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RESEARCH PROMOTION AND DEVELOPMENT WITHIN CONACYT/MEXICO

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RESEARCH PROMOTION AND DEVELOPMENT

It is a privilege for me to participate in this 33rd meeting of the PAHO/WHO Advisory Committee on Health Research in the name of Mr. Carlos Bazdresch, Director-General of the National Council on Science and Technology of Mexico (CONACyT).

I believe that the members of this committee were wise in recommending a meeting of this nature. This meeting will enable us to become more familiar with the policies and strategies for promoting scientific research that have been adopted by government agencies that support science and technology activities in the Region, with a view to exploring the possibilities for collaboration to augment the body of knowledge in the health field.

The participation of my country in panels of this nature is part of our effort to strengthen our capacity to engage in basic and applied scientific research by establishing and consolidating links with foreign institutions, primarily in this Hemisphere.

The Mexican government has a strong interest in promoting science and technology as a way of improving the general well-being of our population.

Today more than ever before, knowledge is an element of strategic importance for guaranteeing our future prosperity; it truly represents the best way to ensure our viability as a sovereign nation, to participate in world progress, and to apply research discoveries toward satisfying our basic needs.

The Mexican government is aware that it plays an extremely important role in this area, since public spending and incentives for private investment improve our ability to educate needed high-level specialists, facilitate our ability to obtain the supplies necessary to achieve scientific and technological progress, and make it possible to coordinate the activities of the various parties involved.

This conviction is expressed in the National Development Plan 1995-2000, which establishes a series of objectives concerning higher education, such as achieving affordable, quality teaching and bringing education in line with the current and future needs of society. The Plan also proposes to promote discoveries by increasing the number of active researchers, increasing the number of research projects, improving and expanding physical infrastructure, and promoting the education of young scientists.

This conviction is even more specifically expressed in the Science and Technology Program 1995-2000, the guiding instrument of the Federal Executive Branch on science policy, which was prepared with the generous cooperation and

full support of the Mexican scientific community, represented by its various organizations and advisory bodies.

- Transparency: “SCIENCE AND TECHNOLOGY PROGRAM 1995-2000”

The main objective of this program is to promote scientific progress in Mexico by increasing the number of grant recipients and specialized graduate-level programs, improving the quality of research projects and increasing their relevance to the problems of Mexico’s social and economic development, creating incentives for private innovation, promoting a real science and technology culture, strengthening the decentralization of academic activities, developing large-scale projects, and focusing on the development of emerging sciences.

In order to fulfill this objective, a number of public activities have been programmed in which the National Council on Science and Technology is an important participant.

I will now show you several indicators that will surely be of interest to you, and which will allow me to explain certain aspects of the context in which we are working, current conditions and trends, and the impact of our efforts.

- Transparency: “R&D EXPENDITURE BY COUNTRY”, “R&D EXPENDITURE BY SECTOR”, “R&D EXPENDITURE BY SOURCE OF FUNDING”, “FEDERAL EXPENDITURE ON SCIENCE AND TECHNOLOGY” and “BUDGET ADMINISTERED BY CONACYT.”

As you can see, although Mexico has still not been able to invest sufficient resources in science, major strides have been made in recent years, and this has had a definite impact on our scientific productivity, as the following tables clearly show.

- Transparency: “WORKS PUBLISHED BY MEXICAN SCIENTISTS AND ENGINEERS ACCORDING TO THE ISI” and “PATENTS APPLIED FOR AND ISSUED IN MEXICO.”

For almost three decades, the National Council on Science and Technology has devoted itself to supporting the substantive needs of universities and research centers, covering a wide range of fields in basic and applied science.

An essential aspect of our work has consisted of helping to increase the pool of scientists and technology experts by providing fellowships and loans to graduates of the Mexican higher education system who wish to pursue graduate studies at national or foreign institutions.

Graduate studies are fundamental to the educational process, because they allow education and research to be combined and coordinated in the best possible way.

Consequently, graduate studies are one of CONACyT's highest priorities, and almost half of its budget is earmarked for this purpose. This has enabled us to administer more than 18,000 fellowships this year that fully or partially cover students' tuition, living expenses and health insurance. This represents a 50% increase in the number of grant recipients since the start of the six-year presidential term.

- Transparency: "FELLOWSHIPS ADMINISTERED BY CONACYT."

I would like to point out that approximately 5% of our fellowships are issued to students in the biomedical sciences and health.

In recent years, not only have we increased the number of grant recipients, but we have also increased the value of fellowships by more than 60%. In addition, the wide range of extended payment and loan forgiveness plans allows borrowers to repay their country for a portion of the support they have received without ever needing to sacrifice their personal assets. This arrangement makes our fellowship program one of the most generous in the world.

Another key aspect the Council's work is managing the National System of Researchers (SNI), which recognizes outstanding and ongoing work by the country's most important researchers.

The SNI has two categories: Candidates and Researchers. The first category is made up of students in the last year of their doctoral studies and students who have recently completed their doctorates. The second category is divided into three levels.

The first level includes researchers with doctorates who have already demonstrated their productivity and are involved in innovative, high-quality research projects. The second level is made up of researchers who have consistently carried out research now recognized for its originality, whether as an individual or as part of a group.

Finally, the third level is reserved for researchers who have made important contributions to the fields of science or technology, the value of which has been recognized by the national and international academic community, and who have also done outstanding work as educators at the highest level.

In all cases, the SNI provides some degree of economic support to beneficiaries that allows them to devote themselves full-time to their work in science or technology, without having to become distracted from this fundamental task.

The SNI classifies its researchers into four knowledge areas: Area I, physical and mathematical sciences; Area II, the biological, biomedical, and chemical sciences; Area III, social sciences and the humanities; and Area IV, engineering and technology.

The National System of Researchers has 6,356 members this year, a 6.5% increase over last year.

- Transparency: “SNI RESEARCHERS, 1984 - 1997.”

Some 56% of these academics live in Mexico City, while the remaining 44% live in other states of the Republic. This is because the largest institutions of higher learning and scientific research are still found in the capital.

- Transparency: “SNI, CURRENT RESEARCHERS BY AREA, 1996– 997.”

However, our efforts to decentralize scientific and technological activities are beginning to yield results. This becomes clear when we notice that in 1984, when the SNI was created, 72% of all researchers worked in institutions located in Mexico City.

Since its beginnings, the National System of Researchers has grown at an average annual rate of 13.6%; during the period 1984-1992, the rate of growth increased rapidly, then declined, and has now begun to stabilize. This is because various procedures for admitting and retaining candidates have been tried. In addition, the criteria for area IV, engineering and technology, were made more stringent, causing enrollment to decline noticeably.

- Transparency: “SNI RESEARCHERS BY LEVEL, 1984-1997” and “SNI RESEARCHERS BY AREA, 1984 - 1997.”

This measure allowed the proportion of SNI researchers who hold doctorates to rise to 75%, whereas in 1992, when the number of researchers enrolled was greater, less than half held doctorates. Since 1992, membership has grown steadily at an average rate of 10% per year.

Researcher promotions and the resulting mobility are clearly reflected in the following diagram on researcher evaluations in 1997.

- Transparency: “SNI EVALUATIONS, 1997. MOVEMENT BETWEEN LEVELS. READMISSION.”

It should be pointed out that SNI evaluations are carried out by peers within the science and technology community, as is the case with every program

administered by CONACyT. This has enabled the academic peer review for researchers to become increasingly acknowledged and accepted for its impartiality and transparency.

It is certainly worth noting that more than 10% of all SNI researchers work in the field of health.

In addition, CONACyT manages a series of programs that have yielded rather satisfactory results, some 7% of whose funding is devoted to health-related disciplines. These programs were first begun within the framework of the Program for the Support of Science in Mexico, or PACIME, which was funded jointly by the Federal Government and a loan from the World Bank.

- Transparency: "CURRENT CONACYT PROGRAMS AND THE OBJECTIVES THAT THEY MEET."

The most significant achievements of the above program over a period of five years include: providing support for more than 3,700 research projects and more than 300 science and technology infrastructure projects; honoring 100 Mexican scientists of exceptional achievement with Patrimonial Professorships; and providing one-to-two-year research fellowships at national institutions to 1,000 senior foreign researchers.

Grants were also awarded to 130 researchers each year to make periodic visits to universities and technical colleges throughout the Republic; support was provided for more than 250 academics working to finish their doctorates; and more than 80 grants were awarded for the publication of textbooks.

It was also possible to attract 1,350 researchers who were residing abroad to almost 100 public and private national institutions of higher education, and more than 500 national graduate programs were placed in a registry that will allow them to receive broad support from CONACyT.

In view of our overall success, we are now making arrangements with the World Bank for a new loan, even larger than the previous one, which will supplement the budgetary efforts of the current Administration to finance a new version of the program that will vigorously promote technology development and consolidate achievements in basic science.

I would like to point out that a total of 1,012 research projects were funded in 1997, including individual projects, group projects, and projects for younger researchers, representing a direct contribution of MN\$500 million for scientific development.

In addition, to meet specific needs of great social relevance, we are involved in a jointly-funded effort with other federal entities whose purpose is to promote

research projects in fields such as health, the environment, agriculture and livestock sciences, and the information sciences.

This year, CONACyT renewed its commitment to help provide equipment for university and research institution laboratories through the Fund for Strengthening Scientific and Technological Infrastructure, which will allocate resources for this purpose.

We are also strengthening other very valuable programs, such as the repatriation program.

This program is intended to make it easier for universities and research centers throughout the country to hire Mexican researchers living abroad. The program provides receiving institutions with an amount equal to the SNI wages, benefits, incentives, and fellowships that a given researcher should receive according to institutional collegiate bodies and the program's own Evaluation Committee. The researcher's travel expenses and household effects, as well as those of his or her economic dependents, are also covered. Finally, researchers are given a relocation grant to ensure that their work is not interrupted.

In 1997, we allocated more than MN\$30 million to this program in the form of 230 grants. Among the program's benefits, it should be emphasized, is the fact that only 1% of the repatriates have returned to living abroad. Approximately 80% of repatriates have entered the National System of Researchers, constituting 15% of its current membership, and have made consistent contributions to research projects.

In addition, state universities and research centers have received 58% of these researchers, which significantly promotes the development of science and technology capabilities outside the capital.

- Transparency: "REPATRIATES BY LENGTH OF STAY IN RECEIVING INSTITUTIONS AND THE COUNTRY," "REPATRIATES IN TERMS OF SNI MEMBERSHIP," "REPATRIATES AND SUPPORTED RESEARCH PROJECTS" and "TOTAL REPATRIATIONS FROM 1991 TO 1996 BY RECEIVING INSTITUTION."

Turning our attention to another area, we have granted more than 250 Patrimonial Professorships since January, worth approximately MN\$30 million. So far this year, we have also financed 67 post-doctoral fellowships at a cost of more than MN\$9 million and 78 sabbatical fellowships at a cost of MN\$10.5 million.

The post-doctoral fellowships have proven a valuable way of ensuring that our scientists and technology experts remain informed about the principal world

research trends, while the sabbatical fellowships, for work in Mexico and abroad, have played an important role in enabling academics to travel.

We at CONACyT also hope to strengthen master's and doctoral programs in our country, through both fellowships and the Fund for Strengthening Graduate Education.

It is worth noting that this fund contributed MN\$50 million in support of 26 programs at 18 institutions last year. The grants are issued through institutions on the basis of a process of peer review, which is intended to confirm the academic excellence of the various programs that respond to the official announcement; this process determines whether the program should be included in the Registry of Specialized Graduate Programs. Each program must be reexamined every 3 to 5 years to remain in the Registry.

This registry was updated last year and now includes 455 programs, some 66% of which are master's programs and 34% are doctoral programs.

- Transparency: "UPDATED GRADUATE PROGRAM REGISTRY, 1996 - 1997"
- Transparency: "REGISTRY DISTRIBUTION BY AREA"

CONACyT has also established mechanisms for encouraging research institutions to disseminate knowledge more efficiently, for example, the Index of Mexican Science and Technology Research Journals. This index permits a more efficient use of the resources allocated to the publication of scientific articles and also helps to coordinate the various grant programs offered by the Council itself.

The Index of Mexican Science and Technology Research Journals has become an objective measuring tool for setting priorities in the allocation of funds. It has also yielded numerous other benefits, such as providing researchers with a way to make qualitative judgements about where they should publish their work, and giving institutions a reliable reference that can be used to evaluate their own publications.

In connection with the above, CONACyT periodically calls on organizations responsible for publishing Mexican scientific journals to submit titles they believe to be of international quality for consideration. The publications are rigorously evaluated by an academic committee that makes decisions based on well-defined general criteria for profile of the journal, the quality of its content, its impact, its periodicity, its regularity, and its coverage. In this way, the high caliber of the titles included is ensured, inspiring a virtuous circle in which each of the publications is esteemed for its merit, and at the same time, adds to the collective merit of all of the journals, which in turn, boosts the prestige of the Index.

During the most recent evaluation, which took place in 1997, 133 journals applied for inclusion in the Index, and 56 were accepted: 17 in the social sciences, 10 in

the human and behavioral sciences, 7 in biology, 7 in the physical sciences, 5 in health sciences, 5 in earth, ocean, and atmospheric sciences, 3 in the exact sciences, and 2 in applied engineering.

Another important aspect of CONACyT's mission is to decentralize research in science and technology in Mexico. To accomplish this, we have two tools that have proven to be very effective: the Regional Research Systems and the SEP-CONACyT Institutions System.

The strategy of the first of these is to decentralize decision-making, resources, and infrastructure, integrating and coordinating scientific and technology capabilities with the needs of the public, social, and private sectors in the nine regions that make up the system. As for the second, it is important to point out that 19 of the 27 SEP-CONACyT institutions currently in existence are located in 15 cities in the country's interior.

- Transparency: "REGIONAL RESEARCH SYSTEMS" and "SEP-CONACYT INSTITUTIONS SYSTEM."

Another of CONACyT's basic tasks is to establish ties between our scientific community and its foreign counterparts. In this way, we endeavor to increase international collaboration and open new channels for cooperation.

In keeping with the above, we established agreements early last month with Argentina, Brazil, and the Latin American Academy of Sciences (ACAL). Our agreement with Argentina concerned joint financing for applied research projects. It was also agreed to create a common fund—with an investment of US\$ 500,000—to support technology development projects and to participate in a joint fellowship program.

Similarly, we made agreements with Brazil on fellowships, publications, and exchanging evaluators of scientific and graduate projects. Finally, we signed a letter of intent with ACAL to grant to this body any facilities it might need to conduct its activities in Mexico, including the study of political science.

We also try to form other kinds of ties. We have become an important promoter of linkages between academia and industry, since we are aware that creating closer ties with the business community is the only way to create jobs, generate income, and satisfy the needs of society.

We believe that creating intersectoral alliances is the best, most innovative, and most creative way to take advantage of the full potential of the academic and economic spheres. We are convinced that promoting these kinds of alliances should not depend solely on the public sector nor on higher education and scientific research institutions. It is crucial that the private sector realize that

expenditures on education and science are long-term investments that nevertheless yield very high returns, and they must also realize that research institutions are economically viable investment alternatives.

Only with this conviction will national industry be able to obtain the technology inputs that it needs to compete internationally.

I would also like to note that private investment in research and development in the United States and Japan accounts for approximately 60% and 75%, respectively, of the total amount spent on R&D in these countries, while in our country the private sector contributes only 20%.

We are attempting to apply new strategies to compensate for the principal weakness of the Mexican system with regard to innovation: low demand for innovation on the part of companies, especially micro-, small, and medium industries, which make up the broadest segment of the business community.

Consequently, last year we revised and adapted the regulations and operating procedures of the Research and Development Fund for Technology Modernization (FIDETEC); the Academia - Business Partnership Program (PREAEM); the Incubator Program for Technology Companies (PIEBT); and the Fund for Strengthening Scientific and Technology Capabilities (FORCCYTEC).

These are only some of the many activities that CONACyT carries out in support of national science and technology policy, to which we dedicate all our efforts and commitment.

Our commitment has always been to design and implement measures that will enable the Council to make the most efficient use of its resources to fulfill the objective of strengthening Mexican science and technology. We have made substantial progress: currently, 93% of CONACyT resources go toward supporting science and technology, and only 7% is absorbed by administrative costs.

Among other areas, we have focused on enhancing academic review procedures. Now more than ever, review is an integral part of scientific endeavor; it forms an increasingly recognized and universally accepted principle for accomplishing the vital task of determining the best way to allocate the mostly public financial resources devoted to science.

These programs and projects are naturally part of a long-term social project and operate in an environment of scarce resources and growing demand for more practical applications.

Consequently, there must be a more rational distribution of financial support, and it is more important than ever that methodologies be used to accomplish this goal.

In large measure, the success of the various programs is determined by the information that is available about them. These programs must therefore be evaluated by a professional team capable of selecting programs that are amenable to preventive and corrective suggestions. To be approved, projects must clearly state how they are going to achieve the objectives that have been proposed, as well as their beneficial effects in terms of producing highly-skilled personnel.

We must recognize that many programs do not perform as well as expected, in spite of initial expectations and appearances. In view of this fact, evaluation procedures currently form the basis of all of our policies at the National Council of Science and Technology.

With this attitude in mind, the road to our mission's success is becoming clearer. I am confident that our capabilities can be greatly increased by cooperating and participating in exchanges with other Pan American organizations, such as the ones that made this meeting possible. We should therefore applaud the efforts that crystallized in this event.

Thank you very much.