"Turning Off" Cancer Genes

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The key to unlocking complex problems like the biological cause of cancer—the second-leading cause of all deaths—may be found in the fundamental building blocks of life. How genes control each other—and how to predict that activity—is a research focus of Chris Wiggins. He is working to develop models that predict how genes behave to explain how some cells become cancerous.

"The relationship between biology and mathematics has completely changed in the last decade," said Wiggins. "New technologies have transformed biology into a data-rich science, and advances in algorithms have made possible data-driven predictive modeling in biology. At the same time, the World Wide Web made it possible for any biologists to share their data with the entire mathematical community with the click of a mouse."

Wiggins and his collaborators have shown how one can use these data, along with the appropriate math, to learn which genes are controlling which other genes and why.

"The problem is a bit like watching stocks go up and down, and trying to predict which stocks are driving each other," he said. "In this case, our models are also constrained and guided by the hard work of decades of bench biologists and medical scientists."

While the architecture of the underlying genetic network is a basic biological topic, Wiggins said, "it is at the root of numerous biological diseases, including cancer, and we are now on the threshold of finding more of those genetic links."

Wiggins, who was a National Science Foundation postdoctoral research fellow in biomathematics at the Courant Institute, was profiled in *Scientific American* in 2008. In recent months, numerous publications have explored his work trying to lure the school's top math students to tech startups instead of joining Wall Street banks.

The influx of new talent would expand the city's technology sector, the brain drain of math and engineering students to West Coast schools and companies would ebb, and New York City's intellectual environment would be enriched. "I want young people to realize the creative things they can do with math," he said.

Wiggins received the Janette and Armen Avanessians Diversity Award in 2007. The award was established to recognize outstanding performance of engineering faculty in enhancing diversity in departmental, school, and university programs at Columbia. The award winner receives a cash prize of $1,000 and a plaque. Nominations are evaluated on the basis of excellence in advancing diversity at Columbia Engineering.

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