

Guardian Angels for a smarter life

Contenu principal

Introduction



Photo credit: EPFL/HBP

The brain, with its billions of interconnected neurons, is without any doubt the most complex organ in the body and it will be a long time before we understand all its mysteries. The *Human Brain Project* proposes a completely new approach. The project is integrating everything we know about the brain into computer models and using these models to **simulate the actual working of the brain**. Ultimately, it will attempt to simulate the complete human brain. The models built by the project will cover all the different levels of brain organisation – from individual neurons through to the complete cortex. The goal is to bring about a revolution in neuroscience and medicine and to derive new information technologies directly from the architecture of the brain. The challenges facing the project are huge. Neuroscience alone produces more than 60'000 scientific papers every year. From this enormous mass of information, the project will have to select and harmonise the data it is going to use – ensuring that data produced with different methods is fully comparable.

The data feeding the project's simulation effort will come from the clinic and from neuroscience experiments. As we try to fit all the information together, we will discover many of the brain's **fundamental design secrets**: the geometry and electrical behaviour of different classes of neurons, the way they connect to form circuits, and the way new functions emerge as more and more neurons connect. It is these principles, translated into mathematics that will drive the project's models and simulations.

Today, simulating a single neuron requires the full power of a laptop computer. But the brain has billions of neurons and simulating all them simultaneously is a huge challenge. To get round this problem, the project will develop novel techniques of **multi-level simulation** in which only groups of neurons that are highly active are simulated in detail. But even in this way, simulating the complete human brain will require a computer a thousand times more powerful than the most powerful machine available today. This means that some of the key players in the *Human Brain Project* will be specialists in supercomputing. Their task: to work with industry to provide the project with the computing power it will need at each stage of its work.

The *Human Brain Project* will impact many different areas of society. Brain simulation will provide new insights into the basic **causes of neurological diseases** such as autism, depression, Parkinson's, and Alzheimer's. It will give us new ways of testing drugs and understanding the way they work. It will provide a test platform for new drugs that directly target the causes of disease and that have fewer side effects than current treatments. It will allow us to design prosthetic devices to help people with disabilities. The benefits are potentially huge. As world populations grow older, more than a third will be affected by some kind of brain disease. Brain simulation provides us with a powerful new strategy to tackle the problem.

The project also promises to become a source of new **Information Technologies**. Unlike the computers of today, the brain has the ability to repair itself, to take decisions, to learn, and to think creatively - all while consuming no more energy than an electric light bulb. The Human Brain Project will bring these capabilities to a new generation of *neuromorphic computing devices*, with circuitry directly derived from the circuitry of the brain. The new devices will help us to build a new generation of genuinely intelligent robots to help us at work and in our daily lives.

The *Human Brain Project* builds on the work of the *Blue Brain Project*. Led by Henry Markram of the Ecole Polytechnique Fédérale de Lausanne (EPFL), the Blue Brain Project has already taken an essential first towards simulation of the complete

brain. Over the last six years, the project has developed a prototype facility with the tools, know-how and supercomputing technology necessary to build brain models, potentially of any species at any stage in its development. As a proof of concept, the project has successfully built the first ever, detailed model of the neocortical column, one of the brain's basic building blocks.

Pied de page

Please note all information in this website reflects the Human Brain Project-Proposal which was submitted 23 October 2012.

Menu d'aide

- [Contacts](#)
- [Press office](#)
- [News and Media](#)
- [Sitemap](#)
- [Powered by WnG Solutions 2012](#)
- [Retour en haut](#)