



## **BASIC AND NATURAL SCIENCES: CHALLENGES AND OPPORTUNITIES FOR U.S.-CUBAN COLLABORATION**

# NATIONAL PROGRAM OF BASIC AND NATURAL SCIENCES

**EXPERTS  
(56)**

**PROJECTS**  
2014-2020 (72)  
2021-2023 (35)  
2024-2026 (47)

**MANAGING  
GROUP  
(6)**

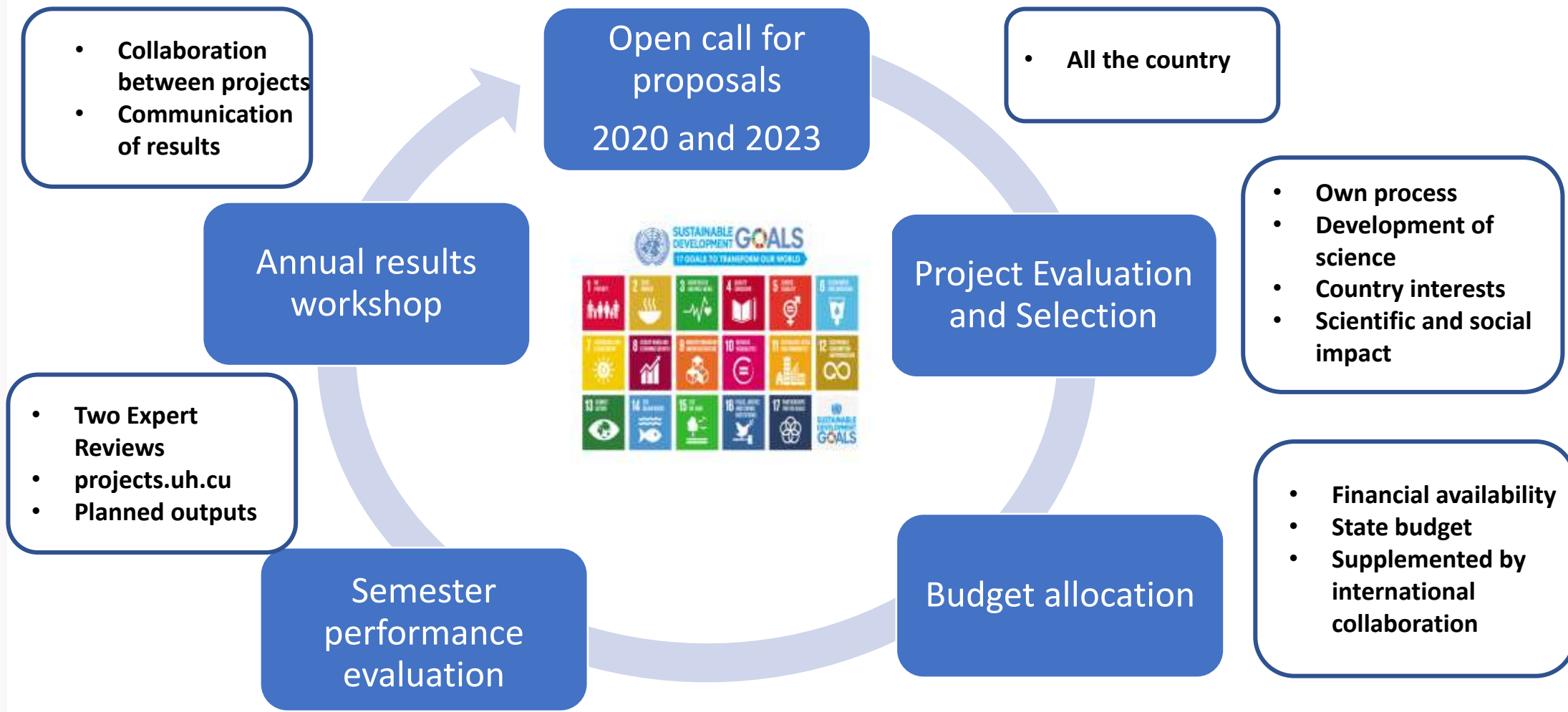
**Program Manager: Marta L. Baguer PhD  
(MATCOM-UH)**

**Executive Secretary : Banessa Falcón PhD  
(JBN-UH)**

**BASIC AND  
FUNDAMENTAL  
SCIENCE IN CUBA**

- In **universities** throughout the country (University of Havana, leading center for Basic Sciences and manager of the National Program of Basic and Natural Sciences)
- In **Research Centers** (Attached to universities or to CITMA)
- In **companies** that dedicate part of their budget to R&D.

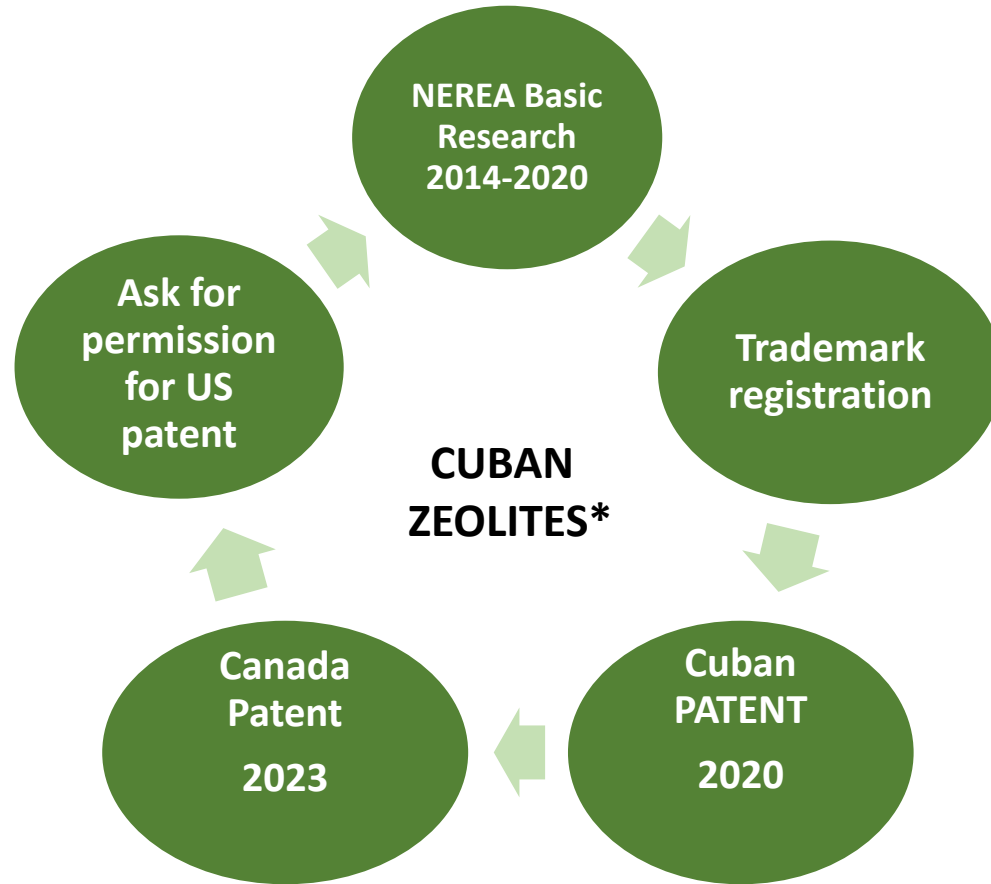
# PROGRAM OPERATION



**STRATEGIC AXES AND SECTORS OF CUBA**

# COLLABORATIVE SCIENCE. OPPORTUNITIES

## NEREA PRODUCTS



**\* Uninterrupted research with Cuban Zeolites since 1980, first formulation 1985, technology development 1988, development of zeoionic concepts, Cuba – Industrie for Zeolites, National registration in 1990, NEREA is used in another fundamental research projects of the Program**



- **PN223LH010-009**
  - Contributions to the knowledge for the agroecological management of black fruit rot in *Theobroma cacao* (**NEREA included**). **Faculty of Biology-UH**
  
- **PN223LH010-012**
  - Contribution with new knowledge on the ecology and management of species of interest for recreational fishing (EIPR) in Cuba. **Marine Research Center-UH**
  
- **PN223LH010-018**
  - “Taxonomic studies of Cuban flora and funga, an essential and permanent need” increase the knowledge of the flora and funga of Cuba, through taxonomic, systematic and biogeographic studies, for the preservation of its unique values. **National Botanical Garden-UH**
  
- **PN223LH010-022**
  - Determination of the genetic potentialities for agroproductivity of cocoa clones based on their characterization. **University of Guantánamo**
  
- **POTENTIAL APPLICATIONS**
  - **Increase cocoa productivity in Cuba.**
  - **Conservation and protection of marine species and coastal resources.**
  - **Conservation and protection of natural resources**

- **PN223LH010-002**
  - Estimation of spectroscopic and bioactivity properties of polyatomic systems. **Faculty of Chemistry-UH**
  
- **PN223LH010-008**
  - Characterization of the influence of membrane physicochemical properties on the permeabilizing activity of sticholysins (Sts) and the in vitro and in vivo biological response of tumor cells to this pore-forming activity. **Faculty of Biology-UH**
  
- **PN223LH010-0019**
  - Synthesis of metal oxide-based nanocatalysts with magnetic properties. Obtaining molecules of biomedical interest. **Faculty of Chemistry-UH**
  
- **PN223LH010-0034**
  - Efficient organic synthesis procedures are used to develop small libraries of molecular compounds, which allow the discovery and development of novel bioactive products (**three patents granted and two filed**) **Faculty of Chemistry-UH**
  
- **PN223LH010-0035**
  - Study of molecular mechanisms of regulated necrosis (necroptosis and ferroptosis) and their contribution to the pathophysiology of some diseases in humans. **Institute of Pharmacy and Food - UH**

➤ **PN223LH010-010**

- Search for new aminopeptidase N inhibitors as potential new antitumor agents. **Faculty of Biology-UH**

➤ **PN223LH010-011**

- Development of nanostructures with biospecific function, based on gold nanoparticles functionalized with organosulfur molecules. Working on the development of a drug for the treatment of cancer.

**IMRE-UH**

➤ **POTENTIAL APPLICATIONS**

- **Novel therapeutic strategies against cancer.**
- **Compounds with antitumor action.**
- **Compounds to treat neurodegenerative diseases, veterinary medicine among others).**
- **Drugs for diseases with the highest morbidity/mortality rates in the country, such as cardiovascular, cancer and neurodegenerative diseases.**



➤ **PN223LH010-003**

- Different algorithms and their theoretical analysis through multiscale modeling. Applications to meteorology, medical image processing (mammograms, diabetic foot ulcer, dermatoscopy, chest X-ray) and computational linguistics.

**Faculty of Mathematics and Computer Science-UH**

➤ **PN223LH010-033**

- Study, development and application of deterministic and stochastic epidemiological models defined by differential equations and on networks. **Faculty of Mathematics and Computer Science-UH**

➤ **POTENTIAL APPLICATIONS**

- **Medical image processing (chest X-rays, diabetic foot ulcer, dermatoscopic images of skin cancer lesions).**
- **Support for effective diagnosis and treatment of diabetic foot ulcer (avoidance of amputations) and skin cancer.**
- **Computational Linguistics (CORESPUC, study of Cuban public Spanish).**
- **Applications to infectious diseases transmitted directly or through vectors, paying special attention to the possible occurrence of multiple epidemic waves and the possible temporal recurrence of the epidemic.**



➤ **PN223LH010-004**

- Evaluation of the vulnerability of mining sites to subsidence using InSAR technology. **University of Holguin**

➤ **PN223LH010-023**

- Study and optimization of coupling mechanisms associated to the multifunctionality of ferroelectric and multiferroic materials. **Faculty of Physics-UH**

➤ **PN223LH010-027**

- Obtaining customized scaffolds from PLA for bone tissue regeneration. **University of Matanzas**

➤ **POTENTIAL APPLICATIONS**

- **Technological applications**
- **Decision-making for engineering works**
- **Applications in medicine**

## CHALLENGES

- To overcome current difficulties and create an environment for collaborative and multidisciplinary science
- To identify research areas for science development in collaboration
- To work in joint PhD programs in different research areas of basic and natural sciences impacting postgraduate development of young scientists
- To communicate joint results
- To publish jointly with Cuban scientists
- Training in different methodologies and techniques not available in Cuba
- To take advantage of the best of each party



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