LOCAL

TECHNOLOGY: 3D DNA structures and synthetic genes among topics on the agenda

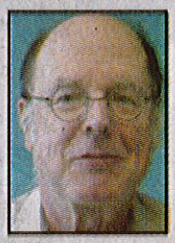
Exploring the digital you

HANK DANISZEWSKI

Forget smartphones, laptops and the Internet: The human body is the digital revolution's next frontier. Hank Daniszewski profiles what three of more than 100 participants at a London conference are up to as they turn the stuff of science fiction into reality.

Who: Charles Bennett
Physicist, IBM research

Every week there are reports of hackers breaking into the word's most sophisticated computer systems. A perfectly secure system would be priceless in the technological world.



Charles Bennett

Bennett said that system already exists.

He said data can be sent by quantum encryption and that a random key can be used to encrypt a message on low-impulse fibre optic cable.

"It's immune to eavesdropping. If you intercept the information, the users can detect and reject the information."

He said the system isn't likely to be widely used because it requires special optical fibre and can only send a limited amount of information over relatively short distances. He said it's typically used by banks to send a small amount of very valuable information.

For now, Bennett said we will have to work with the computer security systems we have and practice better "data hygiene."

Security breaches are usually due to bad "data hygiene," he said, such as short passwords and complicated software programs.

Who: Edwin (Ned) Seeman
Chemistry professor, New York University

DNA is the chemical building block for all life on Earth. But Seeman said it's a good building block, period. His research involves DNA nanotechnology, designing DNA strands so they self-assemble into 3D structures such as cubes and crystals.

Edwin Seeman

Why?

Well, those DNA structures can be used as a kind of scaffold to hold a molecule associated with disease for specific tests to see how it interacts with a new drug.

"We can watch to see it how it works. Does it tweak the molecule and make it do what you want to do?"

He said that could reduce the long process of testing a new drug and getting it to market.

Seeman said those DNA structures could also be used to form nanoelectronic molecules, to create microscopic-sized computing processors so small they could work inside a human cell.

"It opens possibilities that we can't envision, but we know we are pushing in the right direction," he said.

Who: Yaakov Benenson
Professor, Swiss Federal Institute of Technology

Even the most powerful computers can't match the human body's complexities. But Beneson is trying to combine molecular-sized computing power in the form of synthetic genes.

Yaakov Benenson

Those synthetic genes can be engineered to do certain tasks such as surveillance, targeting certain tumour cells while leaving the healthy ones alone.

"Tumour cells and healthy cells produce information that tells us what they are. We can plug in an artificial device that can assess the information and produce a drug in the tumour and not the healthy ones."

Benenson said the synthetic genes function inside the cells to recognize the multiple factors that lead to cancer.

He said the synthetic genes are neither drug nor machine, but an artificial biologically-based tool. The research is heading into the animal testing stage, but it could take another four or five years to get human clinical trials.

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ABOUT THE CONFERENCE:

WHAT: Unconventional Computation and Natural Computation conference.

WHERE: Western University

PARTICIPANTS: About 120 engineers, scientists and medical specialists

WHEN: Through July 18