Horizon 2020
Marie Sklodowska Curie Actions
PROFILE FORM – Expression of Interest

<table>
<tr><td>Organization Name / Department</td><td>Department of Nanoscience and Nanotechnology Institute , National Agency of Atomic Energy</td><td>Organization Short Name</td><td>INN - CNEA</td></tr>
<tr><td>Organization Type</td><td colspan="3">☐ University
X Public Research Centre
☐ Large Scale Enterprise
☐ Small and Medium Scale Enterprise
☐ Public Body
☐ International NGO
☐ National NGO</td></tr>
<tr><td>Research Fields</td><td colspan="2">X Chemistry CHE
☐Social and Human Sciences SOC
☐Economic Sciences ECO
☐Information Science and Engineering ENG
☐Environment and Geosciences ENV
X Life Sciences LIF
☐Mathematics MAT
X Physics PHY</td><td><u>Sub-Fields / Keywords:</u>
Materials Science
Magnetic Materials, Nanomagnetism, Spintronics, Computational Physics.</td></tr>
<tr><td>Short Description of the Organization / Department</td><td colspan="3">The Nanoscience and Nanotechnology Institute (INN) belongs to the National Agency of Atomic Energy of Argentina.

It was created in 2007 aiming at strengthening multidisciplinary research work in nanoscience and at the development and use of innovative micro and nanotechnologies . Its activities cover different areas and interests within the main strategic lines of the hosting institution. Even if it formally belongs to the reasearch and applications management area, due to its transversality, the nuclear management sectors (nuclear reactors, nuclear medicine, nuclear fuels, environment) actively participate of INN's research and development work.

Geographically, INN has two big divisions, one in Centro Atómico Bariloche (INN-CAB) and the other in Centro Atómico Constituyentes (INN-CAC) in Buenos Aires.

About 200 persons (staff, technicians, PhD' s and Postdoc's) belong to INN. It has two clean rooms (one in Bariloche and the other one in Constituyentes) and more than 15 associated growth and characterization laboratories and also simulation and theory groups.</td></tr>
<tr><td>Previous Related Projects / Research Experience</td><td colspan="3">The groups which integrate INN have a wide list of active projects in several big areas. All groups have experience in teaching and training of undergraduate, graduate, and post gradute students and researchers.
It follows follows the list of expertise and projects of those groups that have expressed their interest in participating of H2020.

1- Researchers leading this group/lab have projects and expertise in:

- Synthesis and functionalization of nanoparticles, nanowires and nanotubes, thin films and multilayers.
- Growth and characterization of Artificial magnetic nanostructures</td></tr>
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	People in this group have strong experience in experimental techniques such as: Magnetic Resonance Spectroscopy, dc and ac Magnetometry, Magnetotransport, Magnetooptics, Scanning probe microscopy, Neutron diffraction, etc. 2- The interests of this group lie in the following topics : - Nanomagnetism, - Spintronics, - Interface engineering of oxide heterostructures, - Artificial multiferroics. Researchers in this group have strong experience in experimental techniques such as: Magnetic Resonance Spectroscopy, DC and AC Magnetometry, Magnetotransport, Magneto-optics, Scanning probe microscopy, growth of thin films by sputtering, PLD, Lithography. . 3- Researchers in this group focus their attention on a variety of aspects related to formation, stability, and control of magnetic domains. The distinctive program we offer is based on a complementary approach between theory, experiments and numerical simulations. The following is a partial list of topics they are working on: Domain wall creep at ultraslow magnetic fields. TAFF (thermally assisted flux flow) regime of domain wall motion. Rotational anisotropy of striped magnetic domain patterns. Finite temperature domain wall depinning. Development of a polar magneto-optic Kerr effect (PMOKE) microscope for magnetic imaging. Synthesis of magnetic thin films and multilayers. Lithography and finite size effects on domain wall dynamics in magnetic thin films. Domain wall roughness characterization and properties. Current induced domain wall motion. Electric transport through magnetic domains arrays. Elastic and plastic regimes of domain wall motion. High performance numerical simulations of creep and depinning in the week disorder limit. Domain wall dynamics through periodic disorder landscapes. Researchers in this group have strong experience in experimental techniques such as: Magnetic Resonance Spectroscopy, DC and AC Magnetometry, Magnetotransport, Magneto-optics, Scanning probe microscopy. Researchers also have strong experience in numerical simulations such as: Monte Carlo, Langevin, molecular dynamics, high-performance computing (general purpose graphics processor units - GPGPU). 4- People in this research line have research experience in thermodynamic, magnetic and structural properties of nanocrystalline vortex matter at the micro-scale in high-temperature superconductors 5- People involved in this group have interest in in different areas. It follows a partial list of the projects: -SPR Biosensing MUA/Poly-L-lysine Platform for the Detection of 2,4-Dinitrophenol as Small Molecule Model System. http://dx.doi.org/10.1155/2016/5432656.

	-Layer-by-layer deposition of chitosan derivatives and DNA on gold surfaces for the development of biorecognition layers. Analytical Letters, 2004, 37 (11), 2235–2250. -Periodic electric field enhancement along gold rods with nanogaps. Angewandte Chemie International Edition 2010, 49, 78 –82. -Gap structure effects on SERS intensities for gold gapped-rods. Nano Letters 2010, 10, 1722–1727. -Alignment strategies for the assembly of nanorods with submicron diameters. Small 2010, 6, 1736-1740. Senior researchers of this group have a wide research experience in nanotechnology, plasmonics, lithography (conventional, e-beam and FIB), microchip fabrication, spectroscopy (UV-visible, IR, Raman, Fluorescent), microscopy (atomic force, electron scanning), electrochemistry (CV, DPV, SWV, PSA, amperometry, cronoamperometry, coulombimetry, etc.), electrochemistry-enabled nanofabrication techniques such as on-wire lithography (OWL) and spherical voids cavities (SVC) for the synthesis of plasmonically active metallic structures, SERS and SPR detection of small molecules. Also in the modification and characterization of carbon and metallic surfaces, in the development of afinnity and enzimatic biosensors with spectroscopic, optic or electrochemical detection. 6- Recent and present projects of this theory group involve among others the following topics: Search for new mechanisms for 2D electron gas formation, Surface effects in cathalytic materials such as ceria, TiO2, Study of confining and functional effects at oxide surfaces and interphases Study of magnetic instabilities and polarity effects in 2D materials, in general, And transition metal dichalcogenides, in particular Properties of Lithium-air batteries, among others. The researchers involved in this line of research have a long standing experience in the calculation of electronic, magnetic, transport and structural properties of a wide range of complex systems, both, in bulk and at the nanoscale. Their work is oriented at the understanding of experimental results and to the search, control and prediction of fundamental and functional properties of complex bulk, 2D and other low dimensional systems and is based on the use of state-of-the-art methodologies and
Short Description of the Project idea (if foreseeable)	1-According to the expertise of our group we could be able to develop projects in different areas such as Medical Physics, Spintronics, Magnetic Sensors, Nuclear Materials. 2- The focus of our group's research is investigating spin-polarized transport phenomena and magnetism of single nanostructures and heterostructures as well as developping spintronics devices. We are particularly interested in designing, fabricating and studying artificial multiferroic materials built after oxides multilayers 3-Within the research program of the physics of domain wall dynamics our project will study field- and current-induced domain walls dynamics in new ferromagnetic and ferrimagnetic materials. High-performance numerical simulations using micromagnetic and two-dimensional effective models shall be developed. 4- This project aims to study the evolution of thermodynamic and structural properties of nanocrystalline vortex matter when decreasing the system size down a micron. In particular, we will work in developing new micro-fabrication techniques for growing high-temperature superconducting

	samples with lateral dimensions of a few microns but thickness of few hundred nanometer. We will afterwards study the thermodynamic properties of the first-order vortex melting transition when decreasing the number of vortices to less than a thousand. 5- **Surfaces and nanostructures with plasmonic properties applied to the detection of health biomarkers or molecules relevant to agriculture:** In this project we propose to develop plasmonic sensing platforms for simultaneous qualitative and quantitative detection of health biomarkers (for example of Chagas Disease) or herbicides (such as glyphosate). The sensing platforms will be based either on: a) gold gapped rods nanoantennas with both micrometer length segments that allow electric measurements once connected to microchips, and plasmonic active nanogaps that lead to a high signal enhancement in order to spectroscopically characterize the gap composition by surface-enhanced Raman scattering (SERS); or b) nanopatterned substrates in which the propagating plasmon of the surface can couple to the localised surface plasmon of the nanostructures, combining the quantitative and deterministic abilities of two plasmon-enabled techniques: the surface plasmon resonance (SPR) which is based on a propagating plasmon and is highly sensitive to the amount of analytes present, and the surface-enhanced spectroscopies (Raman and Fluorescence), which rely on the enhanced interaction of nanomaterials with the localized surface plasmons and enable the identification of different molecules, allowing thus to both identify and determine the amount of biomarkers in a given sample. 6- Taking into account the groups' ongoing research fields we are able to engage into projects dealing with the properties' modelization and calculation of a wide spectrum of systems, going from the nano to the bulk scale and involving metals, functional oxides, dichalcogenides, among others.
Related Call	
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Position in the Organization	1- Researcher- Head Magnetic Resonance Laboratory -Centro Atómico Bariloche 2- Researcher- Centro Atómico Constiruyentes. 3- Reasearcher – Centro Atómico Bariloche 4- Researcher - Centro Atómico Bariloche 5- Researcher- Centro Atómico Bariloche. 6- Researche-Head of the Nanoscience and Nanotechnology Institute (INN).Centro Atómico Constituyentes.
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