BRAZILIAN RESEARCH INSTITUTE FOR NEUROSCIENCE AND NEUROTECHNOLOGY – BRAINN

FAPESP Process 2013/07559-3

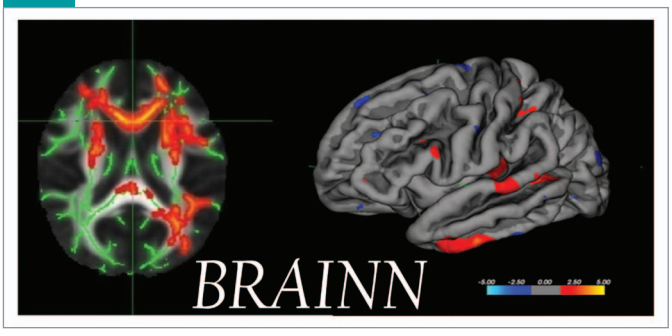
The Brazilian Research Institute for Neuroscience and Neurotechnology (BRAINN) focuses on the investigation of basic mechanisms leading to epilepsy and stroke, and the injury mechanisms that follow disease onset and progression. This research has important applications related to prevention, diagnosis, treatment and rehabilitation and will serve as a model for better understanding normal and abnormal brain function.

The main motivation of this RDIC came from the necessity of approaching these relevant and complex biological problems by combining the expertise of research groups with distinct and complementary backgrounds.

One of the multiple aspects that demonstrate the characteristic complexity associated with research on epilepsy and stroke is the fact that such conditions are not uniquely defined, which means that these conditions cannot be traced to a single disease or a unique syndrome. Therefore, there is a need for collaborative research by scientists with different areas of expertise, driven by solid scientific theories and social needs, to provide relevant applications in the real world.

This research aims to be clinically important, realistic and scientifically highly original, combining genetics, neurobiology, pharmacology, neuroimaging, computer sciences, robotics, physics and engineering. The results will benefit patients with epilepsy, stroke and other prevalent diseases and will contribute substantially to ongoing scientific discussions within neurology, psychiatry, and cognitive neuroscience. The proposed collaborations between BRAINN and other major neuroscience groups will further advance knowledge directly relevant to all people suffering from these devastating neurological conditions.

The field of neurotechnology presents great potential for innovation and technology transfer. The challenges related to neurotechnology are the production of complex equipment and software systems for aiding diagnosis and treatment of neurological diseases such as epilepsy and stroke. This will include the development and construction of functional brain imaging systems



Areas of abnormal neuronal fiber connections in patients with frontal-lobe epilepsy (left image – axial view of the brain; group data using 3-T diffusion tensor imaging) and areas of cortical atrophy 6 months after a stroke (right image – a reconstruction of the brain's cortical surface from structural 3D-MRI with statistical data superimposed)

using infrared photons; the design and microfabrication of neuroprobe targets for innovative research and clinical use; the development of optimized software for medical image processing; the development of fast diagnosis techniques based on gene identification; the design and construction of brain-computer interfaces (BCI) for assistive technologies; and the development of rehabilitation systems.

In the area of treatment and rehabilitation, the Center will work on the remote monitoring of patients. For example, a highly portable video-EEG system can be deployed at home, allowing patients to avoid long waiting periods of hospitalization. In this area, the Center also aims to develop remote-controlled devices (e.g. mobile robots) that allow physicians to interact with patients outside of hospitals.

In addition to a formal graduate student program in neuroscience, there is a plan for diffusion of knowledge and education that embraces the creation of websites, TV and web-radio broadcasts; the creation of specific social networks, blogs, and microblogs; the expansion of an existing lay magazine; and the publication of BRAINN books to help disseminate neuroscience in the community. The Center will create a course for schoolteachers on education in neuroscience, as well as a continuing educational program about scientific journalism. There is also a schedule of events for meetings and workshops every year.

In summary, the goal is to develop new methods and techniques to improve our knowledge for treating and preventing debilitating diseases and conditions affecting the brain.

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Associated Institutions

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Federal University of ABC (UFABC)
Phillips University, Marburg, Germany
Centre National de la Recherche Scientifique (CNRS), France
University of Erlangen, Germany
University College London (UCL), United Kingdom
Université de Montréal, Canada
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