Addressing the Future of Hard Drive Storage

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Through his research, Bryan Huey hopes to revolutionize data storage. Photo by Frank Dahlmeyer

(PhysOrg.com) -- Engineering professor Bryan Huey is developing a new hard drive-like device designed to improve the reliability of data storage and reduce cost and energy consumption.

The goal of revolutionizing data storage is at the heart of research underway in the laboratory of Bryan Huey, assistant professor of chemical, materials, and biomolecular engineering.

Collaborating with Oleg Kolosov, a physics professor at Lancaster University in the U.K. Huey has known since their days together at Oxford University, this team has garnered three-year funding from the National Science Foundation to study the fundamentals of a new hard-drive-like device made out of phase change material. This new drive will have no moving parts; will store data based on states of different resistance; and is especially promising for its predicted high reliability and low power consumption.

Huey says that - unless there is a revolutionary advance in the underlying materials used in standard magnetic hard drives - the future market for this media looks bleak: “Right now hard drives are very impressive and have been for the last 20 years; however, in the next 5 to 10 years, unless something completely unforeseen occurs, it is unlikely they can continue to compete for the functions they now provide.”

There are two reasons: The first is high cost. For hard drive performance to keep improving at the rate demanded by consumers, costs will go through the roof. One of the reasons is that continuous films are currently used in the manufacture of every magnetic hard drive, making them very cheap to produce. Future high performance drives, however, will require films broken up into regular nanoscale patterns to achieve the necessarily high data densities. This lithographic process is dramatically more expensive, opening the door for competing technologies.

The second issue driving current hard drive technology toward obsolescence is power use. “IBM completed a study where they looked at the amount of data Google stored over the last 10 years and projected that out to the year 2020,” says Huey. “The amount of power to run just their hard drives, just to store all of this information we access every day, will be about 100 megawatts. That is essentially a coal plant just to run Google’s supply of information.”

The new technologies Huey is using for his research could cut that power consumption tremendously. “It is reasonable to expect that we can drop energy consumption a thousand-fold with these new materials,” he says.

The NSF grant supports a novel researcher-exchange aspect between the labs at UConn and Lancaster University that will allow Huey's graduate student, Gregory Santone, to carry out research in Kolosov's lab in the U.K., and Kolosov's research student will spend time in Huey's laboratory at UConn. In addition, Huey and Kolosov will each spend two weeks a year at the other's university.

The international collaboration will benefit from the particular resources and capabilities of the two labs. At UConn, Huey can image, map, and quantify properties of materials and the nano-scale very rapidly. Kolosov's laboratory boasts a complementary capability that measures the thermal properties that are pertinent to this research.

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