

## NeuroSpin: the large-scale, intense-field neuroimaging facility at the CEA

NeuroSpin is the large-scale research facility set up to push back the limits of brain imaging. Its objective is to understand how the normal brain works and what happens when it malfunctions by using an original, multiscale and multimodal approach. NeuroSpin boasts an exceptional technical platform: MRI (magnetic resonance imaging) operating at 3 and 7 Teslas (T), MEG (magneto-encephalography) and EEG (electroencephalography) systems, together with image processing and analysis tools.

NeuroSpin's scientists work with CEA engineers to design and develop an 11.7T magnet, a capacity that has never been obtained until now. This project is an example of original research carried out at Saclay by methodologists and neurobiologists.



NeuroSpin focuses on research issues that lie at the very heart of public health. The center is interested in how the healthy brain works, how it calculates, learns to read and process data, as well as what happens when it malfunctions because of addiction, neurodegenerative disease, schizophrenia, epilepsy, CVA and cancer, for example.

To achieve its research goals, NeuroSpin draws on specialized **methodological developments**:

- the experimental use of contrast agents and biological tracers for molecular imaging;
- *in vivo* and *in situ* studies on the action mechanisms of drugs;
- diagnosis and monitoring of how effective treatments may be;
- developing a new generation of very high field MRI systems for clinical use (11.7T);
- multimodal imaging (MEG-MRI Project);
- developing instrumentation related to MRI systems (3; 7 and 17.65T);
- developing neuroimaging software (BrainVISA).

### ***At the heart of a clinical, academic and industrial network***

NeuroSpin is at the crossroads of scientific and technological knowledge and know-how. Working closely with the CEA's Service Hospitalier Frédéric Joliot (SHFJ) at Orsay and MIRCen, the future preclinical imaging center at CEA-Fontenay-aux-Roses, NeuroSpin boasts a unique combination of biomedical imaging resources and expertise.

These three units build up the CEA's Institute of Biomedical Imaging (I<sup>2</sup>BM). They collaborate with clinical research partners, as well as with key players in French and international academic research, universities and higher education institutes. Industrial developers of imaging systems, drugs, biotechnologies and medical devices are also involved.

NeuroSpin provides training and research facilities for students. For example its scientists participate in the "European Master in Molecular Imaging (EMMI)" international training program.



## At the heart of regional, national and international networks

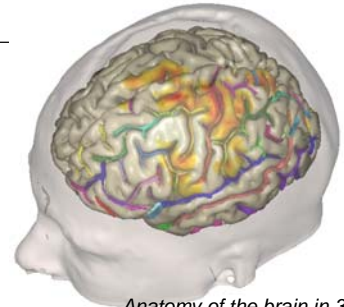
NeuroSpin is a founding member of the 'Ecole des neurosciences de Paris-Région' (ENP), a local thematic network for advanced research dedicated to the understanding of the pathological mechanisms that cause severe physical and mental disabilities. It is supported by the Medicen Paris-Région Competitiveness Cluster, and is part of different local organizations and networks. NeuroSpin's scientist participate in various international projects such as the Iseult-Inumac (design of a 11.7T magnet) funded by industrial and institutional partners in France and Germany.

### NeuroSpin in brief

- o Architect: Claude Vasconi
- o Surface area: 11,400 sqm.
- o Inaugurated on: January 1, 2007
- o 150 people: doctors, pharmacists, mathematicians and physicists
- o 10 different nationalities

### Financial data (Cost of the building and the magnets to date)

- o CEA: 33.3 million euros
- o ANR: 10 million euros
- o Ile-de-France Regional Council: 6 million euros
- o Essonne General Council: 1.7 million euros



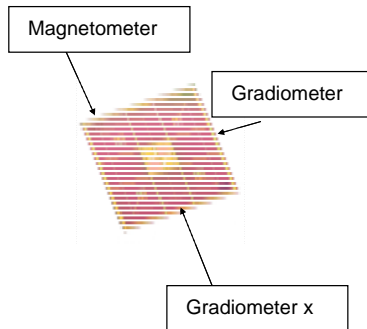
Anatomy of the brain in 3-D showing grooves

## EUROPEAN PROJECTS AND PROGRAMS AT NEUROSPIN

**EATRIS** (*European Advanced Translational Research Infrastructure in Medicine*) is one of six biomedical research projects proposed in the ESFRI roadmap (European Strategy Forum on Research Infrastructures).

**IMAGEN** Imagen is an FP6 project aimed at furthering our understanding of how the brain works. The project involves looking for any links between psychological, biological and genetic factors in changes taking place in the brain during adolescence, of which very little is known. The project also aims to identify risk factors involved in addiction.

**MEG/MRI** This is an FP7 project aimed at building a machine that will combine two kinds of technology: MEG (magneto-encephalography) and MRI. This is a ground-breaking project, the only other attempt to design such a multimodal machine is in the US.



sensors



NeuroSpin also hosts teams of leading European programs, such as a group from the *Ecole Normale Supérieure* carrying out research on dyslexia (under FP6).

**Marie Curie Programme:** NeuroSpin personnel can take advantage of the Marie Curie Program of the European Community