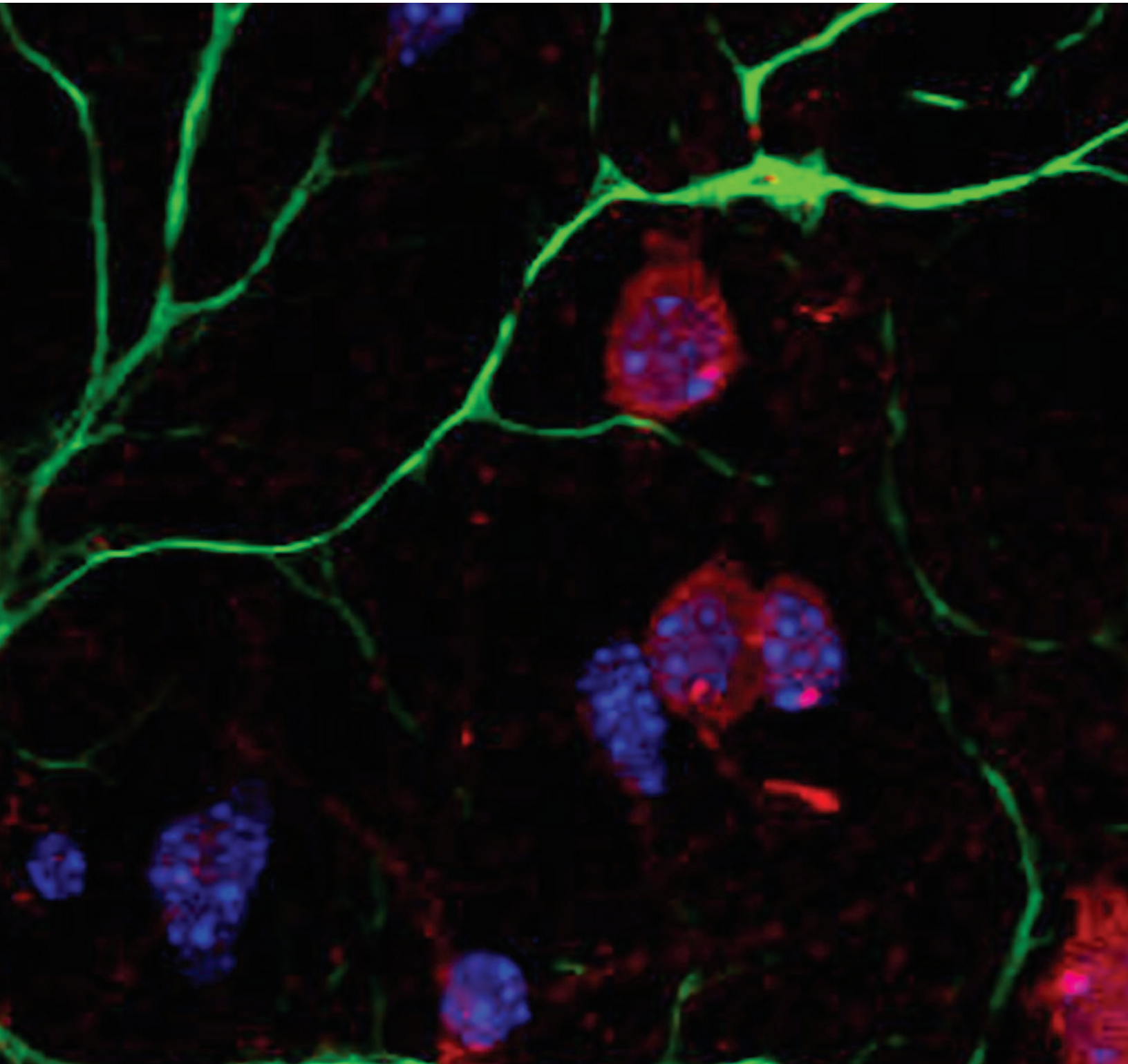


The Ontario Brain Institute

Mobilizing Ontario's **Excellence** in Brain Research

EXECUTIVE SUMMARY



WHY A BRAIN INSTITUTE?

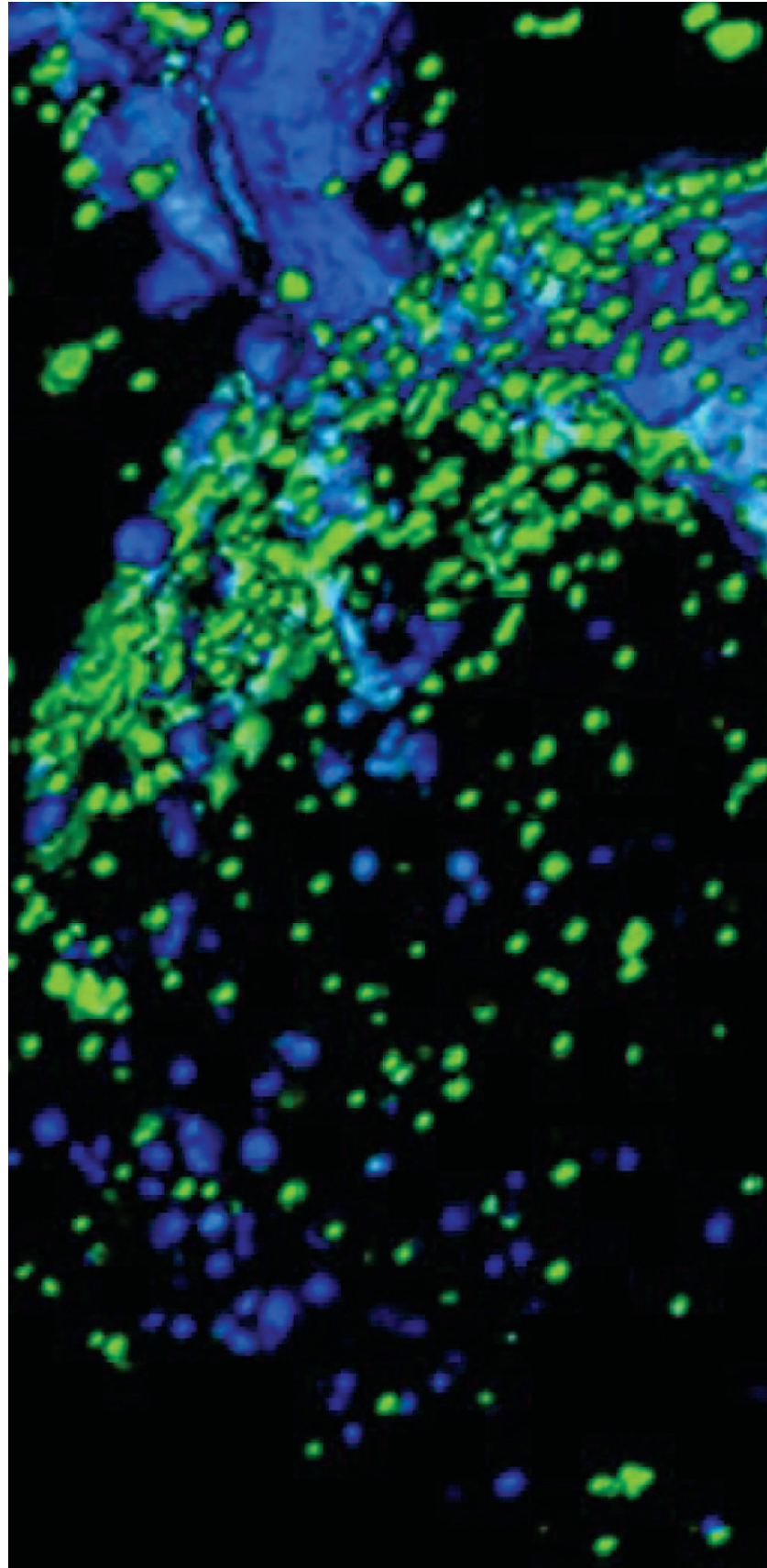
WHY ONTARIO?

WHY NOW?

Optimism has never been greater among scientists that we are on the cusp of making major advances in our understanding of the human brain, the most complex structure in the universe. This optimism is fuelled by powerful new technologies that are enabling scientists to study brain function at all levels—genetic, cellular, circuit, and behavioural—in both health and illness.

The result has been a cascade of significant advances in knowledge of the brain across life's developmental stages, from birth to old age. Springing from this knowledge, risk factors for brain diseases are being identified and markers of disease developed, offering real hope for future diagnostics, therapies, and even cures.

Because the emerging neuroscience landscape is so promising and the societal impact of brain diseases so devastating, governments and foundations worldwide are rallying to support brain research. Ontario, already so strong in neuroscience, can contribute significantly to this international effort; indeed, by adjusting its approach through the research model we propose, the province stands to become a world leader, both in academic research and in applying the results of this research to patients afflicted with brain diseases.



Executive Summary

This report recommends the creation of a research institute dedicated to studying developmental and degenerative disorders of the brain that give rise to diseases, including Alzheimer's disease, Parkinson's disease, autism and schizophrenia. The proposed Ontario Brain Institute (OBI), will bring together Ontario's leading basic and clinical neuroscientists in a unique collaborative effort to work on shared goals and problems. It will also recruit representatives from industry as full partners in the Institute to facilitate the translation of intellectual property to commercialization. The ultimate goals of the OBI will be to create new knowledge about how the brain works, translate that information to patient care, create an interdisciplinary training program in translational neuroscience for clinical investigators and basic scientists, and stimulate the nascent neuroscience industry in Ontario to increase its competitiveness in a \$300 billion global market for treating brain diseases.

The rationale behind this proposal is as follows:

THE BURDEN OF BRAIN DISEASES

Brain diseases impose major medical, social, and financial burdens on people everywhere. In Canada, one in four individuals will suffer from a brain disease in their lifetime; three times as many years will be lost to death and disability from brain diseases as those lost to either cancer or heart disease. And the rates of brain diseases are increasing: diagnoses of autism spectrum disorders in children in the United States have accelerated alarmingly over the past 10 years, and the number of patients with Alzheimer's disease in Canada, now numbering 500,000, is expected to increase to 1 million by 2031.

COST TO SOCIETY

In Ontario, the economic impact of brain disease is estimated to be \$39 billion annually. \$2.5 billion is spent by the Ontario government on direct health care services, almost \$29 billion is attributed to lost workplace productivity, disability and death, and more than \$2 billion is spent by the private sector on disability claims, workers safety and insurance costs, and drug costs. Ontario pays additional costs for special education programs for children (\$2.1 billion) and \$3.3 billion to the Disability Support Program; 50% of recipients have brain-related issues in both programs. Mental health and addictions cost Ontario \$2.3 billion in law enforcement services. The impact of brain diseases on the families of patients is also devastating, with 1,300,000 Canadians now caring for a family member, 39% of whom have Alzheimer's disease or a related dementia. The corrosive effect of these diseases on the vitality of Canada's talent pool is immeasurable.



**ANTICIPATED ANNUAL
GLOBAL MARKET REVENUE
PREDICTED FOR 2018**

**\$300
BILLION**

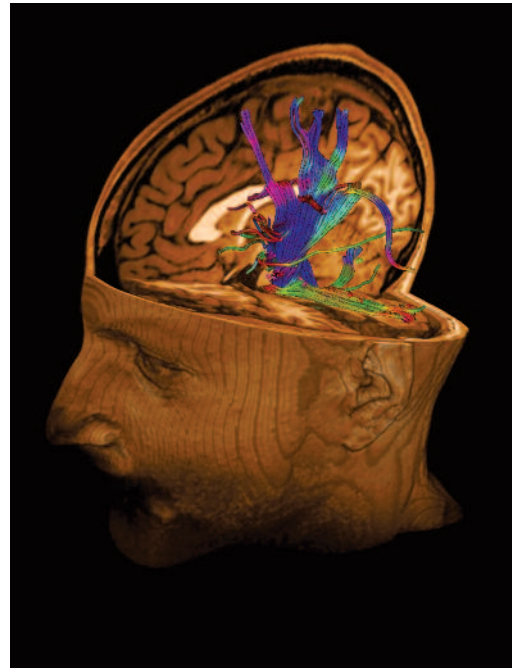
COMMERCIAL OPPORTUNITIES

For industry, development of products relating to diseases of the brain represents a major commercial opportunity. The global market for diagnostics and therapeutics in 2007 was \$130.5 billion and is expected to grow by 10% annually, reaching \$300 billion by 2018. However, limitations in our knowledge about the causes of brain diseases continue to hinder the translation of brain research discoveries to commercial products, a problem with relevance to all aspects of the market, including pharmaceuticals, medical devices, diagnostics, and non-pharmacological interventions.

Globally, Ontario has not been a large player in this commercial sphere relative to other jurisdictions in commercializing neuroscience-related products, despite its academic strength in the field. The creation of the OBI will enhance and focus neuroscience research across the province. As a result, Ontario will be better positioned to galvanize this sector and facilitate partnerships between industry and academia in a new collaborative effort aimed at mobilizing scientific knowledge and improving access to technology platforms that support commercial development.

ADVANCEMENTS IN SCIENCE

Scientifically, the time is right for a major new initiative in brain research, for recent technological advances are allowing scientists for the first time to study all aspects of brain function, making possible fundamental insights into both healthy and diseased brains. For example, advances have been made in applying the results of the human genome project to studying the genetic control of brain function and also the effects of environmental influences on gene expression. Stem cell biology has shown that the brain has the ability to regenerate nerve cells, and new methods of tracing brain circuits are revealing the basis of information processing. Functional brain imaging and related techniques are allowing scientists to monitor brain activity in living people, including the encoding and retrieval of memories and the neural mechanisms of perception and attention.



INTERNATIONAL COMPETITORS

Countries worldwide are recognizing the relevance of this neuroscience technological revolution to improving patient care and to creating new wealth in a huge global market through commercializing brain research discoveries. For these reasons they are investing heavily in developing and expanding the research capacities of their academic communities, which they see as the engines driving knowledge creation and commercial development. They also recognize that major breakthroughs in brain research will require collaborative efforts, for a true understanding of the brain will arise not from one discipline alone, but rather through experts from multiple disciplines working together.

ONTARIO'S ADVANTAGE

Ontario already has many of the intellectual assets in neuroscience that other countries seek. For example, Ontario-based clinical investigators and basic scientists are among the world's leaders in Alzheimer's disease, deep brain stimulation, brain imaging, computational neuroscience, neurophysiology, and medical devices to aid patients with diseases of the nervous system. Toronto is a major North American centre for neurosurgery; more than 800 brain tumours are operated on annually, providing a rich facility for the development of innovative new techniques and treatments. The province is also competitive in genetics, molecular and developmental neuroscience; in the creation of simple model systems of brain disease; and in the study and prevention of stroke.

Indeed, benchmarking studies show that Ontario neuroscientists are the Canadian leaders in research productivity and, when measured against leading international competitors, they either lead as a percentage of population or hold their own with respect to the number and impact of journal publications in neuroscience and behaviour.

ONTARIO'S OPPORTUNITY

For Ontario to become a global leader in neuroscience, the province must:

- Focus on strategic research areas of relevance
- Expand and build upon current research strengths
- Encourage collaboration among disciplines, institutions and industry, and
- Bring together a critical mass of clinical and basic science experts, working with industry, to create a world-recognized neuroscience cluster.

The Ontario Brain Institute will be driven by four principles:

1. Studying the brain during each of life's developmental stages, with an emphasis on
 - Developmental disorders of the brain that give rise to mental diseases
 - Neurodegenerative diseases, including Alzheimer's disease and Parkinson's disease
2. Stimulating translational research by creating a collaborative network of basic scientists, clinical investigators and industry scientists, working on problems of shared interest, and contributing knowledge and technology to achieve shared goals. Industry partnerships will lead to new products for the diagnosis, treatment, and care of patients with brain and nervous system diseases.
3. Creating an interdisciplinary training program for the next generation of clinician and basic scientists.
4. Building upon the success of Ontario's prior investments in brain research by coalescing the scientific professionals and technologies already present within the province and recruiting to the province experts with essential new technologies.

“Recognizing that neuroscience is not, of course, really a single field is important. Rather, it is a multidisciplinary enterprise including diverse fields of biology, psychology, neurology, chemistry, mathematics, physics, engineering, computer science, and more. If scientists within neuroscience and related disciplines could unite around a small set of goals, the opportunity for advancing our understanding of brain and mental function would be huge.” — [The National Academy of Sciences \(US\)](#),

[Workshop Report “From Molecules to Minds” \(2008\)](#)

ONTARIO BRAIN INSTITUTE (OBI) VISION

Ontario is a world leading centre for brain research translation and innovation



THE INSTITUTE'S STRUCTURE

The structure of the OBI will be a hub-and-spoke model consolidating Ontario's existing and future strengths. This model will enhance interdisciplinary and cross institutional collaboration, for which the potential has never been greater, and which is now made possible by technological advances that allow scientists located at research centres located hundreds of miles apart to share data and expertise in real time, all the time.

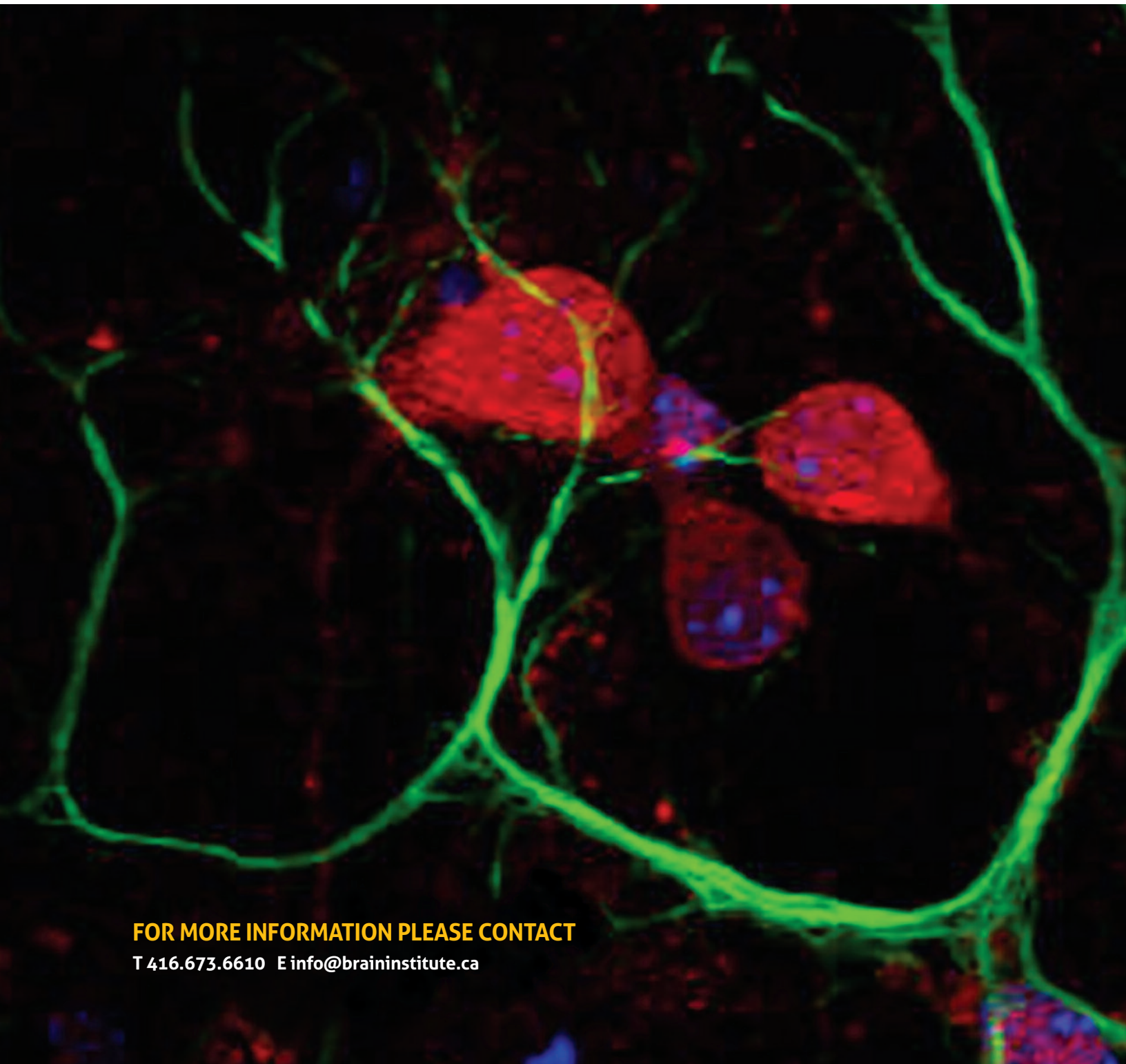
The hub will be the Institute's organizing centre, comprised of a group of core scientists and relevant platform technologies to be used by the province's scientists. The spokes will be distributed across the province, and will engage scientists from Ontario's universities, research institutes, and university-based hospitals. The OBI will also work collaboratively with other agencies (e.g. MaRS, Ontario Institute for Cancer Research). Based upon the budgets of comparable neuroscience research institutes elsewhere in the world, we estimate the costs of establishing and operating the OBI to be \$100 million annually.

BENEFITS TO ONTARIO

Establishing the OBI will provide major benefits to Ontario:

- The province will be recognized as one of the world's leading venues for brain research, and the consolidation of resources will help in recruiting and retaining top talent and in establishing Ontario as an ideal site for interdisciplinary training for the next generation of basic and clinical investigators;
- Ontario will become a world leader in the translation of brain research to clinical care, which will create new medical treatments, accelerate access to innovative technologies, reduce the demand for social services, and improve the effectiveness of the health care system; and
- Ontario will be positioned to capitalize on the translational potential of this research by recruiting industry as a partner with OBI and working with industry to commercialize new intellectual property, with the aim of increasing the province's industrial competitiveness and access to the global marketplace.

“The global information economy is, by definition, an economy of mental performance. This underscores mental health in the labour force as a critical determinant of output much like physical health was in the old industrial economy.” — [Watson Wyatt Canada ULC](#)



FOR MORE INFORMATION PLEASE CONTACT

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