REPORT TO

THE INTERNATIONAL DEVELOPMENT RESEARCH CENTRE

ON

THE FEASIBILITY STUDY FOR RESEARCH ON VENTURE FINANCE FOR TECHNOLOGY FIRMS IN ARGENTINA, BRAZIL, CHILE AND URUGUAY

March 31, 1998

BY

Christopher M. Ostrovski,

Technology Partners International Inc., Toronto

Disclaimer *This document is presented as general background only for the purpose of orienting proponents to the topic at hand. The opinions and recommendations expressed in this report are of the authors only and do not necessarily reflect what IDRC plans to do in this area.*

Country and topic collaboration with:

- Dr. Carlos Marschoff, Executive Director, Science and Technology Fund - Argentina; associate professor - University of Buenos Aires. Buenos Aires, **Argentina.**
- Dr. Marcos Schlemm, President, Institute for Business Administration and Development (ISAD), The Pontifical Catholic University of Paraná, Curitiba, Paraná, **Brazil**
- Dr. Jorge Nef, Professor, The University of Guelph, Guelph, Canada (Chile), Adjunct Professor, University of Chile, Santiago, **Chile**
- Myriam Aldabalde Urreta, Consultant, Programa Bolivar (Uruguay) Montevideo, **Uruguay**
- Jay A. Lefton, Partner, Aird & Berlis**,** Toronto**, Canada**

TABLE OF CONTENTS

PREFACE

It was a true pleasure and challenge to work on this first study for the potential of

establishing a biotechnology venture capital fund for the Southern Cone of Latin America, supported by the International Development Research Centre (IDRC) and coordinated by Technology Partners International Inc. (TPI) of Toronto Canada.

TPI has spent its corporate life developing business opportunities between Canada and Latin America in the field of biotechnology and information technology. TPI operates with partners and associates who all have a strong connection with Latin America, biotechnology, software, the transfer of technology, development, commercialization, licensing and financing of start up companies; whether based on research results or on established companies. Some of the TPI partners and associates, including the author, have lived and worked in one or more Latin American country. TPI has also worked closely in the development of the university-industry interface both in Latin and North America.

It was intriguing to know that IDRC would be interested in researching a mechanism such as venture capital as a tool for development. This is very forward thinking for an institution and incredibly timely and necessary to assist the universities to carry out their task of research and training, and providing new knowledge and benefit to society.

Currently there are so many sources of information, and so many more sources of knowledge that it is next to impossible to keep in every field and every research mode. It has become today, that peers speak to peers and rarely spread their knowledge beyond that tight circle of specialists.

In this the university is failing society. It is not providing the public or society with one of its cornerstones of " raison d'etre", that of providing benefit of knowledge (benefit) to society.

Though it may have seemed some what distant but by assisting universities to have closer links with technology transfer and development and using mechanisms such as venture capital, the university and the research community at large is fulfilling their mandate and obligation to society in yet another way. By no means will this solve the transference of knowledge backlog, but it will assist the university and society benefit from the research that has been carried on.

As a note on the study report, the first section of the study report reviews the country reports. In this section references are made to these country reports as well as to additional research and published material that was obtained as a result of consulting the literature, including that available on the internet. This additional material is indicated as footnotes throughout the first section of the study report. Other references are cited in each of the individual country or subject chapters.

On behalf of TPI, thank IDRC for the opportunity to be so closely involved in a pioneering effort to assist universities and institutions to provide a mechanism to further provide benefit to society.

Also, we would like to extend our special gratitude to the enthusiastic collaborators in this

study,

Ms. Gabriela Couto, Dr. Carlos M. Marschoff, Dr. Marcos Schlemm, Dr. Jorge Nef, Dra. Myriam Aldabalde, Mr. Jay Lefton. Gratitude is also extended to the many that patiently answered questions and pointed to directions that should be followed.

Special thanks to Dr. Scott Tiffin and Dr. Brent Herbert Coupley for their assistance and direction.

Christopher M. Ostrovski

TPI Inc.

(Canada - Latin America / Caribbean biotechnology business development company**)**

EXECUTIVE SUMMARY

One of the crucial elements for the development of new technologies (research results) discovered at universities and research institutions is sustained financial backing. This applies to any region of the world including the Southern Cone of Latin America.

The Southern Cone of Latin America (Argentina, Brazil, Chile, Uruguay) is a socioeconomic region in rapid evolutionary change. The regional trade has tripled in monetary value since 1991, laws on investment, intellectual property, import and export tariffs, partnerships and more have been changing to reflect the need for this region to " internationalize ".

With the changes taking place in this region, there have been economic realities that in the period of adjustment have been the source of difficulties to certain segments of the society. Among these groups are the universities and research institutions that have had to and are needing to adjust to the changing pressures in the society.

Universities and research institutions have been searching for new mechanisms that will allow them to adapt and also to " internationalize ". Beyond international research collaborations, graduate training, professorial exchange, there is an understanding that there are tools available to assist the development of the universities capability to carry out their tasks, including novel methods of disseminating knowledge (research results) to society.

Beyond the traditional teaching of students and presentation of papers, the research function of the university generates results and discoveries, some of which can be developed and commercialized. This last point, though difficult for some academics to accept, that is, the transfer of technology to the private sector in exchange for a monetary contribution, is also a

method of providing benefit to society and to the institution where from came the technology or discovery.

This concept has been widely accepted in Europe and North America. It has spawned a significant professional segment of the university community that specializes in technology transfer, development, commercialization and management.

As in most endeavours one of the key elements to success, is financing. Universities and governments have been supporting part of the technology transfer activity, but are not able to support the full cost. Though the conditions are becoming more favourable in the market place, the competition for the limited funding has increased.

Financing mechanisms are available or have become available to assist in the full development of some of the research results.

Traditionally in the Southern Cone, financing of new developments or small start up companies has occurred through personal backing or funding from relatives or friends of the immediate family. Banks do not lend money to these enterprises, since in most cases, there is a lack of collateral in small start up companies.

There has always been the lack of financial support for the development of research results into market ready products, processes or technologies. This is even more so in the Southern Cone. In part it is paradox, there is money available for investment but not available to the development and commercialization of research results and discoveries. More correctly, the investment money is not be applied to the development and commercialization of research results and discoveries.

There is a need for a delivery mechanism in the form of a financial tool or product, that will marry this investment potential with the biotechnology research and discovery potential present in the Southern Cone.

One such financial tool that has established itself and is gaining popularity each year in North America and Europe, is venture capital funding Venture capital provides long term seed investment for the development of new products, technologies, discoveries and start ups. The venture capitalist generally assumes greater risks than other agents in the financial system. Venture capital firms fill critical roles in the economy by taking equity positions in companies where there are insufficient assets to use as collateral for loans.

Venture capital firms provide another key element normally not present in start up companies, they offer management support for the start ups that they fund.

In Canada, the USA and in Europe, venture capital has made a significant contribution to business development; yet this financial tool is not well known in the Southern Cone, where only a handful of relatively small funds are available. These Latin funds are focused more on established opportunities, where the investment opportunities are better known, rather than on the development of research results from universities and research institutions, where the

knowledge of investment opportunities represented by biotechnology is not well known.

The Southern Cone has a significantly large number of research organizations and universities, it has highly trained and educated academics, researchers and technicians, specially in the field of biotechnology.

Peer reviewed and recognized work is being carried out, and research results are being published; however, in proportion to the work being carried out and the number of people involved in biotechnology research, relatively little is going through technology transfer, development and commercialization.

There are a number of factors causing this low transfer of university and research institution based technology and discoveries. Among these are the traditions of these institutions, the awareness of the private sector of the availability of these opportunities; the lack of personnel trained in technology transfer and business development, and possibly more important, the lack of seed investment for this cycle to begin and sustain itself.

The industry, more specifically the investment community, is not well versed in the opportunities nor in the potential offered by venture capital, nor are they aware of the opportunities available in the Southern Cone biotechnology research community. Further, the entrepreneurs and the academics are themselves not aware of the financial tools available and as a result try to develop an opportunity using limited resources from very limited sources. There is one further difficult that this group of entrepreneurs faces and that is the management of the technology transfer, development and commercialization process.

The points identified above do show that there exists a good, if not an excellent market opportunity for a biotechnology focused venture capital investment fund in the Southern Cone. However, there are a number of steps that should be carried out in parallel and in sequence for this fund to become a thriving reality. Research should be carried out to determine the mechanisms required to adjust the venture capital models currently successful elsewhere; questions of acceptance and successful use by all concerned should be addressed and followed in long term research.

One of these is an intensive research program at universities and centres, such as graduate level business schools, that will do research in the field of technology transfer, development and commercialization and funding of the same.There are many questions that must be addressed and researched in this field; training programs need to be established that will facilitate the formation, use and success of biotechnology venture capital fund dedicated to university and public institution technology transfer.

INTRODUCTION

The Southern Cone of Latin America, comprised of Argentina, Brazil, Chile and Uruguay has been undergoing a rapid economic, political and social change. For many decades there have been promises of changes, but these counties continued to operate in a nearly closed

inward facing environment. As was written recently,

" Prior to 1990, the political risks associated with interventionist governments were considerable, and included a high probability o government expropriation, derailed regulations that imposed inefficiencies , and restriction on foreign investment. The goal of economic self-sufficiency supported extensive tariff and no-tariff barriers to both trade and investment '[(1)]. With the on set of the popularized term " globalization", negotiations of the Uruguay round of the GATT (General Agreement on Tariff and Trade), the establishment of the Mercosur, the control of inflation and stabilization of the economies have caused that, " such political risk has been replaced by a faith in free markets, and an acceptance that Internacional trade and investment are the bases for economic growth."

In a recent Alliance for Trade article described the region as follows:

"Even though the Mercosur is one of the newest sub regional integration processes in the Americas, it is widely considered to be the most economically promising"[(2)]

The Southern Cone is attracting considerable foreign direct investment (FDI), and the United States continues to lead overall. A point of interest, however, is that several Latin American companies are also big investors throughout - and outside - the region. Chile leads this group with investments made in various sectors in Argentina and in Brazil among other countries.

The size and scale of change are remarkable in Latin America, growth is being experienced by most countries and infrastructure development has flourished. International and local companies and organizations have developed associations and ventures. The development, though not homogeneous, is distinct for each country having its own needs, its own culture and languages with unique desires, goals and objectives.

These changes have had profound impacts on all sectors of the social / political / economical structure. Some sectors have been adapting and changing faster than others and there has been a realization that changes must take place , however, there has been a resistance to importing solutions without adaptions and acceptance by those affected.

One of these sectors is the research and development infrastructures within each of the countries. Universities have been founded on the traditional philosophy of universities - that universities are institutions of the search for knowledge and the dissemination of that knowledge to society. The concept of market economy and university activity has been a difficult one to bridge. In North America this type of bridging and closer association with industry began in the late 1970's, implementation and reasonable acceptance in universities during the 1980's, particularly in the late 1980's as evidenced by the growth of organizations such as the Association of University Technology Managers (AUTM), and papers presented at meetings of the Licensing Executives Society (LES), one of which was presented by the author[(3)].

At the same time there were efforts being started by various groups in Latin America and by IDRC itself[(4)], to begin to address this change towards closer ties with industry and towards

finding appropriate mechanisms of linking with industry and of transferring research results to the public sector. This has been a difficult road especially for Latin American institutions due to existing philosophies, mind sets, governmental policies and understanding of the need.

The research community has moved towards the acceptance of the industry and university linkage and has discovered that there exist different cultures, languages, methodologies, expectations and time frames among a myriad of differences. None, however, insurmountable [(5)].

The Brazilian government for instance, was negotiating with the World Bank for a third loan/grant for the continued assistance to develop the university-industry interface. Brazil and Argentina have formed CABBIO[(6)], to stimulate the link between university and industry, facilitate the transfer of technology and assist in the financing of the R & D.

There are many issues that must be addressed when dealing with university industry linkages, collaboration and technology transfer. These range from freedom of the researchers to carry on their research to ownership and intellectual property protection, from financing of the research to valuation and commercialization. There are as many mechanisms towards solutions as there are issues in the developing field of university - industry collaboration, technology transfer and commercialization.

One of these issues is the availability of financial resources to enable the proper and adequate development of research results into a commercial product, technology or process.

The Southern Cone has been particularly active in promoting the development of research expertise in biotechnology and in information technology. These are two areas that have experienced a worldwide growth and have been the cause of many new products and the bases for many new companies. In North America and in Europe, most of the successful development of research results required significant sources of financial resources; and these resources came in a variety of forms including venture financing.

It was proposed to investigate the feasibility of a research project to better understand the situation in the Southern Cone in the two fields mentioned above, and to investigate the feasibility of venture finance for technology firms in the Southern Cone.

For the technology component it was decided to focus the research on biotechnology and postpone the study on information technology to a future stage.

The feasibility project focused on four countries, Argentina, Brazil, Chile and Uruguay; these countries define the Southern Cone for the purposes of this project.

METHODOLOGY

In order to obtain the best possible information, one researcher in or very familiar with the

country was selected to carry out the research within that country. It was important to find individuals that understood the university system, government policy, business and had experience with the industry-university interface.

Each researcher was asked to follow the same format, addressing those criteria that were established for the overall pre-feasibility project. That is:

- Situation in the Region
- Analysis of vencap financing in the Region
- Development of the venture capital culture
- Critical mass of research and development (Capability) and
- biotechnologies, survey and selection
- Regulatory system, IP, foreign investment, controls on vencap
- Contacts and references
- Conclusions
- Recommendations

A separate study was carried out for the overall presentation of venture financing in Canada that described the mechanisms available and possible for the development of research results. This paper addressed the differences among other types of financing tools and vencap and the links to management skills required to be able to successfully develop research results to a successful enterprise.
The above reports are presented in individual chapters within this study.

CHAPTER 1

1.1 SOUTHERN CONE OF LATIN AMERICA

Overview
The Southern cone of Latin America, Argentina, Brazil, Chile and Uruguay (defined as such for the purposes of this study) is a socioeconomic region in rapid evolutionary change. The regional trade has tripled in monetary value since 1991.N This region represents a total population of over 200 million individuals, occupying an area that is larger than continental Europe. The Southern Cone has shown to be one of the world's fastest-growing regions over the last five years and has also showed the greatest integration with the global economy and the movement of capital and goods[7]. Brazil is by far the largest territory in the region in both size and GDP. Followed by Argentina, Chile and Uruguay.

The region has a base of reference the traditional Spanish or Portuguese influence for politics, economics, universities and institutions. Universities were formed on the philosophy of pursuit and teaching of knowledge, professors .held a respected status, research was carried out for the sake of the knowledge, the curiosity and discovery. The Catholic Church

was a strong influence on the development of universities, and some of that ingrained tradition still remains. The traditional land owning families controlled and in cases still in control; however, with the many changes including the higher education attainable by more people, the development and accessibility of new technologies, new methods of learning, accelerated learning and the shear amount of knowledge to be passed on, new lines of research that can be pursued and new technologies developed, have demanded change in universities and in research and development institutions. There is an economic situation of the last decade or more, that has limited resources to universities and research institutions, and in order to be able to pursue their goals universities and research institutions have seen the need to adapt.

This adaptation or change, is reflected in part by the opportunities offered to many of the Southern Cone to study abroad; and countries, especially Brazil and Argentina, have programs to provide incentives for students to do their graduate work aborad, for instance CNPq(8) in Brazil. CNPq has been providing thousands of scholarships, and has been the driving force in supporting research.

These conditions and opportunities have generated a large number of highly trained and motivated individuals in many disciplines, but of particular interest to this study, is the large number of individuals that have been trained over the last 20 years in life sciences in each of the countries.

There is a further fact that should be mentioned with respect to Brazil directly but with the knowledge that this too applies to the other countries of the Southern cone, and it is the following. Brazil has radically altered its view of a nuclear state. No longer is the government seen as a prime producer of goods and services, but rather as a regulatory agent and that it wishes to focus its resources on the country's social needs, and enhancing the government's social role, balancing the budget, reducing the public debt and improving the competitive position of the nation's industry(9)

1.2 UNIVERSITIES AND RESEARCH INSTITUTIONS

Argentina has long supported higher education and of its researchers. There are numerous centres of research in plants, genetic engineering, agriculture, biological control and the environment. Many university research programs are financial subsidized by CONICET(10), and ANPCYT(11), among a number including provincial level funding. This effort and system, though of late is going through a difficult period of adjustment, has produced two Argentinians that received the Noble prize in biology.
Chile's universities developed in the traditional sense as well; but in the mid 1970's Chile took an interesting direction of development, in that applied research, especially in the life science, was encouraged to assist the development of the agricultural and forestry sectors of Chile at first, followed by entry into research and development in other areas of biotechnology - aquiculture, environment and human and animal health.

Brazil, in the late 1970's, formed and staffed major federal research and development

organizations. One of these, EMBRAPA[12], was mainly staffed by post graduate students, many of whom were trained aborad. The Pro Alcool fuel program of the 1970's, added to the accelerated development of well trained R & D professionals with mandates to use the most recent techniques and technologies.

In 1992, with Agenda 21 resulting from the Rio '92 meeting, new and stronger force and direction was provided for the development of biotechnology. It was at Rio '92 that finally the potential of the natural resources became publicly accepted.

Uruguay's university system has also developed along traditional lines. Research is supported by CONICYT[13] which receives, in turn, support from the International Development Bank (BID). Among the four countries, Uruguay holds its own. There is an respectable research activity and there are mechanisms in place whether through certain programs at CONICYT or banks, to supply funding to the development of novel research results.

The Southern Cone has had to adapt and in cases change their traditional methods of dealing the rest of the world. At times tradition was forsaken for progress and development. Foreign models were transplanted and not adapted to regional culture which either caused the eventual abandonment of the models or at best only partially addressed the problem and therefore was partially accepted.

There is an understanding within the region that there are tools available that can assist the Southern Cone

1.3 EXAMPLES OF SOME DEVELOPMENT MECHANISMS

Countries such as Brazil and Argentina have been looking for mechanisms to stimulate the university-industry interface and have co funded research and development efforts such as CABBIO[14], that provide support to biotechnology enterprises working together with research institutions.
This multi million dollar effort will generate businesses based on research results obtained together with the participation of industry. These businesses, however, will require subsequent rounds of financing to develop the research results or prototypes into products and deliver these to market.

Financing for these busnisses has traditionally come from family and private investors close to the business owner; at this stage, rarely from banks, sometimes under special conditions from government incentives.

Forward thinking countries have tested different models for the transfer, development and commercialization of research results. Countries such as Brazil and Chile, have created "Incubadoras" usually linked to universities, by which emerging companies could and can develop their research results into products at a comparatively low cost, with some subsidies, some security, and a helpful and supportive environment.

However, on weaning these companies encountered that further investment opportunities are generally limited or non existent. Hence potentially good products / technologies never make it to the market place, don't create employment and are technically shelved.

Industry organizations such as CNI (Confederção Nacional da Indústria) have promoted and sponsored numerous workshops, seminars and conferences with international experts. The objective of these fora was to find those mechanisms that would stimulate the up-take of research results[(15)] and would bring attention to the resource available at universities and research institutions.

Chile, has developed an intriguing model for the development of products and processes, through the creation of Fundacion Chile. The Fundacion develops a product from its research phase through to market. It is a form of " incubator ", though successful for Chile it is slow and can only develop a limited number of technologies.

There is a further and important point, the Fundacion, however, required a major infusion of money, about 25 million USD in 1975, in order to begin operations. There are few benefactors, other than the investment community that can provide access to this type of money.

In a recent seminar Mr. Milenko Skoknic [(16)], made a presentation showing where traditional investment partners were needed in the Chilean economy. Venture capital was mentioned briefly, as a new financial tool that will become more available in Chile. Chile within the Mercosur, is by far the more forward thinking in terms of new investment products.

In search of new mechanisms, governments such as Brazil's, have gone forward to establish links with Universities abroad, such as with MIT. A major conference[(17)] was held in Boston, with the President of the Brazil making a opening video address to the participants. This conference was brought together to discuss long term cooperation in research and development with commercialization overtones.

Similarly, a meeting was held at King's College London[(18)], to stimulate and establish research and development collaboration between British and Brazilian research institutes.

Research collaboration will generate new research results, some will have market applicability. Research policy makers do not, as yet, fully understand and include the facilitating mechanisms for the transfer of these research results to the private sector.

Brazil has developed its systems of technopoles, among many BioRio and BioMinas for biotechnology; and the software development network of Polo software in a number of major centres across Brazil; supported by a federal program called Softex; however, most of the incubated enterprises are left on their own to find what ever investors they can. BioRio for instance, has survived on the bases of research contracts that it administers on behalf of "Fundão"[(19)] and not on the revenue that should be coming from the successfully funded biotechnology enterprises.

Venture financing is in its embryonic state in Brazil and each of the other countries. The need for venture financing that supports the development of research results is little known by academia, by entrepreneurs and by the investment community. Though a few venture financing funds operate, these are still learning how to do the business, how to evaluate the opportunities and how to manage the enterprise through successful growth.

There is a strong need for institutions of higher learning, especially business schools, to begin the development of courses that will not only teach entrepreneurs about the skills and methods of administrating a start-up company, but teach them how to look for and find financing tools, such as venture capital. But at the same time these same schools should reach out to the traditional investment community and develop with and for them a base of knowledge and understanding of this tool that is so successfully being used in many parts of the world.

It must be noted that venture capital operates differently in different countries. Canadian venture capital industry differs from that in the United States which in turn differs from that in Europe.

The Mercosur model of venture capital will need to be developed. The schools of business in each member country will need to develop that model that functions within the business practices and expectations therein. There is an adaptation required and a culture developed.

1.4 INTELLECTUAL PROPERTY (IP)

The laws governing intellectual property in the Southern Cone countries have been changing, to come under the GATT regulations and in line with the major world treaties on IP. There has been a realization that the protection of intellectual property can and does stimulate the development of national and/or regional, as is the case of the Southern Cone, technologies, products and processes[(20)], which in turn leads to the stimulation of the economy and employment.
This is especially valid for the field of biotechnology where new discoveries can have a profound impact on society, as would be the case of a new varietal of a major crop, or a biocontrol agent against an important crop, or a diagnostic kit that enables the identification and proper treatment of an ailment.

Government officials of the Southern Cone countries are now much less antagonistic toward suggestions of benefits that may be obtained from strong intellectual property. For the longest time these countries would not venture into " harmonizing" their country's law with the international community.

Now the government officials and policy makers are consciously seeking the benefits of strong intellectual property, particularly in relation to export promotion and domestic tecnological growth.

There is a movement toward an efficient IP system that works well. By no means is this a

general attitude since there still exist pockets of resistance in each of the countries' bureaucracy.

A system that works well includes:

1) Substantive Law:

- Patents
- Copyright
- Trademarks
- Trade Secrets
- Life Forms

2) Enforcement of the law, political will, speedy court system

3) Efficient administration, confidential treatment

4) Treaties - which patent conventions recognize the country's law- or, to which treaty does this country's law comply.

5) Public commitment, there must be a belief in and respect of patent rights

Sherwood in his paper[14] uses these five points to rank and compare the performance of various countries including those of the Southern Cone. The ranking is not introduced at this time, but does support the findings as reported in the individual country reports. (chapters 3 through 6)

1.4.1 IP - Argentina

New law introduced in 1996, (Law 24.481);
allows the protection of intellectual property in the pharmaceutical field and in turn allows for the protection of inventions in biotechnology including the patenting of modified life forms. Law 20,247 of 1991 allows the protection of plant varieties specifying certain conditions under which patents are granted.

Enforcement: yet to be demonstrated under the new law.

Administration: process is slow, but steps have been taken to speed the internal procedures.

1.4.2 IP - Brazil

New industrial property law (Law 9279) took effect on May 15, 1997.
Allows the protection of pharmaceutical products and biotechnology inventions, however stops at patenting life forms.

In 1997 there has been a surprising number of patent applications for biotech inventions. BioRio, has received a "flood" of applications for space from very small new companies. The research arm of the Ministry of Agriculture, EMBRAPA, has hired and internal IP lawyer.

The new law is apparently already making a difference[(21)].

Enforcement: yet to be demonstrated.

Administration: INPI, the Brazilian patent office is unable to handle the backlog and internal problems of varying type are now being addressed by the Federal government and is working with WIPO[(22)] to strengthen INPI.

1.4.3 IP - Chile

Law was passed in September 1991 and 1992 (copyright);
Chiles's intellectual property rights is compatible with international norms with a few exceptions; Chile belongs to WIPO.

Patents, trademarks, industrial designs, copyright are protected by the provisions of the International Convention for the Protection of Industrial Property (Paris Convention).

The law is gradually being implemented and will enter in full force in the year 2,000. In some cases pharmaceutical patent infringement will not be punished.

There are restrictions on plant and animal varieties; and registration procedures for new drugs are onerous for the first to file system.

Enforcement: Chile is pursuing enforcement of IP, especially in copyright; it is too early to conclude on biotechnology patents, but it is expected that there will also be vigorous enforcement especially with entrepreneurs and companies pressuring the government for action.

Administration: still lacking and has to develop an efficient system.

1.4.4 IP - Uruguay

The IP laws are older but have been up-dated; Uruguay adheres to WIPO standards and to the Paris Convention on IP, Uruguay has signed the GATT and its IP clauses. Basic rights of the citizens property, intellectual or otherwise are guaranteed under the Uruguayan constitution. The IP law is adequate but i*nclusion of chemicals and biotechnology will be done over the next ten years*.

There is no protection for life-forms or methods for treatments of human beings.

Enforcement: adequate

Administration: adequate.

1.5 SCIENCE & TECHNOLOGY - BIOTECHNOLOGY

Chapters 3,4,5 and 6 describe the level and quantity of technology being developed, and some enterprises resulting from the efforts of a few entrepreneurs. Each country has its special technology focus and all overlap in one field of biotechnology or other. It is not the intent of the following to repeat what is described in that chapter, but to summarize and focus on what will essential to establish a system that will adequately support the transfer of research results to market.

1.5.1 BIOTECHNOLOGY - ARGENTINA (Please refer to Chapter Three (3) for details.)

There is an increasing interest of private companies in biotechnology. Industry has become interested in biotechnology commercial applications to human and animal health, agriculture, animal breeding and food.
Thirty companies have been identified through the study that are offering biotechnology products that include a significant degree of development. Precise figures on the sales volume is difficult to calculate and possibly should be subject matter of future research project.

Biotechnology research groups are active in universities and other public institutions. There are at least 300 researchers plus support staff; these individuals are working on at least 100 different biotechnology related projects.

From the work that is being carried out, this study has identified at least thirty-five of the projects as novel that address a particular interest in the market.

From these, ten technologies have been identified as having the potential for company formation; some of the intellectual property (IP) resulting from this research and development is being patented. Investors in North America feel more secure when they have a tangible commodity such as patent that has passed through some form of professional due diligence.

An example of one of these projects is the biological control of the common house fly, work being carried out at INTA in conjunction with Biofarm S.A. The project is being supported

both by the government and by the company.

1.5.2 BIOTECHNOLOGY - BRAZIL (refer to Chapter 4)

The biotechnology community has been growing and it is expected that by the year 2,000, about 70% of the specialized work force will be focused on the biotechnology sector[23]. There are over 75 companies claiming to be biotechnology companies [24]. The various Bio parks that were develop have been generating the development of some of these companies. Bio Rio and Bio Minas are the two more established and successful biotechnology industrial parks working closely with universities and the private sector.

A project recently developed at Bio Rio used tissue culture techniques to develop sub tropic acclimatized fruit trees (apples).

Brazilian biotechnology industry is represented by ABRABI[25], and a series of state level biotechnology associations.

1.5.3 BIOTECHNOLOGY - CHILE (refer to Chapter 5)

Chile is a net exporter of agricultural products, fruits, vegetables, seafood and forestry products. These sectors have had a steady growth over the last few years, and has been adopting new techniques of biotechnology[26]. The national Committee on Biotechnology has been working in conjunction with CONICYT, and other funding bodies to provide support for basic research.
Most of the biotechnology activity in Chile is concentrated in plant and food sciences, followed by environmental research and human and animal health. There is a strong research effort being carried out to research and develop the potential of marine biotechnology resources and applications, including the search for new adhesives, chitins, chitosans etc.[27] The adhesive project, based on the study of how molluscs and other shell fish attach themselves to surfaces in the marine environment, may result in products that will aid the closure of open wounds in animals and in humans.

There are at least 37 separate laboratories pursuing research in plant/agricultural related biotechnology, and there are 685 members of the Sociedad de Biologia de Chile[28], not all in biotechnology; but this does show a level of life science activity present in Chile.

A number of smaller companies have been started by researchers and entrepreneurs; however, these are going through a myriad of growing pains, including of focused investments. Most companies have under 30 employees, only two have more than 100 employees[29]

Depending on the definition of biotechnology company, there is a range from about 15[30] to 30[31][32]

An embryonic association of biotechnology companies represents the interested parties.

.

1.5.4 BIOTECHNOLOGY - URUGUAY (refer to Chapter 6)

Biotechnology research is being carried out in the field of plants, animal health, diagnostic kits, agriculture and industrial biotech (enzymes).
There are seven public institutions carrying out research into biotechnology and another seven that are of the private sector that also conduct a level of research.

Past governmental policies have caused a credibility level among the public in favour of foreign technologies to the demise of national technologies. There are new efforts within Uruguay to try to stimulate national research and to provide support for the up-take of locally nationally produced technologies, products and processes.

1.6 INVESTMENT CLIMATE

Though there are differences among the four countries in terms of given investment barriers, it is the objective of the Mercosul treaty to create a Common Market that will allow the free movement of goods, services and factors of production, common external tariff, common trade policy in relation to third States and co-ordination of macro-economic and sectorial policies for the country members. This does include trade related fiscal and monetary policies as well as industrial and technological policy.
At the Summit of the Americas meeting in Miami 1994, negotiations started aiming at a free trade agreement by the year 2,005 among all the Latin American countries , the USA and Canada.

According to the agreements, the original member state investors will be ensured free transfer of their investments and any earnings.

The country members are making efforts to improve the foreign investment climate as these try to create a more market oriented economy. International businesses are mostly free to pursue direct investment, but there are a few exceptions.

There exist certain restrictions and protocols that must be followed in order to guarantee proper repatriation. Also, there are restrictions to investment in certain industries and fields. For instance foreign investment in biodiversity applications are controlled and development is limited to national bodies.

There are incentives, exemptions, tax grace periods etc. that are best addressed by specialists form each country, that may provide counsel on the best entry strategy to the Southern Cone.

As there are incentives so there are restrictions to investment, there is the question of

administrative non transparency, legal and administrative restriction on remittances.

The system is complex and in a state of flux.

But the trend is toward stabilization and reform of the economy and modernization. The Southern Cone countries welcome investment and are lifting restrictions. Foreign portfolio investment has been increasing over the last few years. This includes investments through stock exchanges.

Overall there should be no major barriers to investment in any of the four countries, or once within one country for that investment to be transferred to another member state.

1.7 VENTURE FINANCING

Each individual country report identifies a number of government sources of funding for research and research support. Some of these are stand alone, and others are a combination of government and the banking system. One will support the research, another will support human resource development.
There are capital and operating funds for universities and public institutions to establish laboratories, and there have been special funds established to address given development, for example, agriculture and forestry development, aquaculture or biodiversity.

When analyzed these funds are mostly directed towards basic research with some of the funding assigned to applied research. Governments have realized the need to support industry based research, or university - industry joint research programs. Funds, such as those provided by FONTAR in Argentina, Finep/BNDS in Brazil and CABBIO, a joint research and development program in biotechnology between Argentina and Brazil, do provide support for commercially oriented research. There is, however, no significant level of funding being allocated to development of the research results. Even though there have been some federal and state programs to assist the development of enterprises based on research results, there never appears to be enough funding, whether from the public or the private fund sources, to properly transfer research results into beneficial products for society.

Brazil, for instance, has received two sets (each for a five year period) of World Bank loans to develop research in selected scientific fields, including biotechnology; technology transfer and university-industry capability; in 1996 Brazil received a further loan to continue the development of this capability. The first two loan periods did not generate extensive activity in this field[(33)], but there was a definite change in the government's will and attitude by 1995.

For the effort expended to date, and the thousands of researchers carrying out their work over the last few years, there is a relatively small number of enterprises developed or in the process of being developed in the Southern Cone.

Though the Southern Cone has been trying to put its best face forward, the matter of fact is that research results are not being developed through a systematic methodology; nor are funds being made available in sufficient quantity and under specific objective and

management, in order to stimulate the development of university or public institutions research results. There are a few successes such as Biosidus, Gador, Bioschile,Biofil, Biobras, that have biotechnology products. Biosidus and Gador have large pharmaceutical parent company backing. Biobras has strong links to the federal government.

By any formula, rule of thumb or otherwise, there should be many more successful and visible biotechnology companies in the Southern Cone as based on the research monies available, institutions working in this field and trained researchers conducting the work.

There is a lack of financial instruments in the Latin America and more specifically, in the Southern Cone, able to support high - risk investments, and this has been identified as a major obstacle for the generation of new products and processes[34] from evolving technologies such as biotechnology and informatics.

One financial tool that has successfully driven developments in both North America and in Europe is venture financing (venture capital), and has been used successfully to stimulate business and develop research results into viable companies.

1.8 VENTURE CAPITAL (refer to Chapter 2)

Venture capital is a financing / investment tool. It is used to provide long term financing to support enterprises that must go through a range of growth activities; these activities range from seed investment for the development of research results into marketable technologies, products or processes, to the acquisition of on-going enterprises with products and technologies.
Venture capital is not a loan or debt but an equity in the enterprise. This is a more risky investment as compared to other methods of financing, such as a loan (debt). The venture capital addresses a very needed niche in the economy by taking equity positions in companies where there are often few if any assets that may serve as collateral as would be the case for a loan.

For certain enterprises that may only have research results, a patent application or the beginnings of a product, albeit with a significant market potential, venture capital may be the only source of financing that the new enterprise can be eligible to obtain.

Unlike loans, (debt financing) there is a further difference in this form of financing. That is, the interest shown by the venture capital firm in the positive development of the enterprise. This is one of the differences between venture capital and other forms of financial tools in that venture capital firms will offer management support and business experience that is not always evident or available in or to a new enterprise.

The management support may take various forms including direct assistance of the management and participation on the enterprise's board of directors.

1.9 VENTURE CAPITAL IN LATIN AMERICA

Each of the four countries were studied to determine if there was a presence of venture financing (capital) in that country; and if there was a venture capital industry, what were the areas of investment.
It is seen from the reports that the venture capital industry in Latin America as a whole is very small and suffers from mistaken identity in that, the traditional private investment and venture capital are usually considered one and the same; to date few reliable statistics have been kept to measure the venture capital activity and dispel its mistaken identity, and give prominence to this useful and versatile financial tool.

The world trends of globalization, domestic changes, technological advancements, greater availability of money looking for new and diversified forms of investment, and continued increase in small businesses, will continue to expand the world and regional venture capital industry.

Venture capital is being accepted as a way to do business and this is evident from the industry's growth in Canada and the United States.

The Dallas Texas company , Hicks, Muse, Tate and Furst, Inc. is scouring Latin America for deals; deals are being found, and a total of $500 million USD to date (company acquisition) has been invested; Hicks, Muse, Tate and Furst Inc. are building a $500 million USD fund specifically directed at Latin America. The majority of these funds will go into existing companies and not into emerging technologies. What this does demonstrate is the level of confidence of foreign investors in Latin America.

Advent International is another venture capital fund that has been aggressively seeking investments in Latin America since 1995. Their interest is open to any technology that would be of interest to their corporate investors among which are Monsanto (Agriculture, biodiversity, bio control) and Hoffman La Roche (pharmaceutical, nutroceuticals, vitamins)[35]. In general any biotechnology related investment will interest this venture capital group. Advent International currently has 2 billion USD available for investment.

An English based group has established the Beta Fund[36], whose focus is the developed countries of the world, with a sub fund established, called Beta Carib, managed by Havana Asset Management[37] in Havana, Cuba. This fund is mainly directed at Cuba, and in that country Beta Carib has invested in biotechnology originating from research institutions in Cuba.

1.10 CANADIAN VENTURE CAPITAL COMPANIES AND LATIN AMERICA

From a hand full of companies and families in Canada and the United States, the venture

capital industry has grown over the last 35 years to about 650 firms with funds totaling over US$40 billion[38].
The development and evolution of labour sponsored funds, pension funds etc. are impacting this industry.

A number of meetings and interviews were conducted with Canadian venture capital companies, security houses and banks.

Canadian banks such as the Toronto Dominion and Canadian Imperial Bank of Commerce - Wood Gundy are only now entering into the field of venture capital in Canada and are much more at home with loans than equity. Both banks were not interested in participating in any Latin American venture capital fund. The Royal Bank, through their Life Sciences and Knowledge Based Industries division indicated an interest in the development of this biotech venture fund, they were not exactly positive as how this could be accomplished.

Scotia Capital Markets / ScotiaMcLeod Inc., indicated interest with reservations; and these reservations stemmed from their internal analysis of the economy and the politics of the region as well as the foreign investment limits imposed on Canadian funds by the Canadian regulations.

A survey was carried of the members of the Canadian Venture Capital Association members, it was found that most have very specific areas and territories of focus for their investments. Some that do invest in Latin America, invest in established companies or in mining.

In a meeting with a senior vice president of Edper Brascan, however, there was an interest, particularly because of Edper Brascan's wide portfolio of investments in Canada, abroad and particularly in Brazil. They indicated an interest to learn more about the possible investments opportunities stemming from emerging technologies.

Also in a further conversation with the Managing partner of Markdale International, a relatively new investment / management company, it was clear that there was interest in the Southern Cone Venture Capital fund, in biotechnology and in the concept of research results to development and to market.

McClean Watson Capital of Toronto, specializes in high tech investments, both in the biotech and information technology fields. They are not investing in Latin American opportunities at this time, but indicted an interest to review any opportunities. In conversation with McClean Watson it became obvious that they have many opportunities in which to invest from North American sources. Sources, culture, politics and economics that they understand and have worked with in the past.

One key element that was cited by all the Canadian venture capital companies and banks, was the fact that venture capital is done through extensive networking - this networking is a major handicap for any Canadian venture capital company attempting to develop or manage a fund in Latin America. This does not mean that some of these companies are not slowly

working on the development of the appropriate networks.

It was also of interest in a recent meeting with Innoven Partnaires S.A., of Paris, France - venture capital management company that specializes in health, though not Canadian, to note a very strong interest in the biotechnology fund. They do already have investments and investors from Argentina.

It appears that the Canadian venture community is focused and still overwhelmed by the opportunities locally available in Canada. Europeans and Americans are going much further afield and are demonstrating more aggressive investment behaviors.

However, of the numerous conversations only one venture capital group, based in Calgary, were extremely puzzled by the fact that anyone would want to invest in or would wish to form a venture capital fund for emerging technologies in Latin America. This is a small group that has its "hands full" with local investment opportunities and is quite satisfied with the potential represented by their Canadian market.

1.11 LATIN AMERICA

Similar funds are appearing in Chile and in Brazil, where attempts are being structured to invest the funds' monies in growth oriented investments, very few investments, however, are being made in high risk investments represented by venture capital.
Brazil has a number of venture capital funds, all are relatively small and are being used to invest in established industries with occasional foray into information technology. This occasional foray does show that there exists a certain willingness by fund managers to venture into emerging technologies.

Two venture capital funds, Pernambuco S.A. and Companhia Riograndense de Participações have been investing on occasion in these " high tech" ventures.

Both funds operate with both private and public money and it is common for state or federal banks to be part of the fund including development banks, such as BNDS [(39)].

There is a certain awareness of the need of further capital to develop emerging technologies. In the state of Santa Catarina, southern Brazil, a structured effort is in place to develop a venture capital fund; This fund is based on the model used by Companhia Riograndense de Participações (please refer to the Brazil chapter).

At least ten funds have been established in the last five years in Chile that identify themselves as risk capital (capital de riesgo). The funds total about US$100 million and are directed to investment in small and medium sized enterprises and not towards the development of research results or novel technologies directly.

Ventana Global Limited of California that manages a venture capital fund formed (1997) jointly with Fundacion Chile and FOMIN/BID, is introducing a new concept to the region.

The concept is that of a gatekeeper of Chilean technologies and technology companies with a view of internationalizing the opportunities.

Different government funds exist to assist industries to develop an emerging technology, for instance FONTAR[40] which is essentially a loan at relatively low interest rates over a long period. FONTAR gives four years of grace, and a further five years to repay the loan (refer to the Argentina chapter). FONTAR has other funding and pay back mechanisms in addition to the above. Most developments of emerging technologies or of biotechnology companies, have been funded by the private sector and parent companies. Three examples of biotechnology companies funded in this manner are Laboratorios Gador, Biosidus and Technoplant.

In Uruguay there are sources of financing offered by groups such as, the " Corporación Nacional para el Desarrollo" (CND), the " Corporación Interamericana de Inversiones" (CII) and S.A. Indesur.

CND and CII finance primarely small and medium sized enterprises and do not have an investment line directed at emerging technologies. S.A. Indesur will invest in biotechnology companies but at a low invetment (U.S.$30,000). (refer to the chapter on Uruguay)

Potential or existing companies either must have their own private source of funding (angels) or mortgage their personal assets in order to obtain loans to carry out the development of either technology or the business.

It is true for most investors that the one who has seen the opportunity is already in field, whether in Europe or in North America. This is not the case in the Southern Cone. The weakness in the Latin American business, academic and professional investor circles that impinges on the demand for venture capital, is the lack of experience with and exposure to venture investing in emerging technologies. This has been aptly described by Pitch Johnson[41] as follows:

" Let"s picture Latin American venture capital as a young, hopeful gaucho with a new voter registration card and a guitar, singing songs of seduction to an unreceptive capital market maiden who is looking for a bigger operator."

There are still many opportunities available in the Southern Cone that do not represent an added de gree of risk that is perceived to accompany emerging technologies.

1.12 INDUSTRY COMPREHENSION

Companies seeking funds may not comprehend the advantages offered by venture capital.

Here there is a two directional lack of comprehension, one is the investment seeker's lack of knowledge, understanding and comprehension of the advantages offered by venture capital,

and two, the lack of knowledge, of experience and management expertise by the investors with this tool of financing.

A further point. Traditionally the venture capital industry has relied on its networks of contacts to find clients. The industry does not usually advertise, hence few know of its existence. In Canada and in the United States, for instance, there has been a push to the establishment of brokerage houses that match investors to enterprises. This in turn implies knowledge of the existence of brokers and the brokers' knowledge and evaluation of the enterprises. This system does not exist in this format in the Southern Cone, and there is not investor network for biotechnology.

1.13 SOUTHERN CONE- BIOTECHNOLOGY FUND

1.13.1 OBJECTIVES

The venture capital firm's objective is to have the enterprise grow and succeed, thus making an attractive if not substantial return on the inve stment. The returns may be high, but the losses can also be substantial due to the nature and uncertainty of the investment. Hence the professional venture industry's profitability hinges on major successes to offset the inevitable losses. The venture capital firm must not only be able to evaluate the technology in what ever form, but also understand and know the market potential and the cost versus benefit of getting that technology to market. This in itself has sprouted new companies whose sole functions is to ensure the availability of adequate information and analysis related to product development; one such company is ReCap[42].

The venture capital industry is able to attract funds that it needs for the investments. This industry does not compete with the traditional financing sources and it has its own niche and portion of the investment community that is attracted to the high risk and high potential that venture capital represents.

1.13.2 STRENGTHS

- The Southern Cone, has made in roads to harmonization (internationalization), lowering of tariffs, removal or decrease of investment restrictions, control of inflation, privatization, intellectual property protection, incentives to research and development, education, stimulants to local industry, especially in novel technologies such as biotechnology and information technology;
- Importantly, in roads to provide stimulants to universities and research organizations to pursue technology transfer and closer ties to industry.
- The Southern Cone is directing a large effort to the field of biotechnology.
- It does have the infrastructure for funding support for human resource development.
- The scientific human resource element in general is well developed.
- There exists a strong assimilation of scientific techniques and abilities.
- Some companies have been spun out universities or research institutions, based on the

research results developed at these facilities.

- Some limited private funding has been available to develop the research results into products.
- There is a quantity of good research in areas that may have a commercial potential; this potential is evident in all the areas of biotechnology.
- There are foreign and regional investors that wish to channel and place their money.
- As is evidenced by the Mercosul(sur) there is a political will to change, adapt and internationalize the region.
- There is an emerging will at the university and public institute management level, beginning to want to understand university-industry relations.
- Universities and public institutions are looking for new revenue sources
- Governments have identified universities and institutions as part of the national resource and wealth generating process.

1.13.3 WEAKNESSES

- Intellectual property (IP) protection and enforcement is weak.
- There is a lack of confidence in the IP system and cynicism as to enforcement and validity of the protection.
- Intellectual property is as yet not broad enough to cover many biotechnology inventions.
- There is a question of IP confidentiality.
- It will be costly to take IP cases through the courts.
- The courts in the past have been very slow.
- Biotechnology research requires further R & D stimuli in order to be in the forefront.
- There are "me too" research projects and biotechnology companies - these will not attract venture capital.
- The University industry interface is embryonic.
- Universities are moving slowly to change invention policies.
- Governments are not moving fast enough to help the universities.
- There is a lack of professionals for technology transfer, technology development, technology commercialization.
- There is a lack of technology based company management.
- There is a lack of knowledge as to what is needed to develop research results.
- Knowledge of financing tools is required.
- It is not known what will work for the region, in terms of spin off companies.
- There is a hint of a venture capital culture.
- Investors do not fully understand venture capital.
- Those requiring investment do not understand venture capital.
- Universities and business schools are not prepared for university research results spin offs.
- These schools are not yet versed in financing tools such as venture capital.
- Research must be carried out to determine the best model to use, adapt or develop.

- Why is there not a venture capital fund operating for biotechnology opportunities?
- Competition from Europe and USA.

1.13.4 OPPORTUNITIES

- There exists a large scientific biotechnology base in the Southern Cone.
- The research and research results have not been evaluated from the venture capital investment perspective.
- Significantly large pool of untapped R & D results potential.
- Significant technology base.
- Significant market within the region for the spin-off's products.
- Significant market outside the region in the tropics and subtropics.
- Existent funds address the needs of established companies and not for start ups, thus there is a good market opportunity for one or more biotechnology venture capital funds.
- Government policies are favorable to investments and appear that these will continue to be so.
- Government policies and World Bank Loans indicate a strong desire to stimulate university and public institution research and technology transfer.
- Legislation is favoring start up companies.
- No apparent restriction to the creation of a biotechnology venture fund.
- Return on investment can be substantial.
- A biotechnology venture fund would be a pioneering, ground breaking endeavor.
- Availability of investors.

1.14 RECOMMENDATIONS

The recommendations that follow were developed and compiled as based on each of the country reports presented in the subsequent chapters. Some of the recommendations or conclusions in the reports were the same, some of the recommendations were unique, and some stemmed from the overall view and knowledge of the region. The recommendations are the following:

Next phase

- There exists significant interest and need in the Southern Cone to warrant proceeding to the next stage of preparation for the creation of a venture capital fund that would focus on emerging technologies, specially biotechnology. There are research institutions, there is research funding, there are highly trained researchers producing good work. The economy is stabilizing and growing, laws and regulations are being

changed to benefit venture capital investments.

- This study has identified two distinct directions, that are not necessarily mutually dependent, that the next phase will follow. The first, pertains to the need to carry out research that will address the aspects of the business, politics, social culture in terms of technology transfer / development / commercialization / management in the region. That is, the development of a university research and training program that will complement the development of the venture capital fund;

and the second direction addresses the actual biotechnology fund formation and implementation. The actual fund formation and implementation may lag behind the research and training component. There is the possibility that the venture capital fund for biotechnology may take on a life of its own once the business community and investors understand the process and opportunities present in the Southern Cone.

In either case the university research and training component will be an integral part of the process.

- Develop the terms of reference for the proposal that will scope out the university research and development programs, set a time frame of no later than mid of June 1998.
- Some universities in the Southern cone have indicated interest in hosting a research and training program; develop with them the proposal and its components that will address venture financing and have as its objective the development of a venture capital model that addresses the needs of the Southern Cone.
- Establish a program to research and develop an appropriate curriculum for the preparation and support of entrepreneurs and managers. The schools of business and technology development / management have begun work in this field and maybe interested in linking with Canadian institutions to jointly develop the research and curriculum.
- Research and establish programs that will prepare academics and entrepreneurs for research result development, financing and commercialization. Technology transfer is not readily accepted by academics, since the route appears to go against university tradition, in reality technology transfer enhances the academics professional and moral goals.
- Establish programs that will develop high caliber technology transfer specialists for the research institutions that understand the sensitivities of both academia and the business world, as well as have a solid grounding in the science.
- Establish the training of university-industry liaison personnel.
- Establish a collaborative exchange program between certain participating Canadian universities and counterparts in the Southern Cone. To date, institutions in the Southern Cone and in Canada have indicated strong interest to work together on the project, these links should be developed and firmed with contractual agreements.
- Partner Canadian universities that have strong business schools interested in Latin America, to work closely on all aspects of the research, including the revision and adaption of business models as well as collaborative development of appropriate

curricula

Government

- Search for and obtain matching or complimentary funding from the Southern Cone. Federal and State governments have indicated that universities are part of the economic engine of countries, and that these governments want to develop the university - industry link so that both utilize the others strengths. There are funded programs for this purpose in the region.

- Work with the region's governments to establish a biotechnology policy on the commercialization of research results. Biotechnology has its own peculiarities and it is misunderstood by the general public; a flow of information describing biotechnology should be part of the commercialization strategy.
- Work closely with all levels of government to ensure the support and development of the venture capital research programs, demonstration projects, curricula development and follow through. Local (federal, state and municipal), governments will be a key element to the development of the programs, and hosts universities will be knowledgeable as to how best carry out this process.

Promotion

- Promote and support two seminars/workshops, one in Brazil and the second in Uruguay to begin the process of research, orientation and program development on the use of venture capital for the financing of start up companies based on biotechnology research results. Workshop facilitators should be both from the region and Canada, from academia and from the business community. Invitations to government policy and decisions makers should be made with the possibility of their participation in the seminar/workshop.
- Promote and assist in the development of an investors club that would have various purposes,

one, to promote the concept of investment in university research results;

two, form a nucleus of investors than can learn about and jointly fund investment opportunities from university research;

three, become familiar with the opportunities at universities,

four , serve as mentors for the entrepreneurs and newcomers into the

investment community; and

Five, serve as a forum for networking. Networking has been key to the success of venture capital in Canada, the USA and Europe.

- Similarly, promote the establishment of an entrepreneurs club in conjunction with the local participating institution, that would serve as a meeting place for the sharing of ideas, MENTORING and most importantly networking.

Demonstration

- Establish a demonstration project, hosted by an institution or university, such as ISAD of PUC in Curitiba, Brazil, that would function like a " virtual" incubator for a university spin off. The program for the project would have to be designed and would be in itself a research project for the business school.
- Review and recommend the benefits of establishing a Latin American Centre for Tecnological Innovation that would have strong linkages to the R & D and finance, production and management.
- Hire a coordinator for the development of a business plan for the biotechnology fund.

Emerging technologies

- From the technologies identified select a short list and from this short list of technologies conduct an in-depth evaluation of potential research results identified, and select at east one for the virtual incubator research program.
- Evaluate all the short list of technologies identified by this study, and begin to interest the researchers in the commercialization of the research results.

Fund Development

- Work with the Canadian investment community, pension funds, labour funds, established venture capital companies, to assist in the development of the business plan.
- Carry out due diligence on the formation of a biotechnology fund, addressing the necessary questions whose answers will decide the fate of the biotechnology fund.
- Identify a champion in Canada and in the Southern Cone for the biotechnology fund.
- Do not limit the definition of biotechnology - allow the market forces do the selection.

Fund Location

- The head office for the biotechnology fund should be located within the region, in order to have facilitated and quick access to technologies and companies in development. Venture capital is strongly based on networking capabilities of the fund managers and analysts, it is recommended that a central location, such as Montevideo, be established as the location for the fund's head office. The fund will need to have one or more country representatives living in each of the four countries, hence satellite offices in Brazil, Argentina and Chile. Due to the nature of venture capital financing and the close ties that the fund will have with each project and each investor the presence of the fund within the region imperative.

1.15 CONCLUSION

Each of the four country research studies concluded the need for funding beyond the research at universities and research institutes.

It was unanimously agreed that there are technologies, products and process that could be transferred to the public and are not, due to the lack of timely and sufficient investment.

However, it would be disastrously insufficient to provide investment but not the know how to develop a company based on emerging technology from a research institution, nor the know how to evaluate the research results for the market need and potential.

It was also recommended that there is a need for research to be carried out into the technology transfer, development, commercialization, financing, entrepreneurship and management of research results start-ups. This research is needed in order to develop the best methods and models based on the Southern Cone's perspective, and specific cultural needs.

There is no lack of a " critical mass " of biotechnology available in the Southern Cone. Brazil and Argentina are the two largest contributors to the biotechnology research Since it is the Southern Cone that is the focus of this study, individual countries should not be a concern at this stage and the four countries of the Southern Cone should be viewed as a single contributor of research results and potential. When viewed from this perspective, there is significant good research being carried in biotechnology that is generating and will generate transferable research results.

It has become obvious that there is an abundant amount of university level research that needs to be carried out in the field of technology transfer, development, commercialization university-industry collaboration, entrepreneurship, spin-off management - particularly as it specifically applies and adjusts to the Southern Cone traditions, culture and needs. In addition, there is a need to research venture capital and its application to the Southern Cone; this financial tool will require adjustment to the Southern Cone investor market.

The governments concerned, their policies and directions, and the economic

internationalization of the Southern Cone have established a very strong basis for the next step in the development of a biotechnology venture fund. When viewed from a business approach, it is clear that there is a market and there is a supply; a few tools are required and these are available and adaptable or can be readily made. What is required is to point in the direction.

OUTLINE OF THE IDRC PROPOSAL ON VENTURE CAPITAL - SOUTHERN CONE

Background

The Feasibility Study has produced a number of recommendations as a result of the studies carried out in each country and for the region.

One recommendation is that, IDRC proceed to the next stage of the venture capital project. There is a significant biotechnology research and development activity in the Southern Cone.

Existing R&D projects, results and the start-ups indicate a growth in the biotechnology field in this region over the next good number of years. There is a critical mass and need that justifies the establishment of a venture capital fund for the Southern Cone but the results of this activity have been encountering and continue to encounter difficulties in attracting and obtaining investment to fully develop the potential opportunity.

There are a number of reasons for this inability to adequately finance the commercial development of R & D results. One of these is the lack of new financial tools, such as venture capital, that will not only invest, but stimulate and mentor the development of new companies. Latin America has traditionally depended on personal, family or acquaintance money, sometimes loans from banks. This money was most often applied to understandable and existing enterprises, biotechnology is beyond the realm of most of these investors scope of interest and knowledge.

Another, reason, is the lack of knowledge of venture capital by both the financial community and the one seeking investment. There is need for a learning activity to occur for both sides.

It is insufficient to say that venture capital will work as it works in Europe or in North America, there is a definite need to research the different venture capital models being used around the world; there is a need to research the investment culture of the Southern Cone and see what model may apply or how any model may be adapted and modified to reflect the needs of the region.

But there is a more fundamental reason. There is a lack of professionals and policies that understand the full range of disciplines required to develop a research result into a product

and/or a company. There is a strong need at the universities and public research institutions to learn about technology transfer. There is a need to understand technology development, technology commercialization and management of technology intensive products and companies.

For a successful venture capital fund to operate it does require not only the investors and the abundance of technologies, but importantly the availability of personnel trained in the many steps of technology transfer, development, commercialization and management.

Outline

There will be a number of components to the next phase of the venture capital project, these are:

- Research and analysis
- venture capital
- technology transfer, development, commercialization and management
- S & T policy issues, at universities, at the different levels of government, at research centres both private and public.
- Funding sources that would match the R & D in this field of research
- Collaborative work within the region and with Canadian universities and research centres
- training
- exchange and apprenticeship programs

- professors and graduate students from the Southern Cone to study and do research at Canadian unive rsities and research centres.

- development of curricula for graduates and undergraduates

- seek innovative means to support (fund) work in venture capital research and training field

- develop intensive courses open to all particularly to the investment and entrepreneurial sectors.
- Diffusion and promotion
- Organize and conduct at least one major conference to provide information on venture capital
- In addition to the networking, sponsor special regional events to begin to attract investors, incubator seminars, opportunity analysis, technology showcase
- Promote at least one seminar at the Canadian university or research centre that would address the opportunity of the Biotechnology Fund in the Southern Cone.
- Demonstration
- Each of the two hosts to create a virtual incubator.
- At each of the host universities, organize and give impetus to the formation of a network, such as the Southern Cone Venture Capital Network, with chapters in each country, and open to all interested parties - academics, government, legal,

entrepreneurs, investors etc.

Research and analysis

Research and analysis to address the business, political, and social culture of the Southern Cone in terms of technology transfer, development, commercialization and management.

- carry out collaborative work with Canadian universities and institutions should be conducted in at least two locations, one in Brazil and the second jointly shared between Uruguay and Argentina. The Pontifical Catholic University of Curitiba, through their Institute of Business Administration and Development (ISAD), has indicated a very strong interest in being the Brazilian host for the project.

The University of Uruguay, which is developing a new technology start up incubator has indicated their interest in the project.

Three Canadian universities have already indicated interest in participating in this project.

Establish a research and analysis program that will address the issues of technology transfer and venture capital in the Southern Cone. Focus on biotechnology as the base source of opportunities.

Establish a research program for the development of appropriate curriculum and courses that will address the needs of the academic, entrepreneurial and private sector community.

Collaborative research work

Rather than transplanting models from countries where venture capital is working, it will be needed to study these models as well as the needs of the Southern Cone and construct the appropriate model for the region and biotechnology.

A number of Canadian universities and research ventures are already familiar with Latin America and can decrease the time of learning curve.

In addition, there is a strong need to go beyond the just venture capital, it is required that all aspects of the development of research results into products or companies be addressed and, further, appropriate curricula be developed to enable those interested in this field to become well trained, aware and oriented; and begin to assure the success of the biotechnology fund in the Southern cone.

The program to be established should incorporate the training of individuals in Canada on short course at the Canadian host university or research centre.

Diffusion and promotion

Since venture capital is a relatively novel concept in the Southern Cone, and Southern Cone biotechnology is nearly unknown, it will be necessary to structure and follow through with appropriate means of bringing the information to the concerned parties.

That is inform, the academics, the policy makers, administrators, the technology transfer personnel, entrepreneurs, regional investors and Canadian investors in the potential of the region and the use and benefits of venture capital.

It is suggested that at least one major conference/workshop be held, preferably two, one in Brazil and the other in Montevideo, that would bring the key players together to learn about and discuss venture capital financing for the development and commercialization of research results coming from universities and research centres in the Southern Cone.

This would be the first such conference ever held in the Southern Cone.

The conference would address all the aspects of the process ranging from the university and research centre to S&T policy, to human resource development, research needs, critical mass of technologies, venture capital and other forms of financing.

Established networks within the Southern Cone that should be used to provide added diffusion about the Fund, networks such as CamBioTech, The Simon Bolivar Program, CABBIO.

The Canadian host university should in itself hold a series of mini seminars or in conjunction with an interested Canadian investor or interested private sector company, such as a venture capital company, a bank, fund or law firm, on the formation of Venture Capital Fund for the Southern Cone.

Interest in the Fund should be developed in both hemispheres.

Demonstration

One of the strong advantages of venture capital companies beyond their ability to provide financing and technical analysis, is their network of contacts in all sectors.

It is suggested that in each of the two hosts centres of the Southern Cone that a network be developed; through a series of meetings chaired by the host centre, it will be possible to bring together those indicated and interested from the community. It will be required to identify a Champion for the building of these networks that will eventually work towards the formation of an association.

It is envisaged that one network could be established for the Southern Cone that would represent the interests of funding and developing university and research centre research results..

This could result in the Southern Cone (Mercosul(r)) Venture Capital Association (

Network).

It is required to begin to show the steps involved in developing a research result into an actual product and/ or company. It is suggested, and already agreed by the potential host universities in the region, that a " virtual incubator " be created that will select, work with, accompany a technology (research result) and eventually attract investment and follow through.

The virtual incubator would be under the local host university.

There are existing physical incubators that have focused on various technology sources in each of the two regional host university cities. The follow through on the virtual incubator would have added benefit from the on-going support of such an incubator in conjunction with the host university.

Coordination

There is a substantial list of people, entities, tasks, activities and administration that must be carried out in conjunction with this project.

An arms length, Canada based company (consultant)should be contracted as part of the project that would understand the project, the process, the players, the stakes, and would be able to provide the input necessary and structure the networking necessary for this project.

The company would work very closely with IDRC and the host universities/research centres in both the Southern Cone and in Canada.

Part of the work of the company would be to work with the host universities/research centres to develop the overall proposal to IDRC.

Part of the company's work under project would be to find and attract matching funding and investment for the project and fund.

A similar consultant should be contracted under the project that is familiar with process and the region, that can be the local liaison for the Canadian company to ensure that difficulties and problems are resolved as quickly as possible, and assist in the coordination of activities and tasks.

This consultant and company should also be involved in trying to obtain additional funding support in conjunction with the host universities/research centres.

Timetable

The feasibility project has generated interest in both the region and in Canada. Some in roads have been made to interest both regional and Canadian hosts for the next phase of the

projects.

The project proposal stage should begin in May of 1998, partners in the project should be selected by the end of May, with a detailed design of the project available by the beginning to mid August with a start on the project by the first week of September.

A meeting of all the project participants should be held at the latest by mid June, where the design of the overall project will be carried out.

Christopher M. Ostrovski
President
Technology Partners International Inc., Toronto, Canada

FOOTNOTES:

1. David Conklin, " Latin America: Assessing the risks ", Globe & Mail Special Supplement, Friday February 13,1998, Toronto
2. Joachim Bamrud, Special Report - Alliance for Trade, 1997, " Latin America's New Commercial Opportunities - Setting the Agenda", Latin Trade, May 1997.
3. Christopher M. Ostrovski and D. Joseph Irvine, " Technology transfer from University to Industry: Challenges and Opportunities ", University of Guelph. Winter meeting of the Licensing Executives Society (LES) U.S. - Canada, Ottawa.
4. J. Andre Potworowski, " Accessing University research, The Experience of Canadian Industry ", March 1989, IDRC Manuscript report 210e.
5. Christopher M. Ostrovski, " University-Industry Collaboration - R & D and Technology Transfer " paper prepared for the XIII PADCT ((Brazilian) Scientific and Technological Development Support Program of CNPq (National Research Council)) meeting, December 1995, Rio de Janeiro.
6. Comité Argentino -Brasileiro de Biotecnologia, (The Argentinian-Brazilian Biotechnology committee)
7. Royal Bank of Canada, Trade Views: Report on emerging economies, Volume 2, Number 4, July 1996.
8. Conselho Nacional de Desenvolvimento Científico e Tecnológico
9. Global Finance, November 1997, "Piling into Brazil" by Catia Augelli and Bill Shepherd
10. Consejo Nacional de Invstigaciones Científicas y Técnicas
11. Agencia Nacional de Promoción Científica y Tecnológica
12. Empresa Brasileira de Pesquisa Agropecuaria
13. Consejo Nacional de Investigaciones Científicas y Técnicas
14. CABBIO, Centro Argentino -Brasileno de Biotecnologia
15. CNI "Conselho de Política Industrial e Desenvolvimento Tecnológico - Desenvolvimento Industrial Através da Transferência de Tecnologias Emergentes ", Rio de Janeiro, August 1994, Brazil

16. Skoknic, Milenko, Counsel General of Chile in Toronto, and head of ProChile for Canada; " The Chilean Perspective " Canadian Council for the Americas Seminar " Business and Investment Opportunities - October 16, 1997, Toronto.
17. "Atraindo a Inteligência: O início de um processo" Reflexões e Debates da I Conferência Brasileira de Ciencia e Tecnologia - Boston, Massachusetts (EUA) , Conferências Brasileiras de Ciência e Tecnologia, Ministerio das Relações Exteriores (MRE), Departamento de cooperação Científica, técnica e Tecnológica (DCT) Brasilia, 1997
18. " Proceeding of the Science and Economic Development Seminar - 24 and 25 September 1996, King's College London, Co edited by Felipe Fortuna and Giovana Costa, Printed by the Brazilian Embassy in London -Ministério das Relações Exteriores (Itamaraty)
19. Universidade Federal do Rio de Janeiro
20. Robert M. Sherwood, " Intellectual Property Systems and Investment Stimulation: The Rating of System in Eighteen Developing Countries ", IDEA, The Journal of Law and Technology, Franklin Pierce Law Center, Vo.37, No.2 Page 261, 1997.
21. Personal communication with Robert Sherwood. June 1997.
22. World Intellectual Property Organization
23. Antonio Paes de Carvalho, " Biotecnologia", page 19, Ciencia e Tecnologia no Brasil: a Capacitação Brasileira para a Pesquisa Científica e Tecnológica, Fundação Getulio Vargas, Editora, Rio de Janeiro, 1996.
24. Latin American Directory of Biotechnology: Brazil, ABRABI, IPT, IICA
25. Associação Brasileira de Biotecnologia
26. Christopher Ostrovski, Technology Partners International Inc., " Analysis of the Biotechnology Opportunities in Latin America", Industry Canada report 1993.
27. EuroChile Workshop Proceeding, " Biotechnology in Chile Today, An Entrepreneurial Perspective", held in Santiago on November 22-23,1993, organized by the European Community-Chile Business Foundation (EUROCHILE). Paper presented by Dr. Rafael Vicuna, " Biotechnogical research in Chile", Page 11.
28. Sociedad de Biologia de Chile, March 10 ,1998
29. EuroChile Workshop Proceeding, (as # 21)Paper presented by Dr. Arturo Yudelevich, "The biotechnology Industry in Chile", page 21
30. EuroChile Workshop Proceeding, (as #21) Paper by Dr. Arturo Yudelevich, BIOS Chile, " The Biotechnology Industry in Chile", Page 21.
31. Workshop Proceedings, " Biotecnologia en Chile, Oportunidades de Innovacion Tecnologica " August, 1997, Santiago Chile, CamBioTec. Paper by Dr. Lionel Gil y Carlos Irarrazabal, Faculty of Medicine, university of Chile," Estado Actual de la Biotecnologia en Chile".
32. Directorio de Empresas Biotecnologicas - Chile, 1998, CamBioTec, Canada-Latin America Initiative on Biotechnology for Sustainable Development.
33. The author was an invited speaker for the evaluation of the technology transfer project and for proposal preparation for the third loan. Brazilian Ministry of Science and Technology, XIII PADCT GEA meeting, December 1995, Rio de Janeiro.
34. Soleiro, Jose Luis; Latin American regulatory Framework for Biotechnology, Technology Management Consulting Firm, Mexico, 1995
35. Advent International Corporation, Boston MA; profile from Ventrue Capital Insights - firm profile "Advent Internacional" January 1998.
36. Beta Funds Limited, Peter Scott, Chief Executive, Fleet St. London U.K.

37. Havana Asset Management Limited, Simon Hodson, Chief Investment Officer, (registered in Nassau), Initial value of the fund was about US$ 30 million.
38. Johnson, Pitch; " Venture Capital Spans the Globe - Exploring international extensions of the American venture capital model ", Issue #20, The red Herring
39. Banco Nacional de Desenvolvimento, Brazil
40. Fondo Tecnológico Argentino, dependent on ANPYCT (Agencia nacional de Promoción Científica y tecnológica, Argentina
41. IBID. - Asset Management Company
42. Recombinant Capital, San Francisco, California, U.S.A.