CHAPTER 10

Professional migration from Latin America and the Caribbean

From NGO to multilateral organisation and government involvement: three case studies

Fernando Lema

Executive summary

In this chapter we present three case studies of the Latin American diaspora: one on the experience of non-profit organisations (NGO) in France (AFUDEST and ALAS), one on work in an international organisation (UNESCO) and one about field work with a government agency, Argentina's Secretariat for Science, Technology and Productive Innovation (SETCIP). The three experiences took place in succession, each one being the result of analysis and assessment of the preceding one.

AFUDEST (Association franco-uruguayenne pour le développement scientifique et technologique) was an interregional co-operation network of researchers in France and Uruguay, working on scientific projects developed in Uruguay between 1985 and 1994.

ALAS (Association Latinoamericaine de Scientifiques), formed in 1987, was an association of Latin American scientists living in France. Its mainly acted as a think-tank on science policy and new forms of scientific and technical cooperation with Latin American countries.

On the basis of the AFUDEST/ALAS experience and in the light of the strategic importance that these organisations attributed to building a regional knowledge society for Latin America and the Caribbean countries, UNESCO launched a project for a database of Latin American and Caribbean scientists living in developed countries (DATALAC) and a programme for an Inter-Regional Network of Latin American and Caribbean Scientists (IRNLAC). This work was carried out at UNESCO between 1992 and 2000 with support from various international organisations and hinged on the database of Latin American and Caribbean scientists. From this database it became possible to create the ECOMED network and institute training courses at Latin American universities, science exhibitions in the region, and round tables, workshops and other activities about skilled migration at Unesco headquarters in Paris.

Under the IRNLAC programme and with the backing of the Inter-American Development Bank (IDB), on 11 and 12 October 1999, UNESCO held an international workshop on “Valorisation of migrant social capital from Latin America and the Caribbean: new strategies for international co-operation”. This workshop facilitated the exchange of ideas and information among migration specialists, people organising links with Latin American countries, international civil servants and Science and Technology executive managers from various countries. It also made a contribution to analysis of methodologies and actions intended to help solve problems caused by migration of highly qualified professionals from the Latin American countries.

Following the Unesco workshop's recommendations, Buenos Aires University, Buenos Aires city government and IRNLAC signed an agreement to set up the "Red Cre@r" programme (Buenos Aires 1999). Red Cre@r benefited from experience acquired at UNESCO, and provided a way to establish links between the community of skilled Argentinian migrants abroad and the programmes of the University of Buenos Aires and the city government. In 2000, the Cre@r programme and its team were housed at the head offices of the Argentine government's Secretariat for Science Technology and Productive Innovation (SETCIP).

In resolution N° 075 of 29 May 2000, the Argentine government set up the RAICES programme (Red de Argentinos Investigadores y Científicos en el Exterior) which established links between the Argentinian public and private institutions in need of science and technology and the community of the skilled Argentinian expatriates.

On 20 and 21 November 2001, the Secretariat of Science, Technology and Productive Innovation (SETCIP) of Argentina held a meeting in Buenos Aires with representatives from Argentina, Bolivia, Brazil, Chile, Paraguay and Uruguay, to extend the activities of the RAICES programme to all the Mercosur countries. This meeting, "Towards the construction of public policies with regard to professional migration", brought together managers of university courses abroad, science and technology organisations, and specialists on highly qualified migration. The meeting agreed on some major steps to consolidate the Mercosur science and technology system. These measures have not yet been implemented, owing to Argentina's current social, economic and political difficulties.

Recommendations

The following recommendations are drawn from the analysis of the three case studies and other experiences not mentioned here (Red Caldas, TALVEN, programmes to bring scientists back to Argentina, Uruguay government and Universidad de la Republica programmes, FUNDACYT in Ecuador).

Because they generally depend on voluntary work and thus on participants' availability and willingness, NGO initiatives quickly reach their operational limits. The networks established, the academic aspect of the activities and the use of available financial resources have an immediate impact, but, for lack of continuity, they rarely last long.

An attempt to transpose NGO activities to an international organisation (UNESCO) has maintained the dynamism and flexibility of a non-profit organisation's activity and is able to adapt in a modular manner to UNESCO's projects and programmes. It also has the benefit of international dissemination and the experience and knowledge of regional problems from UNESCO.

However, these activities have to be constantly negotiated in the diplomatic and institutional sphere, which means that the cost-benefit ratio is poor compared to the results expected of the programme and the small amount of funding it receives.

Furthermore, activities conducted under the UNESCO umbrella have to be universal in their proposals, whereas NGOs on their own do not have the human or financial resources to achieve such a global reach. The experience could be very useful, however, if it were conducted in the framework of a combined voluntary/institutional structure with which it would be possible to direct activities with the political, logistic and financial support of the countries involved (identifying the usefulness of co-operation with emigrant skilled nationals; local dissemination of activities; financing local branches) and multilateral organisations (organising programmes, structuring activities, dissemination, co-operation with other United Nations bodies, evaluation of completed activities). Additional bilateral and multilateral activities would provide a way of sharing "organisational" experience, network and educational experience, databases of experts, and of setting up North-South-South, North-South and South-South bilateral and multilateral co-operation programmes.

In Argentina, the use of small, modular units in the Buenos Aires city government or the Argentine research ministry to organise national programmes based on the experience of voluntary bodies and multilateral organisations has been a success. After a year of this work, these units – CRE@R and then RAICES – have developed a database of 1600 Argentine professionals abroad, identified local training and expertise needs, organised training activities and managed to get widespread media coverage for these initiatives.

However, this experience has been disrupted by the Argentine economic crisis; this suggests it would be better to direct these activities from a sub-regional and international framework (i.e. MERCOSUR), through inter-government agreements under which activity programmes can be set up.

Governmental, non-governmental and international organisations could effectively facilitate interaction between communities of professional emigrants and academics, scientists and industrialists in developing countries. Below we make some recommendations for carrying out these activities.

Bilateral initiatives

The pivot of scientific and technical co-operation between communities of professional emigrants and their home countries must be in the bilateral sphere (countries or sub regions), so that bi-national co-operation actions and the diasporas' solidarity work will be more effective, visible and relevant.

It would be useful to develop a programme to make use of migrant social capital, defining objectives, instruments and forms of co-operation with developing countries based on the following two components:

Operational units (OUs) in the developed countries: small, flexible, modular, functional structures supported by government and migrants' associations. Their functions would be to

- identify social capital available for co-operation actions (database of cooperating persons, fields of specialisation, availability);
- co-ordinate co-operation activities requested by developing countries;
- identify potential sources of funding for these activities;
- stimulate bilateral or multilateral co-operation activities;
- evaluate existing programmes and activities.

Operational branches (OBs) in the developing countries, supported by the government of the country in question. These would

- organise databases of professional migrants from the developing country;
- identify national requirements for public or private scientific, academic, technical and industrial co-operation;
- transmit requests to OUs in developed countries;
- implement action programmes.

To ensure that the programme runs smoothly, these activities could usefully be conducted in the framework of the regional associations of universities (AUGM, UDUAL, CSUCA, UNAMAZ), science and technology support foundations or other non-governmental bodies concerned with regional activities. These activities could also facilitate linkages with programmes or co-operation actions under triangular Europe/Latin-America/Africa arrangements.

Multilateral activities

Bilateral co-operation could complement and synergise with the multilateral activities of the United Nations agencies.

This programme should take into consideration the past or ongoing experience of the various agencies in the UN system and of governmental, academic or non-governmental organisations.

The objectives should be to

- identify and cooperate with national or regional development programmes that could benefit from emigrant professional skills;
- consolidate *theme-based international co-operation networks (biology, physics, chemistry, molecular biology, biotechnology, mathematics, etc)* that would help to identify and solve developing countries' problems;
- support the creation of *regional multidisciplinary teams* to treat and solve problems connected with the development of the knowledge society, through regional and international scientific and technical integration;
- facilitate the creation of *top level regional training centres* with the support of prestigious international institutions, with a view to conducting specialist training activities and research and transferring knowledge and technology to developing countries;
- contribute to the study of a national innovation system for developing countries and mechanisms facilitating regional integration of this type of system.

These multilateral activities should be conducted in synergy and complementarity with bilateral activities, and could benefit from the support of multilateral financial organisations.

Scientific migration in Latin America and Caribbean countries: Towards Knowledge balance

As the differences between the richest and the poorest countries have increased with the development of the economic globalisation, the gap observed in the field of the knowledge, measured by the number of scientists of each country, are even greater. The deep deficit of knowledge that affects the nations of the developing countries is due to several reasons, some of historical origin, others related to the lack of internal definitions of the development model and the political and economic consequences of that epistemological absence. However, there are also reasons associated with the loss of human resources produced by professional migration from the countries of the region, the asymmetry of possibilities for women to access and participate in the decision making processes and the consequences of new policies of protection of intellectual property.

The effects of knowledge inequality are greater than economic inequality

Nowadays, knowledge generation is a tool for the consolidation of any national strategy, worldwide, since it is no longer possible to conceive the development of any country without access scientific knowledge.

The fact that knowledge constitutes such a key value in any national strategy is a recent paradigm in the world scene. It is worth stressing that what started as a promise, full of hope for developed and developing countries, has changed into a very complex issue, and has been the cause of disruption, violence, and loss of equilibrium in environmental and human relations.

The gap between the richest and the poorest countries has increased with economic growth and globalisation. The differences observed in the field of knowledge, as measured by the number of scientists in each country, are even greater. In 1960 the income gap between the poorest 1/5 of the world's citizens and the same proportion of the richest was of 1/30. That difference was of 1/60 in 1990 and 1/86 in 1999, according to the UNDP Annual Report (Fig. 1 and 2).

Income distribution

GDP ratio 20% poorest /20% richest

1960	1/30
1990	1/60
1997	1/74
1999	1/86

Figure 1 (Source: UNDP, Human Development Report 2000)

Income distribution in selected Latin American countries

Countries	Poorest 20%	Richest 20%	Gini coefficient*
Uruguay	5.0	48.7	0,43
Costa Rica	4.3	50.6	0,46
Peru	4.4	51.3	0,46
Ecuador	2.3	59.6	0,57
Brazil	2.5	63.4	0,59
Paraguay	2.3	62.3	0,59

*Figure 2 (Source: IADB, 1998) (*Gini coefficient of zero represents perfect equality, a coefficient of one perfect inequality).*

On the other hand, the ratio in the number of scientists between the most and less advanced countries is 1 to 1000 (Fig. 3).

Scientists per million inhabitants in selected countries

Country	Year	Scientists	S&T expenditure as % GNP
Africa			
Burkina Faso	1997	17	0,19
Madagascar	1987	20	0,17
	1994	12	0,18
Senegal	1993	3	0,02
	1996	3	0,06
South Africa	1983	270	0,88
	1993	1031	0,70
Latin America and Caribbean			
Argentina	1982	363	
	1997	912	0,45
Brazil	1983	299	
	1997	412	1,24
Chile	1980	358	
	1997	466	0,64
Costa Rica	1988	532	0,18
	1996	545	1,13
Cuba	1983	830	0,59
	1997	682	1,17
Jamaica	1983	12	0,04
	1996	8	0,04
Mexico	1984	226	0,58
	1995	290	0,35
Uruguay	1987	687	0,18
	1997	307	0,42
North America			
Canada	1983	1819	1,37
	1995	2776	1,60
USA	1983	3047	2,58
	1993	3729	2,37

Figure 3 (Sources: Unesco Statistical Yearbook, 1999, RICYT, 1999, Main Science and Technology Indicators, OECD, 1996).

In a global economy, where the final cost of goods is calculated on the basis of their technological value, the access to technology is crucial. It is for this reason that for any country to be competitive, it needs to generate and use knowledge in a way that can be transformed into technological value. However, as it has been shown, wealth is concentrated in very few countries, people and companies. The countries of the OECD, with hardly 19% of the worldwide population, receive 58% of worldwide foreign investments and produce 71% of all interchanges of goods and services. The breach is even more pronounced in products technologically advanced areas such as Internet, for which the gap that separates the different levels from development is more significant: 91% of all Internet users reside in OECD countries (Fig. 4).

Internet users in the World

	Regional population (As a percentage of world population)	Internet users (As a percentage of regional population)
United States	4.7	26.30
OECD	14.1	6.90
Latin America and the Caribbean	6.8	0.80
South-East Asia and the Pacific	8.6	0.50
East Asia	22.2	0.40
Eastern Europe and the CIS	5.8	0.40
Arab States	4.5	0.20
Sub-Saharan Africa	9.7	0.10
South Asia	23.5	0.04
World	100	2.40

Figure 4 (Source: UNDP, Human Development Report 1999, based on data supplied by Nua 1999, Network Wizards 1998 and IDC 1999).

The causes for the knowledge gap among countries around the world are multiple, and are based on historical, social, and policy-related issues. Among those considered here, social issues -the loss of human ressources – produced by the migration of scientists from developing to developed countries at a steady pace, and the inequality in gender relations –making access to a scientific career far more difficult for women than for men – are very serious. Adding to this picture is the fact that the new policies protecting intellectual property do not favour the growth of the National Innovation System (NIS) of developing countries.

Other obstacles for developing countries are associated with the difficulties to create dynamics and sinergy with the components of the NIS; the limited private and public resources put towards developing innovative scientific exchange; and the limited efforts towards reinforcing a regional network of scientific resources. It can be concluded that the system for knowledge generation in developing countries is extremely fragile.

As indicated by a recent OECD report, 90% of the 150 million people who develop scientific and technological activities in the world are concentrated in the seven industrialized countries, whereas little more than four million (3%) are directly working in developing countries (Fig. 5).

Scientists in the world

	Total Scientists	**Scientists/ 1000 inhabitants**	**Scientists/ total world**
European Union (1991)	611,400	1.90	15.10
USA (1993)	962,700	3.80	23.00
Canada (1995)	82,240	2.40	20.00
Japan (1996)	617,365	4.70	14.60
China (1996)	559,000	0.50	13.00
Africa (1991)	73,100	0.15	0.18
Middle East (1991)	19,000	0.10	0.50
Latin America and the Caribbean (1997)	145,963	0.31	3.50
World (1996)	**4,200 000**	**0.60**	

Figure 5 (Sources: Unesco Statistical Yearbook, 1999, Halary Ch., Les Exilés du savoir*, 1994, RICYT, 1999. Main Science and Technology Indicators, OCDE, 1997).*

There are 146,000 scientists, less than the world average, in all countries of Latin America and the Caribbean Region, which represent only 3.5% of the total number of research workers in the world. The total number of scientists in Latin America and the Caribbean is 3 times lower than in Japan; 6 times lower than in U.S. and 1/4 of the research personnel in Europe or China. Only U.S. and Canada have 25% of the researchers of the world. However, the National Gross Product of the Latin American countries represents 6% of world economy.

Migration of scientists: the Achilles heel of the system

It has been shown in several studies that the migration of qualified research personnel has a big impact in the loss of knowledge for developing countries. For example, as shown by a study of the United Nations Latin American Centre of Demography (CELADE), 700,000 professionals and highly qualified people emigrated from Latin America and the Caribbean countries to the U.S., Canada and the United Kingdom, between 1961 and 1983. If this migratory trend continued at the same cadence in subsequent years, it can be estimated that nearly 1,000,000 people, with tertiary education, emigrated from the region in the last 40 years. Considering that the minimal cost for the education of a qualified professional in the region is about 25,000 dollars, the migrations of professionals during the last 40 years has cost more than 25 billion dollars to Latin America and Caribbean countries. Since the region invested a total of 15 billion dollars in scientific activities in 1999, this loss represents 1.6 years of regional investment, and 9 times more than the total amount of direct aid contributed by the Inter-American Development Bank to science and technology since its foundation in 1961.

Migration of professional from Latin America and Caribbean Countries as percent of total professional population

Countries of origin	Residents in Latin America and Caribbean	Residents in United States	Total
Trinidad Tobago (1980)		27.2	27.2
Jamaica (1975)		25.7	25.7
Paraguay (1982)	13.2	1.0	14.2
R. Dominicana (1982)	2.1	9.9	12.0
Panama (1980)	1.3	10.3	11.6
Uruguay (1975-1985)	8.1	1.0	9.1
Bolivia (1976)	6.3	2.1	8.4
Cuba (1980)	0.2	5.4	5.6
Chile (1982)	3.9	1.6	5.4
Honduras (1974-1988)	0.7	2.3	3.0
Ecuador (1982)	0.8	1.9	2.7
Peru (1981)	1.5	1.2	2.7
Costa Rica (1984)	0.7	2.2	2.9
Mexico (1980)	0.1	2.2	2.3
Argentina (1980)	0.9	0.8	1.7
Venezuela (1981)	0.1	0.5	0.6
Brazil (1980)	0.1	0.1	0.2

Figure 6 (Source: Pellegrino, A., Centro Latinoamericano de DemografÌa, 1993).

Human resources is a key factor in the system of knowledge generation, thus, it is the Achilles heel of the whole system. The acute deficit of qualified personnel in developed nations exhibit gives rise to policies favouring the incorporation of professionals from peripheral countries, expressed in ways by which "foreign researchers" have access to professional development, to higher salaries – compared to their salaries of origin – and to favourable immigration conditions.

In the U.S., the total investment in scientific research has stabilized or even diminished, while the number of researchers has increased. U.S. has more than 3700 full time researchers per million inhabitants, whereas in Latin America the number of research workers does not reach a quarter of this number. In terms of the economically active population, research workers in U.S. represent 7.37 per thousand and those in Argentina, ie, the 2,6 per thousand. However, the differences of scientific development between US and the countries of Latin America and the Caribbean (LAC) are revealed not only by the percentage of scientific researchers but also by the total number. Whereas there are less than 150,000 researchers in all the countries of LAC, in U.S. they count up to nearly one million. More than 212,000 persons residing in US and born in the LAC countries have obtained an advanced diploma. For 54,000 of these highly trained people, R&D is a major work activity. These figures emphasize the necessity to harmonize policies of science and technology of the LAC region in order to integrate scientists in collaborative programs and to stress regional priorities.

Number of tertiary level immigrants from Latin America to USA 1990 US Census

	Total	Migration rates
Argentina	35200	1.9
Bolivia	11312	4.2
Brazil	29264	0.6
Chile	19972	3.3
Colombia	63799	5.6
Costa Rica	12784	7.0
Dominican Rep.	42451	14.2
Ecuador	31596	3.8
El Salvador	44465	26.1
Guatemala	25686	13.5
Guyana	25236	77.3
Honduras	15066	15.7
Jamaica	66633	67.3
Mexico	347218	10.3
Nicaragua	23148	18.7
Panama	39463	19.5
Paraguay	2233	1.9
Peru	43583	3.0
Trinidad y Tobago	30330	57.2
Uruguay	6396	3.7
Venezuela	16314	1.6
Total	**932149**	

Figure 7 (Source: data from the 1990 US Census, the United Nations Population Yearbook and the International Monetary Fund paper How Big is the Brain Drain?, W. Carrington. and E. Detragiache. Migrants are defined as foreign-born residents over 25 years of age minus graduate students. Tertiary migrants are defined to years of schooling above 12).

Other factors increase the effects of the migration of scientists to developed countries. The first is related to national and regional educational policies for the education of professionals in developed countries. Researchers from developing countries often participate in their education abroad without a clear definition of their country of origin as to what areas of knowledge, and what special topics within their area of knowledge, are most appropiate. Thus, it becomes evident that developing countries do not have a clear policy as to the education of their human resources. Furthermore, for foreign educated researchers , his or her training becomes a sort of "thematic exile", since the knowledge thus acquired will not be put to use effectively in his or her country of origin.

The second factor is related to the unequal participation of women and men in activities for the generation of scientific knowledge. Women are unequally represented in science and their career progress is not comparable to those of their male colleagues. Much of the groundswell behind the current debate on the reduced number of women in science was based on a 1997 Swedish study. This paper described a gender bias in the way by which research awards were obtained, showing that women had to be about 2.2 times more productive than their male counterparts to be as successful in securing financial support. Studies conducted later in the United Kingdom, Denmark, Finland and the USA, showed similar results.

In developing countries, the figures for students who go to college show a constant increase. In Latin America, women attending college are a larger percentage than males; in several cases, they are the dominant student population of some regional universities. However, these figures are not evenly distributed by area of knowledge, since for Science and Technology, males clearly dominate the scene (Fig. 8).

Women and men in Scientific and Academic Activities

Country	Sex	% in S&T activities	% of Current Students
Argentina	F	40 (1995)	46 (1985)
	M	60	54
Brazil	F	38.6 (1995)	52 (1994)
	M	61.3	48
Ecuador	F	25 (1995)	37 (1981)
	M	75	63
Panama	F	24.1 (1995)	58 (1995)
	M	75.8	42
Spain	F	27.5 (1993)	53 (1995)
	M	72.5	47
USA	F	22.4 (1995)	55 (1995)
	M	77.6	45

Figure 8 (Sources: Unesco Statistical Yearbook, 1999, RICYT, 1999).

These studies shows the gender gap in accessing knowledge. But even in the cases in which a relatively equivalent distribution among men and women is observed, the most significant differences are revealed when analysing age. Equivalent percentages of women and men can be found at the beginning of their careers; this equivalence is soon lost, and by their seniority, the percentage of men greatly surpasses the percentage of women. An greater difference is observed when the data are analysed according to scientific area, responsibility, and gender. Traditionally, this loss has been explained by sociological and psychological events associated with gender "duties" and the "social distribution of responsibilities" by gender. However, more recently another explanation has been shown, that science and the scientific career is "gender biased" in itself, and that the system for scientific generation of knowledge is male-oriented, is indifferent to the needs of women, and is not prepared for women to fully participate. Given this hypothesis, more studies are needed to determine whether these are really the causes, and if so, how they can be corrected in order for women be more fully represented, specially in the areas of science and technology.

Scientific production and the defense of intellectual property

The production of scientific papers has greatly expanded in the last 30 years throughout the world. By 1963 the number of scientific and technical periodical titles was around 35,000, whereas currently the Ulrich's International Database contains more than 145,000 active titles.

Scientific publications are largely dominated by the United States (36%) and the European Union (30%) who totalized 66% of the articles stocked in the databases of scientific information. Japan publishes 8.2% of world's scientific papers, as Australia, New Zealand, the new industrialized countries of Asia, ASEAN and the rest of the Asian countries together.

The Latin America and the Caribbean Region represent only 3%-4% of the world's total publications. The average number of papers from Latin America and the Caribbean carried out on the study of 10 databases gives a figure of 2.62% of regional publications on the total world. The country of the region with more number of publications is Brazil, followed by Argentina , Mexico, Chile and Venezuela.

Distribution of Scientific Publications

Countries	1983 % of the World	1988 % of the World	1993 % of the World
USA	36.6	35.4	35.8
European Union	26.8	27.5	29.6
Japan	6.9	7.6	8.2
Canada	4.2	4.4	4.5
CEI (ex URSS)	8.3	7.3	2.7
NPI	0.3	0.8	1.7
Israel	1.1	1.1	1.1
South America	0.5	0.6	0.5
Rest of the World	1.4	1.5	1.4
Latin America*	1.1	1.2	1.4

*Figure 9 (source: Observatoire des sciences et des techniques, Paris, 1996 – *Taking into account: Argentina, Brasil, Chile, Mexico y Venezuela).*

The small number of specialized newspapers edited in languages of the developing countries, the constraint of writing and reading in a foreign language, the hierarchization established by the english-speaking newspapers, whose approaches are used to evaluate international scientific activity, are some of the cultural orientations that limit the communication and the evaluation of regional scientific results. The high cost of subscriptions to specialized magazines is also an important obstacle to the dissemination of scientific and technological information.

The emergence of electronic newspapers, specialized telematic networks, electronic forums, and the growing mass of published scientific articles, whose innovative contribution sometimes is not clear, lead to a new perspective on the dissemination of scientific information in which the countries of the region should not be absent. However, access of certain newspapers by telematic nets, don't solve the economic problem linked to the high cost of electronic subscriptions.

The production of knowledge implies a series of activities that are visualized through the scientific publications, technological developments, technical assistance to companies and formation of qualified humans resources. A growing tendency in the last years has been the protection of some of those products with the patents, but especially through industrial secrecy.

Strong industrial competition together with the fast technological conversion, the need of protection of industrial secrecy and the existing differences of interpretation with respect to their protection in the scope of the international law, impelled a strong offensive of intellectual protection by companies of developed countries. The administration of developed countries, reasoning on the possible risk of lacking legal mechanisms to protect products from violations of industrial protection, included the subject of applied intellectual rights to industry and commerce in the Uruguay round of the GATT, in 1986. In this way the GATT, a coercive organism, replace the WIPO, the World Intellectual Property Organization. In 1990, U.S. also included to the Uruguay round of the GATT a proposal to protect the confidential information. In other words, the right to protect with the same legal force of a patent, the information that has not yet been disclosed by the companies. In this way the property right extends to the intellectual conception and precedes the product. These measures, adopted by the international community for the protection of intellectual property, seriously endanger industrial expansion in developing countries.

A similar risk is found in biotechnology and in the life sciences through the adoption of dispositions allowing the copyright of materials and procedures related to living matter and its biotechnological transformation. In 1980, for the first time, a patent covering a genetically modified organism was granted, thus opening the possibility of patenting natural substances and products. Later on, genes and plasmids were patented, as well as microorganisms, subcellular particles and, as of 1986, even plants and transgenic animals. Overall, 70% of nearly 60,000 registered biotechnological patents in the world are distributed in equal parts between U.S. and Japan. These patents include procedures to cloning mammals, human genes, and a great variety of transgenics plants, but they also include traditional knowledge from indigenous populations. Many of their plants and therapeutic

procedures have been protected, to the benefit of pharmaceutical companies, by international patent legislation.

The protection of intellectual property is a problem which has not only an economic dimension, but also has important ethical and social consequences and a novel mechanism to take control of the knowledge and biological patrimony of developing countries.

Since the Latin America and Caribbean region includes two thirds of worldwide biodiversity, the tasks of identifying, conserving, transforming and protecting (both biologically and legally) the microbial, vegetal and animal patrimony of the region is a high priority. However, the analysis of the problem must not be limited to only the technical aspects. The biological revolution raises two important questions, one anthropological and the other ecological, about the future of the human species and of the entire planet.

The manipulation of genetic resources is running far ahead of a consensus of where to place the ethical limits. The impact of information technologies and biotechnologies on society also leads to an ideological debate between the humanist thought and the post-modern currents. The environmental destruction produced by technical developments within the reductionist framework imposed by science, aimed at producing technology guided by the laws of the market, represents an ecological challenge. Added to this, there is an anthropological challenge generated by the genetic handling of the human species, made possible by biotechnology. It is therefore necessary to take in consideration the identification of new balances between the development of scientific-technical knowledge and the social control of its effects.

Face with the importance of these developments, society has a responsibility to provide an ethical framework to these questions. The answers cannot be limited to decisions of a group of experts, they also require a social conscience and a collaborative work allowing to expand those principles to all humanity. Only in this way will the societies be able to avoid the danger of

eugenism by genetic manipulations of individuals and their possible commercialization.

Science develops more quickly than social politics and this has important consequences in the legislation, in the scale of values and in people's life. The science is not the result from an approach to the knowledge free from the rules of the society. It is born in social practice and its results impact daily individuals' way of life. Therefore it is important to establish an ethical approach from the root of scientific research. All members of society must participate in the definition of the ethical relevance of the projects in which transcendent topics for their individuals are approach. This ethical reflection should not be a consequence of the impact of those discoveries but should precede it and continue during the methodological development and technical realization.

In terms of human resources, the concentration of scientific thought in developed countries can be transformed into a dynamic North-South and South-South network, with the participation of scientists and technicians of the region resident in developed countries, thus contributing to reduce the existing knowledge gap between countries. The network actions of professional links will also contribute to revaluate the diversity of concepts devaluated by the globalization of the cultures. Only by recovering the interactivity of the different cultures, the multidirectional mobility of people, ideas as innovation vectors and the multicentric diffusion of knowledge, will be possible to create truly pluralistic societies. The approach to this paradigm implies the creation of multiple poles of attraction for the generation of knowledge, in order to facilitate the expression of local values and the construction of networks allowing interaction between the different nodes.

The structure of modern science, built upon a universal system of laws is now broken. The fracture of these paradigms of modernity generates alternatives that give rise to new spaces of dialogue between science and society. Of the manifold future that can be generated by the postmodern expression of science, some may involve a shared brotherhood utopia where knowledge is not a producer of inequality but a generator of harmonic growth and balance, assuring social existence and environmental balances. By this way it will it be possible to generate a knowledge equilibrium based on international cooperation leading to sustainable developement of peoples

Case 1 – AFUDEST: working through a non-profit organisation

In 1985, a group of 40 Uruguayan scientists living in France set up the Association franco-uruguayenne pour le développement scientifique et technologique – AFUDEST. This is a voluntary body governed by the 1901 French law on non-profit organisations; its purpose is to develop scientific and technological exchange between France and Uruguay.

The reason for founding AFUDEST was the huge scientific and technological gap between the two countries and the search for way to redress the balance. Initially there were two objectives:

1) to conduct practical actions in response to requests from Uruguay or initiatives by members of the association, validated as relevant projects by the university authorities or the Uruguayan scientific community.

2) to consider and discuss technology transfer problems.

The topics examined were: problems of training human resources in science and technology; the brain drain due to scientific migration; knowledge and technology transfer mechanisms; the scientific and technical development of Uruguay, and its regional integration in this regard.

The analysis of Uruguayan students' doctoral training abroad revealed a certain number of shortcomings and difficulties, and AFUDEST decided to help solve them through various actions in France and Uruguay. It was noted that university education abroad did not correspond to any locally defined strategy, but was based on individual candidates' interests. Rates of return to Uruguay and of university reintegration were both low, and no mechanism was provided to help emigrants return. Long-term training uprooted students for a long period, reducing their possibilities of reintegrating in their home country. The mismatch between the training requested by the home laboratories and the training actually given by the host laboratories does not promote productivity, professional qualification and job opportunities for the trainees on their return to Uruguay. This population was a potential source of skilled emigrants. Trainees who did not have a job before they left had more difficulty re-integrating on their return. They joined the group referred to as "thematic migrants". Either they managed to develop their speciality, or they stayed on the fringes of academic life, in which case they formed another potential migrant category.

To help solve these problems, AFUDEST promoted various procedures:

- a system to help select host establishments for scholarships in France, so that students' training abroad is better suited to the needs of Uruguayan institutions;
- welfare support for students, to help them integrate into French society and reintegrate on their return to Uruguay;
- actions providing guidance for a selection of candidates, to help guarantee a job on return and promote alternating doctoral training between France and Uruguay.

Developed between 1986 and 1992, with the collaboration of the French and Uruguayan authorities, these activities significantly improved the situation facilitating the return and reintegration of Uruguayan students. In the 150 cases studied over that period, the rate of return rose form 50% before the actions to 96% after.

The complementarity between AFUDEST's actions, the Universidad de la Republica's programme of aid for returning students and the National Basic Science Research programme PEDECIBA have facilitated reintegration of most grant holders in satisfactory job conditions, and helped to build a strong co-operation network between France and Uruguay.

AFUDEST took an active part in training human resources in Uruguay, organising lectures, seminars and conventions that encouraged French organisations in Uruguay to take part in activities to support the development of the country's scientific system.

Since its formation, AFUDEST has taken part in the following actions:

1) Reception and advice for Uruguayan scholarship students arriving in France. AFUDEST identified the most suitable training structures for the students, helped them settle (welfare, reception, advice for finding accommodation, administrative procedures), and facilitated their return and reintegration in Uruguay. Between 1987 and 1992, information and orientation actions were organised in Montevideo to prepare scholarship students' stays abroad. In 1989, an AFUDEST branch was set up

in Montevideo to facilitate relations between academics, the French embassy and students with French government scholarships.

2) Sending collections of books to the Montevideo University science libraries.

3) Obtaining fellowships for Uruguayan scientists from the Fondation pour la Recherche Médicale and CESTA.

4) At the request of the Director of the Uruguayan Programme for the development of the basic sciences, two missions went to the offices of Europe's DG-XII in Brussels. Following these missions, Uruguayan scientists submitted seventeen projects to the EU.

5) Establishing a programme of epidemiological cancer research in Uruguay. This programme was approved by the joint Franco-Uruguayan Commission and twinned the Institut Gustave-Roussy with the Montevideo medical school oncology department.

6) In November 1986, at a meeting with the Uruguayan foreign affairs minister, AFUDEST pointed out the urgent need for a national biotechnology plan for Uruguay. At the minister's request, AFUDEST presented a project, which was discussed at a first Uruguayan meeting on biotechnology in May 1987. That meeting led to a national biotechnology plan being drawn up and submitted to the Uruguayan parliament. This project was also listed as a priority in agreements signed by the joint Franco-Uruguayan Commission. In December 1987 a French mission went to Uruguay in this connection.

7) Interview with the President of the Republic of Uruguay with a view to informing him and debating the implications of developing biotechnology in Uruguay and the strategic importance of science and technology (Paris, June 1987).

8) Participation in the seminar on biotechnology in Europe and Latin America organised by the EEC (Brussels, May 1987).

9) Meeting with the Director of scientific and technical co-operation of the Uruguay foreign ministry, to inform him about the state of science and technology in Uruguay and the development priorities defined by the government (Paris, September 1987).

10) As technical consultants to the official Uruguayan delegation, participation in preliminary negotiations for Franco-Uruguayan co-operation agreements (Paris, 14-16 October, 1987).

11) Meeting with the French government's representative in Uruguay, to assess the possibilities for developing biotechnology in Uruguay, following the signing of cooperation agreements with France (Paris, November 1987).

12) Meeting with the Uruguayan Minister for Culture about the development of biotechnology and the problems of Uruguayan scholarship students in France and on their return to Uruguay (Paris, 25 October 1987).

13) Participation in the "Primer encuentro latinoamericano de Biotecnologia" organised by the Organisation of American States (Sao Paulo, 3-5 July, 1988).

14) Meeting with the President of the Inter-American Development Bank to analyse prospects, conditions and possibilities for drawing up a plan for the development of new technologies in Uruguay with the financial support of the IDB (Paris, 13 October 1988).

15) Organisation of and participation in the "1st Immunology course" in Montevideo (November-December 1986, UNDP/Institute of Biological Sciences).

16) Organisation of and participation in the "1st Latin-American course in immunotechnology" in Montevideo (12-22 December 1988, UNDP/OAS, Montevideo University/Institute of Biological Sciences).

17) Execution of a project to set up a blood products fractionation unit in collaboration with the Montevideo school of medicine and the Fondation pour le progrès de l'homme (1989).

18) Training Uruguayan computer scientists in artificial intelligence and robotics at the French company Cybernetix in Marseille (1990).

19) Project to set up a database of Uruguayan scientists living in the developed countries (AFUDEST-Unesco, 1990).

20) Joint organiser with Montevideo municipality, and with logistic support from the Cité des Sciences in Paris, of the exhibition "Viva el Agua" at the Montevideo planetarium (May-June 1991).

21) Sending containers of scientific research equipment to the University of Montevideo (1989-1992, faculties of science, chemistry and medicine).

22) Establishing a scientific and technical co-operation agreement between the University of Montevideo and the University of Compiègne in France (1992).

23) Co-ordination activities for the formation at Unesco of the "Grupo de paises latinoamericanos y del Caribe en Ciencia y Tecnologia" (Unesco, 1989-1991).

24) Organising a discussion group on science and technology policy (Maison de l'Amérique latine, 1989-1991).

25) Cooperation agreement between INRIA (Institut de recherche en informatique et automatique) and the Montevideo engineering faculty (1991).

26) Creation by AFUDEST and the Union Latine of "Al Sur", a project for regional dissemination and exchange of scientific and technical information, in Montevideo. The project received a grant of 100,000 French francs from the French Foreign Affairs Ministry and an equipment credit from the Inter-governmental Informatics Programme (1991).

27) Coordination of the project "Mobilising young people to join the building trades through humanitarian actions": fifteen young people from Montbéliard in France helped to build a theatre in Montevideo (1992).

The Association of Latin American Scientists (ALAS) was set up in 1987, in Paris, at the initiative of AFUDEST, to give its work a regional dimension and spread the debate about the importance of the knowledge society for Latin America and the Caribbean. The founding meeting of ALAS, at the Maison de l'Amérique latine in Paris, was attended by 120 scientists from Latin American countries living in France. ALAS presented the "database of Latin American and Caribbean scientists" project to the countries represented at Unesco and was subsequently involved in all the actions developed in Unesco.

Case 2 – Inter Regional Network of Latin America and Caribbean Scientists (IRNLAC): Unesco 1987-2000

The generation of scientific and technical knowledge have been key factors for economic, social and political development in Latin America and Caribbean region. However, the human and material resources available to each nation in the region are insufficient to generate adequate technological knowledge and options needed to build the new paradigm of knowledge societies.

These difficulties are continuously aggravated by the loss of human resources that migrate to more industrialized regions. Estimated figures of the migration of high-level scientists from developing to developed countries are approximately 100,000 per year in the world. In the 1990s, approximately 650,000 people migrated from the southern countries to the United States on professional employment visas. Migration patterns are increasing in the Latin America and the Caribbean region but have risen dramatically in the countries due to political, social and economic turmoil.

The key issue of this project is not to consider emigrants a loss of resources but how they can continue to contribute to their home region’s improvement in a significant way once they have relocated.

Worldwide communications based in electronic networks have shortened distances, reduced time delays and permit to re-conceptualise the “drain brain” and view it instead as “brain network”. This knowledge network can be transformed into “brain gain” for the most disadvantaged areas and also be utilized to generate balanced and sustainable contributions toward the development of the Caribbean and Latin America regions.

Since 1987 ALAS (Association Latinoamericaine de Scientifiques) and ACAL (Academia de Ciencias de América Latina) have worked together in order to identify the region’s technicians and scientists who have emigrated to developed countries. This effort has been materialized by the creation of a *database* (1), to compile information on Latin America and Caribbean scientists residing in highly developed countries (1994), the development by the IRNLAC project of the *ECOMED Network* (2) and different *activities organized in the Region* (3) and *UNESCO* (4) (1994-2000). These activities have been supported by ICSU (International Council of Scientific Unions), COSTED, the French

Ministère des Affaires Etrangères, the Fondation Abbé Pierre, the Inter American Development Bank and Unesco.

Preliminary work conducted by ALAS during the years of 1992-1994 has indicated that such a data base is not only a key element in the development of scientific knowledge in Latin American and the Caribbean region, but is also an efficient, yet relatively simple to create, instrument to stimulate links across world-wide scientific communities.

There are four major goals of the Inter Regional Network of Latin America and Caribbean Scientist project:

1) Partially identify and assess the potential scientific and technological resources available to the region in developed countries.

2) Create ways of linking particular regional needs with external resources.

3) Generate an international network of scientific and technological cooperation with Latin America and Caribbean nations.

4) Update or establish scientific and technical databases undertaken by the regional ONCYT's. (Organismos Nacionales de Ciencia y Tecnologia, Unesco).

Support for the Inter Regional Network of Scientists of the Latin America and the Caribbean Program has been ratified by the 151 EX/B on two Unesco documents, the DR12, supported by Argentina, Brazil, Costa Rica, El Salvador and Mexico, and the DR9 presented by the working group composed of Egypt (President), Austria, Bolivia, Brazil, Cameroon, Cuba, Germany, Japan, Jordan, Morocco, Namibia, New Zealand, Pakistan, Poland, Russian Federation, Switzerland, Ukraine and the United Republic of Tanzania. These recommendations by the Executive Board were submitted, examined and adopted by the General Conference (29 C/6 Major Programme II, 24).

IRNLAC MAIN ACTIVITIES

Latin American and Caribbean Expatriates Database

Latin America and the Caribbean region suffer from a shortage of scientific resources to introduce meaningful change in their societies, yet it has been assessed that such contribution is crucial to a well-planned human development. The contribution of scientific and technological knowledge to all areas of human life is a fact that can no longer be neglected; however, a central issue at stake is the specific ways in which technological and scientific knowledge is adapted to the needs of each country and region, in particular in the areas where resources are scarce. Each country and region, in turn, needs to have an easy way to quickly access current information that would make decision-making and strategic development possible.

Structural factors, such as weak regional scientific budgets, and the migratory tendency of qualified professionals and scientists in Latin America and the Caribbean region, contribute to the difficulties that the region have historically had in developing a solid scientific research system.

During the last thirty years, a massive exodus of scientists and professionals has contributed to these structural difficulties. In order to start reversing the process of brain drain and converting it into a process of brain-gain, the creation of the master-data base was necessary.

Such database:

– Allow a quick identification of scientists living abroad, by country of origin and professional discipline.

– Facilitate the identification of their professional potential, and their currently availability to work in cooperation with the countries of origin, or other countries in Latin America and the Caribbean region.

– Make possible the analysis of patterns of residency and scientific/technological cooperation among the scholars living abroad in order to maximize the links across members of scientific communities.

The specific goals seek to:

1) Identify scientists from Latin America and the Caribbean region living abroad, whose professional tasks are related to the advancement of current technological and scientific knowledge.

2) Establish a system of exchange and cooperation among such professional networks that can build on current efforts being made by public and private higher education institutions, and governmental and non-governmental organizations.

3) Support the development of contextually relevant, and regionally situated programs that can use the information generated by scientists abroad in solving current and pressing problems of Latin America and the Caribbean region.

The Inter Regional Network of Scientists of the Latin America and the Caribbean Program was supported by the work of scientists already identified through the data base gathering demographic information about scientists native of Latin America and the Caribbean region residing in technologically and advanced industrialized countries. This compilation of 2,800 researchers and professionals living in the USA and Europe has been classified by discipline and area of interest. ICSU, COSTED and Unesco have supported this work. Preliminary work conducted during the years of 1992-1996 has indicated that such a database was a key element in the creation of networks that contribute to the development of scientific knowledge in Latin American and the Caribbean region.

ECOMED Network

The modification of environnement caused by natural changes and/or human activities are favouring the recovery, emergence or modification of some pathologies, particularly those, which are in connection with insects vectors. ECOMED facilitate the study of those problems by a multidisciplinary approach in the framework of regional cooperation.

ECOMED is a network of scientists founded in Quito, November 17, 1995, by researchers from the Universidad Central de Quito (Ecuador), Universidad de Antioquia, Universidad de Barranquilla (Colombia), Tecnoviva (ONG, Ecuador), the Université de Paris V, the Institut Pasteur de Paris, the Institut français d'études andins, the Fondation pour la nature et l'homme, the Societé française d'ethnopharmacologie (France), the support of FUNDACYT (Ecuador), the French Embassy in Ecuador and the IRNLAC Program.

ECOMED's main goals are to develop regional resources for Latin American and Caribbean countries through research, the education of new scientists and the transfer of technological approaches to the study of specific fields.

The primary goal of ECOMED is to study these pathologies produced in the region by environmental changes, in as much as these can particularly be well understood when using a multidisciplinary approach. The trypanosomiasis americana (Chagas disease) constitute an example of the kinds of phenomena well suited for study with such an inter-disciplinary approach as the one proposed by ECOMED. This illness affects twenty million people in Latin American countries and its development is closely linked to a series of inter-related ecological, medical and biological phenomena.

ECOMED Activities

A. Scientific. The ECOMED network developed research projects in the areas of Parasitology, Ethno-pharmacology and Biotechnology in Argentina, Colombia, Ecuador, Panama and Venezuela.

B. Education. ECOMED considers to be crucial the education of technologically prepared professionals but also the education of young scholars, women, and members of under-represented communities in conducting fieldwork and in conducting laboratory tasks.

An equally important identified need is the education of local leaders through community workshops. These leaders participate in the discussion of the information generated by ECOMED teams, its implementation and dissemination in the local communities.

Several courses were realized in Argentina, Colombia, Ecuador and Venezuela.

C. Dissemination. Scientific findings were disseminated through publications, seminars, colloquia and other forums of scientific exchange.

ECOMED also participate in the production of video-resources, slides, and other audiovisual resources in order to facilitate the dissemination of scientific knowledge. The goal of these audiovisual resources is to better communicate the findings to the people directly affected by the problems researched by ECOMED teams. Three video films were produced by ECOMED (1997-2000) in Argentina, Colombia and Ecuador and co financed by the Fondation pour la nature et l'homme and the Societé française du film de la recherche scientifique (SFRS).

Other INRLAC activities

Several activities were organized in the region.

Scientific Exhibitions:

– "Viva el agua", Intendencia Municipal de Montevideo, Uruguay.

– "Agua, cultura y vida", Universidad de Antioquia, Medellin, Colombia.

– Conferences (Caracas, Quito, Medellin, Montevideo) and a electronic forum (Redes de la ciencia:migraciones cientificas internacionales).

The IRNLAC projet organized 4 meetings in UNESCO (Paris) concerning the scientific migrations:

– 28 General Conference Unesco, Commission III, 6th nov. 1995. Round table: "Scientific migrations, a challenge for development". Speakers: F. Kerdel Vegas, Ambassador of Venezuela, E. Martin del Campo, Director Unesco/ORCYT, F. Lema, IRNLAC Coordinator, G. Lozano, President of ACAST.

– "Les réseaux de la science: les migrations scientifiques internationales et les réseaux des scientifiques latino-américains à l'étranger" , Unesco, 21 may, 1996. Speakers: A. Sasson, Director of Science Division, Unesco, P. Obregon, Ambassador of Colombia, M. Callon, prof. École des Mines, Paris, J. Gaillard, sociologist, F. Lema, ALAS, G. Lozano, ACAST.

– "Rencontre latino-américain et des Caraibes : Femmes, science et technologie", Unesco, 23 mars 1998. Round table. Speakers: L. Arizpe, Director of Culture Division, Unesco, R. Clair (France), B. Cavailles (Peru), M. Arellano (Peru), C. Zaphir (Haiti), E. Bonilla (Colombia), B. Pavlic (Slovenia), C. Marry (France).

– Workshop Unesco/Inter American Development Bank (IDB)/IRNLAC: "La valorisation du capital social émigre des pays d'Amérique latine et des Caraïbes : nouvelles stratégies de coopération internationale", 11th-12th october 1999, Unesco. Invited participants: 35 experts in scientific migrations, scientific policies and education from Argentina, Brasil, Canada, IDB, Spain, France, US, Venezuela and Uruguay.

Case 3 – CREAR and RAICES: governmental experiences in Argentina

One of the main characteristics of the 20th century was the vertiginous growth of knowledge in all fields of science and its uneven spread around the world. Latin American countries have serious problems in accessing, generating, utilizing, protecting and disseminating scientific knowledge.

This situation was considerably worsened by the loss of human resources through migration to developed countries.

Between 1961 and 2000, over a million professionals from the region settled in Europe or the United States. The minimum cost of training is 30 billion US dollars.

More than 50,000 tertiary level graduate Argentinian migrants now live abroad, including 35,000 in the United States, where 5000 are active in research and development. However, migration can be a factor for productive intellectual and social dynamism if it is incorporated in the development activities of Latin American countries.

In October 1999, the University of Buenos Aires, the Buenos Aires city government and the Inter-Regional Network of Latin America and Caribbean Scientists (IRNLAC) signed an agreement setting up the programme "Red Cre@r". This programme had the benefit of the experience Unesco had acquired in the "inter-regional network of Latin America and Caribbean Scientists" project. It provided an opportunity to establish links between the community of Argentinian professionals abroad and the programmes of the University of Buenos Aires and the city government.

The CRE@R network set itself the objective of creating an exchange network between scientists living abroad and professionals in the national innovation system in Buenos Aires.

The programme was organised as a network based on a database of Argentine professionals abroad.

The ultimate purpose of the network was to foster the circulation of knowledge using the new technologies, and to facilitate travel for Argentine scientists and technicians abroad for training or consultancy purposes. In this way it helps endogenous knowledge development and the integration of scientific communities at home and abroad, promotes the development of scientific and technical co-operation policy internationally and fosters the circulation of knowledge.

RAICES programme (Red de Argentinos Investigadores y Científicos en el Exterior)

The RAICES programme was set up on 29 May 2000 by the Argentine education ministry through the Secretariat for technology, science and productive innovation (SETCIP).

The programme's aims are to

- facilitate interaction between the knowledge offering of skilled emigrants abroad and scientific and technical demand at home;
- foster the circulation of knowledge via the new technologies, so as to help solve Argentina's scientific and technical problems.

The programme operates through a network formed using a database of Argentine professionals abroad and by identifying public and private demand for science and technology in Argentina.

Activities in 2001 – RAICES programme

1) Creation and updating of a database of Argentinian nationals abroad. In January 2002, the database included 1600 professionals.

2) Organising a course on the molecular biology of hemoparasites of veterinary interest, at the Universidad Nacional del Nordeste in Corrientes.

3) Organising a meeting in Rio de Janeiro with Argentine researchers and teachers living in Brazil, and with the participation of the Argentine government's Secretary for Science and Technology.

4) Organising a meeting in Paris with Argentine researchers and teachers living in France, with the participation of the Argentine government's Secretary for Science and Technology.

5) Making a video of interviews with Argentinian researchers living abroad.

6) Organising a meeting of Mercosur experts entitled "Building public policy on the emigration of professionals", 20-21 November 2001, Buenos Aires.

The main conclusions of this seminar were as follows:

i) Further consolidate scientific and technical Mercosur. To achieve this, participants decided:

- to hold a Mercosur science and technology meeting in 2002, organised by the region's governments and scientific societies;
- to define key activities combining the scientific, educational, production and social interests of the Mercosur countries.

ii) Co-ordinate policies and actions of Mercosur countries with regard to professional migration, defining policies and strategies around the following points:

- foster consolidation of national innovation systems to reduce the outflow of skilled professionals;
- facilitate and stimulate repatriation procedures and establish links between scientific communities at home and in other Mercosur countries;
- seek out synergies with other national programmes or research teams studying the social, professional, economic and educational impact of migration.
- consolidate and merge existing databases on migrants, for the whole of Mercosur;
- create a monitoring unit on the social impact for the Mercosur countries of profession migration.

iii) Promote educational policies to facilitate training and the development of new cultural and epistemological concepts, and promote integration policies that consolidate the development of the knowledge society.

iv) Define common strategies and policies for the protection of intellectual property.

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ANNEX 1

Foreign-Born S&E Degree Holders in U.S in 1999: LAC Country of Birth by Field of Highest Degree

	Engineering	Life sciences	Math/Comp sciences	Non-S/E	Physical sciences	Social sciences	Total
Total S&E degree holders in U.S.	2 323 300	1 582 900	1 185 600	2 875 300	777 400	3 745 200	12 489 700
Native	1 853 600	1 390 400	979 100	2 613 400	650 300	3 443 600	10 930 400
Foreign-born total	469 700	192 500	206 500	261 900	127 100	301 600	1 559 300
% foreign-born	20,2	12,2	17,4	9,1	16,3	8,1	12,5
Argentina	2 900	1 800	1 400	2 900	1 000	2 800	12 500
Bolivia	S	S	S	1 300	S	S	2 900
Brazil	3 200	600	1 200	1 200	100	S	9 100
Chile	900	300	200	S	300	6 100	3 500
Colombia	3 300	2 400	700	3 100	200	5 600	15 800
Costa Rica	800	600	S	S	S	300	2 500
Cuba	6 100	2 800	1 900	7 400	1 900	1 200	25 700
Dominican Rep.	1 800	800	1 100	1 700	S	1 200	8 700
El Salvador	400	S	S	S	S	800	2 600
Equador	1 700	S	S	2 200	600	7 600	6 800
Guatemala	200	100	S	S	S	1 600	2 100
Haiti	1 100	1 400	800	S	400	26 700	5 800
Jamaica	2 700	2 100	1 500	5 200	1 000	400	16 600
Mexico	12 200	2 000	3 200	5 700	1 800	1 900	37 400
Nicaragua	800	1 500	S	1 300	S	700	5 000
Panama	2 200	1 500	S	2 400	S	11 600	8 700
Peru	3 200	1 500	700	S	400	3 600	9 600
Surinam	1 300	1 600	800	3 400	S	700	8 100
Trinidad/Tobago	2 200	400	800	1 100	S	18 400	7 000
Venezuela	3 200	1 000	900	2 400	100	6 300	8 900
Other_Americas	1 400	1 900	2 000	3 400	700	900	13 100
Total	**51 600**	**24 300**	**17 200**	**44 700**	**8 500**	**98 400**	**212 400**

Source: National Science Foundation/Division of Science Resources Statistics SESTAT file
S: Estimated to be less than 100 individuals, or suppressed for confidentiality

ANNEX 2

Foreign-Born S&E Degree Holders in the United States in 1999: LAC Country of Birth by Education Level

Education level	Bachelor's	Master's	Professional degree	Doctorate	Total
Total S&E degree holders in U.S.	7 278 900	3 411 200	978 000	822 000	12 490 100
Native	6 513 700	2 906 600	899 800	610 500	10 930 600
Foreign-born total	765 200	504 600	78 200	211 500	1 559 500
% foreign-born	10,5	14,8	8,0	25,7	12,5
Argentina	4 600	4 600	S	2 700	12 500
Bolivia	1 300	1 400	S	200	2 900
Brazil	5 400	2 700	S	800	9 100
Chile	1 600	700	S	700	3 500
Colombia	9 200	4 400	1 200	1 000	15 800
Costa Rica	1 600	800	S	100	2 500
Cuba	12 800	7 900	2 500	2 500	25 700
Dominican Rep.	5 700	1 500	S	400	8 700
El Salvador	2 000	500	S	100	2 600
Equador	3 500	1 900	S	400	6 800
Guatemala	S	700	S	500	2 100
Haiti	3 900	800	S	600	5 800
Jamaica	9 500	5 300	S	600	16 600
Mexico	25 800	8 900	1 400	1 400	37 400
Nicaragua	2 700	1 200	S	500	5 000
Panama	5 200	2 200	S	400	8 700
Peru	6 200	2 500	S	800	9 600
Surinam	3 900	2 800	S	600	8 100
Trinidad/Tobago	4 500	1 800	S	300	7 000
Venezuela	5 200	2 000	S	800	8 900
Other_Americas	7 600	2 800	1 800	1 000	13 100
Total	**122 200**	**54 600**	**6 900**	**16 400**	**212 400**

Source: National Science Foundation/Division of Science Resources Statistics SESTAT file
S: Estimated to be less than 100 individuals, or suppressed for confidentiality

ANNEX 3

Foreign-Born S&E Degree Holders in U.S in 1999: LAC Country of Birth by Occupation Group

	Engineering	Life sciences	Math/Comp sciences	Non-S/E	Physical sciences
Total S&E degree holders in U.S.	1 290 300	323 500	1 007 100	7 220 900	294 100
Native	1 043 400	265 100	796 100	6 479 500	242 800
Foreign-born total	246 900	58 400	211 000	741 400	51 300
% foreign-born	19,1	18,1	21,0	10,3	17,4
Argentina	1 000	900	1 300	5 800	600
Bolivia	S	S	S	2 500	S
Brazil	1 300	100	500	5 100	200
Chile	300	100	400	2 100	S
Colombia	1 800	S	1 000	10 100	200
Costa Rica	S	400	S	600	S
Cuba	3 400	500	1 900	14 400	400
Dominican Rep.	1 100	S	900	5 500	S
El Salvador	200	S	S	1 200	S
Equador	900	S	S	4 600	400
Guatemala	S	100	S	1 200	S
Haiti	300	S	600	4 000	S
Jamaica	1 800	400	1 400	10 700	300
Mexico	5 400	500	2 900	22 700	200
Nicaragua	300	S	S	3 200	S
Panama	700	S	700	5 900	S
Peru	1 400	400	600	5 500	200
Surinam	600	S	400	6 000	S
Trinidad/Tobago	700	S	S	4 900	S
Venezuela	1 500	100	1 800	5 000	S
Other_Americas	1 500	400	1 400	7 900	100
Total	**24 200**	**3 900**	**15 800**	**128 900**	**2 600**

Source: National Science Foundation/Division of Science Resources Statistics SESTAT file
S: Estimated to be less than 100 individuals, or suppressed for confidentiality

ANNEX 4

Foreign-Born S&E Degree Holders in U.S in 1999: LAC Country of Birth by Sector of Employment

	Business /Industry	Education	Government	Total
Total S&E degree holders in U.S.	7 176 700	1 960 400	1 342 700	10 479 800
Native	6 217 600	1 717 200	1 198 700	9 133 500
Foreign-born total	959 100	243 200	144 000	1 346 300
% foreign-born	13,4	12,4	10,7	12,8
Argentina	6 100	3 000	1 300	12 500
Bolivia	1 800	800	S	2 900
Brazil	5 700	1 600	600	9 100
Chile	2 100	800	S	3 500
Colombia	9 500	3 300	1 500	15 800
Costa Rica	1 500	400	300	2 500
Cuba	13 000	4 600	3 300	25 700
Dominican Rep.	5 200	1 500	1 100	8 700
El Salvador	1 200	900	S	2 600
Equador	4 800	400	1 000	6 800
Haiti	3 500	1 100	S	5 800
Guatemala	400	600	S	2 100
Jamaica	10 100	2 900	2 200	16 600
Mexico	22 000	6 300	4 100	37 400
Nicaragua	2 800	1 300	S	5 000
Panama	5 200	S	2 200	8 700
Peru	6 300	1 900	S	9 600
Surinam	4 600	2 400	500	8 100
Trinidad/Tobago	3 100	1 200	2 200	7 000
Venezuela	7 300	700	S	8 900
Other_Americas	8 300	1 800	2 000	13 100
Total	**124 500**	**37 500**	**22 300**	**212 400**

Source: National Science Foundation/Division of Science Resources Statistics SESTAT file
S: Estimated to be less than 100 individuals, or suppressed for confidentiality

ANNEX 5

Foreign-Born S&E Degree Holders in U.S in 1999: LAC Country of Birth by Citizenship Status

	Citizen	Permanent visa	Temporary visa	Total
Total S&E degree holders in U.S.	12 060 000	328 900	102 500	12 489 400
Native	10 930 000	1 900	700	10 930 000
Foreign-born total	1 130 600	327 000	101 800	1 559 400
% foreign-born	9,4	99,4	99,3	12,5
Argentina	9 300	2 100	1 100	12 500
Bolivia	2 400	500	S	2 900
Brazil	5 000	2 500	1 600	9 100
Chile	2 600	700	200	3 500
Colombia	12 900	2 500	400	15 800
Costa Rica	1 800	600	S	2 500
Cuba	25 000	700	S	25 700
Dominican Rep.	7 100	1 400	200	8 700
El Salvador	2 000	600	S	2 600
Equador	5 700	800	200	6 800
Guatemala	2 000	S	S	2 100
Haiti	4 800	900	S	5 800
Jamaica	11 800	4 200	600	16 600
Mexico	28 200	7 700	1 600	37 400
Nicaragua	3 900	900	S	5 000
Panama	8 400	S	S	8 700
Peru	6 700	2 100	900	9 600
Surinam	6 100	2 000	S	8 100
Trinidad/Tobago	4 100	2 600	300	7 000
Venezuela	5 400	2 800	600	8 900
Other_Americas	9 300	3 000	800	13 100
Total	**164 500**	**38 600**	**8 500**	**212 400**

Source: National Science Foundation/Division of Science Resources Statistics SESTAT file
S: Estimated to be less than 100 individuals, or suppressed for confidentiality

ANNEX 6

Foreign-Born S&E Degree Holders in U.S in 1999:
LAC Country of Birth by Whether R&D is a Major Work Activity

	No	Yes	Total
Total S&E degree holders in U.S.	9 626 900	2 863 000	12 489 900
Native	8 584 800	2 345 700	10 930 500
Foreign-born total	1 042 100	517 300	1 559 400
% foreign-born	10,8	18,1	12,5
Argentina	8 300	4 200	12 500
Bolivia	1 900	1 000	2 900
Brazil	7 500	1 600	9 100
Chile	2 000	1 500	3 500
Colombia	11 200	4 700	15 800
Costa Rica	1 400	1 000	2 500
Cuba	19 800	5 900	25 700
Dominican Rep.	6 800	1 900	8 700
El Salvador	1 700	900	2 600
Equador	4 800	2 000	6 800
Guatemala	1 500	700	2 100
Haiti	4 200	1 500	5 800
Jamaica	11 700	4 800	16 600
Mexico	29 900	7 500	37 400
Nicaragua	3 600	1 300	5 000
Panama	7 100	1 600	8 700
Peru	6 800	2 800	9 600
Surinam	6 800	1 300	8 100
Trinidad/Tobago	5 000	2 000	7 000
Venezuela	6 400	2 500	8 900
Other_Americas	10 000	3 100	13 100
Total	**158 400**	**53 800**	**212 400**

Source: National Science Foundation/Division of Science Resources Statistics SESTAT file
S: Estimated to be less than 100 individuals, or suppressed for confidentiality