

YL – 7th RIR – Welcoming address – 3 November 2016

President of ARIIS, Claude Bertrand,
Ladies and gentlemen,
Colleagues,

It is a great pleasure to join you to inaugurate the Seventh International Research Meeting (*Rencontres Internationales de Recherche*).

Over the years, this annual meeting—organised in collaboration with our partners at Ariis—has become a genuine hub for innovation in the life and health sciences. It embodies a French model of partnership between the public and private sectors with strong state participation, excellence in research and strategic planning coordinated by means of major collaborations between the academic sector and business.

This year, the theme is **Neuroscience**.

What is at stake? What are the opportunities and challenges?

Firstly, a fact that neither the general public nor decision-makers may be aware of: out of all disease, diseases of the brain and sensory organs now account for the **highest bill in health care expenditure**.

In Europe, **380 million people** suffer from these diseases which underlie **35% of the overall burden of morbidity**. Mental disorders and psychiatric problems, neurological conditions (especially neurodegenerative diseases) and stroke are costing Europe **798 billion euros** each year.

The burden of disease of the brain and nervous system is therefore enormous in terms of both public health and the economy as a whole.

This burden is only going to get heavier in years to come with rising life expectancy because **age is the leading risk factor** for many neurodegenerative diseases such as Alzheimer's, other forms of dementia, Parkinson's disease and pathologies affecting the sensory organs like age-related macular degeneration.

France is implementing a number of governmental research and public health Plans to meet this challenge, e.g. those focusing on **Alzheimer's Disease, Autism and Rare Diseases**. In the more recent **Neurodegenerative Disease Plan, seven centres of research excellence** have been identified across the country.

The field of mental health offers a **very high potential for return on investment**.

A recent study by the National Institutes of Health showed that the return on investment in terms of employability and quality of life for those affected by brain disease was 50% for therapeutic research. For Parkinson's disease, treatment that reduced disease progression by 20% would reduce its cost by 75,800 dollars a year per patient; a drug that could completely block disease progression would reduce the cost by 442,400 dollars a year. This gives an idea of the dimensions of the challenge for our populations and health care systems.

What about research strategies?

These connect around two lines:

- 1) Understanding how the nervous system and sensory organs work and why they go wrong** (development, maturation and ageing) **in their interactions with the genome and environment**. This line of research depends on testing capacities at diverse levels, “-omics research” and bio-informatics, real-time physical observation, *in silico* simulation capacities and new animal models for the expression of different phenotypes and disease modelling.
- 2) Conducting translational research to identify mechanisms that underlie neurological diseases, psychiatric disorders and sensory problems, with a view to developing novel diagnostic and therapeutic approaches**. One major objective is the identification of biological, behavioural and imaging markers for early diagnosis, monitoring the efficacy of treatment and developing personalised medicine (which is itself a major focus in France in the framework of the 2025 Genomic Medicine Plan).

Academic research into neurological and psychiatric disease in France employs some **2,500 scientists and lecturers as well as 1,200 engineers and technicians.**

French science is recognised on the international stage with Stanislas Dehaene having been awarded the Brain Prize in 2014, the same year that Alim Louis Benabid won the Lasker Award

The areas of research in which France's excellence is recognised include development of the nervous system, cognitive neuropsychology, biophysics of the synapse, interactions between neurones and glial cells, neural networks, neurogenetics, vision and signal processing, and neuro-inflammation. Our scientists are also pioneering the fields of functional neurosurgery (deep brain stimulation, intracerebral stereotactic electroencephalography), cell therapy, gene therapy and the development of brain-machine interfaces.

When it comes to medical research, one of France's advantages is its highly centralised hospital system which makes it easy to constitute large cohorts. Research institutions like Inserm and CNRS (as well as CEA, INRA, INRIA, Institut Pasteur, EPHE and EHESP) work in close collaboration with hospital establishments on translational research. **The French CIC and F-CRIN networks** help both private-sector and university sponsors conduct top-quality clinical trials in line with the best practices required by national and European funders.

Another advantage in France is the excellence of the training of its engineers which endows them with a high level of scientific knowledge and creates a propitious environment for development of the systems and instruments that the study of neuroscience requires.

So the ecosystem in France for research into diseases of the brain and sensory organs is one that encourages innovation.

How to establish **win-win partnerships** between academia and business, and **how to drive innovation?**

This is the objective of these meetings.

Discoveries at the molecular and cellular levels can give rise to **monetizable medical applications in the form of novel therapeutic targets and diagnostic tools**, such as **biological markers** that can be used in the fast-growing field of personalised medicine. In the neurosciences, the idea of marker can also cover **behavioural traits** together with the instruments needed to assess them. Another fast-growing field ripe for monetization is that of **sensory prostheses and implantable devices**, e.g. electrodes for deep brain stimulation, retinal chips and novel brain-machine interfaces.

Potential for monetization and industrial transfer goes beyond simple biology and health. The neurosciences are also proving to be highly relevant to the development of engineering science (**information science, robotics, enhanced reality, ergonomics, etc.**), economics (**neuro-economics**) and education (**software, memorisation, learning**). Findings in the neurosciences are also stimulating a boom of innovation with the design of powerful new instruments for **4D imaging, sophisticated new microscopy applications and resources for calculation and data processing in brain-inspired Artificial Intelligence**.

All these topics as well as others will be addressed at this Seventh International Research Meeting. Not only is all this stimulating for the soul but it is also indispensable for health, full of promise for society and drives economic growth.

So I wish you all a great day's work today.