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Scientists may have discovered new 'super-solid' state of matter

CATHERINE SCOTT
News Staff

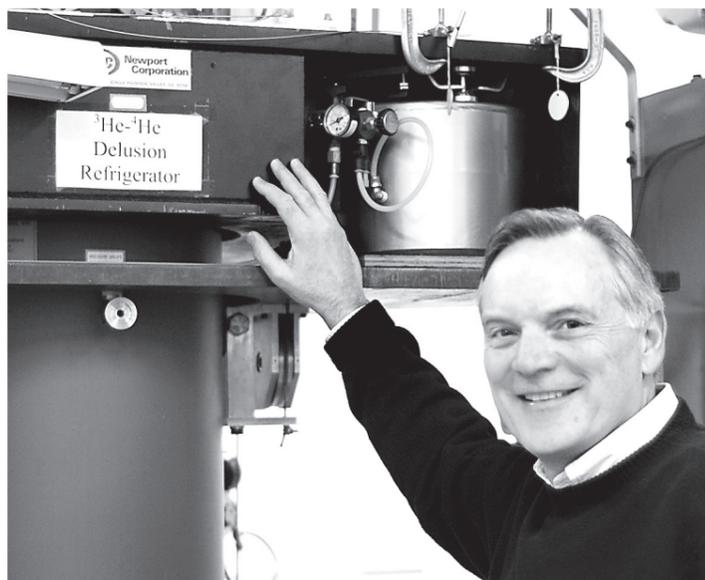
In today's super-sized world of SUVs and big-screen TVs, it's unusual for the microscopic branch of physics to garner a lot of attention. Recently, however, Dr John Beamish, professor of physics and chair of the department, along with PhD student James Day, have been experimenting with helium and testing its properties—and their results have fuelled the debate over existence of a "super-solid" state of matter.

Their latest experiment tested the shear modulus of helium, and their results converged with those of another research team from Penn State University in the US, who conducted oscillation experiments led by Dr Moses Chan in 2004.

The shear modulus of helium, in layman's terms, refers to the rigidity of helium when pressure is applied to it and its ability to bounce back to its original shape once free of pressure. The researchers' answers gave them unusual results that don't necessarily reject or confirm Chan's hypothesis that helium exists in a super-solid state, but the study's findings do provide more information.

"What we're trying to do is get enough information so that if [Chan's] interpretation of super-[solidity] is not right, there's another clue," Beamish said.

He added that about five other groups around the world have done the same experiment that Chan did in 2004, and that they've all achieved the same results. There's no debate as to whether or not the results are true; it's the interpretation of the results that is controversial. However, Beamish and Day weren't interested in replicating Chan's experiment. They had tried a few experiments prior to this, but their latest is noteworthy primarily because it's the first that has shown



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NOT THAT DELUSIONAL Beamish and Day's findings may prove to be super-solid.

results different from the those originally discovered by Chan.

"Instead of proving one way or another what other experiments were doing, we're looking for a convergence because that's the only way the scientific community as a whole will believe that what we have is a super-solid," Day said.

Chan's experiment found that solid helium, when oscillated, behaves like water. What Beamish and Day have found is that at 0.2 degrees above absolute zero, helium becomes stiffer at a relatively alarming rate. Though the two experiments were testing and measuring different properties, there are notable similarities between them.

"We're making a different measurement, but everything—the temperature, the frequency, how hard you stress things—looks the same, except you're measuring different properties. It's just how they connect that's not obvious," Beamish said.

According to Day, the purpose of fundamental science is application-

driven; the purpose is to make things better and faster. Beamish and Day say that theirs is the pursuit of knowledge because they're interested in the unforeseen directions of their experiments. Day noted that sometimes research in one field of study could have an impact on research and discovery in another field of study, or it could result in new technology.

"When you just follow these unanswered questions, you never know where they're going to lead you. It's uncharted territory," Day said.

Besides the noble pursuit of knowledge, there are other incredible rewards to reap from this kind of research. Day observed that because other research and discoveries about helium in this domain have resulted in Nobel prizes, it gives us an idea of how influential and powerful this domain of research can be.

"If it turns out that [people] are right about [helium] also existing in super-solid state, without a doubt, it will result in a Nobel Prize," Day said.

PROFESSOR OF THE WEEK



DR. CARMEN ROPCHAN

ENGINEERING PHYSICS 131

I think that Dr. Ropchan is an amazing professor. She goes out of her way to integrate real world examples into the curriculum. She also works during weekends by holding seminars and information sessions. One example of her willingness to donate her time to students is when WebCT was down before our midterm exam, she emailed each student in her class the review notes (typing in each email address by hand) from her home email client... not using the 'three click' ualberta client. This to me shows that she takes pride in her students performing to the best of their ability and that is why I am nominating Dr. Ropchan for the professor of the week.

Do you have a professor that's unique and shows their value of undergraduate teaching? Nominate them! Email avpa@su.ualberta.ca.

Nominations can also be picked up and submitted at any Faculty Association or InfoLink desk, or the SU executive offices front desk.



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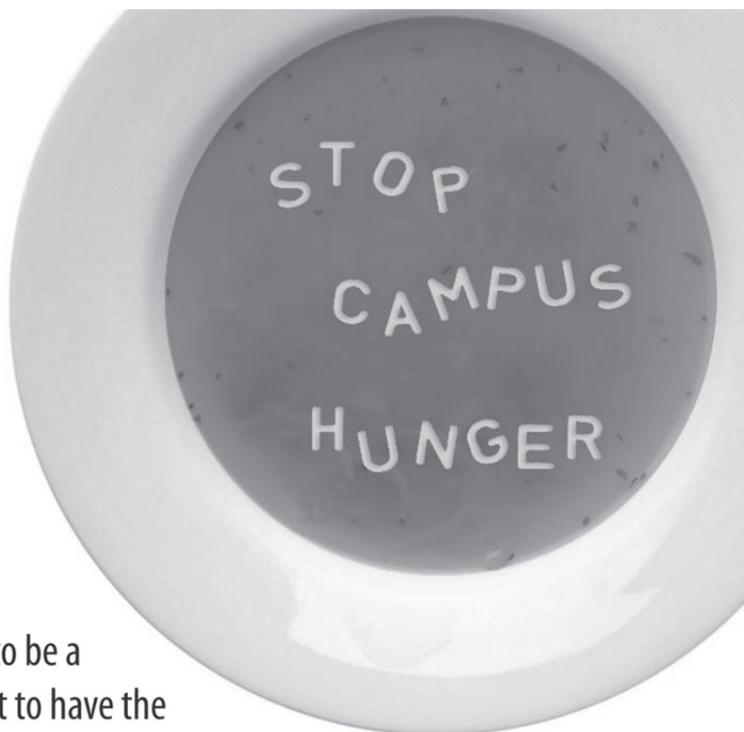
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