

**The contributions of LATSOBIO  
to protein biotechnology:  
a short time experience generating long-term potentials.**

Laura Franco Fraguas  
Member of LATSOBIO

Cátedra de Bioquímica, DepBio, Facultad de Química, UDELAR,  
Montevideo, URUGUAY.

# Latin American Network for Solid Phase Protein Biotechnology (LATSOBIO)

**Coordinator:**

**Prof. Francisco Batista-Viera**

**Members:**



**Gabriela Irazoqui  
Laura Franco Fraguas  
Beatriz Brena  
Carmen Manta  
Cecilia Giacomini  
Karen Ovsejevi**

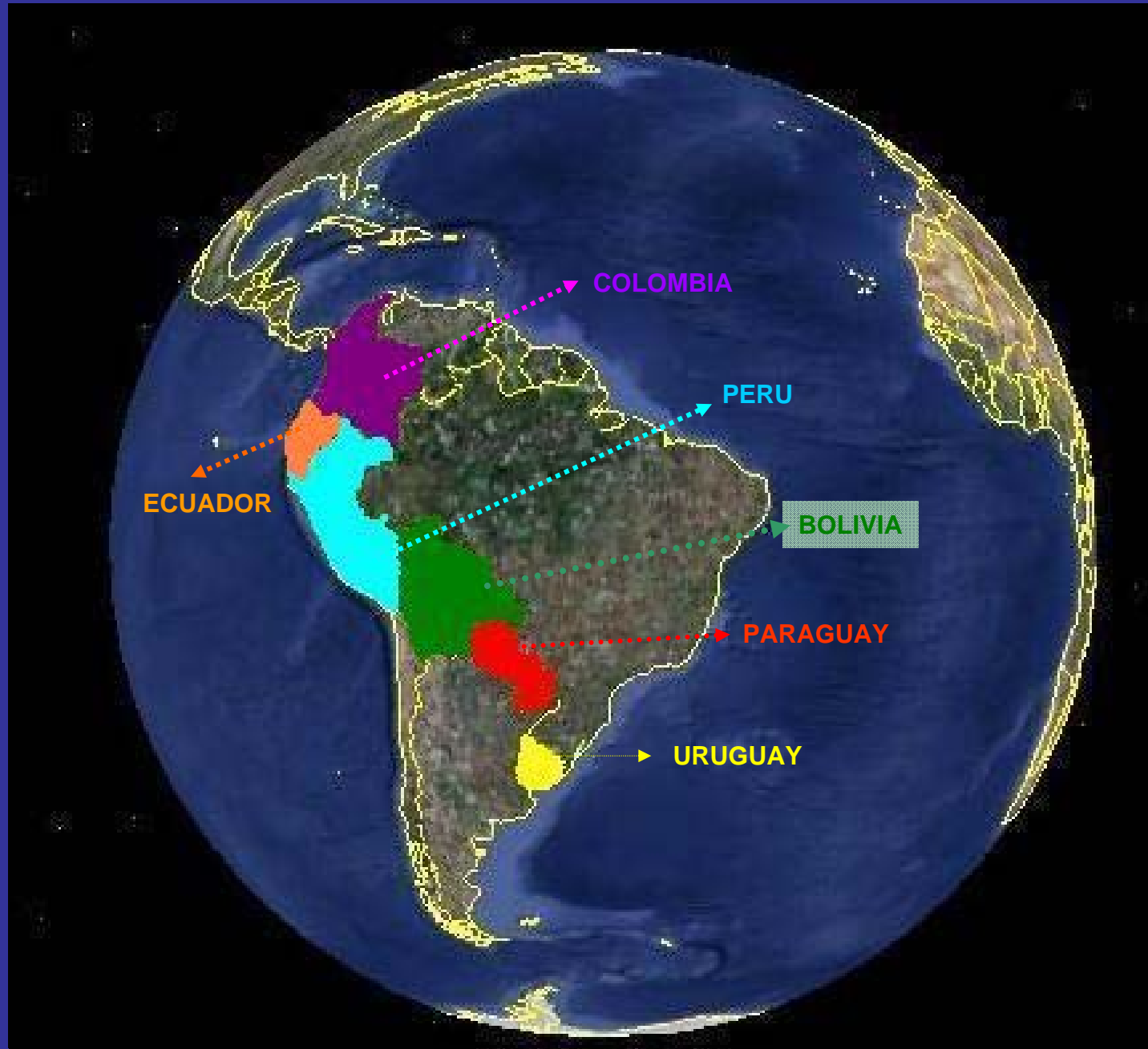
**<http://mail.fq.edu.uy/~bioquim/latsobio/>**

- ☛ The starting point of this network has been the development and consolidation of a research group in Uruguay (**Resource group**).
- ☛ The network developed its activities between **2003-2007**, under the sponsorship and financial support of the International Program in Chemical Sciences (IPICS), Uppsala University, Sweden.

### **The long-term general objectives of the network are:**

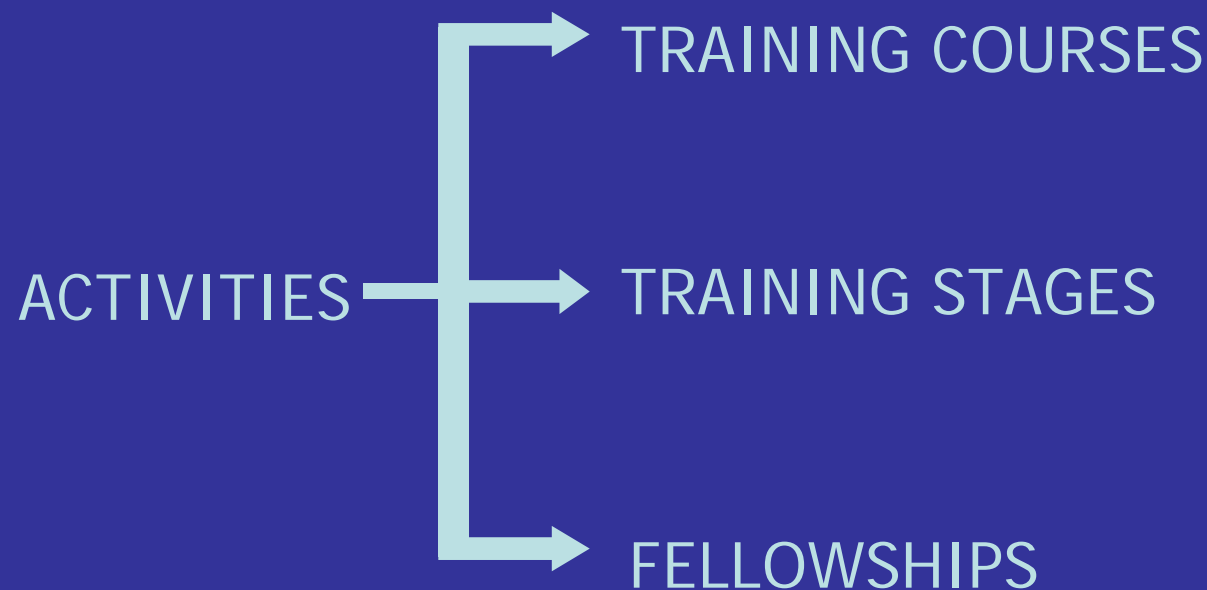
- ▶▶ to promote high level **education in the area of solid phase protein biotechnology**,
- ▶▶ to contribute to the **general scientific knowledge** in this field,
- ▶▶ to **generate tools** that can facilitate the transfer of these technologies to the industry and health centers.

The emphasis of these goals are focused on the **development and strengthening of collaborative activities in Latin America**. Target countries have been:



Two main strategies were followed to accomplish these objectives:

- i) the organization and promotion of **postgraduate courses/workshops** in countries of the region
- ii) the encouragement of South-South exchange, providing **research training stages** for scientists and postgraduate students from Latin America, thus contributing to the formation of human resources.



# Postgraduate courses

Two different postgraduate courses in the field of solid phase protein biotechnology have been organized and coordinated:

## ① Module I

*Affinity techniques for the purification of biomolecules (lectins, glycoproteins, enzymes).*

## ② Module II

*Enzyme immobilization techniques and their biotechnological applications.*

*Both courses includes high content of laboratory exercises thus supplying students with the necessary practical experience in solid phase protein technology, to be applied later for basic research as well as applied science.*

*Both courses are supported with bibliographic material prepared, organized and optimised by members of LATSOBIO:*

## ***Immobilization and Affinity Techniques: Laboratory exercises for a postgraduate course***

Laura Franco Fraguas & Jan Carlsson, May 1990.

Cátedra de Bioquímica, Facultad de Química, UDELAR, Montevideo, URUGUAY. BMC, Uppsala University, SWEDEN.

### **AFFINITY CHROMATOGRAPHY: Affinity interactions: LECTIN / CARBOHYDRATE**

***Content of the practical part of the course ( 30 hours):***

**1. Immobilization of mannose on** agarose (Sephacrose 4B)

**Result:** synthesis of the affinity adsorbent MANNOSYL-Sephacrose

**2. Purification of the lectin Concanavalin A (Con A)** by Affinity Chromatography on a column of

Mannosyl-Sephacrose. **Result:** Purified Con A

**3. Immobilization of Con A** on agarose (Sephacrose 4B)

**Result:** synthesis of the affinity adsorbent Con A-Sephacrose

**4. Adsorption / desorption of a glycoprotein (HRP)** on a column of Con A-Sephacrose

**Result:** Influence of the ligand density on the performance of an affinity adsorbent

## ***Reversible immobilization of *K. lactis* $\beta$ -galactosidase onto thiol-sulfinate-agarose and its application for the hydrolysis of lactose: Laboratory exercises for a postgraduate course.***

Karen Ovsejevi & Carmen Manta, December 1996.

Cátedra de Bioquímica, Facultad de Química, UDELAR, Montevideo, URUGUAY.

### **IMMOBILIZED ENZYMES AND THEIR BIOTECHNOLOGICAL APPLICATIONS**

***Content of the practical part of the course ( 30 hours):***

**1. ENZYME REDUCTION** Native disulfide groups of *K.lactis*  $\beta$ -galactosidase reduced with dithiothreitol

**Result:** Enzyme with thiol exposed groups.

**2. SYNTHESIS OF THIOL-SULFINATE- AGAROSE.**

**Result:** A Thiol-reactive agarose for the covalent reversible immobilization of thiols

**3. IMMOBILIZATION OF REDUCED  $\beta$ -GALACTOSIDASE ONTO THIOL-SULFINATE AGAROSE**

**Result:** An insoluble enzyme derivative with biological activity.

**4. LACTOSE HYDROLYSIS USING THE INSOLUBLE ENZYME DERIVATIVE**

**Result:** Biotechnological application of the enzyme derivative

*These postgraduate courses were organized in the following editions:*

Module I: Affinity techniques for the purification of biomolecules

**2003** 7-21 February, Dept. Food Sciences & Biotechnology, Escuela Politécnica Nacional, Quito, **ECUADOR**. Organized and financed by **LANFOOD** and **LATSOBIO**.

Participants (16): Ecuador, Colombia, Costa Rica, México, Perú.



**2004** 22-26 November, Food Engineering School, Facultad de Ingeniería, Universidad Peruana Unión (UPEU), Lima, PERU.

Organized and financed by **LATSOBIO**.  
Participants (12): Perú.

*These postgraduate courses were organized in different editions:*

Module I: Affinity techniques for the purification of biomolecules

**2006** 13-17 November, Biotechnology Center, Facultad de Ciencias y Tecnología, Universidad Mayor de San Simón (UMSM), Cochabamba, **BOLIVIA**.

Organized and financed by [LATSOBIO](#).  
Participants (13): Bolivia and Paraguay.



**2007** 12-16 November, Cátedra de Bioquímica, DepBio, Facultad de Química, Montevideo, **URUGUAY**.

Organized, sponsored and financed by [LATSOBIO, PEDECIBA, IPICS and IFS](#).

Participants (15): Uruguay, Cuba (1) and Burkina Faso (2).

Module II:

**Immobilized Enzymes: basic principles and biotechnological applications**



**2005** 21-25 November.

Place: Food Engineering School, Facultad de Ingeniería, UPEU, Lima, **PERU.**

Organized and financed by [LATSOBIO](#).

Participants (12): Perú and Bolivia.

**2007** 23-27 July.

Place: Facultad de Ciencias Químicas, Universidad Nacional de Asunción,

Asunción, **PARAGUAY**

Organized and financed by [LATSOBIO](#).

Participants (11): Paraguay and Bolivia.



# Research training stages

*All them performed at Cátedra de Bioquímica, Facultad de Química, Montevideo.*

① **MSc Patricia Millán**, Colombian. Universidad del Valle, Cali, **Colombia, 3 months, 2004.**

**Purpose:** training on immobilization of industrial enzymes and their applications for the processing of juices from tropical fruits.

② **MSc Moisés Quito**, Peruvian. Food Science School, Facultad de Ingeniería, Universidad Peruana Unión, Lima, **Perú, 1 month, 2005.**

**Purpose:** Extraction and purification of enzymes obtained from vegetal species native from Perú, for industrial applications.

③ **Ing. Daniel Sumire**, Peruvian. Food Science School, Facultad de Ingeniería, Universidad Peruana Unión, Lima, **Perú, 3 months, 2005.**

**Purpose:** Extraction and purification of enzymes obtained from vegetal species native from Perú, for industrial applications.

④ **MSc Ing. Quim. Cecilia Carpio**, Ecuadorian. Department of Food Sciences and Biotechnol., Escuela Politécnica Nacional (EPN), Quito, **Ecuador, 15 days, 2006; 15 days, 2007.**

**Jointly supported by LANFOOD and LATSOBIO.**

**Purpose:** revision and discussion of manuscripts emerging from PhD thesis work.

⑤ **Mabel Condori**, Bolivian. Biotechnology Center, Facultad de Ciencias y Tecnología, Universidad Mayor de San Simón, Cochabamba, **Bolivia, 3 months, 2007.**

**Purpose.** Training in biochemistry techniques with the aim of purifying amylases and cellulases from microorganisms isolated from Bolivian altiplano.

## LATSOBIO has also provided fellowships to

*scientists from countries in the region, to attend these postgraduate courses. The priority was given to postgraduate (MSc and PhD) students but also young graduated researchers were included, aiming to provide them with tools useful for their respective research projects.*

**Ing. Quim. Henry Antezana, and**

**Ing. Quim. Daniel Guzmán**, Biotechnology Center, Facultad de Ciencias y Tecnología, UMSS, Cochabamba, **Bolivia**.

*To attend regional postgraduate course held at Universidad Peruana Unión, Lima, **Perú** (2005).*

**Bioquím. Carlos Zárate,**

**Bioquím. Nelson Portillo, and**

**Bioquím. Nelson Marquez**, Facultad de Ciencias Químicas, Universidad Nacional de Asunción, **Paraguay**.

*To attend regional postgraduate course held at Biotechnology Center, Facultad de Ciencias y Tecnología, Universidad Mayor de San Simón, Cochabamba, **Bolivia** (2006).*

**Raquel Mencía Torrico**, Biotechnology Center, Facultad de Ciencias y Tecnología, UMSS, Cochabamba, **Bolivia**.

*To attend regional postgraduate course held at Facultad de Ciencias Químicas, Universidad Nacional de Asunción (UNA), **Paraguay** (2007).*

*How can regional and interregional cooperation best strengthen Basic Sciences In developing countries?*


During the course held in Montevideo (November, 2007) a **novel collaborative experience** allowed to fund the participation of **Cuba** (one PhD student) sponsored by International Foundation for Science (**IFS**) and **Burkina Faso** (two researchers) sponsored by **IPICS** through a support to African scientists in the biotechnology area.

A PhD thesis is performed **under the support of two Networks, LATSOBIO and LANFOOD:**

Cecilia Carpio is almost finishing the PhD studies co-supervised by Dr. Jenny Ruales (LANFOOD, Ecuador) and Prof. Francisco Batista (LATSOBIO, Uruguay).

*... by joining efforts between different partners:*

***network members (as LATSOBIO members):**  
organization and coordination of the postgraduate  
courses.*



*How can  
cooperation be  
enhanced?*

***national programs** involved in the development of basic sciences  
(as PEDECIBA): promoting the participation of students of the  
program, in these courses.*

***international financial agencies (....):** financial support for both,  
-students involved in their research programs,  
to attend these courses and  
-the laboraty involved in the organization of the  
course, contributing to finance the cost of the activity ... ..*

*The posgraduate course **Affinity techniques for the purification of biomolecules**,  
performed in 2007 (12-16 November, Cátedra de Bioquímica, DepBio, Facultad de  
Química, Montevideo, URUGUAY), was organized, sponsored and financed by  
LATSOBIO, PEDECIBA, IPICS and IFS.*

*Participants (15): Uruguay, Cuba (1) and Burkina Faso (2).*

During the very short period of existence of LATSOBIO, the outcome from all the network activities pointed out **a high demand for training of young scientists from biological sciences**, in enzyme immobilization / stabilization strategies and in protein purification techniques

*What has been the impact of these courses?*

These demands came from both, countries of the region and from Uruguay:

At the Biotechnology Center, UMSS, Cochabamba, **Bolivia**, these courses have been considered as essential requirement of the programs for postgraduate degrees in Biotechnology (*under progress*).

At the Faculty of Chemical Sciences, UNA, Asunción, **Paraguay**, the authorities have claimed for these courses, as a way to promote the development of postgraduate education in the biotechnology area.

In **Uruguay**, these courses are being considered a **requirement for postgraduate degrees** in Chemistry, Biochemistry and Pharmaceutical Chemistry at Facultad de Química, and for the case of the **Pasteur Institute of Montevideo**, for the young researchers of different labs.

One milestone of the success of LATSOBIO as regional program has been

The previous long term support of IPICS to the group leadered by Prof. Francisco Batista, which allowed:

\* the consolidation of a PhD program in this area, through the theses of:

- **Beatriz Brena** (PhD in Molecular Biotechnology, UU, Sweden, 1996);
- **Laura Franco Fraguas and Carmen Manta** (PhD in Chemistry, under sandwich program, 1998);
- **Karen Ovsejevi** (1998), **Gabriela Irazoqui and Cecilia Giacomini** (2005), PhD in Chemistry, under local basis,

which allowed the formation of a solid research staff, participating in the activities of the network.

\* To develop the infrastructure of the research laboratory which allowed us to establish a regional training center

\* To attract young human resources, thus allowing the growth of the research group.

## Objectives proposed and achieved

The supported group

The financial agency

Consolidation of the staff  
Infrastructure of the Lab  
Growth of the group

✓ achieved

✓ achieved

The key point to hold and to strength these achieved goals is to attain *the commitment of the country that receives external financial support, to consolidate it and if possible, to strength it.*

*What is the role of the governments and intergovernmental organizations in promoting research cooperation in Basic Sciences?*

In Uruguay, the governmental policies has promoted the development of Basic Sciences through the support of a national program, the **Program for Development of Basic Sciences, PEDECIBA**, first financed by PNUD-UNESCO (1986) and now, by the Government of Uruguay.



<http://www.pedeciba.edu.uy>

This program has been **internationally recognized** for the original self-management with high participation of the researchers in the execution of the program.

**All actual members of LATSOBIO are active researchers of PEDECIBA.**

*What is the role of the governments and intergovernmental organizations in promoting research cooperation in Basic Sciences?*

In the last 5 years the Government has substantially increased the budgeted in education and in particular, in **Science and Technology**, rising from **2.5 to 4.5** of GDP.

The policy of the *Universidad de la República Oriental del Uruguay* (UDELAR, the Public University) in the last 10 years, has been to promote full-time and exclusive dedication of the university staff.

***All the staff of LATSOBIO have permanent positions at the Biochemistry Department, Facultad de Química, most of them in full-time regime.***

All members of LATSOBIO have been awarded by the **ANII** (*National Agency for Research and Innovation*), in the status of *active researchers of the National Researchers System*. This is the National Organization that joins all the uruguayan scientific community, recently created and financed by the Government of Uruguay.

**Members of LATSOBIO are all participating in different collaborative programs with Universities from South and North America, and Europe expanding to new research areas and applications.**

Member of LATSOBIO: Prof. Francisco Batista-Viera  
Research field: Enzyme immobilization and stabilization, and their biotechnological applications.  
Ongoing project: ***Valorization of lactose from cheese whey by enzymatic transformations***  
International cooperation: INTEC, Santa Fe, Argentina; IFI, Madrid, Spain (sponsored by CYTED)

Member of LATSOBIO: Beatriz Brena  
Research field: Bioanalytical methods for evaluation of environmental contamination  
Ongoing project: ***Training and research program in environmental immunoassays***  
International cooperation: Fogarty Center, University of California (Davis), NIH, USA

Member of LATSOBIO: Laura Franco Fraguas  
Research field: Biotechnological applications of Lectin-carbohydrate interactions.  
Ongoing project: ***Lectins: relevant proteins in the design of affinity adsorbent for biotechnological industries.***  
International cooperation: Uppsala University, Uppsala, Sweden

Member of LATSOBIO: Karen Ovsejevi and Carmen Manta

Research field: Biotechnological applications of cyclodextrins in the control of enzymatic activity.

Ongoing project: ***Modified cyclodextrins as inhibitor agents for apple and tomato polyphenol oxidase: an alternative for fresh apple and tomato preservation***

International cooperation: Laboratorio de Biofisica, Universidad de Sao Paulo, San Carlos, Brazil.

Member of LATSOBIO: Cecilia Giacomini

Research field: Enzymatic synthesis of galactosides with potential biological activity

Ongoing project: ***Lactose biotransformation for the generation of low molecular weigh galactosides: potential galectin inhibitors.***

International cooperation: Instituto de Fermentaciones industriales, CSIC, Spain.

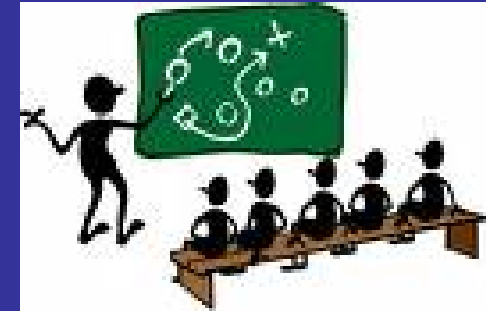
Member of LATSOBIO: Gabriela Irazoqui

Research field: Covalent enzyme immobilization for biotechnological purposes

Ongoing project: ***Preparation of an immobilized derivative of Tobacco-etch-virus Nla protease for cleavage of the His-tag of recombinant proteins.***

International cooperation: Centro de Biología Molecular, Universidad Federal de Sta. Catarina, UFSC, Florianópolis, Brazil.

The courses organized by LATSOBIO are ready to be developed in Uruguay or in other laboratories.



The network staff is ready to continue and expand these activities, once the network gets financial support, since all of them have permanent positions at the Dept. of Biochemistry, Faculty of Chemistry.



**To keep LATSOBIO as an active regional program is mostly a matter of financial agencies, interested into contribute to the field of basic sciences.**



