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Imaging opens biology's final frontier

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Byline: Andrew Duffy
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The University of Ottawa Institute of Mental Health Research wants to join a technological revolution that holds tantalizing promise for the diagnosis and treatment of mental illness.

That revolution was launched in the early 1990s when magnetic resonance imaging (MRI), followed by positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) opened biology's final frontier -- the thinking human brain -- to scientific scrutiny.

In the almost two decades since, scientists have gained new insights into the brain patterns of people with psychiatric disorders such as depression, schizophrenia and anxiety.

Neuroimaging has even offered real-time pictures of plaques in the living nerve cells of Alzheimer's patients -- something that used to be seen only in autopsies.

In Ottawa, psychiatric researchers have watched the revolution unfold with only a limited ability to participate.

Scientists here do not have a functional MRI dedicated to psychiatric research. Those at the Institute of Mental Health Research have "sporadic" access to fMRIs, said institute chief executive Dr. Zul Merali, and must rely on low-resolution scanners in local hospitals and clinics.

"But you know how busy they are: you can wait months sometimes," said Merali.

The institute's new research facility, which is part of the Royal Ottawa Health Care Group on Carling Avenue, has a room purpose-built for a state-of-the-art brain scanner.

But the institute, so far, has not been able to secure the estimated

\$6 million it needs to buy a high-resolution unit. The only such machine in Canada, at Toronto Western Hospital, affords researchers colourful detail, down to the brain's basic processing units (neocortical columns).

"This is one of the very few tools that lets you peer into the brain, into the functioning, alive human brain," says Merali. "And by understanding how it is functioning normally, you can understand when it is not functioning normally, as with mental illness."

Merali hopes that with acclaimed German researcher Dr. Georg Northoff now installed at the institute, it

will be easier to attract funding for a dedicated unit. (Until the Ottawa institute secures its own machine, Northoff will return to Germany when he requires consistent access to an fMRI.)

Mental health research, Merali said, remains poorly funded in Canada, even though it weighs heavily on provincial health care budgets.

"If you look at the burden of illness, cardiovascular is number one, and number two is mental illness: it costs a tremendous amount of money; it's a huge issue.

"But if you look at how much money we spend in mental health research, it's less than five per cent of medical research dollars."

Neuroimaging, he said, holds the promise of reducing costs associated with mental illness through early detection and treatment.

Scientists believe they will one day be able to identify definitive brain "markers" for common psychiatric conditions to speed accurate diagnoses.

The technological revolution in psychiatry has not yet reached that stage since activity inside the natural world's most complex organ has proven stubbornly difficult to codify during the past two decades.

Still, the technology is already being used to understand how psychiatric patients respond to treatments.

This week, researchers at the Centre for Addiction and Mental Health in Toronto announced they will use genetic testing together with brain imaging to assess the best course of treatment for patients with schizophrenia, depression and other disorders.

Ottawa's Northoff said the development points to the "clinical applicability" of brain imaging when used in combination with other technology.

He intends to combine brain imaging with biochemical measures, rather than genetic testing, to improve treatment methods.