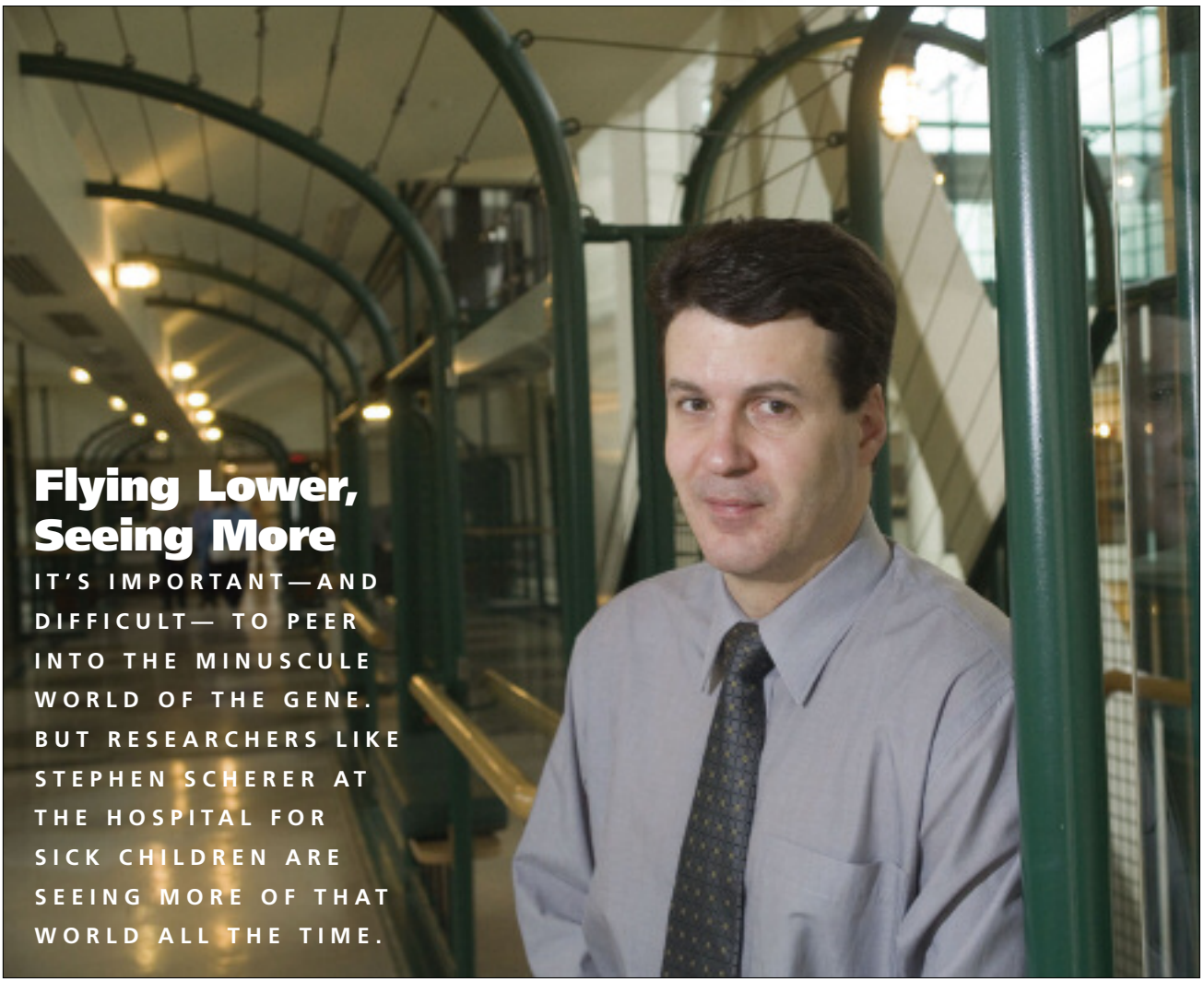
Ideas on the Edge



Flying Lower, Seeing More

IT'S IMPORTANT—AND DIFFICULT— TO PEER INTO THE MINUSCULE WORLD OF THE GENE. BUT RESEARCHERS LIKE STEPHEN SCHERER AT THE HOSPITAL FOR SICK CHILDREN ARE SEEING MORE OF THAT WORLD ALL THE TIME.

"It's as if you're looking down from an airplane, and you can't tell the difference between a ten story building and three story building. You have to get closer."

Dr. Stephen Scherer, a researcher at Toronto's Hospital for Sick Children, is trying to describe the challenge of observing the incredibly small and complex world of genes.

A gene is one section of "rungs" on the spiraling, ladder-shaped DNA molecules we carry in the nucleus of every one of our cells. These sets of rungs form chemical patterns that carry directions for making the substances— mainly proteins—that our bodies need. There are as many as 40,000 genes in human DNA, and the ability to observe them is crucial to understanding how a healthy body operates, and what happens when things go wrong.

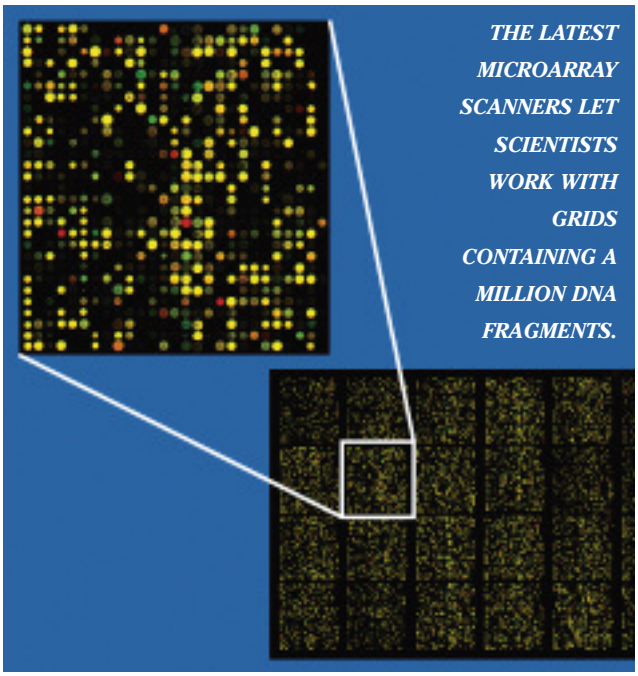
It's impossible, however, to see the DNA "ladder" with a conventional microscope. While the strands of DNA in each of our cells measure an amazing 1.5 metres in length, the "rungs" are only one trillionth of a centimetre wide—and there are 3 billion of them.

To glimpse what's going on at this

RESEARCH THAT MATTERS

REAL-WORLD BENEFITS FOR ONTARIANS:

- New tests that will enable preventive treatment of genetically-related diseases.



THE LATEST MICROARRAY SCANNERS LET SCIENTISTS WORK WITH GRIDS CONTAINING A MILLION DNA FRAGMENTS.

Project: Integrative Genomics for Health Research
Institution: Hospital for Sick Children
Research Sector: Life Sciences
Principal Investigator: Stephen Scherer
Trust Investment: $3,223,761
CFI Investment: $4,678,220
ORF Investment: $1,454,459
Total research investment from all sources: $12,935,121

impossibly small scale, scientists use a process called DNA microarray scanning. A microarray is a microscopic grid of chemically-generated DNA fragments, created using some of the same techniques used in making computer chips. When researchers introduce a sample of real DNA to the microarray, coloured dyes show how the sample reacts to the artificial fragments at various points on the grid. In this way, scientists can determine what genes are present in the sample, and what parts of those genes may be missing or modified.

The larger the number of points on the grid, the more detailed the information that can be retrieve from a single sample. To use Dr. Scherer's analogy, they can fly lower and closer to the world of genes—and see more. The latest microarray scanners, including a new machine at the Hospital for Sick Children, offer grids containing a million DNA fragments. "That's a hundred-fold increase in resolution over our previous devices," says Dr. Scherer. "We can see deletions and changes that we couldn't see two years ago."

Dr. Scherer is using the technology, funded in part by an investment from the Ontario Innovation Trust, to probe the role genes play in autism. He predicts that this kind of genetic research will change our approach to the whole field of medicine. "Traditionally, a diagnosis is made by a doctor after giving you an exam or chemical test. But with genetic testing, we can, in some cases, diagnose a disease before it actually occurs—and take steps to prevent it."

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Infrastructure for Innovation
About the Ontario Innovation Trust

The Ontario Innovation Trust was created in 1999 by the Government of Ontario to invest in research equipment and facilities at Ontario's universities, colleges, hospitals and other non-profit research institutions. The Trust is governed by a volunteer Board of Directors, according to the terms of a Trust agreement established by the Ontario government. A small permanent staff looks after day-to-day operations.

Since its inception, the Trust has committed almost $843 million to strengthen Ontario's position in the global marketplace of ideas. This represents more than a third of the $2.44 billion in total funding that has been invested in Trust-supported projects.