Preface

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Biographical notes: Physicist Catherine Bréchignac was appointed President of CNRS by the French Council of Ministers on January 11, 2006, on the proposal of the French Minister of Higher Education and Research. She formerly held the position of CNRS Director General from 1997 to 2000.

With the fast progress in the observation and the manipulation of nanometric objects and of matter at a nanometre scale, nanosciences and nanotechnologies have become new fields of research and development. Experiments can now be performed at the level of a single nano-object, matter can be custom designed and built with specific properties, using nanostructuration. Devices with a size on the order of a fraction of a micrometre to a few nanometres have revolutionised electronics and optoelectronics. The miniaturisation of electronic and opto-electronic devices, of sensors, of systems for chemistry and biology induces an increased need both for basic research and for development in the very broad field of nanosciences and nanotechnologies.

CNRS has been among the leading research organisations worldwide to launch and support projects in science and technology at a nanoscale and a number of CNRS laboratories are at the forefront of research in the field. CNRS has also played a major role at the national level in the organisation of the experimental facilities which have given the scientific community the necessary tools for the fabrication and the observation of elaborated objects at the nanometre scale. Four of the five national nanotechnology platforms are managed by CNRS or by partnerships involving CNRS strongly, as well as the regional centres 'C'Nano', which provide local support to research and to student training in nanoscience and nanotechnology.

Reducing the size of devices further is a critical technological challenge, which constitutes the roadmap of future electronics. In contrast with this 'top-down' approach, where objects with a pre-designed structure are built, one has to consider the 'bottom-up' approach, by which objects are fabricated or structured at a nanoscale through atomic or molecular assembly, via auto-organisation in controlled conditions. Exploring the concepts of molecular-scale electronics, self-assembled layers, nanoscale characterisation, supermolecular chemistry and molecular machines will bridge the gap between chemistry, physics and electronics. Applying these concepts to biology and conversely, studying biologically based or inspired nanoscale systems will involve modelling and experiments in all natural sciences.

Relying on its very broad disciplinary spectrum, CNRS can put together mathematicians, physicists, chemists, biologists, experts in engineering sciences, in environment and in space sciences to develop specific strategies in order to further

improve the efficiency of the various approaches and extend their applications. At the same time, CNRS can include social science approach and build openness, disclosure and public participation into the process of developing nanotechnology research.

Major breakthroughs are expected in next few years at the nanometre scale, resulting in revolutionary changes in material sciences, information technologies, biology and medicine, with potentially large impacts for environment, energy or space technologies. In this context, CNRS, by strongly supporting nanosciences and nanotechnologies as one of its major priorities, will reinforce the pace of fundamental research and create the knowledge needed for technical innovation.