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.

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Research into the new materials, with the new NSF support, could help usher in a new era of computing power.

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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 Heulser 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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