html> - and a picture of the frog:

Molecular Magnetism and Levitation.

(The Frog Which Learned to Fly)

Seeing is believing:

A little frog (alive!) and a water ball levitate inside a =D840mm vertical bore of a Bitter solenoid in a magnetic field of about 16 Tesla at the Nijmegen High Field Magnet Laboratory.

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The image of a high-temperature superconductor levitating above a magnet in fog of liquid nitrogen can hardly surprise anyone these days. It has become common knowledge that superconductors are ideal diamagnetics and magnetic fields must expel them. On the other hand, the enclosed photographs of water and a frog hovering inside a magnet (not on board a spacecraft) are somewhat counterintuitive and will probably take many people (even physicists) by surprise.

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This is the first observation of magnetic levitation of living organisms as well as the first images of diamagnetics levitated in a normal, room-temperature environment (if we disregard the tale about Flying Coffin of Mohammed as such evidence, of course).

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In fact, it is possible to levitate magnetically every material and every living creature on the earth due to the always present molecular magnetism. The molecular magnetism is very weak (millions times weaker than ferromagnetism) and usually remains unnoticed in everyday life, thereby producing the wrong impression that materials around us are

mainly nonmagnetic. But they are all magnetic. It is just that magnetic fields required to levitate all these nonmagnetic materials have to be approximately 100 times larger than for the case of, say, superconductors.

The water and the frog are but two examples of magnetic levitation. We have observed plenty of other materials floating in magnetic field - from simple metals (Bi and Sb), liquids (propanol, acetone and liquid nitrogen) and various polymers to everyday things such as various plants and living creatures (frogs and fish). We hope that our photographs will help many particularly non-physicists to appreciate the importance of magnetism in the world around us. For instance, it is not always necessary to organize a space mission to study the effects of microgravity. Some experiments, e.g. plants or crystal growth, can be performed inside a magnet instead. Importantly, the ability to levitate does not depend on the amount of material involved, V, and high-field magnets can be made to accommodate large objects, animals or even man. In the case of living organisms, no adverse effects of strong static magnetic fields are known. After all, our frog levitated in fields comparable to those used in commercial in-vivo imaging systems (currently up to 10T). The small frog looked comfortable inside the magnet and, afterwards, happily joined its fellow frogs in a biology department.=20

A.K. Geim, J.C. Maan.=20

The work is featured in: Physics World, April 1997, p. 28. A.K. Geim et al, Molecular Magnetism and Levitation, in Proceeding of European Low Gravity Association (ELGRA), Biannual Meeting, Paris, 17 March 1997.

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Last updated on 25-mar-97. =20
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