

# Center-NorWest Region Major National Cluster for NanoBioScience Development in Argentina

*Node Tucumán*

Self-organización of bioactive péptides and hormones in biomimetic systems

**SELF-ORGANIZATION OF BIONANOSTRUCTURES FOR THE TRANSMISSION AND CONTROL OF MOLECULAR INFORMATION IN NEUROBIOLOGY, AND BIO-AGRO-PROCESSES ON THE NANOSCALE**

Career Investigators : .....17

Fellows : .....19

Average annual publications in the area since 1972 : ..... 19

PhD Thesis since 1972 : .....23

Collaborations: USA, Spain, Germany, Italy, France, Denmark, Australia, Chile, Brasil

*Node Córdoba*

Self-organization of biointerfaces relevant to neurobiology, biocatalysis and bioremediation



*Node San Luís*

Computational chemistry and molecular dynamics of biomolecules

Bruno Maggio  
(CIQUIBIC – UNC)  
Gerardo D. Fidelio  
Santiago Quiroga  
Graciela A. Borioli  
Rafael G. Oliveira  
Maria L. Fanani  
Natalia Wilke

Roberto Morero  
(INSIBIO – UNT)  
Paula A. Vincent  
Rosana Chehin  
Rosa M. Alvarez

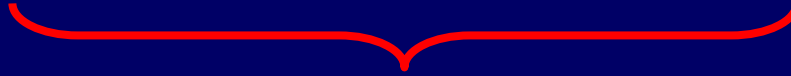
Jorge Vila  
(IMASL – UNSL)  
Guillermo G. Montich  
Hector A. Baldoni  
Marcos Villarreal

# "Bottom-up" Vectorial self-organized Nano-Bio-Assembly from nanoscale to microscale (Since 1973)

**Spontaneous Self-Configuración  
of bio-electro-mechano-chemical  
nano-microprocessors**



**Dinámica Self-regulated Variability and  
Reversibility between the Atomic-Molecular-  
Supramolecular-Topographic-Topologic Levels**



**1) Controlled-Targetting and Self-Structuring of Peptides and Proteins in nanovesicles and Ultrathin Films of Defined Composition.**

**2) Lipid and Polymer Nanostructures as supporting/entrapping Matrix for Bioactive Molecules.**

**Applications: Molecular Engineering of Antibiotic Peptides and Proteins, Ecologic Biocontrol and Food Preservation, Entrapping/release of bioactive compounds and enzymes, Chemically-directed membrane fisión-fusión for inflammation, excitotoxicity and avian stress control**

**3) Self-Structuring of Thin Films Anti-adherent to Pathogenic Bacteria (*P. aeruginosa*) and Adherent to Biofilms of *P. fluorescens* Mutants for Biodegradation of Organic contaminants.**

**4) Production of Protein Variants involved in DNA repairing, Recognition and Detection of Molecular Defects in Genetic and Oncogenic Diseases.**

**Applications: Molecular Control of Bacterial Adhesion for Implant Biomaterials, Soil Bioremediation of Hydrocarbon and Organic Pollutants, Detection of DNA Polymorphism.**

**5) Ultra-Thin Films for Topographic-Biocatalytic Control in Structured Media and Nanoreactors**

**6) Self-organized Neural Molecules in Monomolecular Surfaces for Neurobiological Response**

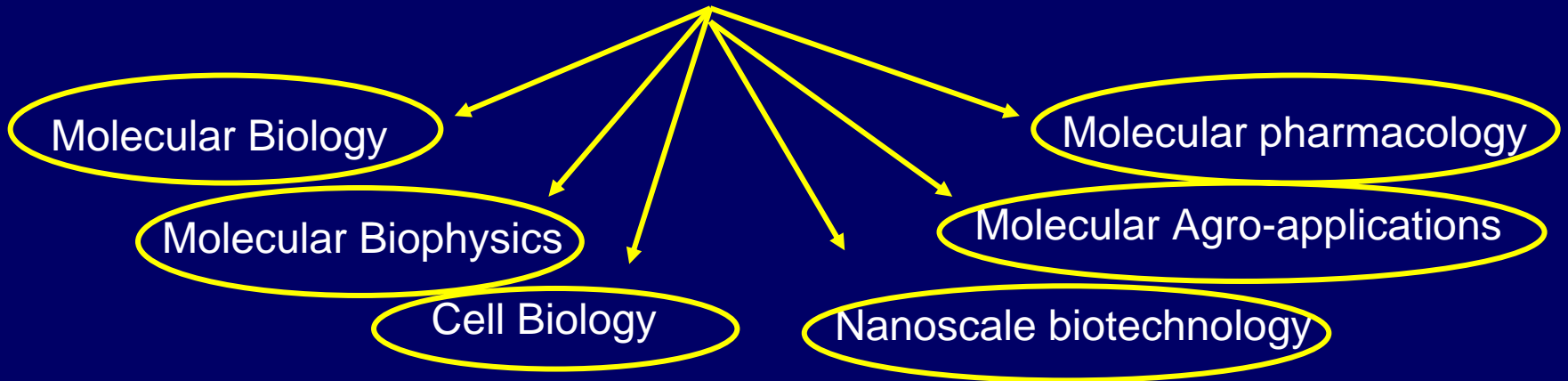
**Applications: Biocataysis with immobilized and entrapped enzymes, Control of hydrolytic reactions in pollution control, Modulated Biorecognition and Substitutive Therapies, Molecular Control of Neurotransmitter Release and Excitotoxicity in Neural Isquemia, Refunctionalization of of nerve cells and Remyelination in Neurodegenerative Diseases.**

# Research in Nano-Bio-Sciences and Nano-Bio-Technology

Developed over the last 40 years in Argentina using self-organized biomolecules and biosystems in several groups.  
Fundamentally directed to understand molecular features enabling the employment of “bottom-up” approaches under controlled conditions



Derived all national knowledge leading to applications and development in



## **Institutional and Financial support**

**Establish increasing funding for “research to understand” on controlled and well known defined molecular bases the behavior and dynamics of self-assembled nano-bio-structures**

**Greater emphasis should be devoted to stimulate development and understanding of the molecular features underlying the behavior of the nano-biosystem and not only aim at “operational” studies directed to achieve quick market earnings with nano-structures and nano-devices**

**Only in this manner adequate control and knowledge of their potential biosefety and ethical or social use can eventually be achieved**

**Committees and boards on Ethics in Nanoscience should insist on the application of regulations and methods to determine that national and international institutions and potential private enterprises effectively provide financing and adequacy of infrastructure and services (and not only establishing wishful policies or statements) to comply with biosefaty and ethical aspects of research**

**Establish economically equitable and just regulations for redistribution of potential earnings derived from Nanoscience research when concerting developments, agreements and collaborations with foreign countries and enterprises. A portion of those earnings should be distributed to general access to local research in Nanosciences**

**Demand the local complymnt to the same safety procedures and technology that is required by the foreign regulation in the original country**

## **Bases for biosafety and ethics**

**In Nano-Bio-Sciences there are long standing procedures for the manipulation and the experimentation with biomolecules, biosystems, biomedical development, agrosafety procedures, and treatment/handling of biopathogens (Laboratory & Research Codes for Biomedical Research, OMS Manual)**

**In Nano-Bio-Medicine in particular strict scaling procedures must be observed for disposal of potential hazards, experimentation, development and application.**

**A) Preclinical “in vitro” and experimentation animal studies.**

**Phase 0) Exploration, low dose, pharmacokinetics and pharmacodynamics**

**Phase 1) test in few voluntary healthy or consenting terminal disease subjects**

**Phase 2) Dose efficacy, test in small voluntary groups or consenting terminal disease subjects**

**Phase 3) Controlled tests in large multicenters. At least two successful tests required**

**Phase 4) Vigilance and surveillance after the procedure is approved**

**Extend, adapt and apply similar procedures for other branches and areas of Nanoscience research such as Agro-industry, Cosmetics, Veterinary, Implant Biomaterials-Biosensors-Nanodevices**