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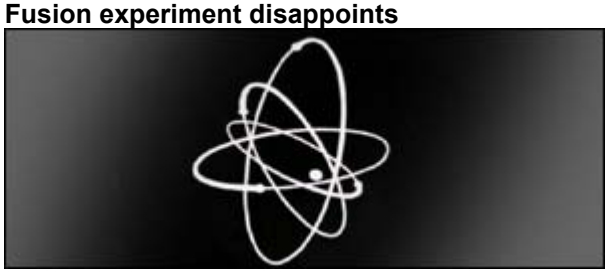
Fusion experiment disappoints



The idea that we could build nuclear fusion reactors that relied on the extraordinary pressures and temperatures experienced inside tiny, collapsing bubbles in a liquid has suffered a grievous blow.

New calculations all but rule out the controversial suggestion, made earlier this year by US and Russian researchers.

They fired sound waves through acetone, causing minute bubbles in the liquid to form and then collapse at temperatures of millions of degrees to produce small flashes of light.

> We've shown that chemistry occurs within a collapsing bubble, and that it limits the energy available during cavitation
>
> Kenneth Suslick

Their claim was that atomic nuclei could fuse in these conditions, releasing colossal amounts of energy, just as happens in the Sun.

But fresh research from Kenneth Suslick and Yuri Didenko, of the University of Illinois at Urbana-Champaign, now suggests the temperatures inside a single imploding bubble fall several million degrees short of that needed for fusion.

If confirmed, this would be a disappointment. Science is desperately looking for a practical fusion approach that would eliminate the need to use the far dirtier fission process currently employed in the world's nuclear reactors.

Sapping energy

It was in March that Rusi Taleyarkhan, and colleagues from the Oak Ridge National Laboratory in Tennessee and the Rensselaer Polytechnic Institute in New York (both US), reported their "table top" fusion experiment.

They claimed that by firing powerful sound waves through acetone they could make tiny bubbles expand and then implode, generating flashes of light and temperatures reaching

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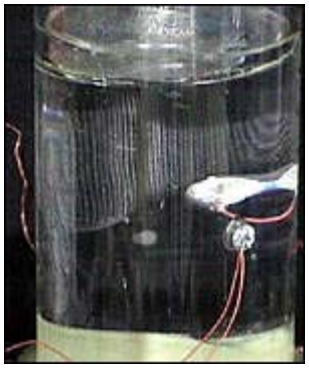
millions of degrees Celsius.



Taleyarkhan's work was done with an acetone liquid in which the normal hydrogen atoms had been replaced with deuterium

The phenomenon, known as "sonoluminescence", has long been observed, but Taleyarkhan's team was the first to make strident claims that the conditions inside these "cavitating" bubbles could induce the fusion of heavy hydrogen nuclei. And they claimed the presence of tritium and excess neutrons as proof that fusion had occurred in their experiment.

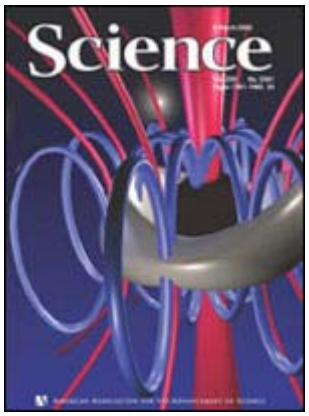
But when the University of Illinois at Urbana-Champaign team examined closely what was going on inside individual bubbles, it said it found that chemical reactions in the interior of the bubbles were almost certainly sapping the energy available to drive a fusion event.

Controversial research

Illinois's Professor Kenneth Suslick said: "Some researchers have suggested that conditions within a cavitating bubble might be hot enough and have high enough pressure to generate nuclear fusion.

"But we've shown that chemistry occurs within a collapsing bubble, and that it limits the energy available during cavitation."

Instead of the millions of degrees Celsius that are needed to drive a fusion event, Professor Suslick said the temperature inside the cavitating bubbles was only reaching 15-20,000 Celsius.



The original research was published in Science

Taleyarkhan's research went through an exhaustive period of peer review before being published in the journal Science.

However, such was the controversy at the time, and claims that the experiment may have been contaminated, that Science also published material criticising the research simultaneously.

Professor Suslick's work has been published in the journal Nature.

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