Professor Ilya Krivorotov part of new $2-million NSF materials research grant

The grant will help Krivorotov and collaborators expand probabilistic computing research via materials discovery.

Tuesday, October 24, 2023
Lucas Van Wyk Joel
UCI Physical Sciences Communications
Research into the new materials, with the new NSF support, could help usher in a new era of computing power.

Picture Credit:
NSF

Professor Ilya Krivorotov of the UC Irvine Department of Physics & Astronomy is part of a new $2-million grant from the National Science Foundation to help expand the frontier of probabilistic computing. Krivorotov, who’s a member of the recently-
established **UCI Eddleman Quantum Institute**, explained that the grant will help he
and his team develop new materials that could help usher in the next era of
computing. The computers that dominate the commercial market today rely on
information encoded using 0s and 1s in classical bits of data, or c-bits, and they use
silicon in their processing chips. But silicon-based chips are approaching their
processing power limits, and one of the emerging areas of computing that promises
to help address this problem is probabilistic computing, which uses so-called p-bits
instead of c-bits. P-bits are unique in that they can either exist in a state of 0 or 1,
which can expand chip processing power. One hurdle, though, is that, unlike silicon
for c-bits, there currently exists no ideal material for p-bit computing – which is
where the new grant comes in. “The main goal of our project is to study a new class
of materials called magnetic Heusler alloys for the realization of p-bits with much
improved speed and energy efficiency compared to the p-bits used today,” said
Krivorotov. “Magnetic Heusler alloys remain unexplored in the context of
probabilistic computing. By analysing the fundamental physics of the p-bit dynamics,
we found that Heusler alloys hold great promise for p-bit realization.” The team, led
by **Professor Zhihong Chen of Purdue University**, will work to identify best p-bit
material candidates in the vast family of magnetic Heusler alloys. “I would like to
acknowledge all co-PIs of the proposal,” said Krivorotov. “Outstanding collaborative
teamwork enabled this exciting project.”

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