PAN AMERICAN HEALTH ORGANIZATION

ADVISORY COMMITTEE ON MEDICAL RESEARCH

FOURTH MEETING

14-18 JUNE 1965
WASHINGTON, D.C.

BIOMEDICAL RESEARCH POLICY IN LATIN AMERICA

STRUCTURES AND PROCESSES

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Ref: RES 4/6B
19 May 1965

PAN AMERICAN HEALTH ORGANIZATION
Pan American Sanitary Bureau, Regional Office of the
WORLD HEALTH ORGANIZATION

WASHINGTON, D.C.

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IN LATIN AMERICA

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BIOMEDICAL RESEARCH POLICY IN LATIN AMERICA:

STRUCTURES AND PROCESSES

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1. ARGENTINA

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1. ARGENTINA*

1.1 Argentina, the second largest country in South America, has a land area of 1,084,000 square miles. It extends from the Tropic of Capricorn southward 2,300 miles to Cape Horn; and from the ridge of the Andes bordering Chile in the west to the south Atlantic Ocean. Its climate, therefore, ranges from tropical to extremely cold. Its geography includes high Andean peaks, broad coastal plains, and jungles. It is a fertile land with abundant forests, grazing and crop lands. There are five great river systems which provide access to its interior, to adjoining countries and to the sea; the largest, the Plata, is second only to the Amazon and provides excellent harbor facilities. Most of the country has a temperate climate and is easily accessible to transportation.

Fifty-two percent of the total land mass (361 million acres) of Argentina is utilized in agriculture, about 41 percent in pasture, 11 percent cultivated; and an additional 32 percent of the total land area is in forests. Per capita agricultural land of 17 acres is the highest in Latin America. About 20 percent of the gross national product is derived from agriculture; 22 percent from manufacturing, 27 percent from trade, transport and communications;

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* Prepared by Dr. Hernando Groot. Based on a site visit on 10-23 December 1964.

31 percent is derived from other sources, including services. Argentina is largely self-sufficient in foods and food-processing, coffee being almost the only food import. Its chief exports are still specialized agricultural products, chiefly grains, meat, wool and hides.

The population of Argentina has reached 21.4 million, with a 1.7 percent annual growth rate (lower than the South American average). Since 1948 immigration has been negligible. The population density of 20 per square mile makes Argentina one of the least-crowded countries of the world. Over 75 percent of the population is urban, about one-fourth living in greater Buenos Aires, the largest city in South America. Fifty percent of the population lives in the four largest cities: Buenos Aires, Rosario, Córdoba, and La Plata.

Argentina has a free educational system, compulsory for ages 6-14, and enjoys a literacy rate of over 90 percent, the highest in Latin America and one of the highest in the world. The life expectancy is 59 years, which is one of the highest in South America. Infant mortality is reported as 59 deaths per 1,000 live births. The population of Argentina shows a pattern similar to that of the United States. It is increasing, but at a decreasing rate. Birth rates show a very slight but gradual drop. A birth rate of slighlty over 20 per 1000 population and a death rate of slightly under 10 per 1000 closely approximates that of the United States. The health standards are high. Argentina has approximately 15 physicians and 710 hospital beds

per 100,000 people, a rate similar to that of the United States. The average caloric intake is 3,360 per capita and high in protein foods and cereals. The federal government's Ministry of Social Welfare and Public Health administers a very extensive health program for its citizens. It maintains over 30 regional centers to serve the rural population, primarily providing maternity and infant care, nutrition assistance and child health care.

The leading causes of death are heart disease, cancer, vascular lesions, accidents, and infant diseases - similar to the situation in the United States.

In order to study the structures which exist in Argentina for the development and advancement of research, visits were made to several of the most important research centers of the country, as well as to various organizations whose primary role is to encourage research. These visits took place during the period December 11 to December 22, 1964. Because it was impossible to visit all of the institutes, as would have been desirable, only some of the most outstanding ones were visited. Similarly, not all of the cities where important research is being done were covered. This study is thus limited to the cities of Buenos Aires and Cordoba. The list of institutions visited appears in Section 1.12. Although the report tries to be as objective as possible, it also necessarily includes personal and rather subjective impressions, as well as some of the opinions of the interviewed persons.

Argentina has a long tradition in biomedical research

established principally in the first decades of this century, thanks in part to the scientific concern of professionals trained in Europe.

The Second World War, however, interrupted this cultural connection with the Old World. Furthermore, political events developed in Argentina during the mid-forties which seriously affected the progress of research.

An exodus of scientists who did not sympathize with the governmental procedures was witnessed in the universities of Argentina. Fortunately, the situation changed so that since 1956 there has appeared a renewed spirit in scientific research, increasingly modeled on the experience in the United States.

Traditionally in Argentina there exists considerable interest in biomedical and clinical research and, in certain other fundamental aspects of research. On the other hand, significantly less interest in public health research has been expressed.

The number of medical institutions doing research and the many research publications are obvious indications of this interest. Likewise, most of the resources of the National Research Council is directed toward biomedical research.

Biomedical research activities are centralized in the universities and in the Ministry of Health.

Geographically, most research centers are concentrated in the city of Buenos Aires, but there are some in important university towns, such as Córdoba, Mendoza, Rosario, La Plata, and Bahía Blanca.

Most of the biomedical research in Argentina is done in government institutions. There are only a few private organizations that have research programs.

The Argentine government has clearly shown interest in research, resulting in the creation of the National Research Council. However, the Council has not been given sufficient financial means to fully carry out its task. Steps have been taken to increase the budget which now is only approximately two million dollars, a sum clearly insufficient to meet the needs. Various opinions have been given to explain the Government's attitude. It seems that the unstable economic situation of the government makes it mandatory to give support to many problems considered to have higher priority.

The interest in research is not the same at all levels of the Government. Usually Congress is less interested. The present Minister of Health is exceptionally interested in promoting health research. He is studying the establishment of a special fund of 150 million pesos (US $10 million) for that purpose.

It was impossible to obtain all the figures on Argentina's research expenditures. Budgets were obtained from some of the institutes and many of them are not exact.

As explained above, the National Research Council spends nearly two million dollars annually in research, which means an expense of US $0.09 per capita. About 48 per cent of this figure is devoted to biomedical research. Official funds for health

research come from the national or from the provincial governments. Those from the national government come through the Office of the President (National Research Council), through the Ministry of Health (National Institutes of Health, Nutrition, Microbiology, etc.) or through the Ministry of Education and Justice (Universities and Academy of Medicine). Funds from the provincial governments come through their health agencies (sometimes provincial departments) or through special organizations such as the Commission for Research of the Province of Buenos Aires.

At the national agencies, the head of each one prepares the budget which is then submitted to the respective Minister, who presents it to the Ministry of Finance. After discussion and approval by the Ministry of Finance, the budget is submitted to the Congress for final approval.

There are no statistics indicating how much support private enterprise in Argentina gives to research, but there is reason to believe that this support is of some importance. The cases of Campomar Foundation, of the Martín y Mercedes Ferreyra Foundation in Córdoba, of the Fundaleu of Buenos Aires and of the Fundación Empresaria in the same city stand as proof that private enterprise in Argentina does have a lively interest in biomedical research.

Figures regarding the amount contributed by North American organizations to the development of scientific investigation were not available. This contribution, however, seems to be considerable, particularly that given by the Rockefeller Foundation, the Ford

Foundation and the USPHS. Several of the laboratories of the Faculty of Medicine of Buenos Aires received grants for equipment from the Rockefeller Foundation.

There is a marked trend towards the establishment of a full-time schedule in all institutions dealing with basic medical research. According to a publication of the National Research Council of Argentina, in 1963, of 1256 scientists working in 120 different institutions engaged in basic medical research there were 439 (35 per cent) working full-time.

Their distribution was as follows:

Institutions or Departments	Number of Institutions	Number of Scientists	Number of Scientists Working Full-Time	Percentage Working Full-Time
University of Buenos Aires	33	448	171	38%
Other six National Universities	62	478	118	25
Two Private Universities	9	50	3	6
National Ministry of Health	5	147	77	52
Department of Health of the Province of Buenos Aires	1	24	0	0
Other	10	109	70	64
Total	120	1256	439	35%

The highest proportion of scientists working full-time was observed in the group of 10 institutions classified as "Other" in the above table. This group includes several private research organizations such as the Instituto de Biología y Medicina Experimental, the Instituto de Investigaciones Médicas Mercedes y Martín Ferreyra,

the Instituto de Investigaciones Bioquímicas - Fundación Campomar, and the Centro de Investigaciones Neurológicas del Instituto Torcuato di Tella.

1.8 The Universities

At present there are thirteen universities in Argentina, as follows: eight national, one provincial and four private. The national universities are those of Buenos Aires, La Plata, Litoral, Córdoba, Cuyo, Bahía Blanca, Tucumán and Nordeste (Corrientes). The provincial university is that of Mar del Plata. The private universities are the following: the Catholic University of Buenos Aires, the University of El Salvador, the Catholic University of Córdoba, and the Universidad Libre of Mendoza. The latter is presently being organized. There exists, therefore, a strong university system substantially supported by the National Government. Three universities are located in the capital: The National University of Buenos Aires, the Catholic University of Buenos Aires and University of El Salvador , the latter being Jesuit-sponsored. The remaining ten universities are located in important provincial cities.

In general, the universities are composed of faculties fully independent of one another, a system common in Latin America.

In accordance with the existing regulations , the students participate actively in governing the university, a situation which has on a number of occasions hindered the progress of universities.

Among all persons visited there is unanimous agreement in citing co-government as one of the factors which limits and impedes the normal development of the universities and, consequently, the development of research.

With few exceptions, there is no limit to the number of students admitted to a university. As a result, the universities are overcrowded and do have inadequate facilities for these numbers of students.

Obviously the small resources available must be spread very thin in attempting to meet the needs of so many students. One of the more positive aspects of the Universidad de Buenos Aires, for example, is that it has been able to develop various institutes which, whether within the Faculty of Medicine itself or outside of it, have been entrusted to leaders in research and have benefited the University.

Another fact of note within the development of the Universidad de Buenos Aires is the creation of the Center of Applied Research as an organ directly responsible to the Rector's Office. The mission of the Center is to promote within the University the study of problems of vital interest to the country. The Center has an Advisory Council consisting of one representative from each of the ten faculties. Thus, it is hoped that a multi-disciplinary approach to the programs is achieved.

One of the most important aspects in the consideration of university problems is political interference. In the past there has been a marked decrease in scientific activity,

particularly because investigators were forced to emigrate for political reasons. The universities thus are liable to fall into the hands of politicians who are neither scientists nor educators. The consequences may also be felt in a more material way in that equipment may be removed from the universities to serve other than university purposes.

The migration of scientific personnel from Argentina interrupted a tradition of research that was to a great extent dependent upon the individual effort of a few people. As an example is the physiology school, developed under the leadership of Professor B. A. Houssay, which was on the point of virtually collapsing. Nonetheless, thanks to the strong spiritual and scientific training of his students, many have reconstructed the physiological laboratories and are helping to reconstitute the disrupted tradition.

1.3 Schools of Medicine

In Argentina there are nine schools of medicine; seven official and two private. The government schools belong to the following National universities: Buenos Aires, Córdoba, Cuyo, La Plata, Litoral, Nordeste and Tucumán. The private schools belong to the University of El Salvador, in Buenos Aires, and to the Catholic University of Córdoba.

The number of students in these medical schools is estimated at 34,000. The Faculty of the National University

of Buenos Aires has 10,500, the school of La Plata 8,400 and the school of the National University of Córdoba 6,500. These schools are indeed overcrowded. Frequently a class in the University of Buenos Aires will have as many as 1,000 or 1,200 students. Formerly, no entrance examinations were necessary and the schools were open to anyone with secondary school education. Similarly, the student may stay indefinitely at the school. The situation is changing with reference to entrance requirements. Admission to the medical school of the University of Buenos Aires is limited. Approximately 1,000 studends per year are admitted, out of 4,000 applicants. In other schools admission is entirely open.

Students pay no tuition fees at government universities. Furthermore, they usually find other economical advantages at the medical school. For instance, at the University of Córdoba, the cost of one lunch (in a good cafeteria served by waiters) is 10 pesos (US $0.07).

The ease with which one can enter the faculties of medicine has brought about a phenomenon which is important to note and which in an indirect way affects research in the centers in Argentina. Many students from other countries come to Argentina to study medicine, most of whom could not enter the medical schools in their own country, usually for academic reasons. There is, therefore, a high proportion of poorly qualified students in these faculties in Argentina. The number of foreign students is appreciable. As an example, there are 1,800 in La Plata. It is stated that there was a time when foreign students predominated

in the Universidad de Tucumán.

As a consequence of the excessive student enrollment and of the high percentage of unqualified students, morale in the medical schools is low. The faculty, faced with the necessity of carrying a heavy teaching load, has no time for research and has developed a severe feeling of frustration. In addition, the students have been known to criticize the fact that some professors do research. In a situation where, because of excessive enrollment, the students do not receive all the teaching attention desired, the fact that some of the professors dedicate time to research and not to them is viewed by the students as an unnecessary luxury. This situation has been termed "Cientificismo" by the students who censure it publicly and also censure the funds received by the investigators, especially if given by a country other than Argentina. An instance actually exists in which the University Councils, pressured by students, had to refuse grants by North American foundations.

1.4 Schools of Public Health

The School of Public Health of the Faculty of Medicine of the University of Buenos Aires was developed recently (since 1960) and still has precarious resources. Its activities include one regular course for Public Health Administrators and several orientation courses in different fields related to health sciences. Up to the present, its research activities have been extremely limited.

There is also a school of Public Health under the Ministry of Health. The scope of this school is restricted, however, to the training of nurses, technicians, dietitians and social workers. No research is carried on. The school is located in Ramos Mejía, a suburb of Buenos Aires, in the building of the National Institute of Health.

1.5 Other Research Institutions

Biomedical research is carried on in a variety of institutions, not associated with universities. These include hospitals, laboratories belonging to the Ministry of Health or to the Provincial Department of Health, and private institutions.

1.5.1 Government Institutions

1.5.1.1 Ministry of Health

Research Centers under the Ministry of Health include the National Institute of Health, the National Institute of Nutrition, and the National Institute of Microbiology.

The Institute of Microbiology is being reorganized after having undergone various upheavals. Its orientation is clearly towards public health research. With the leadership provided by the present Director, the Institute can be expected to make important constributions once the administrative difficulties have been finally overcome.

The Institute of Nutrition is instead oriented towards the clinical aspects of research. Its program of investigation is

considerably limited by several factors, including financial ones.

The National Institute (or Institutes) of Health has from its beginnings been clearly oriented towards clinical and basic medical research. Of the various departments to be developed at the Institute only those of pneumonology, rheumatology, endocrinology, gastroenterology and hematology are operating. As regards scientific activities, programs and planning, each of the departments (or Institutes as they are usually called) is independent of the others. The present Minister of Health stated that the National Institute of Health should reorganize its research program to focus on the major health problems of Argentina. It is doubtful whether this objective can be easily reached, due to the tradition of the Institute, the clinical interests of its directors and the lack of a clear research policy by the Ministry.

The Ministry of Health supports an additional institution of endocrinology, the Center of Endocrinology. There appears to be a duplication of effort between this center and the one at the National Institute of Health. It is impossible to determine the justification for the duplication. What does not seem to be justified is that in the same Ministry exist two institutions conducting research in the same field without any coordination.

1.5.1.2 Ministry of Education

The Ministry of Education gives support (about 23 million pesos annually) to the Academy of Medicine which has two research centers, the Institute of Cardiology and the Institute of Hematology.

The latter is one of the three centers of hematology which exist in Buenos Aires. The remaining two are the Municipal Center and the Institute of Hematology of the National Institute of Health.

1.5.1.3 Other

The Instituto Nacional de Tecnología Agropecuaria or INTA (National Institute of Agronomy) is a decentralized or autonomous organization of the national government, managed as a private enterprise. INTA was organized in 1958 and is administered by a Board of Trustees, only two members of which are government officials. Financial support comes mainly from a 1.5 per cent annual levy on agricultural exports; additional funds have been received from FAO and the Rockefeller Foundation. INTA maintains ten institutes and several field experiment stations, all of which provide technical assistance or participate in research programs designed to be of service to farmers. The various institutes, staffed with full-time, well-trained personnel, conduct a variety of investigations including those on the public health aspects of zoonoses and food technology.

The Instituto Nacional de Tecnología Industrial or INTI (National Institute of Industrial Technology) is also a decentralized organization of the Argentine government, similar to INTA. Its income derives from a one per cent annual levy on industrial production. INTI occasionally has cooperated in research projects in biomedicine.

Provincial governments also have laboratories of their own where some biomedical research is conducted.

1.5.2 Private Institutions

In Argentina there are a number of private institutions which have been very productive in research. Most scientiests in these centers are full-time. Some of these centers maintain relationships with universities.

Among private institutions, the following are cited: the Institute of Biology and Experimental Medicine, the Institute of Medical Research of the Association for the Advancement of Research of Rosario, the Institute of Biochemistry of the Foundation Campomar, the Institute of Medical Research Mercedes y Martín Ferreyra, the Laboratory of Neurobiology, the Center of Neurological Investigations of the Children's Hospital, the Center for Medical Education and Clinical Research (CEMIC) and the Endocrinology Institute for Children. These institutions are fine illustrations of the contribution to research by the private sector in Argentina.

1.6 Research Organizations

The single most important force for the promotion and support of research in Argentina is the National Research Council. There is also a similar organization for the Province of Buenos Aires.

1.6.1 National Research Council

1.6.1.1 Objectives

The National Research Council of Argentina, (Consejo Nacional de Investigaciones Científicas y Técnicas, CNICT) was created in

1958 to serve as the scientific advisor to the Executive Branch of the Government and to promote, coordinate and orient both basic and applied scientific research.

1.6.1.2 Organization

The CNICT is under the direct authority of the President of Argentina. The highest authority of the Council is its fifteen member Board of Directors. One member is the Director of Cultural Affairs of the Ministry of Education; another is a representative of the Research Council for the Armed Forces; the remaining 13 members were appointed directly by the Executive Branch for the first time only. Now those 13 are nominated by the Board itself and then appointed by the Executive Branch. Every year one-third of the Council is renewed. In practice the renewal process is as follows: the candidates, chosen by the Board from names of well-known scientists that have been suggested by major scientific institutions, are presented to the Executive Branch for their appointment. The candidates must be actively engaged in research.

The Board elects a president and a vice-president from its own members. The Executive Committee is composed of the president, the vice-president and three other members of the Board, and is in charge of planning and supervising the various activities of the Council. This Committee meets once a week.

The President of the Board is Professor Bernardo A. Houssay who was the organizer of the Council and is the most powerful force in its operation.

To assist the Board, there is a Commission on Fellowships (Comisión de Becas), a Commission on Grants (Comisión de Subsidios), and a Committee for the Promotion of Scientific Careers (Junta da Calificaciones y Promoción de la Carrera del Investigador Científico).

Moreover, there are several honorary commissions for different branches of science and for different geographical regions, composed of well-known scientists. At present there are nine commissions for the various sciences or groups of sciences and related fields: Biology; Medicine; Chemistry; Mathematics; Physics and Astronomy; Earth Sciences; Technology; Anthropology, Archaeology and History; Philosophy, Psychology, Philology and Education; and Social Sciences, Economics and Law. The regional Commissions are six: one for the Central Region (Córdoba, la Rioja and Santiage del Estero); one for the Northwest (Tucumán, Salta, Jujuy and Catamarca); and for Cuyo (Mendoza, San Juan and San Luis); one for Litoral (Santa Fé and Entre Ríos); one for the Northeast (Chaco, Corrientes, Somosa and Misiones); and for the South (Province of Buenos Aires - La Plata excepted - La Pampa and Patagonia).

The administration of the National Research Council is headed by one Executive Secretary who directs the following sections: fellowships, grants, scientific career, statistics and surveys, libraries and bibliographic information, advisory commissions, international relations, printing office and general administration.

The main programs of the Council are directed towards the training and the supporting of scientists.

1.6.1.3 Fellowships

Fellowships are available for research training in Argentina (becas internas) or abroad (becas externas) for initial or for advanced training. They are given only to individuals who are or will be working full-time.

1.6.1.4 Scientific Career Awards

The scientific career awards (carrera del investigador) have been created in order to provide adequate salaries for investigators who work full-time. In most cases this objective is attained by supplementing salaries from the institutions where they are working, until a satisfactory level of remuneration is reached, which varies with the experience and qualifications of the scientist. For this purpose scientists are grouped in six categories, from junior research assistant to full director of research. Each class is subdivided into several sub-categories. The salary scale is revised periodically, supposedly to meet the cost of living. With the revision of September 26, 1964, the monthly salaries for unmarried scientists will go from pesos 30,000 (US $200) to pesos 78,000 (US $520). There is an additional sum of pesos 4,000 (US $27) for the wife, and of pesos 1,000 (US $7) for each child. (In these calculations the official exchange rate of 150 pesos per dollar has been used).

1.6.1.5 Grants

Grants are given mainly to help specific research projects in official and private institutions. Some grants are also given for the development of libraries, for travel related to research, for repatriation of Argentine scientists, for contracts with outstanding foreign scientists, and for other purposes.

1.6.1.6 Other Programs

Various other programs are carried out by the CNICT. They include:

1) The establishment of its own research centers such as the Institute of Limnology at Santo Tomé, near Santa Fé, to study the biology of the Paraná River;

2) the collaboration with other institutions to establish new research centers such as the Cosmic Radiation Center (Centro Nacional de Radiación Cósmica), with the Atomic Energy Commission for Argentina, with the Faculty of Exact and Natural Sciences of the University of Buenos Aires, and with the Institute of Radio-Astronomy (Instituto Nacional de Radio-Astronomía) in collaboration with the Carnegie Institution;

3) a Scientific Register (Registro Científico), which compiles information on scientists, research centers and research facilities in Argentina;

4) the Documentation Center (Centro de Documentación) which co-ordinates national documentation services, supplies photocopies and microfilms, makes translations from languages other than English,

French, Italian and Portuguese, prepares lists of publications existing in Argentine libraries and establishes relationships with similar national and international centers;

5) the dispensing of scientific awards (Weissman, Mibasham, and Bunge and Born);

6) The program for the improvement of science teaching in high schools;

7) activities on behalf of the adoption of administrative measures to facilitate research, such as changes in custom duties and import regulations; and finally,

8) coordinating scientific activities, stimulating cooperation between scientists and institutions, fostering meetings and assisting in the creation of scientific societies.

A very important role played by the National Research Council is acting as an intermediary between the grantees and foreign (usually US) sources of money for research. Thus certain universities have received grants from the NIH/USPHS and U.S. Foundations, which otherwise would have been refused, since generally the student representatives on the University Councils are against such foreign grants. Examples of this attitude are the refusal by the University of Córdoba to accept a grant from the Ford Foundation, the insults received by the Rector of the University of Bahía Blanca for accepting one, and the publications of "Agrupación Reformista", an important student group in the University of Buenos Aires, that condemns foreign grants.

1.6.1.7 Current Activities

During the six-year period ending January 31, 1964, a total of 833 fellowships (493 internal and 340 foreign) were awarded by the National Research Council. The majority (278 or 33 per cent) was given to investigators in the medical sciences and 107 or 13% in biology.

During the same period, a total of 367 grants (worth 115.5 million pesos) were given, mostly in medicine (108 grants worth 28,3 million pesos). The second place was held by biology (68 grants worth 19 million pesos).

On January 31, 1964 there were 258 individuals given scientific career awards, 94 of which (36.4 per cent) in the medical sciences, and 63 (24.4 per cent) in biology.

1.6.1.8 Sources of Income

The sources of income of the Council have been regular government appropriations and occasional local and foreign grants. The government appropriation for the first year was 100 million pesos; more recently it has been about 204 million pesos per year.

Grants from local sources have included a 20 million peso grant in 1961 from INTA (Instituto Nacional de Tecnología Agrícola- Institute of Agronomy-) given for the training of scientists and researchers in agronomy and related fields. This grant has expired. Other local grants have come from Di Tella industrial enterprises, and Michel Torino. The Council has funds for scientific prizes such as the Weissman and Mibashan awards.

Foreign grants include those from the Ford Foundation(US $150,000 during 3 years, for fellowships in social sciences; US $150,000 for fellowships in education; US $325,000 for repatriation of scientists; US $750,000 for the improvement of science teaching in high schools); from the Rockefeller Foundation (US $150,000 for two years to help in the establishment of returning scientists); and from the National Science Foundation (US $18,500) for the improvement of the teaching of biology.

Furthermore, as it was explained before, the Council has acted as the intermediary for grants given by other agencies such as the US Air Force Office of Scientific Research to the University of La Plata, the Population Council to the Faculty of Medicine of Buenos Aires, and the NIH/USPHS to several institutions.

1.6.1.9 Budget

For the year ending October 31, 1963, the following were the available funds in pesos:

Reserve (Balance) from previous years	110,709,712
Government appropriation	204,792,554
Grants	35,141,580
Sale of microfilms	48,828
TOTAL	350,692,674

The grants were those from the Rockefeller Foundation (pesos 6,400,000), the Ford Foundation (about pesos 27,000,000) and the National Institutes of Health, USPHS (nearly pesos 1,500,000).

During the same period the following expenditures were made:

	Amount in Pesos	Percentage
Fellowships	49,465,841	21.5
Grants	87,609,050	38.0
Scientific Career	53,675,142	23.3
Various	476,100	0.2
Publications	1,520,250	0.7
New Equipment	6,739,728	2.9
Building, 3rd installment	6,346,666	2.8
General administration	24,273,667	10.6
TOTAL	230,106,444	100.0

For the year ending October 31, 1964, there was a similar appropriation from the Government (about 204 million, plus a reserve corresponding to unexpended funds in previous years). These combined amounts - approximately 295 million pesos or 2 million U.S. dollars at the official rate of exchange - have not been sufficient, however, to cover the needs of the Council during the same period, due to the further devaluation of the Argentine peso and to the ever increasing cost of living. The situation is, moreover, aggravated because a significant part of the expenditures, such as the foreign fellowships and the imports of scientific equipment, must be covered in hard currency.

The Council has asked the government for an appropriation of 516 million pesos (US $3,440,000) to cover the expenditures during the year ending October 31, 1965. The Ministry of Finance,

however, has not been able to support the request. The budget is now under discussion in Congress; some congressmen have been pressured so as to obtain an appropriation larger than 205 million. Needless to say, if a significant raise is not obtained, the Council will be forced to limit its programs, thus endangering all of them, especially the one supporting scientific careers. The latter provides stipends which barely cover the needs of its scientists. The budget of 204 million was estimated when the rate of official exchange was 83 pesos per US dollar. Now it is 150 per dollar officially, and higher on the black market.

1.6.2 Research Commission of the Province of Buenos Aires

The Research Commission of the Province of Buenos Aires (Comisión de Investigación Científica de la Provincia de Buenos Aires) promotes and supports research in the Province of Buenos Aires, particularly in the city of La Plata, where its offices are located. Members of the National Research Council informed that the Commission spends approximately 75 million pesos (US $500,000) per year, receiving its funds from the provincial lottery.

1.7 Miscellaneous Organizations

Under this heading several organizations are mentioned which in one way or another influence biomedical research in Argentina.

Among government organizations, the following should be mentioned: Junta de Investigaciones y Experimentaciones de las Fuerzas Armadas, Comisión Nacional de Investigaciones Espaciales, Comisión Nacional de Energía Atómica, Instituto de la Antártica, and Instituto Oceanográfico. The Academia de Medicina, mentioned earlier, also tries to stimulate research by means of awards, meetings, etc.

Argentina is the country in Latin America where research has received most support from private sources. As mentioned in paragraph 1.5.2, at least ten highly important institutes are private. In addition, there are other private organizations which do not have research institutes of their own but who contribute to the support of research in either private or official centers. Such is the case, for instance of the Fundación para la Hemofilia, the Fundaleu and the Fundación Bibiana Luckhouse (all three support research in blood diseases); the Institute Torcuato di Tella (which supports the Center for Neurological Investigation), the Foundation Carames (which supports a laboratory at the El Salvador School of Medicine), the Bunge and Born Foundation and the Fundación Empresaria (which give financial assistance to several research institutions).

Moreover, gifts and grants for biomedical research are frequently given by the leading industrial enterprises of Argentina. There are also some scientific prizes such as The Weissman and Mibashan awards given by private groups of citizens.

Finally, the Banco Hipotecario Nacional has special housing projects for scientists.

1.8 Factors Impeding Health Research

Some of the factors discussed in the report on Brazil are equally valid for Argentina.

There are factors affecting research in general as, for instance, the shortage of financial resources. The Government may realize the importance of research, but it does not provide the necessary funds for its development. Health research has to compete with other activities. The resources shortage is aggravated by inflation and by frequent devaluations. There is also a lack of understanding for the need of a firm connection between government and science, and for the incorporation of plans for scientific development into the general plan for national development.

At the university level, all factors affecting the general operation of the institution, also directly or indirectly affect its research. Participation of students in governing the university, excessive number of students, lack of a selection process for applicants, unrestricted admission of high school graduates, and political activities of students are all causes which have been invoked as hindering research. Another factor worth considering is the lack of defined objectives on the part of the universities. The essential quality for a successful scientist is a well-trained mind which will permit him to solve unforeseen problems. Instead

of training the mind of their students, some universities, however, feed them with facts and information, trying to anticipate further difficulties and organizing courses around their possible solution. Very frequently, this is a useless task because the information is usually discarded and, furthermore, nobody can foresee the problems and challenges of the future. This is particularly true now, when changes are so rapid and one is overwhelmed by a real explosion of knowledge. It is, therefore, an appropriate time for universities to clarify their objectives and to revise their programs accordingly, aiming toward the formation of the student and not merely at his information.

1.9 Factors Promoting Health Research

Among the factors promoting health research in Argentina, there is the tradition of fine research in the biomedical field. With proper orientation, further emphasis on public health research could be given easily.

Another important factor is the improvement of universities and their developing excellent research and training centers. Clear examples are the recently established basic science institutes in the universities. This tendency toward improvement is also illustrated by the growing employment of full-time scientists, better salaries, more security for research workers and by the establishment of centers, such as the Center for Applied Research at the University of Buenos Aires.

The growing interest of the government in public health research is shown by the proposed establishment of a special fund to foster research in that field.

The evident interest of the public sector in biomedical research is a favorable development.

1.10 Summary

In summary, there exists in Argentina a marked interest in biomedical research, focusing primarily on the clinical and basic aspects of medicine. Public health research receives limited attention.

There are a number of institutions in the Ministry of Health, the Academy of Medicine, the universities and private organizations where important biomedical research is conducted. Investigations into public health problems are carried out at the Institute of Microbiology of the Ministry of Health and in certain Universities. Emphasis on public health research is beginning to be given in the Ministry of Health.

The Government, cognizant that research is an activity of national concern, created the National Research Council. This organization has been the single most important factor in the promotion and development of research in recent years. This is a remarkable accomplishment since most research facilities suffered serious setbacks in the forties and early fifties.

Some of the governmental mechanisms have proved to be rather slow in promoting research. For this reason, there is a

trend in Argentina, as in Brazil, toward organizing governmental research institutions as "decentralized centers" or autonomous organizations ("foundations" in Brazil), which enjoy great administrative freedom and which are managed as private enterprises.

It is important to emphasize the constribution of the private sector in Argentina to research. In all Latin America, Argentina is the country where research receives more attention, both public and private.

1.11 Recommendations

A number of recommendations appear in the body of the report. Some of them need reiteration: for instance, the establishment of a long-term policy of health research at the Ministry of Health, the coordination of the research efforts in the Ministry of Health and the strengthening of the universities.

More financial assistance should be given to the basic instrument for the promotion of research, the National Research Council. Additional sources of funds for the universities must be developed. Among these, the payment of some tuition fees might be considered. These fees, if graded according to the applicant's income, have been accepted by other nations where a policy of free official universities also existed.

In other countries, the establishment of cooperative programs between universities and the health authorities has been

found beneficial for the promotion of research (e.g. Brazil).

Finally there is the need for a wider acceptance of research as a matter of national concern of high priority.

1.12 Institutions Visited*

University of Buenos Aires

- Office of the Rector
- Office of the Dean of the Medical School
- Center of Applied Research
- Institute of Clinical Research
- Institute of Anatomy and Histology of the Medical School
- Department of Biophysics of the Medical School
- School of Public Health

University of Córdoba

- Office of the Rector
- Office of the Dean of the Medical School

University of El Salvador

- Office of the Dean of the Medical School

Ministry of Social Welfare and Public Health

- Office of the Minister
- Office of International Relations
- National Institute of Health
- National Institute of Nutrition
- National Institute of Microbiology

Other Research Institutions

- Institute of Hematology of the National Academy of Medicine
- Institute of Biochemistry of the Campomar Foundation

Special Organizations

- National Research Council

* All institutions visited are located in Buenos Aires with the exception of the University of Córdoba located in the city of the same name.

BRAZIL

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2. BRAZIL*

Brazil, the largest of the South American countries, encompasses a land area of 3,280,000 square miles. It is three times larger than Argentina, the second largest country in South America, and surpasses in area continental U.S. (exclusive of Alaska). It has an Atlantic coastline of over 4,800 miles.

Although 93 percent of Brazil is situated in the torrid zone, such factors as altitudes, prevailing winds, rainfall, and distance from the ocean combine to vary the climate from tropical to temperate. In the north is the heavily wooded and largely unsettled basin of the Amazon with a network of rivers navigable for 15,000 miles, the largest river system in South America. Ocean steamers can navigate 2,300 miles upstream to Iquitos, Perú. The south of Brazil constitutes a vast dissected plateau sloping inland from coastal mountain ranges. It is drained by the Plata system: the Paraguay, Uruguay and Paraná Rivers. The west central part of the country has swampy lowlands. All told, there are 27,000 miles of navigable inland and coastal waterways that offer a hydroelectric potential estimated at 80 million KW.

About 28% of the gross national product comes from agriculture and almost an equal percent from manufacturing, mining, electricity and construction; 13% is derived from commerce. Only 315 million acres, or 15% of the total land mass, is utilized for agriculture, most of the fertile and productive land being in the central and southern regions.

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* Prepared by Dr. Hernando Groot. Based on a site visit on 30 November-8 December 1964.

Coffee is the prime crop, grown primarily for export (52% of total exports), along with cotton. The extensive resources of Brazil's forest areas (more than half of the country) are relatively undeveloped, except for commercial pine cutting in the southern states and the production of carnaúba palm wax in the north. The vast fishing banks and grounds in the rivers and along the coast, with some 2,500 species of fish, are only now beginning to be exploited. The same is true of its mineral and coal resources.

The population of Brazil has now reached 80 million with a 3.1 percent annual growth rate. About 31,000 immigrants, mainly Portuguese, Japanese, and Italians, arrive every year, 80 percent of these being farmers or skilled workers. About 90 percent of the population lives in the central plateau and the narrow coastal plain along the Atlantic. Of the more than 25 million labor force, 51 percent are engaged in agriculture, 10 percent in manufacturing, 13 percent in services, 5 percent in commerce, 3 percent in mining, 4 percent in transportation and communications, and 14 percent in other activities. Fifty percent of the population over 9 years of age are literate, the figure reaching 75 percent in the urban centers and about 30 percent in the rural areas. In the latter situation educational opportunities exist almost only in the small towns and villages. The life expectancy in Brazil is 45 years for the country as a whole, but as high as 53 years in the major cities.

There are 171 infant deaths per 1000 live births, but this is reduced to only 97 per 1,000 in Rio de Janeiro. There are approximately 4.4 physicians per 100,000 (a total of 35,000 physicians), these being

concentrated in the large cities: Rio de Janeiro has a rate of more than one physician per 600 population, while the rural areas are very poorly attended. Brazil, reflecting its mixture of highly developed and underdeveloped characteristics, shows a mixed pattern in terms of the major causes of death. The five leading causes are heart disease, enteritis, diseases of early infancy, influenza/pneumonia, and cancer. Malaria, yellow fever, and smallpox are no longer major causes of death, while tuberculosis is still a serious public health problem. In 1960, Brazil spent 5 percent of its total governmental budget in providing medical-health services, compared to 6.5 percent in the United States. However, this averaged $1.88 per Brazilian versus more than $30.00 per U.S. citizen.

2.1. Background

During the period 30 November to 8 December, 1964 a small number of institutions in Brazil were visited for the purpose of obtaining information on the structures which support biomedical and public health research in that nation. Because of time limitations and because most of the significant biomedical research is known to be conducted in Rio de Janeiro and in São Paulo, only institutions in these two cities were visited. The list of these institutions appears in Section 2.10. Since several of the institutions visited had only local influence, it is doubtful whether all the impressions received are applicable to the whole country.

Although the report tries to be as objective as possible, it does include personal impressions, as well as the opinions of individuals interviewed. These and other limitations of the report are easily

recognized.

Health research started in Brazil with the creation of the Bacteriological Institute of São Paulo (later to be named Adolfo Lutz) in 1892 and with the establishment of the Federal Institute of Serotherapy (which later became the Oswaldo Cruz Institute) in Manguinhos, near Rio de Janeiro, on May 25, 1900.

The contribution of Brazil to tropical medicine during the first four decades of the century was important indeed, and the Institutes Oswaldo Cruz, Adolfo Lutz and Butantan became world-known centers of research.

In the universities interest in research developed later than in the institutes. However, it has been growing steadily ever since in most places and now it is considered as an inseparable part of the expression "teaching-research", essential for the promotion of both teaching and research of high quality.

A highlight of the evolution of research administration in Brazil was the adoption, in 1946, of the new Constitution of the State of São Paulo which provides for not less than 0.5 per cent of the income to be devoted to research.

2.2. Present Status of Biomedical Research

2.2.1. Interest in Biomedical Research

In Brazil there is a marked degree of interest in biomedical research. This is exemplified by the number of institutions engaged in research and also by the fact that the greater share of financial assistance given by the National Research Council and the Foundation for the Support of Research goes to the biomedical field.

Similarily, a significant part of the activities of the Coordinating Agency for Advanced Training (CAPES) is oriented towards biomedicine.

There is also notable interest in health research. CAPES has a list of 77 government institutions engaged in biomedical research. At least 30 of these are developing research programs in public health or related fields.

Although the research centers are located in several cities, the greatest concentration is in Rio de Janeiro and São Paulo. Of the 77 aforementioned institutions, 20 are located in the city of Rio de Janeiro, 13 in the city of São Paulo, and the remaining 44 in Belém, Recife, Maceió, Aracajú, Salvador, Belo Horizonte, Niterói, Ribeirão Prêto, Curitiba and Pôrto Alegre.

2.2.2. Research Groups

Biomedical research is concentrated in universities, in independent schools of medicine or in laboratories of the Ministry of Health, such as the Instituto Oswaldo Cruz in Río de Janeiro, or in institutions under the health authorities of the different states, for instance, the Fundação Gonçalo Moniz in Salvador, Bahia, and the Butantan and Adolfo Lutz Institutes in São Paulo. With the exception of that health research which may be conducted in a very few of the private universities, all the rest is carried out in government institutions.

Most of the difficulties reported by the investigators visited are financial. Occasionally, however, political activities have interfered with research.

2.2.3. The Attitude of the Government

Research receives attention from the Government through the National Research Council and similar regional organizations. Research competes with other activities as high priority and frequently does not obtain the support it deserves. There are, however, indications that in certain government areas there is the consensus that an effort to improve advanced training as an essential ingredient of the economic development of the country could be initiated immediately. The strengthening of CAPES is a good example of this new attitude, which has received public recognition in the press. The acceptance of research needs to be established further at all levels of the government together with a long-term research policy.

Although usually the Executive Branch realizes these needs, the attitude of Congress may differ. This is significant since Congress approves the Budget.

2.2.4. Financing Research

Biomedical and health research is dependent on a number of organizations. It is not possible to estimate the total amount of money spent although budget figures of some institutions are available. Often the budget represents only the government appropriations which occasionally do not materialize completely. Furthermore oscillations of the value of the money often makes budgets meaningless.

How much the Brazilian Government spends in research or in health is not known exactly. The Basic Law for Education establishes that 12 per cent of the money received from taxes will be allocated

for education. The way this money is used is defined by the Council of Education.

The budget of the National Research Council for 1965 amounts to 7,868 million cruzeiros (US $4,253,158) which means an expense of US$0.05 per capita.

The opinion of all persons interviewed is that the support given to health research by the private Brazilian sector is practically nil. Occasionally a drug manufacturer makes a small gift to an institute.

There is a new private institution, the Antunes Foundation, in the process of being organized. Although one of its main responsibilities will be to promote agricultural research, the Foundation is also interested in health research in the Amapá territory.

No figures regarding the contributions from foreign sources were available. In 1940 the coopeȓation of the US Government (through the Institute of Inter-American Affairs) was important in developing the Special Public Health Service of Brazil (SESP). The financial and technical assistance given by the Rockefeller Foundation to research, especially in yellow fever, in arbovirus (Belém Virus Laboratory at the Institute Evandro Chagas) and in the development of university institutions in the State of São Paulo is well known. During recent years the Ford Foundation has given important grants for the development of programs for advanced training. The U.S. Public Health Service has also made a number of significant grants to scientists interested in health research.

2.3 Universities

In Brazil there are forty universities, as follows:

Federal	20	
Federal, rural	3	23
State	3	
State, rural	1	4
Private, Catholic	12	
Private, other	1	13
TOTAL		40

The federal universities are scattered in eighteen states and in the District of Brasilia. The two oldest universities are the University of Paraná (1912) in Curitiba and the University of Brazil (1920), situated in the city of Rio de Janeiro. The private universities are distributed throughout eleven states. Only two states have universities under their local government, Guanabara and São Paulo. The universities are concentrated in the areas of Guanabara and Río de Janeiro where five are located in the state of São Paulo, also with five universities.

The Basic Law for Education (Lei de Diretrizes e Bases da Educação Nacional), in effect since January, 1962, establishes decentralization and ample autonomy (academic, administrative and economic) for universities, leaving to a collegiate agency, the Federal Council of Education (Conselho Federal de Educação) a dependency of the Ministry of Education, the definition of minimum norms, such as the minimum curriculum and duration of courses for

the different careers. The universities, therefore, enjoy a certain amount of autonomy, which, however, sometimes is not enough to avoid undue political interference. For this reason, the new University of Brasilia has been organized as a foundation, which assures it greater autonomy and a large degree of administrative freedom. Nevertheless, this was not accomplished without opposition. There are hopes that the status given to the University of Brasilia will lead to the development of an excellent center of higher education. Opinions were heard that the same status should be given to other universities which are frequently exposed to political interference and to pressures.

Some universities have special research councils to promote their own research. No information regarding the corresponding budget was received, however.

The University of Brazil is trying to set an example of how to foster research. For this purpose, four special deans, chosen from leaders in the field, have been appointed to assist the Rector: one for administration, one for student affairs, one for curriculum review, and another for graduate studies and research. Dr. Carlos Chagas is Dean for Graduate Studies and Research.

2.4 Schools of Medicine

At present there are thirty-six medical schools in Brazil, as follows:

Federal, in universities	19	
Federal, isolated	1	20
State, in universities	4	
State, isolated	1	5
Private, in universities	6	
Private, isolated	5	11
TOTAL		36

Twenty-nine belong to universities and seven are independent institutions. They are concentrated in four main areas as shown by their geographical distribution by states: seven in São Paulo; five in Rio Grande do Sul; four in Minas Gerais; three in Guanabara; two each in Pernambuco, Bahia and Paraná; and, one each in Pará, Maranhão, Ceará, Rio Grande do Norte, Paraiba, Alagôas, Sergipe, Espirito Santo, Rio de Janeiro, Santa Catarina and Goiás.

The resources available to the private schools are very limited. Official schools usually have more funds. Some of the federal and state medical schools have a long tradition of good research. In all of them, the tendency is toward having an increasing number of full-time personnel and towards better faculty salaries. The School of Ribeirão Prêto has its whole faculty on full-time basis. Other schools have practically everybody in the basic medical sciences departments on full-time.

The unanimous consensus is that it is impossible to have first class medical schools with second class faculties, and that there is an urgent need for improvement.

In certain schools efforts have been concentrated on improving some of the laboratories or institutes. In others, the efforts have been pooled by merging similar units and by concentrating services. These actions foster teaching and research. Such is the case of the Institute of Microbiology of the University of Brazil which serves the School of Medicine and other dependencies of the University, develops its own teaching programs to train microbiologists and has become the leading center in this field in Brazil. Another example is the Institute of Tropical Medicine of the University of São Paulo which arose from the merger of the Chairs of Microbiology, Parasitology and Clinical Medicine.

Traditionally, in Brazil, schools of medicine have been the seed-bed of research activities. At present, the Government is trying to raise the level of their activities and is studying the possibility of establishing new medical schools. In fact Brazil, with nearly 35,000 physicians for 80 million people (4.4 per 10,000), is deficient in medical care. The new schools, if properly oriented, would be invaluable instruments for the promotion of research.

The Schools of Medicine have formed an association, the Association of Medical Schools of Brazil, which is coordinating their activities and promoting better medical training and research. The Association is a member of the Pan American Federation of Associations of Medical Schools, which is in charge of coordinating the associations in the different countries. The Federation, organized only a short time ago, is a very important mechanism to promote research in medical schools.

2.5 Schools of Public Health

There are now four schools of public health in Brazil, one in Salvador (School of Medicine and Public Health of the Catholic University of Bahia), one in Belo Horizonte (School of Public Health of the University of Minas Gerais), one in São Paulo (School of Public Health of the University of São Paulo), and one in Río de Janeiro (National School of Public Health of the Ministry of Health).

Without passing judgment on the amount and quality of the research conducted in all these centers, the School of Public Health of São Paulo has established a tradition of research in the health sciences and, for years, has been a training center of high quality for public health personnel from Brazil and from practically all the other Latin American countries.

The National School of Public Health of Rio de Janeiro is in the process of reorganization. The Congress is considering a law to convert this School into a Foundation (Fundação) linked to the Ministry of Health. Foundations have autonomy and great administrative and financial freedom. This is of importance in hiring of personnel, permitting more flexibility and better salaries. On repeated occasions it was stated that, because of the existing laws, one of the causes which tend to impede research in all governmental agencies (foundations excepted) is that scientists are treated the same as clerical workers. The present faculty of the National School of Public Health is part-time, and is paid on an hourly basis. The current operating budget of 144 million cruzeiros (US $78,000) will be raised to 244 million cruzeiros (US $132,000) in 1965. At the

moment no research is conducted. A nine-story building near the Oswaldo Cruz Institute is being adapted for the School. The new law, the building and the budget will permit the development of research programs.

2.6 Other Research Institutions

2.6.1 National Institutions

Research centers under the Ministry of Health includes the Special Public Health Service (Servicio Especial de Saúde Publica or SESP), the Institute of Rural Endemic Diseases (Instituto de Endemías Rurais or IER) and the Instituto Oswaldo Cruz.

The SESP, created in 1942 to solve public health problems in the Amazon region, later extended its activities to a large part of Brazil, establishing a tradition of fine service and research. The SESP was a cooperative agency between the Government of Brazil and the Office of Inter-American Affairs of the U.S. Government. In 1960 it was transformed into a Foundation, which has great administrative freedom and is semi-autonomous. SESP carries out several research programs (surveys, research on statistics, administration and public health practice) and administers the Instituto Evandro Chagas which h originally had the responsibility for all the laboratory work regarding tropical diseases in Northern Brazil. At present the Belém Virus Laboratory of the Rockefeller Foundation is a part of this Institute. However, some of the expenditures are still paid by the Rockefeller Foundation (including the salaries of two staff members). The Belém Virus Laboratory is considered one of the

leading centers of research in arboviruses in the world. Another important feature of the Institute is that it has developed close ties with the Medical School of the University of Pará : the entire Department of Microbiology of the School will move to buildings of the Institute, and the Instituto Evandro Chagas' staff will serve as staff for the Medical School. In this way, the medical students will be closely associated with the research of the Institute, with tthe obvious advantages for students and staff.

The SESP was often criticized for its connections with the US Government. Nowadays, in spite of being a Foundation it often faces political difficulties.

The Institute of Rural Endemic Diseases has two centers of activity - in Recife and Belo Horizonte - where important research on tropical diseases, mainly schistosomiasis and trypanosomiasis, is carried out. The Institute has suffered from reduced budgets, low salaries, and a part-time schedule for its scientists. During the first half of this century the Instituto Oswaldo Cruz was well-known for its research. Although research was much reduced during the last fifteen years, at present there is clear indication that the situation is improving. Low salaries, the equating of scientific personnel to common civil servants, the supression of teaching activities, and the presence of politically minded directors are reported to be causes for the slackening of research work in recent years. The present director is doing his best to rejuvenate the institution, bringing to it young scientists, arranging new training programs and promoting an ample research program.

2.6.2 Regional Institutions

Several state institutions are well-known for their scientific contributions. This group includes the Instituto Adolfo Lutz and the Instituto Butantan, located in the State of São Paulo. Both are public health institutions. The Instituto Adolfo Lutz serves as a public health laboratory for the State of São Paulo, whereas the Butantan is engaged in the production of biologicals. The situation of Butantan is, in a way, similar to that of the Oswaldo Cruz, since at the Butantan research activities also slowed down during recent years. The new director of the Butantan, appointed in December, 1964, maintains that the slow-down of the great health institutes of Brazil (Cruz, Lutz and Butantan) is due to the fact that they still have the organizational structure existing at the beginning of the century, which was adequate for solving the problems of the time. The new Director expects to convert the Butantan into a semi- autonomous foundation and to reorganize the production of biologicals along modern industrial lines.

2.7 Special Organizations

Under this title three organizations with the specific task of promoting research or higher education have been grouped. They are the Coordinating Agency for Advanced Training (CAPES), the National Research Council, and the Foundation for the Support of Research of the State of São Paulo. All of them are government agencies with special structures which gives them autonomy and great administrative freedom. The first two are federal,

Since their role in the promotion and support of research and in the training of scientists is so important, they merit a separate description.

2.7.1 Coordinating Agency for Advanced Training (CAPES)

The Coordinating Agency for Advanced Training, or CAPES (Coordenação do Aperfeiçoamento de Pessoal de Nivel Superior) was organized in May, 1964, as the result of the union of three different institutions which had rather similar objectives related to the promotion of higher education. The institutions were:

-The National Campaign for Advanced Training (Campanha Nacional de Aperfeiçoamento de Pessoal de Nivel Superior, also formerly known as CAPES);

-The Commission of the Institutes' Plan (Comissão Supervisora do Plano dos Institutos, or COSUPI);

-The Expansion Program of Technological Training (Programa de Expansão do Ensino Tecnológico, or PROTEC).

The old CAPES was created in 1951 as a dependency of the Ministry of Education with the aim of improving higher education and the training of university professors and specialists. The program included mainly fellowships in Brazil and abroad. COSUPI was created in 1958 to improve technological instruction and to foster applied research in universities and in industry. COSUPI helped in the creation of important centers of research, especially in the technological field.

2.7.1.1 Objectives

The objectives of CAPES are as follows:

-To collaborate in the development of programs for advanced training by different means, including the establishment of graduate courses in fields with special priority.

-To collaborate in the formation of university professors.

-To improve teaching and research conditions in universities and institutions of higher learning by means of technical and financial assistance. This assistance is to be used for the establishment of a full-time regime for the faculty members; for the acquisition of equipment and libraries; and, finally, for the construction of buildings.

-To promote in universities the integration of teaching and research, grouping similar fields into academic units where resources and facilities can be adequately concentrated.

2.7.1.2 Organization

CAPES is under the Ministry of Education but has a large degree of administrative freedom and is organized like a private enterprise. CAPES is directed by a Deliberative Council in charge of defining policies and by an Executive Director in charge of implementing the decisions of the Council.

The Deliberative Council is composed of nine members, two of which are the President of the National Research Council (CNPq) and the Director of Higher Education of the Ministry of Education. The remaining seven are appointed by the President of the Republic from candidates submitted by the Ministry of Education. The term

of each member is three years. Every year one third of the Council is renewed. (At present the members of the Council are well-known leaders in the fields of education and science such as Raymundo Aragão, Antonio Couceiro, Paulo de Góes, Ernesto de Oliveira, Oswaldo de Lima, Metry Bacila, Frederico Brieger, Pedro Penido and Ernani Braga).

The Executive Director is assisted by five secretaries, one for each of the following activities: 1) University Programs and Training Centers; 2) Technical and Scientific Personnel; 3) Planning and Documentation; 4) Fellowships; and 5) Administration. The Executive Director and the five secretaries are appointed by the Minister of Education. The present Executive Director is Dra. Susana Gonçalves.

2.7.1.3 Relation to the National Research Council

Although it is stated that the National Research Council gives fellowships for professional training and CAPES fellowships for research training, it appears that both institutions sponsor very similar activities. The problems of duplication overlapping are minimized, however, by a certain coordination which exists between both entities and by the participation of the President of the Research Council in the administration of CAPES.

2.7.1.4 Priorities

The aforementioned objectives are in the following fields: basic sciences (mathematics, physics, chemistry and biology); technology (engineering, chemical engineering and agronomy); and

medical sciences (medicine, pharmacology, odontology and nursing).

2.7.1.5 Activities

The activities of CAPES follow the norms of the Direction of Higher Education of the Ministry of Education and are closely coordinated with the National Research Council. They include a fellowship program, studies to determine needs, grants for strengthening training centers and grants for miscellaneous purposes such as the contracting of qualified foreign professors, scientific meetings, publications and studies on the problems of higher education.

2.7.1.6 The Fellowship Program

The program includes the following categories:

a. Full-time advanced training in Brazil for graduate students awarded to those who have distinguished themselves in the university courses so that they may continue their studies at a graduate level. The aim is to stimulate the preparation of master's or doctoral theses and the beginning of scientific research.

b. Full-time advanced training in Brazil for young faculty members intended for university instructors or research workers, so that they may carry out specific study programs and familiarize themselves with new scientific methods.

c. Advanced training abroad for young faculty members and for exceptional graduate students destined for the training of personnel in Categories a. and b. This training abroad is available only when the possibilities of obtaining the level they need have been exhausted in Brazil.

d. Formal refresher courses for older faculty members.

2.7.1.7. The Strengthening of Training Centers

CAPES is developing a plan to strengthen a restricted number of training centers, the so-called "islands of excellence". The limitation to a specific number of training centers permits a concentration of effort which will contribute more to the scientific development than would a plan distributing funds more widely. So far, sixty-three centers have been selected to receive financial assistance for equipment and libraries. This assistance corresponds approximately to US $4,000,000.

In the selection of centers, CAPES takes into consideration the record in producing scientists, the scope of their scientific activities, the nature of their scientific environment, the capacity to train students at advanced levels and the willingness to serve as regional, national, or international centers for training in basic sciences.

Obviously it is desirable that key personnel be on full-time basis and that laboratory, library and financial resources exist at more than minimal levels.

The sixty-three centers are in the following fields: biology, 14; agronomy and veterinary, 11; chemistry, 10; technology, 9; physics, 7; mathematics, 6; and earth sciences, 6. The centers are geographically distributed as follows: São Paulo, 17; Guanabara (city of Rio de Janeiro), 13; Pernambuco, 5; Federal District (Brasilia), 4; Paraná, 3; Ceará, 3; Bahia, 2; Sergipe, 2; and Rio de Janeiro, 1. Sixteen centers will receive special aid from a grant given by the Ford Foundation for the training of scientists. Five of these

centers are in the field of biology as follows: The Institute of Microbiology and The Institute of Biophysics of the University of Brazil, the Laboratory of Cell Physiology of the University of São Paulo, The Oswaldo Cruz Institute, and the Departments of Biochemistry and Microbiology of the Paulista School of Medicine.

2.7.1.8 Source of Income

The main source of CAPES funds is the allocation made by the Federal Government. The current program of fellowships and assistance to selected centers for the purpose of advanced training of university professors is worth approximately US $7,630,000, and its duration will be three to four years. This amount will be covered by US $2,500,000 from the Brazilian Government, US $1,130,000 from a grant given by the Ford Foundation and US $4,000,000 from a loan given by the Inter-American Development Bank (BID) on December 21, 1964. This loan is to be repaid by the Brazilian Government through the Banco do Desenvolvimento Economico in twenty years with an interest (on balances) of 1.25 per cent yearly plus the customary 0.75 per cent for service.

The loan money will be used for the purchase of new equipment and for enlarging libraries in the sixty-three centers. The largest amounts of funds will be used for physics (21 per cent), for biology (18 per cent), and for agronomy and veterinary (14 per cent).

The grant from the Ford Foundation will be used mainly for fellowships for sixteen training centers. These fellowships will be as follows: 673 domestic fellowships of one year duration, 38 fellowships abroad with the same duration and 32 refresher courses.

2.7.1.9 Budget for 1965

The budget for 1965 was estimated in October 29, 1964 as 5.99 billion cruzeiros (US $3,652,000 at the exchange rate of 1640 cruzeiros per US dollar). When the exchange rate changed to 1850 cruzeiros per dollar during December 1964, the budget corresponded to US $3,238,000.

The estimated expenditures will be as follows:

	Cruzeiros (Millions)	US $ at 1850	Per cent
Fellowships	2,358	1,274,595	39.4
Aid to Training Centers (Equipment, Personnel, Graduate Courses)	2,500	1,351,351	41.7
University interchange (Foreign professors, meetings)	550	297,297	9.2
Studies, Publications	150	81,081	2.5
Administration	432	233,514	7.2
	5,990	3,237,838	100.0

The fellowship program for 1965 includes 400 domestic fellowships and 50 fellowships abroad. (Domestic fellowships are estimated as 2.5 million cruzeiros per year; those abroad as US $7,500 per year). The percentage distribution of fellowships according to subject, is as follows:

Basic Sciences

Mathematics	3	
Physics	6	
Chemistry	8	
Biology	12	29

Technology

Engineering	18	
Chem. Engineering	3	
Agronomy	10	31

Medical Sciences

Medicine	15	
Odontology	6	
Pharmacology	5	
Nursing	6	32

Other

Psychology	1	
Economics	1	
Administration	2	
Philosophy	2	
Letters	1	
Sociology	1	8
		100%

From the 2.5 billion cruzeiros allocated for Aid to Training Centers, 760 million (US $410,800) or 30.4 per cent are in the fields of biology and medicine.

2.7.2 National Research Council (CNPq)

2.7.2.1 Objectives

The National Research Council of Brazil (CNPq Conselho Nacional de Pesquisas) was created by Law No. 1310 dated January 15, 1951 as a direct dependency of the President of the Republic to promote scientific and technological research in any field.

2.7.2.2 Organization

The highest authority is the Deliberative Council, composed of up to 27 members as follows: two members selected by the President of the Republic (The President and the Vice-President of the

Council); five members selected by the Government as representatives of the Armed Forces and the Ministries of Agriculture, Education, Foreign Relations, and Labor and Industry; one representative of the Brazilian Academy of Sciences; one representative of Industry; one representative of Public Administration; and from six to fifteen selected well-known scientists belonging to universities and other institutions of higher learning. These fifteen members are nominated by the same Council. The period of service is three years. Each year one third of the members is renewed. The Deliberative Council meets four times a month.

There is also a Technical and Scientific Division in charge of planning of the activities of the Council. The Division comprises eight sections as follows: technical, physics, mathematics, chemistry, biology, geology, agronomy and technology. Each one of the sections has a director and the Division is headed by a Scientific Director. Furthermore, there are several advisors for the different subjects chosen among the best qualified scientists.

For practical purposes the executive activities are carried out by the President, the Vice-President and the Scientific Director. At present the President is Dr. Antonio Couceiro and the Scientific Director Dr. Manoel da Frota Moreira.

The Council has three main programs: Fellowships, Grants and Special Institutions.

2.7.2.3 The Fellowship Program

The Council provides fellowships for a) beginners in the scientific career, b) perfecting or specialization, c) graduate

work and d) research. Fellowships for categories a, b, and c are given in Brazil or abroad. At present there are 60 students abroad. These fellowships are for training in research, not for professional training. Fellowships for research workers are given in three categories: research assistant, research worker and director of research. Fellowships for research assistants are given for two-year periods but are renewable. Those for research workers and directors of research are given for three-year periods and are also renewable. The monthly value of the fellowships is established according to the category of the fellow, his scientific production, cost of living and size of his family. The Council supplements the salaries of the investigators until a certain ceiling is obtained, which may vary from 40,000 to 500,000 cruzeiros. These fellowships are given only to individuals working full-time.

2.7.2.4 Grants

The Council gives grants for the following purposes: purchase of equipment, supplies and books, contract for special services, travel, scientific missions and expeditions, and publications. These grants are only for individuals or institutions on a full-time basis.

2.7.2.5 Special Institutions

The following organizations are dependencies of the Council: The Brazilian Institute of Bibliography and Documentation, The Institute of Pure and Applied Mathematics, the Organization Group of the Space Commission, the Institute for Highway Research and the

Institute for Research in the Amazonia.

The last two Institutes operate in collaboration with other governmental organizations. The Institute of Atomic Energy used to be under the authority of the Council.

The National Institute for Research in the Amazonia has two major divisions: The Institute proper located in Manáus and the Museum Emilio Goeldi in Belém. The objective of this Institute is the study of the Amazon Basin with the aim of developing the area and improving the economy, health and culture of the inhabitants. Its support comes from the National Research Council and the Supervisory Council for the Economic Development of the Amazon Basin. Both Councils contribute approximately equal amounts. The Goeldi Museum is well-known for the quality of its research.

2.7.2.6 Other Programs

Other programs include the adoption of measures to facilitate the importation of equipment, assistance for summer seminars in sciences and aid in the publication of Brazilian text books.

2.7.2.7 Current Activities

The Council has played a very important role in the formation of scientists and in the promotion of research. Several aspects have deserved special consideration such as the activities of some research centers and research in the utilization of semi-arid regions (The Study of the Cerrado Region), oceanography, and fisheries.

During 1965 and 1966 a program of activities based on well-

studied priorities will be carried out. In the bio-medical field they will include: neurophysiology, pharmacology of natural substances, genetics of microorganisms, immunochemistry and immunopathology, virology, schistosomiasis and Chagas' disease.

The Council awarded 558 fellowships for research during 1963, as follows: 70 for agronomy, 230 for biology, 66 for physics, 27 for geology, 24 for mathematics, 106 for chemistry, 33 for technology and 2 for the technical section. Most of the research workers (290) came from the city of Rio de Janeiro (Estado Guanabara). In the specific field of biology the distribution is as follows: Guanabara, 118; Rio Grande do Sul, 29; São Paulo, 25; Minas Gerais, 24; Pernambuco, 15; State of Rio de Janeiro, 7; Paraná, 5; Bahía, 3; Sergipe, 2; Santa Catarina, 1; and Ceará, 1.

The Brazilian Institute of Bibliography of the National Research Council undertook a survey of the research work in progress in the country. The Institute sent out 4530 questionnaires addressed to all research laboratories existing in the technological institutes at Federal and State Universities and at public service offices throughout the national territory. 810 replies were thus far received.

2.7.2.8 Budget

The income of the Council consists mainly of appropriations made by the Federal Government. The Council has also received occasional grants, such as one from the Rockefeller Foundation in the amount of US $75,000 for scientists returning to Brazil.

The regular budget for 1963 was 1,450 million cruzeiros.

(US $1,450,000 at the rate of 1,000 cruzeiros per dollar); and for 1964, 3,750 million cruzeiros (US $2,287,000 at the rate of 1640 cruzeiros per dollar).

For the year 1965 the budget was estimated at 7,868 million cruzeiros (US $4,798,000 at the exchange rate of 1640 cruzeiros per dollar which existed when the budget was prepared; and US $4,253,000 at the exchange rate of 1850 cruzeiros per dollar on January 1, 1965). Of this amount, 6,671 million cruzeiros have been assigned for research grants and fellowships in the following proportions expressed in percentages: agronomy, 5.3; biology, 18.0; physics, 16.5; geology, 7.2; mathematics, 3.3; chemistry, 9.0; technology, 9.8; technical section, 2.1; strengthening of activities during 1965-66, 2.8; and special institutes, 26.0.

2.7.3 Foundation for the Support of Research of São Paulo (FAPSP)

The Foundation for the Support of Research of Paulo (FAPSP, Fundação de Amparo à Pesquisa do Estado de São Paulo) was organized by Law No. 5918, dated October 18, 1960, in order to develop article 123 of the Constitution of the State of São Paulo (1947. Article 123 states that research should be promoted by a special foundation which shall receive not less than 0.5 per cent of the income of the State).

2.7.3.1 - Objectives

The main objectives of the Foundation are the following: financing research, both official and private; financing new research centers; the establishment of inventories of research

facilities and research activities; the study of the situation of research in São Paulo and in Brazil for the establishment of priorities; the exchange of scientists, both at national and international levels by means of fellowships for study or grants for research; and the promotion of publishing research results.

The Foundation is not allowed to develop its own centers of research. This is in contrast to similar organizations at the national levels such as the National Research Councils of Brazil and Argentina.

The Foundation dedicates a significant part of its income for the establishment of its own endowment. At present it is dedicating about 40 per cent of its income for this purpose.

2.7.3.2 - Organization

The authorities of the Foundation form the Superior Council, which defines policies. The Technical and Administrative Council is in charge of executing the policies.

The Superior Council is composed of twelve members, known for their scientific achievements. Six members are selected by the Government of the State; three members are chosen by the Government from a list of nine candidates submitted by the University of São Paulo; and three members are chosen by the Government from a list of nine candidates submitted by the institutes of higher education or research which function in the State other than the University of São Paulo. The Superior Council is headed by a president (and vice-president) selected by the Government from the members of the Council.

The Technical and Administrative Council is composed of three members appointed by the Government from candidates submitted by the Superior Council. One of the three members is the President, a another is the Director of Administrative Matters, and the third is the Director of Technical and Scientific Matters.

Furthermore, there is a group of Scientific Advisors in the various sciences. At present the President of the Technical and Administrative Council is Dr. Jayme Cavalcanti and the Director is Dr. Jead Hosne.

2.7.3.3 - Budget

During 1963 the income of the Foundation reached the amount of 1,492 million cruzeiros, six per cent of which came from the endowment funds. The expenditures amounted to 1,148 million cruzeiros. Forty-two per cent of the expenditures (482 million cruzeiros) correspond to grants and fellowships for research, 54 per cent to investments for the endowment fund, and 4 per cent for general administration and miscellaneous expenditures.

2.7.3.4 - Current Activities

Of the 482 million cruzeiros spent for grants and fellowships, 386 million (80.2 per cent) corresponded to 361 grants and 95 million (19.8 per cent) to 200 fellowships.

The funds for research grants and fellowships were distributed as follows: biology and medical sciences, 26.7 per cent; mathematics, 14.2 per cent; agronomy, 12.2 per cent; chemistry, 8.2 per cent; social

sciences, 6.5 per cent; geology, 4.1 per cent; geography and history, 3 per cent; industrial technology, 21 per cent; other 1.6 per cent; meetings and publications 2.6 per cent.

The percentage distribution of grants and fellowships is as follows: University of São Paulo 66.6; other official institutions, 22.6; private institutions for research, 2.6; private industry, 3.8; meetings, associations, publications, 4.4.

During 1962 a total of 298 research projects received financial assistance from the Foundation. One hundred and twenty nine projects, which correspond to 43 per cent of the total were in the biomedical field (67 in biology and 62 in medicine).

The Council publishes periodically not only a list of grants but also progress reports on all research.

2. 8 Miscellaneous Organizations

Under this heading we are considering several organizations which, in one way or another, influence research in Brazil.

2.8.1. Academy of Sciences

This institution publishes a scientific journal, fosters scientific meetings and gives some awards. Its activities are limited by the size of the budget which amounts to 20 million cruzeiros (approximately US $10,800 at the exchange rate of 1850 cruzeiros per dollar). The Academy is an institution of high prestige, and the scientists are eager to belong to it. There is a marked interest in biomedical research.

2.8.2 Brazilian Society for the Advancement of Science

This meritorious society publishes the journal "Ciencia e Cultura" and fosters periodic scientific meetings. The annual meeting congregates the most distinguished scientists in Brazil and is usually attended by hundreds of persons. At present the Society has a very stimulating leadership.

2.8.3 Private Organizations

Mention was made of the Antunes Foundation which, although specially interested in agronomical research, gives some attention to health research.

Other foundations have also expressed their interest in research by establishing scientific prized. This is the case, for instance, of the Jafet Foundation and the Moinho Santista. There is some doubt, however, whether these awards are really effective in encouraging research.

2. 9 Final Remarks

It is the consensus that the training of adequate personnel is essential for the promotion of research. The Government goals regarding higher education are the increase in the capacity of the universities and the improvement of instruction in all fields. Furthermore, Brazilian universities are aware that the improvement of university teaching will be achieved if research programs are promoted, and, conversely, that good teaching will stimulate research. They are aware also that adequate teaching and research levels are not

attained unless full-time schedules are adopted. For this reason, a number of universities are gradually adopting full-time schedules, especially in the basic sciences. Also the preparation of a new generation of teachers and leaders of research is considered essential for the development of Brazil. Now mental attitudes capable of meeting modern needs are required.

Unfortunately for the development of these objectives, there are many difficulties which range from lack of money to indifference toward research at certain Government levels, and from lack of personnel to faults inherent in the structure of the institutions. For these reasons, the Brazilian Government has decided to concentrate its efforts only in a few institutions, in order to convert them into models of excellence. They will be the example for others to be developed in the future when new resources would be available.

2.9.1 - Factors Tending to Impede the Development of Health Research

A number of factors tend to impede the development of health research. The majority, however, are those affecting research in general. For instance, there is a shortage of resources. The Government may realize the importance of research but does not provide the necessary funds for its development. Usually, since there are heavy requirements for economic and social development, these activities receive more attention. The shortage of resources is aggravated by inflation and by frequent devaluations. This fact

impedes serious planning and the establishment of long-range policies. There is also some inadequate governmental attention given to planning for the development of research: for instance, regulations which make difficult the importation of essential materials used for research.

At the institutes where investigations are conducted several factors affect research in a negative way. One of these factors is political interference which may operate in various directions. For instance, proselytism is used unduly in universities to advance political parties. New governments try to get rid of those who were supported by the old regime and often unjustly accuse them of taking extreme political attitudes.

At another level, the lack of full-time, well-trained personnel, and of adequate salaries and leadership in scientific institutions tends to impede the development of health and other research.

2.9.2 - Factors Promoting Health Research

Among the factors tending to promote health research in Brazil is the tradition and recognition that health research is important. This attitude is more firmly rooted in Brazil than in other countries.

Another important factor is the policy of the government to strengthen higher education and to develop the so-called "islands of excellence". There is also a trend toward the reform of universities, demonstrated, for example, at the University of Brazil.

The government, furthermore, is coordinating more effectively its resources for education. This happened for instance, with

the merging of COSUPI and the old CAPES.

Two of the most important factors are the development of the National Research Council and the Foundation for the Support of Research of São Paulo.

2.9.3 - Recommendations

The awareness that health research is an investment whould be strengthened on all levels.

More financial assistance should be given to the basic tools for the promotion of research, such as the National Research Council and the Foundation for the Support of Research of São Paulo.

Universities should be strengthened. In fact, the university constitutes the single most important factor in the development of research. This is where scientists are formed and where a significant part of the research - especially basic - is conducted. The scientific and technological progress of developing countries depends upon the quality of their universities. If the quality is not improved, progress is impossible. Financial assistance should not be given only to official universities. Private universities are rendering good service to Brazil and, therefore, should also be improved.

The private sector should be encouraged to give more financial aid to education, to research in general and to health research. The private sector should understand that giving for these purposes is a duty which is justifiable as an investment.

2.10 - Institution Visited in Rio de Janeiro and São Paulo

University of Brazil

Office of the Director of the Medical School.

Institute of Microbiology.

University of São Paulo *

Institute of Tropical Medicine.

Department of Cellular Physiology.

Paulista School of Medicine *

Department of Biochemistry and Pharmacology.

Ministry of Health

Office of the Minister.

Special Public Health Service (SESP).

Director of the Department of Rural Endemic Diseases. (Endemias Rurais)

Institute of Rural Endemic Diseases (Endemias Rurais)

Instituto Oswaldo Cruz

São Paulo State Health Department *

Instituto Butantan

Special Organizations

Coordinating Agency for Advanced Training (CAPES).

National Research Council (CNPq)

Foundation for the Support of Research of São Paulo. *

Miscellaneous Organizations

Academy of Sciences

Brazilian Society for the Advancement of Science.

Antunes Foundation

* Located in the City of São Paulo. The remaining organizations located in the city of Rio de Janeiro.

CHILE

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3. CHILE*

Chile has a population of 7 - 8 millions, of which some 4 - 5 millions live in cities. The number of physicians is approximately 3,500 or about 5 per 10,000 people. In general, approximately 22 per cent of the annual budget goes to the armed forces (much the same percentage as in other Latin American countries) but Chile differs from most other countries in that it has a record of little or no military interference in its government. On the other hand, despite the fact that its present government is pushing ahead with plans for land reform and industrial development, Chile is plagued with the problem of unemployment involving some 18 per cent of its people. Furthermore, the rate of growth of the population during the past two decades has been rather greater than the national economic growth, leading to a disastrous and continuing monetary devaluation, which, in turn, has added to social unrest.

It is stated by a number of authorities that Chile is currently receiving more foreign aid per capita than any other country in the world. Some of this affects biomedical research and adds to the resources for research; many countries are involved in this contribution and it is difficult during a brief visit to derive a realistic sense of the whole. The time of the visit was unfortunate also in that it coincided with final examinations and with budgetary preparation for the coming academic year.

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*Prepared by Dr. J. C. S. Paterson. Based on a site visit in 7-19 December 1964.

3.1 Structure for Health Activities and Research

Essentially, the Government of Chile has relegated the responsibility for scientific research to the Universities and to such bodies as the Atomic Energy Commission. There are in addition several research scientists in the National Health Service.

Article 36 of the Law 11575 (Official Diary No. 2292 of 14 August 1954) transferred one-half per cent of tax and customs revenue to a University Fund for construction and investigation. This fund is distributed as follows:

10/18	University of Chile of which 2/18 goes to the University of Chile in Valparaiso
2/18	University of Concepción
2/18	Catholic University of Chile
1/18	Catholic University of Valparaiso
1/18	Universidad Tecnica Federica Santa Maria
1/18	Universidad Tecnica del Estado
1/18	Universidad Austral

The uses to which these funds are put are determined by the Council of Rectors, comprised of the Rectors of the respective Universities.

Very soon, the new Universidad del Norte (Antofagasta) will also qualify for support in this way (Law 15561 of 1964).

The law directs that these funds be used by the Universities for construction and equipment of experimental stations, laboratories and scientific and technological institutes, specifically concerned with agriculture, industry and mining. For these purposes the Council of Rectors acts as a National Research Council, but biomedical research is concerned only indirectly, if at all

Research in Concepción is largely in the fields of marine biology and archeology, as in Valparaiso. At the new Universidad del

Norte the production of pure water by means of solar enegy is being explored.

3.1.1. University of Chile

The University of Chile is a classical example of the Spanish university, being located in a number of buildings throughout the city of Santiago (and in Valparaiso), and without any one particular campus. This dispersion and the organizational complexity that has grown up over the past 120 years gives rise to some initial difficulty for the observer from outside. Basically, the University is organized into Faculties, and each faculty in "chairs". However, many of these "chairs" are re-grouped into Schools and Institutes within the Faculties, and anyone member of the faculty may have, and commonly does have, duties and responsibilities in several departments, institutes, schools or even faculties. There are also joint appointments between the medical faculties of the University of Chile and the Catholic University.

On December 16, 1964, the University of Chile approved the establishment of a Faculty of Sciences, now headed by Dr. Gustavo Hoecker as Dean. This new Faculty will replace the existing, but relatively new, Institute of Natural and Mathematical Sciences, and will also incorporate many of the biologists presently listed in other faculties. The new faculty will comprise the following:

Biological Sciences	46 (26)*
Biochemists	10 (6)
Physiologists	10 (6)
Neurobiologists	8 (6)
Geneticists	6 (3)
Botanists	4
Zoologists	3 (1)
Microbiologists	3 (2)
Morphologists	2 (2)

* Number in parenthesis are M.D.'s.

Physical Sciences
(Theoretical, crystallography, nuclear). 9
Chemical Sciences
(Theoretical, organic, inorganic, physico-chemical). .9
Mathematics. 8*

There has been much discussion of this step, particularly because it will involve the departure of a number of scientists from their present institutes and faculties. This, it is hoped will be only a short-term effect, because the new faculty will train replacements. It is likely that an application will be made to the Ford Foundation for funds to develop and establish this new Faculty. Should it become well established it will undoubtedly become one of the dominant influences upon biomedical research in Chile and will probably give training to nationals of other countries as well.

3.2 Present Biomedical Research Programs

Currently, most of the biomedical research is carried out in the Faculty of Medicine. This is controlled largely by a Committee on Scientific Investigation (5 persons) which is aided by a study section of 12 scientists who judge the scientific merit of research proposals submitted. The total research budget for the year 1964 was of the order of $310,000. About $40,000 was provided by the University (in addition to salaries, etc.) and $277,069 was derived from the following sources:

Kellogg Foundation
Rockefeller Foundation

* 3 mathematicians are on contract from abroad.

Jane Coffin Childs Memorial Fund
Foundations Fund for Research in Psychiatry
Damon Runyon Memorial Fund
U.S. A.E.C.
U.S. Air Force
U.S. National Institutes of Health
P.A.H.O.

Local sources include the Guildemeister Foundation (mainly assists the Catholic University) and the Lopez Perez Foundation for cancer research.

In 1964, one hundred and eleven research projects were judged by the Committee on Scientific Investigation of the Faculty of Medicine, 64 being new and 45 continuing projects. For the greater part, the results of the research are reported at the annual meeting of the Chilean Biological Society and published in "Archivos de Biologia y Medicina Experimental". However, an impressive number of papers emanating from Chile are presented at the meetings of international societies and are published in foreign journals.

This method of local decision by a faculty committee on the kinds of research and the degree of research support appears at the present time to be the method of choice in the University of Chile. The Committee would prefer to have the freedom to determine what is done and considers that the current national problems that merit investigation are the following:

1. Malnutrition
2. Alcoholism and cirrhosis
3. Cholelithiasis
4. Rheumatic fever
5. Gastric cancer

The Faculty of Veterinary Medicine of the University of Chile is growing rapidly and is now putting up a new building. Research is

presently going on in the fields of genetics and virology. In several fields of its activity this school derives considerable support from F.A.O. and from the Rockefeller Foundation.

A most important aspect of biomedical research in Chile is the decision by the University of Chile to establish a science reference library.

3.2.1. The Faculty of Medicine, Catholic University

The Catholic University has an annual budget of approximately $3.5 millions, about 1/3 of which goes to the Faculty of Medicine. The university income is derived as follows: Government of Chile 60%, private donations and investments 30%, and foundations (local and foreign) and foreign governments 10%. In the Departments of Biochemistry, Physiology, Neurophysiology, Medicine and Pediatrics, research is being conducted actively. In this case, however, it is left to individuals to obtain personal support rather than through a research committee as in the University of Chile.

3.3. Factors favoring biomedical research in Chile

3.3.1. A most important factor is the realization in Chile of the relevance of research to economic and social development. For this reason several senior members of the faculty are very much aware of the need to establish a National Research Council which would include biomedical research. Plans to present this to the government have been prepared and at present it is expected that this council would be under the Ministry of Economics and Development. Additionally, the Ministers

of Health (Dr. Rojas Villegas) and of Education (Dr. Gomez Millas) both expressed their interest in establishing a Research Council.

An alternative method would be to appoint an inter-disciplinary committee under the Council of Rectors.

3.3.2. The development of a Faculty of Sciences

3.3.3. The development of a science reference library

3.3.4. Cooperation of the University of California with the assistance of U.S. governmental and foundation resources.

3.4. Factors inhibiting biomedical research in Chile

Undoubtedly, the principal problems are the devaluation of the currency and the concomitant rise in prices that have occurred during the past few years. In 1962 $1.00 was equivalent to 1.05 escudos; by the end of 1964 $1.00 was equivalent to 3.25 escudos. Not only does this make it difficult to purchase equipment, etc., from abroad, but it has become a most difficult matter for the Chilean scientist to devote full-time to university teaching and research.

3.5. Institutions visited and persons interviewed

Ministry of Public Health

Dr. Francisco Rojas Villegas, Minister
Dr. J. Santa Maria, Assistant for Foreign Relations

Ministry of Education

Dr. Juan Gomez Millas, Minister

U.N. Special Fund

Dr. Adreano Garcia

Atomic Energy Commission

Dr. Eduardo Cruz-Coke

Food and Agricultural Organization

Dr. H. Stoddard

Rockefeller Foundation (Agriculture)

Dr. Joseph A. Ruppert

Council of Rectors

Mr. Cesar Fighetti, Secretary

University of Chile

Dr. Eugenio González Rojas, Rector

Institute of Physics, Chemistry and Chemical Engineering

Dr. Enrique D'Etigny, Director

Institute of Natural and Mathematical Sciences

Dr. George Hodgson, Director

Faculty of Medicine

Dr. Amador Neghme, Dean

Institute of Physiology

Dr. Samuel Middleton, Director

Institute of Physiological and Pathological Chemistry

Dr. Julio Cabello, Director

School of Public Health

Dr. Guillermo Adriasola, Director

J.J. Aguirre Hospital (Internal Medicine)

Dr. Hector Orego Matte
Dr. Jorge Litvak

Hospital del Salvador (Internal Medicine)

Dr. Hernán Alessandri, Professor
Dr. José Barzellato

School of Medical Technology

Dr. Jorge Artigas

Faculty of Veterinary Medicine

Dr. Ramón Rodríguez T., Dean

Catholic University

Professor Joaquín Lueo
Professor Hector Croxatto

COLOMBIA

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4. COLOMBIA*

4.1 The University of Los Andes

Viewing the creation of an establishment of higher education which would not experience political influences nor be exposed to a confessional type of teaching, a young group of Colombian scholars in 1948 took steps to create the Los Andes University. With the help of private resources, mainly from industries, it was possible in 1949 to begin only 2 courses: that of Engineering and that of Architecture, totaling 79 students, all paying tuition, and 16 professors, the majority of whom were "ad honorem". From then on, the University's activities have expanded into other fields, especially into those concerning the training of higher level personnel, necessary for the socio-economic development of the country. In this manner, the University has already five Schools (Arts and Sciences, Architecture, Fine Arts, Economics, Engineering,and Philosophy and Literature), which graduate architects; electronic, mechanical, civil and industrial engineers; economists; "Licenciados" in philosophy and literature, in modern languages, in biology and in bacteriology; masters in fine arts and natural sciences. Besides this, the University awards the title of "Master" in economics and biology. It also offers special graduate courses of University extention in different fields, for those who are interested and do not need to enroll in one

* Not fully edited.
Based upon a site visit by Dr. Ernani Braga, 14-23 December 1964.

of its schools.

Due to a scarcity of initial means, the University settled in some very old buildings, which had been the women's prison "The Good Shepherd", in order to be able to begin its courses. Today it owns a number of well-planned and economically built construction, within a well-located campus of great land value. Even though its financial situation is not easy - in reality, private teaching establishments are rarely free of money difficulties - the budget for 1964 was over 20 million Colombian pesos (nearly 2 million dollars). This sum tends to increase gradually, especially due to the growth of the University's own income from special funds for research and from the increase in registrations. Private donations are substantial, for only the local ones in 1964, represent 8% of the budget. They rose from 50,000 pesos in 1941, to 1,545,000 in 1943, not counting special donations in 1962 and 1963, worth 707,000 and 1,500,000 pesos respectively, consigned to a Special Study Center and to an Audio-Visual Center.

Since its organization, the University of Los Andes has given great importance to research activities, in which its students take active part. So much so, that in 1958, the Rockefeller Foundation granted funds to begin a research plan on Economical Sciences and with the help of IBM Colombian branch in 1963, organized at the Engineering School, an Electronic Computing Center.

It might be in the biological field that the Los Andes University will develop its research with greater intensity. Indeed, great emphasis is made in the study of ecology not only of

vertebrates, reproduction cycles and distribution of the amphibians, reptiles, birds and mammals, but also of the Drosophila fly, that is being used for investigations in the field of evolutionary genetics through a plan in which this insect is irradiated. On the other hand, with the collaboration of foreign scientists, the Department of Biology undergoes studies concerning cellular permeability and the derangements on account of certain cancer agents in pure cultures of water protozoans. The Department of Microbiology is also engaged in research projects connected with fungi and bacteria as causes of disease in plants or man.

There is no doubt that in Colombia, the University of Los Andes is a pioneer institution. It is the first University in Colombia to create in its structure a School of Arts and Sciences and to establish as a pattern of performance, the development of scientific investigation, giving special attention to the biological field. Most of the University students are full time and under such regime, the number of students has gone up from 75, in 1949 to 980, in 1964. On the other hand, its faculty, during this last year, is 57% full time (91 professors) and 43% part time (71 professors). They come from different countries of the world, totalling 45 foreigners, of which 22 are North Americans.

Great importance is given to foreign teachers who bring new techniques, mold new elements and collaborate to create "islas de excelencia". Within a relatively short time, they return to their own countries, leaving behind substitutes capable of instructing new elements to contribute efficiently towards the development of

scientific investigation on the national level, on the regional level (i.e. Latin America) and even on the international level, linked with the countries of greater scientific progress.

The authority responsible for the supply of water for Bogotá (The District Aqueduct) maintains adequate laboratories for a series of studies in limnology. The Department of Biology of the University of Los Andes provides very satisfactory assistance for these studies.

4.2 Association of Colombian Universities

The Association of Colombian Universities (ACU) is an independent, permanent and legal organization formed by the official and private Colombian Universities. Besides operating throughout the country, it can represent or join similar international societies. Its purposes, among others, include the furthering of "la investigación científica y cultural" and "el análisis de los problemas nacionales y sectionales". Through a special fund, the "Fondo Universitario Nacional", the ACU may contract national or foreign investigators, officiate conventions with individuals or official bodies of the country or from other nations, towards the development of scientific and cultural programs, encourage scientific investigation, etc. This Fund, created in 1954, is also a legal entity, having annually at its disposal, a sum of not less than 1% of the budget of the Ministry of Education and also a contribution from all the universities affiliated to the ACU, in a proportion of 2.5% of what is granted to them annually by the national government.

Its utilization is carried out by the ACU, that, like the "Fondo", has a Council of Deans, an Administrative Committee of the said Council and a Director. The ACU also has a "Congreso Nacional de Universidades" which is its utmost authority. In view of the similarity of structures, it was possible to turn over to the ACU's Director the responsibility of managing the "Fondo" and in this manner making it possible for the two organisms to cooperate in achieving the objectives as stated in Article 8, Decree 251 of 1859.

Concerning scientific investigation in general (not referring only to biomedicine), besides what has already been referred to, it is convenient to mention that the National Convention of Rectors which met in Medellín, in October of 1957, with the attendance of 18 rectors, 26 advisors, besides observers from the Ministry of Education and of the "Fondo Universitario Nacional", includes the following in its statement concerning the "Responsabilidad de la Universidad ante la Patria".

"2º - La investigación científica de la Universidad es proceso con múltiples modalidades:

a) Los fenómenos conocidos y por descubrir.

b) Los problemas nacionales: sociológicos, históricos, correlación internacional, económicos, artísticos, etc.

c) La pura lucubración, aunque sus pesquisas no sean de immediata aplicación.

d) La Universidad que no irradia a todo el conglomerado social perece.

e) La Universidad Colombiana debe cumplir su función con la democracia a fin de que sus elementos capacitados puedan llegar a los más altos honores y responsabilidades sin discriminaciones sociales, políticas, religiosas, raciales.

Respecto a la investigación científica recomendamos:

A- A Las Universidades

1º -Establecer dentro del presupuesto universitario apropiaciones suficientes con destino a investigaciones científicas tanto en las ciencias puras como en las aplicadas y en las ciencias sociales.

2º -Al fijar los horarios y demás obligaciones docentes de los catedráticos universitarios, la Universidad procurará darles el tiempo necessario para que se puedan dedicar a las investigaciones científicas en los campos de su especialidad.

3º -Cada Universidad deberá establecer estímulos de orden académico para premiar aquellas investigaciones adelantadas por sus catedráticos; tales estímulos comprenden distinciones académicas, decoroso respaldo ecónomico, la publicación de trabajos, y particularmente, ascensos en el escalafón universitario.

4º - La Universidad debe procurar vincularse a las actividades creadoras para prestar un servicio cada vez más eficiente en sus laboratorios, apoyadas por los organismos beneficiados.

5º -La Conferencia Nacional de Rectores Universitarios recomienda a las Universidades poner en práctica las RECOMMENDACIONES adoptadas por los Seminarios Colombianos convocados por el Fondo Universitario Nacional.

6º - Cada Universidad debe planear anualmente un programa de investigación científica en sus diversos aspectos, en especial en los problemas que son propios de la región donde ella funcione, y también aquellos que presentan características de mayor urgencia dentro del panorama nacional."

Besides this, the National Convention of Rectors, in its "Declaración sobre Niveles Académicos", not only recommended the Colombian Universities to organize special research programs, to be coordinated by Special Committees, but also thought it convenient to create an "Instituto Nacional de Servicios de Investigación". The finality of such an Institute would be to promote mutual assistance and reciprocal exchange between the organizations engaged in scientific research. Ever since its organization the ACU has tried to obtain facilities so that the Colombian Universities might import scientific material, but only on December 3 of 1964 was obtained by a legislative Decree of the Government's Military "Junta", exemption of the referred material from customs duties and other taxes. The said Law also settled that it would be permitted to raise the ceiling for donations towards teaching establishments up to 20% on income tax deductions. Unfortunately this legal order is not being put into practice as often as desired.

It was also up to the Government's Military Junta, in July of 1958, to dispatch a Decree fixing the legal rules for the Official Departmental Universities and the setting of directions for their structure, to be composed of a Superior University Council, a Directing Council, and a Dean.

The Superior University Council, must have up to 9 members, one being the Governor of the Department or his representative, a delegate of the Ministry of Education (who may be chosen from among the professors of the University), a church representative and representatives of the professors, of the students and from private corporations or professional associations (including those of alumni) in the manner by which the by-laws are established. The Colombian Universities have thus a structure of their own, which enables them to attract the participation of the community's elements, without being exclusively dominated by the faculty, a factor which has brought strong "inbreeding" and much isolationism in many countries.

The ACU comprises 26 universities (14 official and 12 private ones), totaling 116 schools, which distribution is as follows:

Law	16
Economy	10
Architecture	9
Civil Engineering	9
Chemical Engineering	7
Medicine	7
Electrical Engineering	6
Agronomy	6
Education	6
Others	40
TOTAL	116 Faculties

Some universities have many teaching units (The National has 24 faculties, two departments, 4 institutes, 2 schools and one conservatory of music), while others, like the University of Nariño (one law school, one Instituto de Bachilleratoand one School of Fine Arts), or like the Fundación Universitaria Santiago de Cali" (only one law school) are reduced to a few units of higher learning.

Distribution of the universities by century founded is as follows:

UNIVERSITIES

	Official	Private	Total
XVII	-	2	2
XVIII	-		-
XIX	4	1	5
XX	110	9	19
TOTAL -	14	12	26

The distribution of those formed after 1900 is as follows:

	Official	Private	Total
Before 1945	2	2	4
After 1945	8	7	15
TOTAL	10	9	19

4.3 Colombian Institute for Advanced Training Abroad (ICETEX)

The ICETEX was founded on August 3, 1950 by the Legislative Decree No 2586. It was based in a project proposed by Dr. Gabriel Betancur Mejía , in conformity to the thesis which he presented at the University of Syracuse, USA, in 1944, in order to obtain his Masters Degree in Public Administration. With the creation of ICETEX, Dr. Betancur Mejía was appointed to preside it.

ICETEX is an autonomous governmental organization with allocated funds and independent resources subject to fiscal control of the State. Its commitments are primarily intended to promote, finance, guide, and conduct high level training and specialization for technical and scientific personnel at the principal educational centers of the world, in accordance with the country's major needs.

The major part of the program is achieved through loan grants of medium terms and low interest rates. The loan grants are refunded by recipients as they pursue their specific professional activities upon their return to Colombia.

In accordance with its by-laws, ICETEX functions are:

a) To concede loans for advanced training abroad to eligible candidates.

b) To provide credit through loan grants, free of interest, to Colombian students who pursue a university career in the country.

c) To determine on a national scale present and future needs for high level trained personnel.

d) To coordinate to the best advantage of the nation and the individual all available technical assistance and scholarship programs offered by foreign nations, private entities or international organizations.

e) To advise and help in placing professional grantees trained abroad in occupational activities to the advantage of both the grantee and the country.

f) To select the educational centers best fitted to train applicants in their desired field of study.

g) To supervise the academic progress of Colombia's students sponsored by ICETEX who are studying abroad.

h) To cooperate with enterprises in developing technical programs by sending selected personnel to foreign countries.

i) To comply with Colombia's international agreements for cultural interchange of students.

j) To administer public and private funds destined to finance technical and professional education within the country.

k) To serve as Secretariat of the National Committee for Scholarships, of which ICETEX is a member.

l) To manage the nationally sponsored scholarship award program for prominent Colombian artists to be sent abroad for training.

m) To authorize foreign exchange currency to cover expenses of Colombian students abroad.

n) To administer the financial resources of the Colombian Linguistics Institute, ILCA.

o) To supervise a program of loans awarded by commercial banks for college students.

ICETEX is organized as an autonomous institution, has its own capital and is subject to the nation's fiscal comptrollership.

The general management of ICETEX is entrusted to a Board of Directors, a Director, and a Deputy Director.

The Board of Directors includes five members, plus the corresponding alternate members, who represent the National Government, the private and public universities, the commercial and industrial associations, and the recognized Church of Colombia. The Director, appointed by the President of the Republic, is selected from a list of four candidates presented by the Board of Directors.

The various services offered by ICETEX are conducted by specialized departments which are coordinated through Administrative and Academic Secretaries.

These Departments are: Loans for Studies Abroad, Coordination of International Scholarships, Currency Exchange for Studies abroad, Loans for undergraduate students in Colombia, Research on Human Resources, Accounting, Financing and Credit and Collection.

ICETEX has contributed to the specialization and training of 12,889 students during the first ten years of its operation, through programs of financing, supervision, academic control and others.

In 1953, the financial resources of ICETEX amounted to the equivalent of US $40,000.00 in Colombian currency, and in 1962, the capital outlay was nearly US $3,000,000.00. The services were also expanded through the administration of other public and private funds.

Financial resources have come from three primary sources:

30% Government grants.

58% Income from the administration of private funds.

12% Surplus accumulated by ICETEX after paying all administrative expenses with its own funds.

In 1964, ICETEX has

a) obtained from AID a loan of US $ one million towards educational credit within the country, to become effective during the first few months of 1965. This is the first loan that has ever been given in the history of international loans, viewing the objective already mentioned,

b) gave technical assistance to two countries toward the creation of organizations similar to ICETEX the "Fondo Rotatorio para la Educación", in Panamá, and the "Instituto Dominicano de Crédito Educativo", IDCE,

c) established the first regional offices of the Institute, in the Departments of Antioquia and Valle,

d) begun a large plan for fellowships, the LASPAU-ICETEX, sponsored by important North-American Universities and meant for graduates who wish to take a complete course in the said country and upon their return home would follow a teaching career.

e) completing negotiations with the State of Florida, in the United States, viewing an educational alliance with the said State.

One of the most important aspects of the ICETEX work consists in a manpower study for specialized talent. The Association of Colombian Medical Schools, with the aid of both the Milbank Memorial Fund and the Pan American Health Organization and in agreement with the Ministry of Health, is also accomplishing a study on health

manpower. Due to the limited area which it will cover, this study will be rather deep. On the other hand the ICETEX's programs aim at coming to know the country needs.

ICETEX, in cooperation with the National Planning Office, the School of Public Administration, the National Apprenticeship Service, the National Department of Statistics, plus other public and private entities, is investigating the needs of the country for highly-qualified manpower.

The analysis consists of:

a) Present statistics of human resources of the country.

b) The present and potential supply of professionals and technicians.

c) The actual long range requirements of these professionals in the different economic, administrative, and social sectors of the country.

d) The shortages and surpluses of these occupational levels.

This analysis will help to formulate the pertinent ideas, thereby integrating an educational policy for professional training.

The study acknowledges the necessity of integrating the economic and social plans of the country and the formation of a group of highly specialized technical and scientific personnel, that due to the country's expansion, are vitally needed.

4.4 Colombian Association of Medical Schools

The Colombian Association of Medical Schools is made up by the 7 medical schools of the country (founding members), by several other societies bound to medical education (affiliated members) and by a group of professors of the Colombian medical faculties (individual members). It was formally established in March of 1959, during the 12th Meeting of Deans of Medicine, that is, a little more than 3 years after its organization was recommended during the first Seminar of Medical Education (Cali, December of 1955).

Among the many purposes of the Association, one may be singled out because of its reference to research, as follows:

Stimulate studies on medical education and investigation in Columbian Medical Schools.

The main direction of the Association is to search for the betterment of the level of Colombian medical education. Not only for these circumstances but also for the attained achievements, it has deserved the recognition and support of national and international organizations, especially from the Kellogg, Rockefeller and Milbank Foundations, as well as the Agency for International Development (AID).

The Association's legal status is in its essential nature that of a non-profit entity. This status was granted by the Ministry of Justice, through the Decree No. 1518 of 1953.

During its 7 years of existance, the activities of the Association have been multiple and of great significance for the

betterment of medical education in Colombia. 30 meetings of Deans have been held and 3 General Meetings, the first one in Popayán, in 1960, the second in Bogotá, in 1962, and the third in Cartagena, in 1963. During those meetings the most important problems were studied and conclusions and recommendations of great importance were attained, which were applied by the 7 schools of the country and by the organisms pertaining to the Association.

The Association approved and published the minimum requirements which a school of medicine should abide by, and following the recommendations of the III Conference of Latin American Schools of Medicine, it is carrying out a very complete work concerning the unification of systems of admission for candidates in the study of medicine. By this study, it is expected to obtain unity in the field of judgement for admissions, in such a manner that the level of acceptees should be of the same quality in all 7 medical schools. By means of the Planning Division a ten year medical study plan is being elaborated in Colombia, which in agreement with the Colombian Association of Universities and with the General Plan for Development, can supply an objective appraisal of the needs for the schools of medicine of the country. Finally, in conformity with the Law No. 2 of 1963, a general internship plan which all medical schools have accepted the obligation to meet, has been approved.

The Association counts with a stable office structure, with its own headquarters. It has 5 permanent executive employees and an efficient secretarial staff.

The Association has taken on very serious responsibilities in relation to the medical schools of the country and also with general medical education. The new legal provisions, specially the Law Nº 14 of 1962, have given to it important duties, which imply in continous work and require highly competent and efficient personnel.

The ACFM has been gradually led to assume new responsibilities. One of them is the study about "Health Manpower Study and Medical Education in Colombia" which is being accomplished in cooperation with the Ministry of Health and the aid of the Pan American Health Organization and the "Milbank Memorial Fund".

It is expected that this study will last for about 2 years and provide the elements by which the country may complete its plans for the development of human resources for health within a brief period. The other is CIECP, the "Interdisciplinary Committee for the Scientific Study of the Population", organized with the aid of the Ford Foundation, and which will be in charge of coordinating activities, studies, and investigations related to the problems of the population of the country, and promoting the realization of these studies according to the strictest scientific procedure. The CIECP is made up of 12 members, 8 of which represent the 7 Universities that have Medical Schools, plus the Los Andes University. The Colombian Association for the Scientific Study of the Population and the ACFM, will have each one, 2 members, in this manner completing that number. There will be an Executive Secretary, based at the ACFM.

Colombia is worried about the population problem, specially its explosive growth. Thanks to the organized spirit of certain professional groups, particularly the ACFM, well planned studies of the subject will be carried out.

4.5 Faculty of Medicine of the National University of Colombia

In 1867 a Law was published creating the National University of Colombia, to which a medical school was incorporated and begun to function in Bogotá in 1865. It is a public establishment, independent and decentralized, governed by a Directing Council, made up by a Dean, a representative of the University High Council, by a representative of the faculty, by an alumni elected by the local Medical Association and by a respresentative of the student body.

The medical school course is given in 7 years, in 3 teaching cycles: 2 years of general basic sciences, 2 years of basic medical sciences, 2 years of clinical sciences, and one year of rotating internship. The student body is of about 700 students. In 1964, 120 were admitted.

The Department of Basic Sciences functions at the University City (University Campus); within an ample building of about 90,000 square meters, where the Dean's Office, the Library, and the Department of Preventive Medicine are also found. Previously the School of Public Health was also there. It has recently begun functioning in Medellín, at the University of Antioquia.

The Clinical Departments, operate in various hospitals. The main one, the "San Juan de Dios", belongs to the "Beneficencia de Cundinamarca", and is affiliated to the University, for the clinical

teaching. It figures on 1022 beds, for medicine and surgery, besides 300 for pediatrics, located in the Materno-Child Health Institute is annexed to it. Also serving the teaching of medicine, through an agreement with the University, there are the Hospital "de la Misericordia", having 530 beds and the neuro-psychiatric institute, with 76 beds for selected cases. The Department of "Cundinamrca" has another hospital, the "Buena Samaritana" with 350 beds, where refresher courses for graduates are given.

The library holds about 10,000 volumes and receives about 800 periodicals.

It is a school with great potentialities, but which lacked leadership authority and organization. With the appointment of a new rector of the University and a new medical school dean, the institution is rapidly becoming a center of teaching and research. These activities, up till now, followed the normal traditional pattern for Latin America: researchers, either isolated or with other colleagues, carry on various research projects, by using the normal resources of their services or departments. The School did not have special facilities towards the development of research, nor could it fall back upon the University, whose budget for 1964 was only 10,000 Colombian pesos for "eventuals", -the acquisition of flowers and for investigation! Now for the year of 1965, not only the University but also the Medical School, will have funds for research. They will be submitted to a Special Committee which will operate on the School

level and together with the "Vice-Rectoría", which will be in charge of coordinating the research program of the University, according to the Investigating Committee's recommendations.

It is worth mentioning that in the biological and medical sciences, Colombia has a good tradition. Before the Independence, towards the end of the XVIII Century and during the beginning of the XIX, an eminent naturalist, José Celestino Mutis sent by the Spanish Government, came to Colombia and started the first nucleus of biology and medicine at the "Colegio del Rosario" and trained the first biologists and doctors. At this time the famous "Expedición Botánica", took place attracted Humbolt to Colombia. From these beginnings originated the Institute of Natural Sciences and at a later date the National University. The scientific production of this Institute, with its ups and downs, is recorded in its very important journal, the "Caldasia", with its 2 supplements "Mutisia" and "Lozania", for Botany and Zoology respectively.

4.6 Medical School of the University of Antioquia

The School, founded in 1872, is part of the University of Antioquia, an official, autonomous organization of a local character. It is run by a Dean, an Executive Director, and an Academic Council composed of eight professors, elected from among the department and section heads. There are also several permanent committees, one of them devoted to research.

The course is given in seven years, one of general basic studies, five of medical studies, and one of rotating internship. The first year classes are given in the Institute of General Studies in physics, chemistry, mathematics, english, anthropology and biology. In 1963, 76 students where enrolled, the capacity of the School being 80.

The basic sciences departments function in two buildings located on the same site where the other school buildings are. In the main building there is the dean's office and the library, which has some 13,000 books and 800 different journals; as well as the School of Public Health.

The clinical departments function in the University Hospital of "San Vicente de Paula" where there are more than 1,000 beds, attached to the University and located near the Medical School. An additional large area for the University campus was purchased recently.

Scientific research in the Medical School of the University of Antioquia has a fine tradition. The research activities in connection with the teaching programs have steadily grown that the School decided to establish a committee to coordinate them. With an ever-growing number of the teaching staff being taken on full-time, there has been a corresponding increase in the demand for funds and facilities for isolated research projects, and indications are that the School is developing to the point of becoming a good bio-medical research center in the near future. It is quite evident that the teaching staff has a fine "esprit de corps" and that the work carried out by the present Dean and the Council which assists him has been quite productive.

The School has two units worth noting: the Pediatrics Department and the Graduate Division. The former operates in an excellent independent building, six stories high. It not only offers assistance to the child population of the region but also serves them through a section for Social Pediatrics, which is devoted especially to a neighboring city section and is for the purpose of teaching and research. The Head of this Department, gives special attention to the development of research programs on the part of his staff (which includes 10 full-time members) as well as of recently graduated members who take up residence there for a three-year period. Most of these programs are carried out in collaboration with other Departments and services of the Medical School and of the University Hospital. The latter, in addition to its responsibilities in connection with coordinating the advanced training specialization programs for graduates, also is in charge of a continuous education plan called "Divulgación Médica".

4.7 Public Health School

The School of Public Health of Antioquia succeeded that of the National University which, up to 1963, was operating in Bogotá. The Ministry of Health decided at that time it would be more convenient to locate it in Medellín and this was made possible by means of an agreement signed with the University of Antioquia in December 1963, to be in force for five years, subject to extension. The School serves as the main preparation center for medical and para-medical personnel

to fill the country's requirements and for this purpose it has a full-time teaching staff of 19, who has at its disposal the facilities of the Medical School, the University Hospital and the Social Pediatrics Center.

The School of Public Health will continue to train university level personnel for public health work, as sanitary doctors, hospital administrators, veterinarians, dentists and public health nurses, health educators, inspectors and several types of specialists. To this end, it will receive international aid from the Pan American Health Organization and the UNICEF, in addition to financial help from the Ministry of Health. The School took into their staff those who had been developing a course in Hospital Administration in the Medical School since July of 1962, as a result of an agreement between the University of Antioquia, the Kellogg Foundation and the Ministry of Health. The Dental School of that University, which was already executing special training and research programs, sponsored by the PAHO, the Kellogg Foundation, and the Public Health Department of the State of Antioquia, also incorporated the same programs into the School of Public Health.

It is therefore quite a complete and lexible organization, capable of training personnel not only of a higher level of education but also efficient personnel who have a minimum of schooling but who can take some medical and health assistance to the remote points of the interior which usually do not have receive such aid at all.

In spite of the fact that teaching load occupies the whole staff to a considerable degree, the School has not neglected research activities in public health and has taken special interest in problems of ecology and of the influence of environment on health. Their resources however, are limited and the research carried out by the School is nothing more than a by-product of the teaching program. It is nevertheless true that the Department of Antioquia had voted an annual budget of 50,000 Colombian pesos for the institution to carry out studies and research. This is proof of the public interest in solving the local health problems and, at the same time, a sign of the faith the community has in the Public Health School.

4.8 Medical School of Del Valle University

The Medical School of Del Valle University has already reached a high degree of progress, although it completed only twelve years of regular operation on October 12, 1964. It belongs to an official, autonomous university of a local character, and is run by a Dean, an Associate Dean and a Council made up of the Department Heads (nine) and two representatives of the teaching staff. In 1963, 82 students were enrolled in the pre-medical course, which is carried out in collaboration with Los Andes University, by means of a donation from the Rockefeller Foundation. The medical course takes seven years, two of them in general basic studies, four in medical studies, and one of rotating internship.

The basic science departments function in two buildings, the smaller of which contains the Preventive Medicine Department, the Dean's office, the library (with some 8,500 books and 750 differents journals), the other departments being in the second larger building which is more than 5,500 square meters in area. The clinical departments function in the Del Valle University Evaristo Garcia Hospital, with 450 beds, affiliated to the University but owned by the Department Del Valle.

A study has been made by a member of the medical department specially interested in problems of metabolism, on the institution's activities in the field of scientific research. This study, the results of which will be published later, comes at an opportune time, because it will serve for initial guidance of the Committee on Scientific Research recently set up by the School. This study covers the following points:

What is being done individually or collaboratively in the way of research?

What has already been accomplished? (Publications)

Plans for future research

Personnel: professors (curriculum); techniques; exchange students; and students

Equipment: existing and required

Physical facilities (laboratories, space, etc.)

Financing of research

A series of items of considerable interest appear in the study, covering problems, which have been felt but which have not been studied. Research began right after the School was inaugurated, and it was a result of individual interests on the part of the teaching staff, who only received support for it after teaching requirements had been filled. A few of the more impatient staff members did not want to wait for the natural growth of the School and left for more progressive scientific centers. Others remained and developed with the respective departments, most of which are already carrying out research with the support of the Rockefeller Foundation, the National Institutes of Health, USPHS, etc.

The majority of these projects are connected with a cooperative plan of international scope, an agreement on which was signed in September 1961, between Del Valle University Medical School and Tulane University, with funds from the National Institutes of Health, USPHS. This plan, executed through the ICMRT (International Center for Medical Research and Training) is administrated by a mixed group, from the two universities.

According to the terms of the agreement between the two Universities, they both decided to mobilize members of their staffs to develop research projects covering a wide portion of the biomedical field. This is a well-planned cooperative effort, by means of which American and Colombian researchers work in unison, in order to study the medical problems related to local ecology in Colombia.

At the present time, the research work being carried out is of two types:

a) cause, prevalence, and distribution of human diseases and zoonoses;

b) environment, physical or sociological factors which influence health or disease conditions.

The activities connected with the first type are in full swing, an important number of research projects already having been carried out and published, others being under way. As for the second type, there is considerable interest in starting a series of studies, especially with respect to the aspects of mental health of the community. Colombia having to face, the serious problem of "la violencia" affords an excellent field for such studies.

The ICMRT is also taking part in cooperation with the "Delta Regional Primate Research Center" in a study project on the Cebus and lagothrix species of monkeys, which are prevalent in Villavicencio, where a special field station was set up. This will also be used for studies of trypanosomiasis and filariasis.

At the time of the visit, the liaison staff member between the two universities, gave a list of the research projects under way, as follows: tetanus neonatorum, longitudinal survey of diarrheal diseases, heat-testing project in children, zoonoses survey in abattoirs in Colombia, studies of hematophogous arthropods, zoonotic filariasis, trypanosomiasis research, primate field studies in Colombia, nutrition research, socio-anthropological studies, studies of the bollution of the Cauca River, and study of viral and bacterial flora of Colombian bats.

As part of the ICMRT plan, a field laboratory was set up in Buenaventura which made it possible not only to open up locally new avenues of research but also to enlarge those already being explored in the Cauca Valley. It is planned to study there the causes of certain fevers, anemias, paragonimiasis, visceral larva migrans and social migration.

In addition to what is mentioned above, the Medical School of Del Valle University participated in the creation of an Interdisciplinary Committee for Scientific Study of the Population (CIECP), an organization which will function in conjunction with the Colombian Association of Medical Schools, with the aid of the Ford Foundation. In order to get the studies in question started immediately, the Del Valle University established a University Committee "Comité Universitario de Investigaciones sobre Población" (CUIP) which will make use of the pilot health unit of Candelaria, attached to the Medical School, in order to serve for a program of family planning for that section. The population aspects of the region, in line with the factors which have been influencing the growth of population, will be studied in detail, and steps towards family planning will be taken. The Executive Secretary of the CUIP is on the teaching staff of the Medical School.

4.9 Instituto Nacional de Salud (INS)

Up until 1959, when Law Nº 22 was passed, the health services of Colombia maintained a number of isolated laboratories in Bogotá

carrying out activities in epidemiology. These laboratories varied in quality, the most outstanding being the Carlos Finlay Institute, established as a result of an agreement with the Rockefeller Foundation for special studies on yellow fever. Law No. 22, endeavored to unite all those laboratories into one institution, in order to form a well-balanced and high quality organization. The law authorized the government to sell property owned by the laboratories, to equip the Institute more thoroughly and to build the School of Public Health of the National University. The object was to bring the University into the Instituto, as the latter's resources in the laboratory and in the field could thus be used for teaching and for research by a responsible university institution, and to train personnel for developing the medical and health activities of the country.

There were located in one place not only the Carlos Finlay Institute, but also the former Samper y Martínez Institute, the Laboratory of the Malaria Erradication Service, the Lleras Acosta Leprosy Institute, the BCG, Smallpox and Industrial Hygiene Laboratories. Unfortunately, however, in spite of the comparatively abundant resources the Institute then had at its disposal, the high quality of some of its components did not seem to have improved the others. Some think that the phenomenon of communicating vessels took place: since the majority of the laboratories which made up the Institute were modest in quality, the higher grade ones gradually lowered to their level. In addition, because of various factors which

resulted in the Institute losing a good number of their best scientists, this lowering became even more accentuated. There is still, however, a nucleus of men of excellent quality, who are perfectly capable of leading there a movement towards the rehabilitation of the Institute. This may be accomplished if it becomes a center for advanced training of personnel in cooperation with the National University of Colombia.

The funds the Institute has received in recent years are insufficient to permit satisfactory progress. The Institute's budget for 1965 is close to five million Colombian pesos, or approximately US$400,000. It must be remembered, however, that this sum can do in Colombia what would cost at least twice that amount in the United States.

The structure of the Institute can be charged by government act, at any time it may be considered necessary. Certain general functions, however, must be outlined as follows:

" a) Investigar los problemas de salud para el descubrimiento, diagnóstico causal y epidemiológico, prevención y control de las enfermedades, y de acuerdo con los resultados determinar bases para la elaboración de las normas que deban aplicarse en todos los niveles.

b) Servir como laboratorio de salud pública de referencia a nivel nacional y realizar los exámenes especializados para diagnóstico.

c) Elaborar y hacer cumplir las normas destinadas a regular y uniformar el trabajo y las técnicas de los laboratorios públicos y privados.

d) Organizar, dar las normas y supervisar los laboratorios de salud pública regionales y locales.

e) Elaborar los productos químicos y biológicos que determine el Gobierno."

An extremely important job of the Institute is the production of yellow fever vaccine, not only for Colombia but for other countries of Latin America as well. Prior to the creation of the INS, the vaccine were produced by the Carlos Finlay Institute which operated on agreement with the Rockefeller Foundation. In recent years, however, the Pan American Health Organization has been financing this production, contributing with the sum of about US$25,000 per year.

4.10 Medical School of the Javeriana Pontifical University

The University was founded by the Jesuits in 1621. The courses in Philosopy and Theology were inaugurated in 1608 and 1610, respectively. On April 1, 1636, the first medical classes were started, given by Don Rodrigo Enriquez de Andrade, a doctor graduated by the Alcalá University of Spain. These were the very first medical teachings given in the New World. The Javeriana University is the fourth oldest in the Americas.

In 1767 the Jesuits were expelled from New Granada by Carlos III and the University had to be closed down. It was only in 1931

that it was restored, with a course in economic and legal science. In 1933 it was recognized by the Colombian Government and in 1937 it was granted, by the Holy See, the title of Pontifical. In 1942, its Medical School was transferred to the University area, after an initial period in which it functioned in temporary quarters. There it has at its disposal the San Ignacio University Hospital, which it is partially operating and a building annex in the basic sciences.

The School first followed the orientation of the Medical School of the National University, but their program was revised and modernized in 1955 and in 1957. As a founder member of the Colombian Association of Medical Schools, the School has participed actively in the progressive movement in medical teaching which is under way in Colombia.

According to the new study plan, the medical course is divided into four cycles: one year of general basic sciences, two years of basic medical sciences, three years of clinical sciences, and one year of rotating internship.

The school library has some 3,500 books and 250 journals. They publish a magazine "Universitas Médica" which comes out every three months and which covers the school activities, including their scientific production. The teaching staff is about 300, more than 50 on full-time. In December 1963 the School had 561 students, 145 having been enrolled in the first year.

The important negative factor in the development of research - not only in Javeriana but in the others in Colombia - is the lack

of qualified personnel in sufficient number to form "critical masses", and the little interest shown by the universities themselves. It is true that this situation has been changing, as new people are trained, and return brimming over with enthusiasm for research. It so happens that as there is still a dearth of such personnel and since it is necessary to consider the more urgent teaching needs, little time is left for research. On the other hand, it happens that due to modest budgets, most of the medical teaching institutions of Latin America cannot offer adequate salaries or facilities for research comparable to those of scientific centers in foreign countries. This results in frustration and discouragement, mainly by those in the basic sciences. In the clinical sections, on the other hand, research based on actual case studies can be made with a minimum of technical resources.

Another unfavorable factor is the feudal regime which exists in many universities, where part-time permanent professors block the scientific development in their department.

One way to resolve this difficulty would be to adopt a system of research coordination and promotiom, to be introduced at all levels. In addition to a university committee for research, each school would have its own committee. On a national scale, it would be advisable to have a Research Council, with funds to promote research, at least in the priority areas most closely connected with the social and economic development of the country.

The Medical School has a Committee for Research. Prospects are very encouraging, especially because, thanks to a recent donation from

the Ford Foundation amounting to US$500,000, the University will considerably develop the general studies of exact and natural sciences. This will enable them to take on more full-time professors and purchase equipment, thereby creating conditions for offering better teaching to the newly enrolled students, in any field, including medicine.

4.11 Office of Education and Training of Personnel of the Ministry of Health

The Office of Education and Training of Personnel of the Ministry of Health, in cooperation with the Colombian Association of Medical Schools, is conducting studies aimed at fixing the requirements of health services for the population and the bases for adequate training of personnel to attend to these services. They intend to make up plans based on these studies for developing human resources for health, on medium and longterm basis.

This work, which is a pilot study for Latin America, is being carried out under the auspices of the Pan American Health Organization and by the Milbank Memorial Fund, it having been formally inaugurated on August 12, 1964. Aside from its results and recommendations, however, the Ministry of Health of Colombia considered it of interest to make up a two-year plan of education and training of personnel for the years 1965 and 1966, for the purpose of taking care of the more urgent needs as well as to cover the natural expansion of the health services in that period.

The plan includes giving courses of different lengths to the various professional and sub-professional health groups, the advanced training of this personnel to be carried out in several teaching institutions of the country who would receive help from the Ministry of Health for this purpose. The School of Public Health of the University of Antioquia will, however, be the main center for the plan.

The Ministry intends to use some 5 million Colombian pesos for this plan in 1965 and 7.3 million in 1966. They also expect to receive financial aid from UNICEF to the amount of 2 million pesos in 1965 and 1.8 million in 1966. Assistance was also solicited from AID in the amount of 2,836,500 for 1965 and 3,680,500 in 1966. This would result in approximately 23,500,000 Colombian pesos, or US$2,000,000 being used to train about 200 university level people and almost 1,800 sub-professional level and auxiliary people.

The plan provides for assistance from the Ministry of Health to improve teaching facilities in the university institutions which cooperate in it. This improvement may have some influence on the development of their research projects, but according to what was set out in Decree 3.224 of December 19, 1963 -which reorganized the Ministry of Public Health of Colombia- economic aid to institutions will not be used for research. In any event, with the improvement and progressive expansion of the facilities existing in the country, the Ministry of Health hopes to gradually reduce the need for using foreign teaching centers. Thus, in the future, only those who require advanced specialization, impossible to acquire in Colombia, will need to leave the country.

4.12 Summary

In order to have a precise idea of the status of biomedical and public health research in Colombia, it would be necessary to close these notes by commenting briefly on general data on health, education, welfare, manpower, etc. A report on the contributions of the international organizations, both official and private, toward the development of public health activities, teaching and research in the biomedical field, advanced training in foreign countries, etc., would also be indispensable. It happens, however, that some of these data at the present time are reliable, others are still somewhat inadequate and still others, such as those which refer to health manpower, are being collected and will be completed in the near future.

It was thus considered preferable to simply note the main factors of a historical or cultural nature which have been influencing the development of biomedical and public health research in Colombia, based on impressions gathered from prominent educators, research experts and administrators of that country.

The impression an observer acquires, even after a quick glance, is quite favorable in respect to the scientific atmosphere in Colombia in the biological and medical field. The country really has a fine background of tradition when it comes to forming of personnel to work in these fields and also in the execution of scientific research projects.

Even before the country's Independence, at the end of the 18th Century and beginning of the 19th , a small nucleus of biologists had already been graduated, under the creative impulse of the Spanish naturalist, José Celestino Mutis, who had been sent to Colombia by the Spanish Government. The teaching of biology thus began in cooperation with the "Colegio Mayor de Nuestra Señora del Rosario", at present a part of the Colombian Association of Universities and now limited to two course, jurisprudence and economy. After the Independence, several eminent members of this first nucleus had already vanished, but the consciousness of biomedical research subsisted in their disciples and followers, in such a manner that an Institute of Natural Sciences to be devoted particularly to zoology and botanic was established at the National University.

It is true that around 1636 the Javeriana University, founded in 1621, had already started giving the first classes in medicine, which continued until the Jesuits were expelled from New Granada in 1767. Medical teaching therefore only became established in an organized fashion later on, with the medical schools of the Universities of Cartagena, the National University and the one in Medellín. In the first, classes were given intermittently beginning in 1828 and in the other two they started on a regular basis in 1867 and 1872, respectively. There was a considerable gap until new schools appeared, which was the case of the ones of the Javeriana University in 1942, the Del Cauca University in 1950, the Del Valle University in 1950, and the Caldas University in 1952. Along with

this, with the establishment of the Los Andes University in 1948, supported mainly by private funds, the opportunity presented itself for the establishment of the first school of Arts and Sciences in Colombia. Its Biology Department was very well set up for teaching as well as for research, to such an extent that it is being able to cooperate with the other universities of the country, especially those devoted to the teaching of medicine. It is only fair to refer, at this point, to the collaboration given by the Rockefeller Foundation. This Foundation, acting as a true promoting agent, helped to start off a type of chain reaction which has been developing in the biological field ever since the creation of the Biology Department of the Los Andes University.

It cannot be said that biomedical research in Colombia has had a very rapid development in recent years, but it can be declared definitely that it has been growing in volume and in quality, in a steady and progressive manner. There is no doubt that the Colombians are aware of its importance. As a matter of fact, in the Declaration on "Responsibility of the University towards the Country" approved by the National Conference of Rectors held in Medellín, in October 1957, it was recommended that the universities establish within their budgets special funds to be devoted to scientific research, pure as well as applied, setting up their teaching plans in a way for the professors to have time to carry out such research. That Declaration also suggested that the universities make up annual program of scientific research, covering its several aspects, taking into special consideration the programs proper to the regions in which they are located. Along with this, the same Conference produced a Declaration on "Minimum Academic Levels", in which special chapter was included on Research. This repeated what was mentioned above and further recommended that the Universities not only establish Special Committees, with funds to promote such research, but also organize a National Research Institute to encourage and coordinate it on a more ample, nationwide scale.

Several universities have already followed that recommendation, having set up their Research Committees and encouraged their medical schools also to set up their own ones. What is still lacking is the national organization, which will eventually have influence similar to that of the respective National Research Councils in Argentina and Brazil.

As has been seen, the Colombian universities have already defined the position they must take in terms of research, thus having started the "march of progress" so to speak. The evolution of this progress is closely connected with that of the country itself and the spirit of research is impregnating the scientific and educational institutions of the country in a steadily growing manner. In 1958 they took the initiative of establishing the Colombian Association of Universities, with their own funds and under very favorable conditions to bring influence to bear in this respect. On the other hand, in 1959 the medical schools themselves founded the Colombian Association of Medical Schools, which, in addition to immediately becoming affiliated to the Colombian Association of Universities, was at the same time officially recognized by the latter as a specialized cooperating body. For this purpose, the two associations signed a Declaration defining the

responsibility of each one and attesting, among other things, to the fact that both agreed to maintain the necessary unity in the university regime in Colombia by means of a series of agreements with respect to the modus operandi of each. The aforementioned Declaration ended up by stating that they did not accept the existence of a medical school which was not a part of a university. The Colombian Association of Medical Schools also declared that the first requirement for the legal teaching of medicine in Colombia was for this to be done within a University and that this University be affiliated to the Colombian Association of Universities.

In 1952 the ICETEX (Colombian Institute for Advanced Training Abroad) was established and this was a local initiative of extraordinary importance to further the formation and advanced training of the personnel needed by the country to take over the responsibilities of leading up the various fields of development. The most interesting aspect of that institution is that it functions through the utilization of a revolving fund out of which students in Colombia receive loan grants, as against the traditional scholarship-grant procedure. ICETEX feels that this innovation has wrought the transition from a system of concepts of modern State operative procedures. This authentically Colombian organization is already inspiring the creation of similar ones in other Latin American countries. Throughout twelve years of experience ICETEX has been trying to demonstrate that its system serves to develop in each trainee a greater sense of responsibility.

Colombia therefore has at its disposal important elements to give impulse to its scientific and cultural development, especially in regard to research in the biomedical field. With their own funds and with the help of international agencies, young elements are being trained in ever increasing numbers for teaching jobs in the country's medical schools, and on returning they build up well trained groups working on full-time, thus finding themselves in condition to carry out research. At the same time, the Ministry of Health promoted a widespread plan of training, by means of which they intend to cover immediate necessities and satisfy the demand which will appear as a result of the expansion of the Health Services in the next two years. With this purpose in view they will mobilize the services of the Public Health School of the Antioquia University and other teaching organizations of Colombia which are responsible for forming and giving advanced training to medical doctors, engineers, nurses, dentists, veterinarians and a whole series of technical and auxiliary personnel. Substantial sums will be employed in this plan in the 1965-1966 period.

Government recognition of the interest in channeling public funds to the formation and training of the technical and scientific personnel necessary for the development of the country was also expressed by the Minister of Education, whose opinions coincide in fact, entirely with those of the group in charge of the present study. He favors the establishment of a Latin American Common Intellectual Market. The idea of first establishing a Common Biomedical Market with a comparatively simple executive mechanism would, in his opinion, have full support in his country.

Summing up, it may be said that perspectives for development of biomedical research in Colombia present the following favorable aspects:

Good tradition of experimental work in biomedicine;

Beneficial influence on the part of outstanding research leaders;

Development of universities outside the capital, with a consequent decentralization of research activities;

Organization of a strong and well supported agency (ICETEX), to foment, coordinate, and stimulate the regular preparation and advanced training of university level personnel;

Establishment of an association for the Colombian universities whose Statutes include principles which place scientific research as a basic university activity;

Existence of a Biology Department, well equipped with personnel and facilities in the School of Arts and Sciences of the Los Andes University, capable not only of training biologists for the other teaching institutions of the country but also of cooperating for the development of biology groups in them;

Creation of the Colombian Association of Medical Schools and increasing influence of such organization over the institutions affiliated to it;

Recognition by the Government of the importance of training the personnel necessary for the technical and scientific development of the country;

Extension of international cooperation on the part of official and private organizations, not only towards the development of research projects of greatest interest to Colombia but also for the advanced training of personnel;

Extension of full-time work to a constantly greater number of professors and researchers;

Improvement of the country's economy and greater stability of its political system.

Some negative factors could also be mentioned, as for example, the fact that government funds are still insufficient and private funds comparatively small. It seems, however, that these difficulties would be reduced and a considerable impetus would be given to research in general - and to biomedical research in particular - if the recommendations made at the Conference of Rectors at Medellín (1957) were actually followed and Colombia would, within the near future, have its official agency to stimulate and support research, with sufficient funds at its disposal to promote it in continuous and progressive manner.

Guatemala

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5. GUATEMALA*

The third largest of the Central American Republics (42,042 square miles), Guatemala has a population of 4,335,000, of which over 400,000 live in Guatemala City. About 55 per cent are of pure Mayan Indian stock.

It has often been said that Guatemala has more variations in altitude in proportion to surface area, as well as greater diversity of climate, than any other portion of the earth. Bordering on the Pacific Ocean, the coastal plain appears as a 30 - 50 mile-wide band rising uniformly to an elevation of 1,000 - 2,000 feet; following are the foothills of the Sierra Madre which rise more rapidly and irregularly to about 5,000 - 6,000 feet; these continue into the volcanic mountains which rise to heights approaching 14,000 feet, forming the principal cordillera; there is then an altiplano with ridges and slopes between 6,000 and 8,000 feet; then comes an extensive region of low mountains with luxuriant rain forests, abundant streams, and almost daily rains, followed by a semiarid valley of the principal river of the country, the Motagua; north of this is a chain of low mountains and finally the moist lowlands of the Atlantic coast, including the Plain of the Petén. The Petén Province accounts for one-third of the nation's territory, has the smallest density of population, and contains 40% of the rich forest land of the country. Attempts on the part of the government to set up agricultural colonies in the Petén have been unsuccessful due to its inaccessibility and lack of communications. It is in this region where

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* Prepared by Dr. Ernani Braga. Based on a site visit on 26-29 October 1964.

the major supply of chicle is harvested and in which large stands of hardwoods are found.

Approximately 19 percent of the total area of Guatemala is considered suitable for agriculture, the principal money crops being coffee and bananas. These are grown primarily on about 1,500 large plantations (fincas) employing about 430,000 workers, who live very much in a semi-feudal type of social structure.

In spite of the large number of bridges constructed during the regime of Guatemala's last dictator, there are actually only three main roads, the others being very poor, narrow, unpaved ones that are dangerous and often impassable during the rainy season.

The life expectancy in Guatemala is about 50 years, the infant mortality being 86 per 1,000 live births. There are approximately 2.4 physicians per 10,000 population, these being concentrated in the cities. During the past 13-14 years a system of social security was evolved under which dispensaries have been developed in many outlying areas where the population never had enjoyed any type of medical care. Only 30% of the population are literate, most rural areas offering no more than 3 years of total education. Since it is customary for the entire family to work on the coffee plantations, and since the father also must keep up his small garden of corn, tomatoes, peppers, and greens, children are usually not encouraged to continue school. A large part of the population gets its educational instruction from plantation schools which vary in quality according to the attitudes of the owners and his administrator, and the availability of teachers. In contrast to this restricted educational opportunity, Guatemala has one of the oldest universities in the Western Hemisphere.

The University of San Carlos developed from the College of San Carlos de Borremeo which was founded in 1562 in Antigua, Guatemala, then the capital. In 1622 the latter was authorized to award degrees and was raised to the university rank. In 1687 it was declared to be the Pontificia y Real Universidad de San Carlos by royal decree of Charles II. After the destruction of Antigua by flood and earthquake in 1773, the capital was moved to Guatemala City and the University was later reestablished there. The University was declared autonomous in 1944 by the Governor's Revolutionary Council. This University historically has given its training in a strictly didactic manner, with little laboratory or applied work. In the biomedical fields, the staff has been composed of persons working on a part-time basis, actually present only long enough to deliver lectures. Some have run their own practice and a private laboratory, as well as having a position with the Department of Health, while also serving as a staff member of the Medical Faculty. Such a schedule would preclude giving much attention to preparation for classes or engaging in research.

In Guatemala, as in many of the other countries of Latin America, biomedical research was first engaged in by practicing doctors with curiosity about some clinical or public health problem. In 1915 Dr. Rodolfo Robles discovered the presence of onchocerciasis in his country (first occurrence in the Americas), isolating the parasite and incriminating the black flies, of the family Simuliidae, as the vectors. His initial paper, based on sound work and carefully documented, was published in the Bulletin de la Societé de Pathologie Exotique. This work represents some of the first medical research done in Guatemala. Organized studies (involving several people) first appear in terms of the campaigns against malaria and hookworm, carried on by the Rockefeller

Foundation from 1915-1927. These were epidemiological studies of specific public health problems. The Guatemalan Department of Health, established in 1927, developed through the efforts of European doctors and sanitary engineers who were brought over by the Guatemalan Government. All investigations undertaken by the Department of Health were published in the Boletín Sanitario de Guatemala. Examination of this journal gives further evidence of the fact that in Latin America in the past, biomedical research had been initiated by the Health Services and usually resulted from individual interest on the part of persons who happened to be well-equipped for the particular type of activity. Since this had been primarily individual research, with very limited resources, it had been restricted to the parasitological field - biological aspects of parasites and vectors, epidemiology and pathology of certain parasitic and infectious diseases. To date, the situation in Guatemala has not changed very much.

An Institute of Tropical Medicine (under the Ministry of Health) was started not many years ago, with a single person serving as Director and professional staff. The Institute made it possible for this person to develop his research interests in onchocerciasis and leishmaniasis. Since the epidemiology of these diseases must include the arthropod vectors, the investigators had to learn entomology. Until recently no one in Guatemala had any formal training in this latter field, and those that now do are involved primarily with insects affecting agriculture. Thus, interested investigators have had to be generalists, doing various aspects of their research almost on an ad hoc basis. In recent years, some of the service laboratories of the Department of Health have had well-trained directors who have also had staff positions at the University. They have used their Department of Health facilities

for teaching which has helped broaden the training given the students. To date, there aren't enough persons who are well-trained in their respective fields to supply full-time staffs to the Department of Health and to the University. In addition to this, University salaries have not been conducive to attracting good people on such assignments.

It is interesting to note that in Guatemala a good deal of the research and training has been the outgrowth of public health programs carried out by foreign groups or international agencies. As stated previously, the Rockefeller Foundation directed programs for the control of malaria and hookworm. The U.S. Public Health Service collaborated with the Guatemalan Department of Public Health in a Venereal Disease Research Project. In the course of this project excellent serological laboratories were set up, technicians and laboratory directors from Guatemala, as well as the other Central American and South American laboratories, were well trained in all aspects of VD serology. This program also brought about close ties between responsible individuals in the various countries. The Onchocerciasis Project, in progress for over eight years, the last six under an NIH grant to the Pan American Health Organization using PHS project directors, led to the development of techniques for study of the disease in the field and laboratory, and to the development of methods for attacking the disease by drug treatment and vector control. Over 40 scientific papers and one book resulted from this extensive epidemiological study.

The Institute of Nutrition of Central America and Panamá (INCAP) has had a substantial and continuingly developing program in Guatemala which is described below.

5.1 Present Status of Research

5.1.1 National Public Health Campaigns

Guatemala has had a National Onchocerciasis Campaign in force since soon after the organization of the Department of Public Health. In general, brigades consisting of 2 - 3 trained men each visit all the plantations in the various areas of the country known to be endemic. They palpate all residents for Onchocerca nodules and extirpate those that are palpable. Visual acuity is also measured. Much has been discovered in relation to the transmission of the disease and its treatment, but the public health program in Guatemala has changed little. Although the Director of the "Instituto Rodolfo Robles de Enfermedades Tropicales" has studied various entomological and parasito-aspects of the disease, little has been done to control or eradicate it. Since the National Malaria Program follows PAHO/WHO guidelines, a certain amount of epidemiological investigation is carried out (infection rates, resistance of mosquitoes to insecticides, etc.).

It must be said that there is little biomedical research associated with national campaigns against specific diseases.

5.1.2 Rodolfo Robles Institute of Tropical Diseases

This Institute, expressly founded to permit its enthusiastic Director to carry on research in fields within his interest, is probably the only autonomous government research institution. It has increased the fund of knowledge concerning the vectors of onchocerciasis and of the round-worm causing the disease; he has studied leishmaniasis in Guatemala as well as Chagas' disease. The contributions have been published, often in the form of separate pamphlets, but in 1958 the Institute started publishing the studies under its own aegis. The budget of this institution

is not very great and there is an extremely small permanent staff.

5.1.3 International Organizations

The best organized and most far-reaching research effort in Guatemala is that of the Institute of Nutrition of Central America and Panamá (INCAP). This institution was organized in 1949, with funds derived from PAHO, from the member countries and from a U.S. foundation (Kellogg). In addition, PAHO serves in the administration and co-ordination of INCAP. The Institute has been engaged in many aspects of nutritional research - epidemiological as well as the most refined laboratory studies. Persons coming to INCAP from the member nations who have shown exceptional talents have been sent to the USA for advanced studies. The Institute has not only been doing nutritional research and trying to develop means to cope with the problems, (i.e., the development of the inexpensive soybean food supplement, Incaparina), but it has been training large numbers of persons from Latin America and some from the U.S.A. who are involved with nutritional problems. Young physicians from various Latin American universities are accepted for a one-year period during which they do research to satisfy the thesis requirements for the M.D. degree. Nutrition programs are given annually to Latin American dieticians (3 months of basic study and 8 of field work). They give a 10-week summer program in English and Spanish for up to 15 physicians. Under an NIH training grant, INCAP also accepts people on research fellowships. A major part of the funds for the research activities of this Institute is derived from NIH research grants.

Very recently (June 1964) INCAP entered into an agreement with the San Carlos University whereby the former will have University status,

not only to serve in the undergraduate and post-graduate programs, but also as an advanced training center for professors and investigators throughout Latin America. This agreement places INCAP within the structure of the "Consejo Superior de Universidades de Centro América" (CSUCA) and consequently in a position of working with all the universities. Several of the staff members of INCAP already enjoy staff status in the Medical Faculty of San Carlos University. As an outcome of this arrangement one can expect a real stimulation of research interest in terms of the regional health problems.

Although INCAP certainly is a positive force in Latin America, especially in Central America, in terms of biomedical research and its application to the improvement of nutrition, it does have certain problems. A principal one is its current great dependence upon the NIH for research funds. Should this source be cut off, the program of INCAP would be seriously affected. The second problem is the difficulty the Institute has in promoting its program among the member nations where research is traditionally considered a luxury. The governments believe the Institute does too much basic research instead of devoting itself more to practical application and advisory functions. Perhaps through the demonstrated results of the INCAP program and the understanding that its graduates bring back with them, the attitudes of the persons concerned in the various countries will gradually change.

5.1.4 Universidad de San Carlos de Guatemala

The University established a Chair of Medicine as early as 1681. Its first physicians graduated in 1703. In 1821 the School of Medicine was organized and in 1840 this became a Faculty. It, like the entire University, moved to Guatemala City in 1777 after the destruction of the

old capital in Antigua. It moved its locale several times, finally occupying the present buildings in 1921. Until 1944, the University was administered by the Ministry of Public Education but since that time it has had its autonomy.

The University is composed of 14 faculties and schools, including Medicine, Dentistry, Veterinary Medicine and Animal Husbandry, Chemistry and Pharmacy, and Engineering with a total enrollment of about 6,500. The only other government University in Guatemala is the University of the West in Quezaltenango, the second largest city of the country, which has a total enrollment of only 400 students. There is also a Catholic University in Guatemala which is small and not research oriented.

Until recently the entire staff of the Medical Faculty of the University of San Carlos was part-time. In recent years there has been a concentrated effort to bring about changes in the organization of this faculty and several have already been implemented. There are now six full-time faculty members distributed in the departments of Microbiology, Chemistry, Physiology, Anatomy, and Pathology, all of whom have had training abroad. The attempt to build up full-time medical faculty is gaining strength. The Dean of the Medical Faculty now has an advisory committee composed of chiefs of the various departments, the former tripartite council (2 students, 2 faculty, 2 non-faculty physicians) almost being defunct. In 1964, for the first time, the Faculty administered selection examinations choosing only the top 40 - 50 for entrance into the freshman class. To date there has been almost no research carried on in this Faculty, except in the Department of Parasitology and Pathology. Individuals in some other departments are doing isolated research under rather trying circumstances.

The Faculty of Dentistry has good facilities in contrast to other faculties in the biomedical fields. Some support had come from the Kellogg Foundation and a small dental research laboratory was established with funds from an industrial concern. A number of the faculty members have had graduate training in the U.S. and have been stimulating interest in research.

The Faculty of Veterinary Medicine and Animal Husbandry has been designated as the regional Veterinary Medicine School of Central America. This designation was made under CSUCA, the organization of universities of Central America. Under this arrangement any Central American student may be sent by his government to study in this school, and he will be enrolled without having to pay tuition. It is this organization which also has designated INCAP as the regional graduate school in nutrition. The laboratories of the Veterinary Faculty are fairly well-equipped and manned by well-trained people, many of whom have had some graduate training abroad (U.S., Canada, Brazil and Perú). The school has a strong research orientation and research laboratories are set up in connection with teaching laboratories. The Departments of Physiology, Microbiology, and Biochemistry have active research programs. This school has an exchange of professor arrangement with the University of Oklahoma. There are approximately 150 students in the Veterinary School representing all of the Central American countries and Panamá.

5.2 Comments

In Guatemala at the present time biomedical research is carried on actively only at INCAP, and at the Dental and Veterinary Schools. At the Medical School, except for a few of the faculty who are also associated with INCAP, there appears to be no great interest in research.

The changes in the organization of the Medical Faculty, the active program to increase the number of full-time staff appointments, the increase in the number of persons receiving advanced training in foreign institutions, and the acceptance of INCAP into the University structure, all appear to be good omens in terms of research appreciation and development in Guatemala. The active interest and participation of the Pan American Health Organization has been responsible for a great deal of the progress. PAHO has assisted in the organization of health services, in strengthening the faculties of the University involved in health sciences, and in making possible advanced training in many of the fields allied to public health.

Although a substantial acceleration and diversification in Guatemala's research efforts is not forseeable in the immediate future, it would be feasible, however, to take advantage of the possibilities that some of its institutions offer and to include them in a joint research organization of Central American Republics. Guatemala need not have its own research council, but there could be a type of coordinating board under CSUCA that will handle research policy as well as the designation of regional schools. Certainly, the professionals returning to Guatemala after receiving advanced training abroad should be able to influence the trend of scientific endeavors in the future. With the gradual orientation of responsible governmental authorities toward the value of research expenditures, an improvement in the present situation can be expected.

JAMAICA, TRINIDAD and TOBAGO and BRITISH TERRITORIES in the CARIBBEAN

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6. JAMAICA, TRINIDAD AND TOBAGO, AND BRITISH TERRITORIES IN THE CARIBBEAN*

In this report of the way in which science in the British Caribbean is organized and of the forces which tend to promote or retard science in the islands, primary attention is paid to Jamaica, Trinidad and Tobago, the independent islands. The British Caribbean is dealt with as a whole, however, because it is in practice a cohesive area so far as biomedical research is concerned. The brief descriptions of research in progress are not intended to be comprehensive, or to be scientific reports, but rather to convey a sense of the range and the nature of the studies.

The Caribbean area is closely comparable in many respects with those parts of the world which are in a period of transition: in political terms from colonial to independent status; in economic terms from producers of raw materials and dependency on a single crop to economies with a broader base; in educational terms from a restrictive to an open system; in health terms from misery, high infant mortality, debilitating infectious diseases and extensive malnutrition to increasing importance of chronic diseases; and in sociological terms from a rural agrarian society and economy to an urbanized one.

All of these changes are coming about rapidly and are in a sense inevitable. They generate stress as well as hope. Resources and

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*Prepared by Dr.C. V. Kidd. Based on a site visit to Jamaica and Barbados, on 2-11 April 1965.

trained people are scarce. Needs for things that must be urgently done far exceed the capacity to perform. Competition for scarce resources - for education, for economic development, for research - is intense among equally urgent fields. Yet the sense of rapid change and of strain is a sign of productive growth. Biomedical research is part of this scene and it shares the characteristics of an entire society in transition.

6.1 Factors Advancing and Hindering the Development of Biomedical Research in the Caribbean

The development of biomedical research in the Caribbean has been determined by an array of influences, some of which have tended to promote and others to retard progress. The net result of these forces has been to produce a set of biomedical research activities in the islands that is diverse, vigorous, expanded, and reasonably balanced among laboratory, clinical and public health research.

6.1.1. Organization

Biomedical research in the British West Indies is well organized, without being so over-organized that red tape or coercive effects appear. The Standing Advisory Committee on Medical Research in the British Caribbean (SAC) operates well as a means of communication and intelligence on logistical, personal and political as well as on scientific matters affecting biomedical research. It is an efficient means of presenting the needs of research to the non-research community. The Medical College of the University of the West Indies is

a powerful positive factor, as are the three most important research institutions -- the Tropical Metabolism Research Unit, the Epidemiological Research Unit and the Trinidad Regional Virus Laboratory. The involvement of the health authorities with public health research and with the affairs of the SAC is likewise a significant factor.

It is interesting to note that attention is being paid to science in the islands on a broader scale. Jamaica has a research council and Trinidad is considering the establishment of a research committee advisory to the Prime Minister. These are beginning to develop approximately a decade after the SAC was set up. These groups are a means of calling to the attention of political leaders the significance of science, of securing support for research, and of ensuring that advice on matters related to science is professionally sound.

There is still no general scientific advisory body for the British Caribbean. One reason for this may well be that as science moves from essentially humanitarian fields to areas of inquiry that may affect the competitive economic position of the islands, cooperation becomes somewhat more difficult.

In considering how the organization of biomedical research has come about, the significance of outstanding personalities, absorbed not only with the biological and medical problems of the islands but also with their general development, must be recognized. The existence of essential political stability - in terms at least of the continuity of tenure of key people in science - must be also recognized. Willingness to compromise and the ability to invent flexible forms of

organization and to act effectively without undue attention to the formalities of government have also been significant in the development of organizational forms for biomedical research.

6.1.2. Orientation Towards Europe

The policies of England, France and the Netherlands - including policies for research -- have resulted in the orientation of each of the islands towards the European homeland and particularly towards its capitals. This policy, pursued over decades, has strongly influenced both biomedical research and advanced education. The Pasteur Institute in Martinique is in the tradition of the Pasteur Institutes throughout the world in the former and existing French colonies. The medical research conducted in Curaçao is strongly influenced in approach by Dutch influences. In the British Caribbean, virtually all of those who now lead biomedical research and who are the heads of departments in the medical school of the University of the West Indies in Jamaica were trained in English, Scottish or Canadian universities. They have brought to the islands the traditions of British medical education. The staffs of the two medical research units - epidemiology and tropical metabolism - at the University of the West Indies are similarly led by investigators trained in England. The existence of this core of excellently trained investigators has provided a stimulus and an example for research throughout the British Caribbean.

The colonial tradition, however, has imposed some handicaps on the development of research in the islands. Perhaps the most

significant of these is the barrier to cooperation among the islands generated by the system of colonial government which stressed not the development of a sense of commonality, but the direct links of each island separately to London. Despite this general tendency, the existence of the Standing Advisory Committee and of common professional interests have tended to reduce the isolationism of the islands.

The orientation of the islands towards Europe in biomedical research has, as has been the case with the Latin countries, tended to shift in recent years to North America. Professional collaboration with investigators in universities in the United States and Canada is more extensive than in earlier years. Nevertheless, the orientation remains primarily British and continental.

The ties of Caribbean biomedical investigators to Latin America appear to be less extensive than would be supposed from an examination of the common problems faced by the islands and the mainland. For example, in both areas protein malnutrition and common infectious and parasitic diseases generate not only major public health problems but consume the efforts of a substantial proportion of the most competent scientists. The Trinidad Regional Virus Laboratory is an important research center in which Latin American virologists have been trained but it is the only such effort of any consequence in the area. The gap is the consequence of many things, such as the European orientation of the islands, the language barrier and the need to concentrate upon local problems in view of the scarcity of resources and personnel. The question of forging stronger bidirectional links with Latin American investigators has been broached at the meetings of the Standing

Advisory Committee. Any such steps, however, will probably be preceded by efforts to stengthen relationships with investigators on the French and Dutch islands. These links have also been weak because of political traditions and language problems.

6.1.3. Personnel

6.1.3.1. Professional. The Caribbean area is fortunate in having a cadre of excellently trained physicians. The groups working as teachers and investigators at the centers of research in the islands establish a tone of intellectual vigor and curiosity which is a powerful stimulus for research. Most of these are of European origin. The maintenance of a balanced faculty of high quality is not an easy task. The environment does not provide the variety and stimulus that exist in the world's outstanding teaching hospitals and medical schools. Some faculty members and investigators miss this; others find the local problems fully absorbing. Opportunities to work in laboratories in other countries are fairly readily available, and these tend to reduce the severity of the scientist's problem. The shortage of technicians mentioned below tends to frustrate those whose work is vitally affected by the number and qualifications of ancillary personnel. As a consequence, a continuing recruitment effort is necessary to sustain the full range of pre-clinical and clinical skills.

There are, in addition, small groups of dedicated public health workers who approach their operational tasks with the curiosity and skepticism that lead to research studies. In addition, scattered

private practitioners carry on investigations. The great bulk of the practicing physicians, however, are so overwhelmed with their patient care responsibilities that they cannot spare the time required for research. There is only one physician for each 3,700 persons in Jamaica, and one for each 2,400 in Trinidad and Tobago. The comparable figure for the United States is 740.

The predictable consequences of establishing a good medical school - the production of physicians interested in research as well as in service and teaching - are being felt. The first generation of graduates is now supplying faculty members at the school, practitioners and investigators in the medical research units. In this connection, plans to provide one year of clinical training in Barbados and in Trinidad are significant. In 1965, 10 to 20 students will go to each island. This is an interesting but difficult move. It involves substantial expenses (particularly for libraries), accredition problems and the establishment of a teaching hospital environment. It seems likely that a gradually increasing proportion of the investigators in the Caribbean area will be locally trained, although periods of study abroad for some advanced clinical or research specialties will continue to be necessary.

6.1.3.2. Technicians. One of the most difficult problems encountered in carrying on biomedical research in the British Caribbean is the shortage of technicians. This shortage is so extreme that it forces grossly ineffective use of highly trained professional personnel, and there seems to be no easy solution. The roots of the

problem are complex. First, only about 10 per cent of the school age population completes secondary school. Those who do, aspire to a university education, or at least to graduation from a technical school. A job as a technician of any kind requires secondary schooling, and hence is open only to university aspirants. Technicians tend to be bright young people who are en route to either technical or university education. After completion of any kind of education or training following secondary school, jobs in industry are available at wages much higher than can be paid at the university or the research units. The academic wage scale is fixed inflexibly at levels which preclude hiring of well-trained technicians who can be paid adequately and kept on a long-term basis. Technicians in this case include not only assistants in research laboratories, but technicians in clinical laboratories and other ancillary personnel. The shortage, therefore, affects the quality and volume of clinical laboratory tests as well as the direct research work.

For the present and the immediate future, the shortage of technicians is a greater barrier to effective research than is the supply of professionals and may well be the more significant factor.

6.1.4. Funds

The economies of the islands are not adequate to support a large research effort, given the extreme urgency of other expenditures for economic and social development. The gross national product per capita of Jamaica was only $443, and that of Trinidad and Tobago $615 in 1963. While these figures are well above those of the

poorer Latin American countries, they are not adequate to provide for a large continuing investment in research. The priorities will probably continue to favor educational expenditures, and research directly related to teaching. This is the pattern in biomedicine, where the government supports the medical school and the basic expenses - salaries, space and patient costs - of research allied with teaching of physicians. The same is true in the field of public health, where the research supported by government is largely related to improvement of the efficacy of public health measures. The expenses of research which is not tightly interwoven with either teaching or public health practices are borne almost entirely by outside sources. Some of these investigations, such as the fundamental metabolic processes involved in protein malnutrition, may have extremely important practical results over the long range, but the ability of the economies to sustain long range investments is limited in science as it is in the economic field. This will probably continue to be true for some time to come.

Shortages of money are more important than lack of organization, shortages of professional personnel or shortages of space as a factor impeding the development of biomedical research.

6.1.5. Facilities

As is often the case with developing areas, laboratory space is not as serious an impediment to research as is commonly the case in countries with more advanced research structures. On the campus of the medical college of the University of the West Indies, a laboratory research building for the biomedical sciences is not being

used to full capacity. Similarly, the new Queen Elizabeth Hospital in Bridgetown, Barbados, contains ample laboratory space for research. Hences, while clinical facilities are crowded, shortages of space are not as serious a factor limiting research as is the shortage of money and technical personnel.

6.2. The Standing Advisory Committee for Medical Research in the British Caribbean*

6.2.1. Form and Function

The Standing Advisory Committee is a most remarkable organization for the stimulation, coordination and financing of medical research in the British Caribbean. It serves in fact the functions served by national medical research councils in some other parts of the world. The Committee was formed in 1956, largely as a consequence of the efforts of Dr. John C. Waterlow and with the stimulus of the Secretary of the British Medical Research Council - Sir Harold Himsworth. The organization was deliberately set up as a Committee with great flexibility and a large degree of informality. This structure contrasts with the Medical Research Councils of East and West Africa, which were formed with a greater degree of association with governments. The informality of the Caribbean organization has proved to be extremely useful and perhaps essential to its survival. The group was set up before the Federation of the West Indies was

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* Additional data may be found in Document RES 4/1

established; it operated during the period of the Federation; it has continued to work after the dissolution of the Federation.

An interesting feature of the operation of the Committee is the manner in which the common professional interests in research in biomedical and public health problems have tended to transcend boundaries which have limited Caribbean cooperation in economic and political matters. The islands which find themselves at odds over many issues continue to cooperate in the work of the Standing Advisory Committee. They continue to sit on the Committee. Their scientists attend the annual meetings and present papers. They continue to be eligible for grants administered by the SAC.

The members of the SAC, who are chosen by informal consensus of the Committee, include both scientists and the chief medical officers of the islands.

The Committee consists of 13 members, including the chairman and scientific secretary. Two members are from the United Kingdom, representing the Ministry of Overseas Development and the Tropical Medicine Research Board. These members, with the assitance of one or two additional scientific assessors, make an annual visit to the major research undertakings in the islands, and they have accumulated a large amount of information relevant to decisions with respect to research grants. The other members include three members of the medical faculty of the University of the West Indies, one representative from the Rockefeller Foundation, and five chief medical officers of the islands. The heterogeneous and highly desirable mixed membership would probably be impossible if the Committee were the formal organ of some government.

The two chairman of the Committee have been laymen in the field of biomedical research. The Committee has the de facto authority to select its own chairman, although the de jure authority to do so is somewhat cloudy. The Committee also selects its own scientific secretary who also serves as a member of the Committee. The scientific secretary carries the burden of arranging for the annual scientific and business meetings. He also makes a practice of traveling extensively among the islands to meet with and encourage investigators.

The Committee meets once a year, alternating between Jamaica and another island. Each meeting consists, first, of a three-day scientific session with a broad theme (metabolic and endocrine disease in 1964; infectious and parasitic diseases in 1965; renal and cardiovascular disease in 1966; malignant disease in 1967), but with papers not confined entirely to the central theme of the meetings. This gathering is by far the most significant biomedical research meeting in the British Caribbean. It provides an invaluable means for exchange of scientific news, views, leads and data, development of collaborative efforts, interchange of ideas between public health and research groups, and expression of needs for personnel, supplies or equipment.

The meeting of the SAC itself is devoted to consideration of such matters as grant requests, reports of the major research organizations in the islands, consideration of new lines of activity (for example, a virus epidemiological intelligence service to strengthen virological research in the area). The consideration given to all grant requests - both for grants under 500 pounds sterling and for

larger amounts - is sympathetic, but detailed and constructively critical. Some members of the group are almost invariably well acquainted with the investigators and the studies proposed. Since needs are great, funds are limited, and the scientific scene is understood in detail, the requests for support are subjected to thorough screening.

6.2.2. Finances

The Committee has had available for some years, and continues to have, a grant of $7,000 (2,500 pounds sterling) per year from the Ministry of Overseas Development and the Tropical Medicine Research Board for small grants (not to exceed $1,400 per year) to be distributed at the discretion of the Committee.

In addition, the Committee serves as the group to recommend to governmental sources in the U.K. (The Medical Research Council and the Ministry for Overseas Development) grants for larger sums. Such grants, if approved, are paid from the budgets of the U.K. bodies and not from sums administered by the SAC. There is no guaranteed amount from this source, but the total amount available has approximated $40,000 per year. About 10 large grants are, on the average, in effect in any given year.

A primary characteristic of the U.K. funds is their predictability. Funds for the block grant are committed for three years in advance. This provides a sense of security and continuity which contributes importantly to the stimulation of research in the islands.

In addition to funds for research, a grant is available for the expenses of the secretariat. This amounts to about $7,000 per year,

distributed approximately as follows:

	Percent
Salaries (honorarium to scientific secretary and salary of secretary)	40
Offices expense	8
Travel (secretary and scientific secretary)	24
Expenses of Meeting	28

This grant is provided by the governments of the United Kingdom, Trinidad and Jamaica. Trinidad and Jamaica are gradually assuming a larger proportion of the cost of operating the Committee.

6.2.2.1. Small Grants from the Block Grant. Over the period 1957-1964, about 50 grants totalling almost $40,000 were made from the block grant. (See Table 1). The average grant has accordingly been for about $800. These relatively small sums have had a facilitating and stimulatory effect far greater than might be supposed from the funds involved. About four-fifths of the funds have served to support 37 investigations at the University of the West Indies (See Table 1). The high concentration of funds in the University is accounted for by the presence there of most of the talent and by the fact that the University does not itself provide funds for the extra expenses of research. It does, of course, provide the basic resources for research by paying the salaries of faculty, nurses, technicians, etc., and by providing office and laboratory space and library services. Extra expenses for special equipment, services and personnel required solely for research must be financed by the investigators concerned from sources outside the University.

The grants are distributed among a wide variety of fields

(Table 1). The primary fact revealed by the tabulation is the wide diversity of investigations, which reflects the wide range of competence and interest of the investigators. It should be borne in mind that these small grants are made to investigators not associated with the two research units at the University or with the Trinidad Regional Virus Laboratory. The small grants therefore do not provide a reliable profile of the totality of biomedical research conducted in the British Caribbean.

The SAC does not have a scientific program of its own, but is rather a facilitating group. Accordingly, the substance of research is discussed in connection with the work conducted by the various research groups.

See Table 1, next page

Table 1

Small Grants Made by the Standing Advisory Committee, 1957-1964*

Number and Amount of Grants		
Size (US $)	Number	Amount (US $)
Total	53	$38,672
Under $280	8	1,498
280-559	14	5,774
560-839	10	6,740
840-1,119	9	8,431
1,120-1,400	12	16,229

Distribution by Site of Research		
Site	Number of Grants	Amount (US $)
Total	53	$38,672
University of the West Indies	37	31,265
Trinidad	5	2,310
British Guiana	3	2,005
Ghana	2	991
Barbados	2	974
Antigua	2	588
Jamaica (other than U.W.I.)	1	434
St. Lucia	1	105

Fields of Research				
Field**	Number of Grants		Amount of Grants	
	Number	Percent	Amount	Percent
Total	53	100	$38,265	100
Clinical Research	12	23	9,047	23
Epidemiology	14	30	8,390	21
Infectious diseases	11	20	7,379	20
Metabolic Studies	9	15	6,551	17
Other (neurophysiology, veterinary medicine, cytology, chemistry of natural products)	8	12	7,305	19

* Source: Scientific Secretary of the SAC

**Distribution based on raw data supplied by SAC

6.3 The Medical College of the University of the West Indies

The Medical College of the University of the West Indies is a fully developed institution in that it trains physicians, serves the community and carries on research. The development of the school is a remarkable achievement, as is the growth of the entire University. The University was founded in 1952. Planning for the Medical School began in that year with a single staff member located in a temporary World War II wooden barracks building. Since it takes almost a decade to produce the first medical graduate after planning begins, the progress of the school represents an achievement of the first order. This is particularly the case when one considers that this period covered pre-federation years, the time of the federation, the break-up of the federation, and independence. These changes involved shifts in the status of the University: from a university college of the University of London to a full-fledged independent university. Involved was the loss of some support from the U.K., such as the Colonial Medical Research Studentships.

The pressures to train more physicians are powerful. The school is in the process of increasing its entering class from 35 to 65 and to an eventual ceiling of 100. At the same time, a number of medical students will be sent from Jamaica to Trinidad and Barbados for a clinical year. These constitute a heavy load on the faculty. While these efforts on the teaching side are going forward, pressures for provision of medical care in the University Hospital continue to mount. That research is undertaken at all in the University is note-worthy. The range and quality of the investigations are remarkable. The nature

and diversity of the effort can be sensed from the brief sampling which follows:

6.3.1. The Department of Biochemistry under excellent scientific leadership conducts a continuing research program. Perhaps the most spectacular result of the program has been the isolation, characterization and determination of the mode of action of a substance found in the immature nut of a local tree (the ackee) which has the peculiar property of severely depressing blood pressure in humans. This drug, "hypoglycin", is fatal in small doses. Its pharmacology and possible uses are being further explored.

6.3.2. Members of the Department of Medicine are engaged in a variety of studies. One of these is based upon the epidemiological finding that the incidence of coronary thrombosis is relatively low in Jamaica, and on the hypothesis that the question of "platelet stickiness" may be involved. Another study, relates to the size of protein molecules and the rate at which they are metabolized.

6.3.3. In the field of hematology, interesting investigations on sickle cell anemia are in progress. In contrast to the situation in Africa, the disease is not a serious one in Jamaica.

6.3.4. The research effort in microbiology is extensive, covering virus, microbial and fungus diseases.

6.3.5. The research carried on in the Department of Pathology is also quite extensive.

6.3.6. On the other hand, investigations are less extensive in the departments of anatomy, physiology, surgery and obstetrics, but some research is in progress. For example, an investigation relating to enzyme histochemistry of the placenta is in progress in the Department of Surgery.

The primary determinants of the variety and quality of research are the interest of individuals and the nature of the leadership in the departments. A research club exists, in which research units, as well as the faculty, participate. But the center of initiative is with individuals and departments. The primary barriers to research in the Medical School are shortage of time, arising from the extreme pressures of teaching and medical care and from the shortage of technical help.

The influence of the Medical School on research in the area extends far beyond the investigations undertaken in the laboratories and teaching hospital of the school itself. It is an energizing, catalytic influence. The interests of the faculty members extend to other islands, and they seek collaboration with and provide help to other investigators. The medical research units are, in accordance with the policy of the British Medical Research Council, attached to the Medical School.

6.4 The Medical Research Units

6.4.1. General

The British Medical Research Council supports two medical research units on the grounds of the Medical College of the University of the West Indies. One is a unit for the study of tropical metabolism, established in 1954, and the other is for epidemiological

investigations, established in 1956.

The MRC has provided the funds for the buildings and equipment of these units. It has also purchased instruments for them, including such sophisticated equipment as a mass spectrometer. The MRC also pays the salaries of all of the personnel and the full operating costs of the units. The annual budget of each of the units approximates $200,000 (60,000 pound sterling).

Salaries and prerequisites are set at the university level but the professional staff of the units are not required to teach. Some of the staff does teach in the Medical School, but this is not mandatory. The staff also takes part in the general scientific affairs of the area. The Director of one of the units has been a major figure in the development of research, and two of his staff have served as the Scientific Secretary of the Standing Advisory Committee.

The Units provide the physical setting and guidance for advanced degree students. For example, seven doctorates (Ph.D. or M.D.) have been obtained (through 1964) as a result of studies done in the Tropical Metabolism Research Unit, and three more theses are in progress.

6.4.2. The Tropical Metabolism Research Unit

The rationale of the Tropical Metabolism Research Unit is simple. There are few places in the world where the clinical material required for study of problems of human metabolism under conditions prevailing in the tropics is available to a highly competent leader and to a group in a setting where sophisticated research is possible. Jamaica is one of these places. The British Medical Research Council selected it as a center for such work and developed the medical

research unit form of organization.

The work of the TMRU does not relate to improvement of diets or to the resolution of problems of nutrition, but rather to the fundamental physiological and metabolic phenomena associated with severe protein malnutrition, particularly in children. The studies involving children, carried out for the most part in the clinical facilities of the Unit, include the following: studies of the short and long term prognosis of severely malnourished children; studies of body composition of malnourished children; minimum protein requirements of children; turnover of total body protein in children; collagen metabolism; studies on renal function in malnourished children; studies on liver enzymes and serum lipids to explain severe fatty livers in children with kwashiorkor. Studies of total potassium in young children have been markedly facilitated by the acquisition of a whole body scintillation counter, financed in part by a grant of $10,000 from the International Atomic Energy Agency.

The Unit works not only in its own laboratory at the University in Kingston, Jamaica, but also upon occasion in other islands and in other countries. The Director, for example, is currently in London studying protein turnover in animals. The work can be done better there, and elucidation of protein turnover is a central problem in malnutrition. With the support of the United States Army, the Unit studies mountain sickness in the Colombian Andes at altitudes from 12,000 to 15,000 feet. This work, done in 1963-64, centered around the relation of potassium intake to mountain sickness, and it was found pragmatically that dietary supplements of potassium did reduce the severity of the illness. These

studies are related to nutritional studies because the handling of potassium by the body is a significant aspect of the metabolism of malnutrition.

This brief description of the work of the Unit indicates the diversity and complexity of the program, and the fact that it attracts support from a number of international sources. The quality of the work is indicated by a steady flow of significant findings, most of which are published in the standard international journals, such as the Biochemical Journal, the Journal of Clinical Investigation and the British Journal of Nutrition.

6.4.3. The Epidemiological Research Unit

The Unit has undertaken a varied program of studies in terms of diseases, population groups, and techniques of investigation.

One group of investigations has been concerned with cardio-vascular conditions - myocardial disease and arterial blood pressure. Population groups in Wales and in Jamaica have been compared. The work in Jamaica was undertaken with the collaboration of both the Tropical Metabolism Research Unit and the Departments of Medicine and Pathology of the Faculty of Medicine at the University.

Longitudinal studies of infant development which began on a controlled rural population group in 1962 are being carried forward, and results are being compared with those of similar surveys carried on in Gambia and Mexico. The work is aided by the Association for the Aid of Crippled Children of New York City.

Cross-sectional studies of primary and secondary school children and adults in Jamaican population groups have been completed. Two

interesting findings are that children of equivalent age are now larger than was true 13 years ago, and that women in urban areas average about 20 pounds heavier than women of the same age in rural areas.

The Unit works closely not only with the academic community, but also with the health and census officials of the islands.

As is true of the Tropical Metabolism Research Unit, the staff of the Epidemiological Research Unit contributes steadily and significantly to the world literature.

6.5 The Trinidad Regional Virus Laboratory

The Trinidad Regional Virus Laboratory was originally established and completely financed by the Rockefeller Foundation as part of its broad biomedical research and agricultural programs in Central and South America and the Caribbean. The Laboratory was originally established as part of a three-laboratory network (the laboratories at Cali, Colombia, and Belém, Brazil, being the other two) for the study of arboviruses. The Trinidad area is particularly significant because it is in the transitional zone between the South American tropics, and Central and North America. Viruses found in Trinidad include both those found in the Amazonian rain forests and those found in the Gulf Coast States of the United States - and even further north. This strategic position played a large part in the establishment of the Laboratory. The Laboratory was established under the leadership of Dr. Wilbur Downs, who served as Director of the Laboratory for 12 years. Under his direction, the Laboratory expanded gradually in terms of staff, equipment and space. It is now a fully equiped virus research laboratory with a

professional staff of six persons.

The scientific program of the Laboratory is quite diverse. A major line of work has been the maintenance of an intensive monitoring program to trace the presence and absence of specific viruses through time. Much of this has been done by studying the antibodies to specific viruses in a large population sample. The Laboratory also works on the complex problem of transmission and survival of the virus in nature. It seems virtually certain that rodents are implicated, but the details of survival and transmission remain to be worked out. The program of the Laboratory is carried on by a staff of seven senior scientits, three of whom are staff members of the Rockefeller Foundation and by fifty technicians and assistants. The investigations involve studies of animal vectors, epidemiological and ecological studies, and identification of virus strains.

The Laboratory is fully equipped for the inherently expensive and complicated procedures involved in virus work. Recently, the Foundation gave the Laboratory a much needed insectary, while the government of Trinidad and Tobago built a virus diagnostic facility. The expense of virus research is such that the few virus laboratories of excellence existing in Latin America should function as regional resources. The TRVL is organizationally a unit of the Department of Microbiology of the University of the West Indies, and the working relationships may be expected to become closer as the present trend continues.

In addition to the conduct of research, the Laboratory serves as a training ground not only for the British Caribbean, but for the entire Caribbean and for Latin America. The training encompasses a range from

laboratory technicians to post-doctoral fellows.

The leadership of the Laboratory has by design shifted to the capable hands of scientists from Trinidad. Similarly, financial responsibility is moving away from sole reliance on the Rockefeller Foundation. The Foundation now provides half of the annual budget of $200,000. About thirty percent of the budget is provided by the governments of the British West Indies, and the government of Trinidad supplies about 15 percent of the operating expenses of the Laboratory. The remaining 20 percent of the operating expenses are paid by the Tropical Medicine Research Board of the United Kingdom. Thus, the Laboratory is in terms of its financial structure, as well as of its research and training activities, an international institution. Indeed, the evolution of this Laboratory, from one concerned solely with research and financed totally by a U.S. foundation, to a laboratory with diverse research and public health missions cooperatively financed by a foundation and governments, provides a thought-provoking example of the manner in which institutions can adapt productively to emerging needs.

6.6. Public Health Research

The health authorities of the larger islands, particularly Jamaica and Trinidad, carry on a continuing research program associated with disease control measures, often in cooperation with investigators from the University of the West Indies, the Medical Research Units, and the Trinidad Regional Virus Laboratory.

In Trinidad, for example, a recent outbreak of acute respiratory disease was studied epidemiologically by the health authorities, and

virologically by the Regional Virus Laboratory. This pattern of cooperation is prevalent in both Jamaica and Trinidad.

The health protection and surveillance measures required of health authorities give rise to a continuing flow of needs and opportunities for research. For example, techniques of water purification involving scattered rather than central installations generate complex technical problems. Similarly, the techniques of mass immunization in the special cultural, economic and geographical setting of the islands require study. Finally, health and vital statistics records provide a source of information relevant to the study of health problems, but there exists also a healthy degree of skepticism as to the validity of some of these sources.

In the area of public health research, nutrition laboratories associated with the health departments of Trinidad and Jamaica should be mentioned. The laboratory in Trinidad has been equipped primarily through the donation of equipment used in a nutrition survey conducted under the U.S. Interdepartmental Committee on Nutrition for National Development. The primary need of this laboratory is for funds to pay the salaries of technical assistants. The comparable organization in Jamaica is the Human Nutrition Unit in the Ministry of Health and Welfare. The primary tasks of this Unit are to determine the nature and prevalence of dietary deficiences, and to develop dietary supplements to deal with them.

As is true of academic research, the intensity of research conducted by public health agencies is limited by the shortage of funds available to them in relation to their responsibilities, and by the

heavy work load of the staff. In spite of these obstacles, the health authorities in Jamaica and Trinidad have managed to assemble a small nucleus of alert, qualified, and curious staff members interested in studying the problems confronting them, as well as in carrying out the day-to-day operating activities. However, shortages of professionally qualified staff - for example an epidemiologist in Trinidad - remain a barrier to a more effective research program.

6.7 Appendix

6.7.1. Clinical Research - 12 Grants, $9,047

Pelvimetry
Anesthesiology
Hypertension and the placenta
Eclampsia
Fluorescent antibodies in relation to arteriosclerosis
Analysis of deliveries
Gastroenteritis and thyroid function
Aortic dilatation and serology
Serum iron estimations
Anemia and menstrual loss
Hemodynamics of the perfused liver
Heat cramps among sugar workers

6.7.2. Epidemiology - 14 Grants, $8,390

Carcinoma of the cervix
Epidemiology in Antigua (2 grants)
Immunity to poliomyelitis in St. Lucia
Distribution of veno-occlusive disease
Incidence of glycosuria
Fish poisoning in St. Kitts
Medical records
Cleft lip in Trinidad
Neonatal deaths
Congenital heart disease in Trinidad
Folic acid deficiency in Trinidad
Analysis of nutrition survey results
Infection and growth failure

6.7.3. Infectious Diseases - 11 Grants, $7,379

Study of A. bellator
Filariasis in Barbados
Leptospirosis in Jamaica
Electrolytes in gastroenteritis
Leptospirosis in W. I. Islands
Differentiation of treponemal antibodies
Isolation of viruses from patients
Chagas'disease in Trinidad - clinical aspects
Distribution of Hemophilus influenzae in Jamaica
Simian malaria parasite

6.7.4. Metabolic Studies - 9 Grants, $6,551

Carbohydrate metabolism
Radioactive B_{12}

Electrolyte disturbance in malnutrition
Diet and rat liver metabolism
Beta lipoprotein and hypertension
Iodine uptake in thyroid
Iodoamino-acids
Electrophoresis of thyroid proteins
Protein turnover and molecular size

6.7.5. Other Fields - 8 Grants, $7,305

Neurology, Neurophysiology and Neurochemistry
- Electrical changes in the central nervous system (2 grants)
- Jamaican neuropathies
- Release of catecholamines from the nervous system

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MEXICO

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7. MEXICO

After the long and debilitating revolution which lasted from 1910 to 1917, Mexico established the form of government which still exists. Between 1920 and 1934 there was a period of political reorganization from which modern Mexico has emerged. The country has enjoyed stability. Its social and economic programs have been progressive. They have been studied and emulated by several countries facing similar problems.

Between 1921 and 1940 the population of Mexico went from approximately 14.5 million people to about 20 million. Between 1940 and 1960 there was an increase of 15.2 million (or 80%) - almost three times that of the preceding 19 years. In this same 20-year period, the mortality rate was cut in half. The decline in infant mortality was even more dramatic. Between 1930 and 1934, an average of 135 out of every 1,000 babies born died by their first birthday. Between 1950-1959, the average dropped to 83. It is now approximately 69.5. The birth-rate is 47.7 per 1,000 (one of the highest in Latin America); the death rate 11.8 per 1,000. As recently as 1923 the average life expectancy of a Mexican male was only about 30 years; today with the reduction in infant mortality and in enteric diseases, male life expectancy is about 60 years. The principal causes of death today are enteritis, pneumonia, infant mortality and heart disease. Mexico has one of the highest homicide rate

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* Prepared by Dr. Herbert T. Dalmat. Based on a site visit by the Study Group on Biomedical Research Policy in Latin America: Structures and Processes, on 17-26 October, 1964, consisting of Drs. Kidd, Braga, Groot, Paterson and Dalmat.

and a very low suicide rate. There are an estimated 26,000 doctors in Mexico, of which 10,000 care for seven million people covered under the three Social Security systems of Mexico, while the other 16,000 doctors are responsible for the care of the remaining 33 million inhabitants of the country. It has likewise been estimated that 14 times more money is spent for medical care in the Social Security systems than outside of them. Nationally, there are approximately 6.5 physicians per 10,000 population as compared to 13 per 10,000 in the United States. Although all newly-graduated physicians in Mexico are required to spend a six-month period in the provinces, too few remain there to practice, preferring to establish themselves in the urban centers. In rural areas, the untrained curandero or "healer" is still widely depended upon for medical care. In 1964, with nearly 40 million people, Mexico is the most populous Spanish-speaking country in the world.

The Mexican government has done much to tackle its problems in public health, education, agriculture, and industrialization. Modern public health methods began to eradicate some diseases and to halt premature deaths. This of course has contributed much to bringing about the extremely pronounced population increase, primarily in children under 15 years of age. Although great strides have been made in the field of education, 25% of the Federal budget being relegated to it, it has been difficult to keep up with the ever-increasing population requiring schooling. Since 1910 industrialization has tripled and agricultural production has almost tripled. The gross national product has tripled since 1939 and real wages per capita almost tripled between 1929 and 1962. There has been a slow but steady rise of the middle class.

However, these excellent records have also been partially negated by the tremendous increase in population. The rural population of Mexico, which is the poorest segment, constitutes up to 49 percent of the total. Thirty eight percent are still illiterate; 37 percent of the children of school age are not in school; 24 percent do not regularly partake of meat, fish, eggs, or milk as part of their diet. In agriculture, the scarcity of arable land, the physical isolation created by difficult mountain ranges, unfavorable rainfall patterns, and the uneconomical type of farming resulting from the division of the land into very small parcels under the agrarian reform program (in 1915), have been obstacles in the country's attempt to keep up with its ever-increasing needs.

The Mexican government is now faced with a multitude of decisions. Should it give more weight to the primary school needs of an ever-increasing young population or should it put emphasis on more and better facilities for technical and higher education to satisfy the demand for more highly trained citizens in the development of the country? Should it budget more for economic development or for education? It seems to have made its choice, favoring education over economic development projects, and primary schools rather than higher education. An examination of government expenditures for 1960 ($820,000,000) and 1964 ($1,276,200,000) indicate that for industry and commerce the investment of the government dropped from 1.0% of the total budget to 0.8%; in public health it went from 5.2% to 4.9%; in agriculture as a whole, the expenditures went from 2.2% to 2.0%, although for agrarian problems it rose from .6% to .9%. In education there was an increase from 18.3% to 25.4%. This last figure represents approximately $321,665,000. Mexico has geared its educational

program toward satisfying these four basic needs: cultural integration of the Indian population; extension of literacy to adults; provision of universal primary school education; and the expansion of secondary, professional, and technical schools to provide personnel trained to contribute to the modern economic and social world.

Although new schools have been built at a rapid rate, it has been impossible to keep up with the demand. It is difficult to run literacy programs where people find it a problem just to eke out a mere existence to allay hunger; attendance at school would mean absence from productive work. There is also a lack of qualified teachers who must be trained in the universities and in schools specializing in pedagogy and who would be willing to work in isolated areas.

The Mexican government is well aware of its manifold problems - educational, agricultural, industrial, and socio-economic, and it is using all possible approaches to try to solve them. Research is simply one among many areas which have a legitimate claim on scarce resources.

7.1 Brief History of Biomedical Research in Mexico

Mexico has had a long history of research. Although the University of Mexico was not the first in Latin America to receive a charter from the King of Spain, it was the first to be constructed and to function in that region (Jan. 25, 1553). It began as the Real y Pontificia Universidad de Mexico, giving a doctorate in theology. The Instituto de Geología of the National Autonomous University (UNAM) was engaged in research at the end of the last century and, in 1910, an International Congress was held in Mexico City to honor the work of this Intitute.

The Instituto Médico Nacional, under the Secretaría de Educación Pública, was also carrying on research in botany, pharmacology, and medical zoology during the last decade of the nineteenth century, into the early part of this century, and during the period of Mexico's revolution. During the latter period, due to the exigencies brought on by the revolution, it was necessary to produce vaccines to combat smallpox, rabies, and typhoid. To do this, persons were sent to the United States and France. Some experimental work, in addition to the production of vaccines, was initiated in the Instituto de Higiene and this continued until about 1939.

By 1930, a certain amount of research was in progress in dependencies of the Secretaría de Salubridad, like the work of Dampf in entomology. During this same period the Institute of Biology of the National University had Dr. Carlos Hoffmann on its staff, who not only did fine research in entomology and parasitology himself, but also stimulated a large number of students to go into research. This was the period when Mexico began to move ahead after its revolution. It probably was due to the interests of Dampf and Hoffmann that onchocercosis became the early, and still continuing, public health problem to be organized on a campaign basis under the Secretaría de Salubridad.

In 1934, the present Escuela Nacional de Ciencias Biológicas was begun as part of the Gabino Barreda University. At that time it was called the Escuela de Bacteriología. In 1937 this school was incorporated within the newly-formed Instituto Politécnico Nacional and its name was changed to the Escuela de Bacteriología, Parasitología y Fermentaciones. In 1939, after broadening its scope, it assumed its present name. The "Escuela de Medicina Rural" was founded as part of the newly formed Instituto Politécnico. Its prime purpose was to prepare doctors who would

serve in the provinces outside of the large cities. In the National School of Biological Sciences, research was carried on in botany, entomology, helminthology, and protozoology. Up to that time biomedical research was done by only very few individuals scattered in a number of institutions. This school appeared to be the first to serve as a center of research with a relatively large group of investigators working on a number of different problems. In 1962, it inaugurated a doctoral program which is preparing investigators on a formal basis.

In 1939 the Instituto de Salubridad y Enfermedades Tropicales came into existence for the purpose of doing research in fields related to public health, especially tropical diseases, and to provide training for research through courses, apprenticeships, and its own hospital arrangement for clinical studies. Since its inception it has been publishing the "Revista del Instituto de Salubridad y Enfermedades Tropicales" containing papers in tropical medicine.

The Hospital Infantil was established in 1943 as the first of the autonomous Institutes. In 1944 the second of the autonomous Institutes for medical research came into existence, the Instituto de Cardiología, and finally the Instituto de Nutrición, in 1946. Each of these three institutions has been organized as an independent entity, with research as its theme. Each has its own research committee to review suggested programs, as well as its own board of directors, to help it secure needed financial aid from sources outside of government. Its basic support comes from the national government, the funds being made available through the Secretaría de Salubridad, the Secretary of Health and Welfare serving on the Board of Directors of each of these institutions.

They all have close ties with the National University in that some of their staff members are also on the University staff, and in that capacity they give advanced training for the University.

About 1945, the Colegio Nacional was established by presidential decree for the express purpose of educating the public in the fields of science, art, and education. Only 15-20 select persons are members of the Colegio, no more than two representing any particular field. These persons have an annual budget which they use as they see fit. By giving free lectures and demonstrations throughout the country they are stimulating interest among the people.

Back in 1942 the "Comisión Impulsora y Coordinadora de Investigación Científica" (Commission for the Promotion and Coordination of Scientific Research) was established which was reorganized in 1950 to form the Instituto Nacional de la Investigación Científica (National Institutes of Scientific Research). This organization was formed to help support the training of scientists and to help stimulate research in fields important for the development of the economy of the country. In 1961, the Instituto was again reorganized on a more functional basis, making available a small number of fellowships and limited subsidies for research purposes. The INIC also was committed to make a survey of the scientific manpower and facilities in the country.

The Academia de la Investigación Científica (Academy of Scientific Research) was founded in 1958 as a meeting place for active research people and as a forum for stimulating research and training. After six years of existence there are over 120 members and there are about a million pesos ($80,000) available for fellowships, lectures, short

courses, and to a very limited extent, for research needs. Prizes for outstanding research are also awarded. Funding has come from the members themselves and from private industries and foundations.

In 1963, the Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (Center for Research and Advanced Studies of the National Polytechnic Institute) was opened. Besides giving post-graduate training, it can be proud of its full-time professional staff (very rare in Mexico), all engaged in research. It is a powerful institution.

During the last half of 1964, the Secretary of Health and Welfare established the Consejo Nacional de la Investigación Médica (National Committee of Medical Research) which has as its stated goal the coordination of research efforts in the medical field. The President of this 17-man body is the Secretary of Health, and the Vice-President is the Head of the National Public Health Research Laboratories. The other members are primarily directors of major units under the Secretary of Health which have within them some research in progress. This is a weak and maybe a transitory invention.

7.2 Institutions conducting Biomedical Research

Institutions in which biomedical research is in progress in Mexico can be classified under the following agencies:

A. Dependencies of the Secretariat of Health and Welfare

1. Instituto de Salubridad y Enfermedades Tropicales (Institute of Public Health and Tropical Medicine)
2. Laboratorios de Salubridad (Often referred to as the Institute of Biological Research)

(a) National Registry of Anatomical Pathology

(b) Laboratory of Immunological Research

(c) Laboratory of Virus Research

(d) Hospital for Clinical Research (under construction)

(e) Laboratory for the Study and Production of Poliomyelitis Vaccine

(f) Laboratory for the Study of Pertussis Vaccine

3. Instituto de Higiene

4. Dirección de Epidemiología y Campañas Sanitarias (Department of Epidemiology and Sanitary Campaigns)

5. Comisión Nacional para la Eradicación de Paludismo (National Commission for the Eradication of Malaria)

6. Instituto Nacional para Enfermedades Nerviosas y la Investigación Cerebral (Brain Research Institute) of the Department of Neurology, Mental Health and Rehabilitation.

B. Dependencies of the Secretariat of Education

1. Association of Universities - there are nine regional groups which encompass all the universities and institutions of higher learning in the country

2. Instituto Politécnico Nacional (National Polytechnic Institute)

(a) Escuela Nacional de Ciencias Biológicas (National School of Biological Sciences)

(b) Centro de Investigación y de Estudios Avanzados (Center of Research and Advanced Studies)

C. Universidad Nacional Autónoma de Mexico (UNAM) - National Autonomous University of Mexico

D. Autonomous Institutes

1. Hospital Infantil - Instituto de Investigaciones Científicas (Children's Hospital - Institute of Scientific Research)

2. Instituto Nacional de Cardiología

3. Instituto Nacional de Nutrición

E. Dependencies of Secretaría de Trabajo y Previsiones Sociales (Mexican Institute of Social Security, IMSS)

In Mexico there is no institution directly responsible for the coordination of biomedical research. As might be expected, research programs have developed as the result of the interest of individuals in their particular specialities or position responsibilities, and not because of the policy of the overall agency for which they may work. As time went on, with the increase in population and with the formalization of programs of different secretariats of the national government, it was found necessary to support research in order to carry out intelligently their respective responsibilities.

The two major secretariats that have under their jurisdiction institutions in which biomedical research is being carried out are those of Health and Welfare and of Public Education. The three autonomous Institutes were set up by presidential decree with independent federal budgets, although each does have the Secretary of Health and Welfare serving as Chairman of its Board of Directors.

7.2.1. Secretariat of Health and Welfare

In the Secretariat of Health, the Institute of Public Health and Tropical Medicine was established in 1939 to investigate the public health and disease problems of the country. In addition, it gives specialized training to selected professionals from all parts of the country. As should be expected, the research of this Institute is primarily epidemiological, with the support of its numerous laboratories. With 52 hospital beds available and with a large outpatient department, the staff see a good number of interesting cases, especially in tropical diseases. The Institute publishes its own journal, The Revista del Instituto de Salubridad y Enfermedades Tropicales, three times a year.

This primarily includes the field observations, surveys, or research findings of the staff. Since its inauguration in 1939, the direction of this Institute has been in the hands of relatively few people, and some older staff members are well known for their research achievements. On the other hand, well trained younger people are, with some exceptions, not being attracted to it. An exception is the Head of the Department of Mycology, a relatively young dermatologist who is an outstanding research man and who attracts young trainees. However, with few of the staff working exclusively at the Institute, and with no formal ties between it and the University of Mexico or the Polytechnical Institute, the outlook for meaningful research is not bright.

Funds are derived from three sources: the Secretariat of Health; the national lotteries; and the charges for services given to other institutions or from the estates of persons dying intestate. Although there are sufficient funds for the regular programs, none are available for fellowships to train younger people for staff positions.

Under the Secretariat of Health, and running its program in the Institute of Public Health and Tropical Diseases, is the Facultad de Ciencias Sanitarias y Asistenciales (Faculty of Sanitary and Public Welfare Sciences), formerly the School of Public Health and Welfare. Although this institution should not be included in a list of those in which research is carried out, it is to be a "Faculty" and it expects to grant doctoral degrees. As such this organization might be expected to be engaged in research. It has not felt justified in doing so because of the tremendous demands to produce graduates with training in public health, public health administration, sanitary engineering and nutrition for

work in rural areas of the country. Mexico does have a pressing need for more practioners of medicine and allied fields to work in the rural areas of the outlying states. This institution must do all possible to prepare such people, but training people to fill these needs is quite different from a Faculty that plans to give a doctorate degree without a research program. It is customary that advanced degrees be conferred by universities after completion of a recognized curriculum that must include appropriate original research done under a preceptor engaged in research activities.

The present faculty rotates between periods of teaching and work in the field. Some of the staff of the Institute of Public Health and Tropical Diseases, where the faculty is now housed, give lectures and demonstrations. The practical courses for technicians in all fields of public health given by this institution are badly needed, and it could help establish an appropriate number of other similar institutions, possibly in collaboration with existing universities, in other parts of Mexico.

The "Laboratorios de Salud Pública" (Institute of Biological Research), under the Secretariat of Health, has been organized specifically for research and training activities. New buildings have been constructed adjacent to the Institute of Public Health and Tropical Diseases and the laboratories have very fine, modern equipment. For example, the National Registry of Anatomic Pathology, is extremely impressive. It has laboratories of histochemistry, tissue culture, exfoliative cytology, and is in the process of mounting its laboratory of electron microscopy. The primary mission of the Registry is to prepare much needed modern

pathologists for hospitals throughout Mexico, to prepare technicians to work in the pathology laboratories, and to build up the registry of pathological material received from all parts of the country for diagnosis, thereby adding to the knwoledge of the diseases of the country and their distribution. Since the inauguration of the Registry in 1959, it has prepared a number of pathologists and technicians, who are working in diverse areas of the country. In addition to the training given at the Registry, persons are also sent outside the country for further preparation in special fields. This is one of the few organizations that finds it financially feasible to do this on its regular budget. The Registry has excellent relations with the Armed Forces Institute of Pathology of the United States and appears to be progressive in its activities. Certainly this center will be pinpointing interesting problems for research. It is also giving much of the basic training necessary for persons to carry on investigations. However, research at present is limited to the field of histoplasmosis only. With the proximity of the Laboratories of Virus Research and of Immunological Research (headed by the Director of the entire Institute) and the availability of the new Hospital for Clinical Research which is already well along in construction - all of them components of the Institute for Biological Research - the Registry could become a very important center for research. Certainly the President of the Registry, who is also Director General of Scientific Research in the Secretariat of Health and Welfare, is not only aware of the possibilities along this line, but is already planning for its implementation.

Several components of the Institute other than the Registry have

well-trained, research-minded chiefs who would be expected to develop good programs of investigation in addition to their responsibilities for service to the Institute of Public Health and Tropical Diseases. Under PAHO sponsorship, the Laboratory of Virus Research collaborates with Cornell University in running an NIH Training Grant in the field of arbovirology. The consultant to the Laboratory for the Study and Production of Poliomyelitis Vaccine is principal investigator on an NIH research grant in the Research Institute of The Children's Hospital.

The Institute of Hygiene is almost completely involved with the production of biologics relative to diphteria, typhus, typhoid, paratyphoid, scorpion bites, etc. Its research, if any, probably would revolve about the efficacy of a product and the production methods.

The Department of Epidemiology and Sanitary Campaigns of the Secretariat of Health and Welfare organizes field programs for the endemic diseases of Mexico. The National Campaign against Onchocerciasis has been going on for many years, including both control and research programs. The serious side reactions manifested during treatment, the difficulties in making definite diagnoses, the non-existence of an experimental animal for parasite studies, and the inability to date to explain the pattern of distribution of the disease have stimulated interest in research. In recent years this has become more sophisticated, involving many more scientific disciplines. Other epidemiologic studies carried out within the Department of Epidemiology are in tuberculosis, Mal de Pinto, and in chronic skin diseases.

The Secretariat of Health and Welfare also has within its organization the Commission for the Eradication of Malaria. It coordinates

through PAHO/WHO on the world-wide campaign against this disease. With the need to know the ecology of the mosquito vectors, whether these show resistance to insecticides employed in control activities, and the efficacy of malarial drugs used for prophylaxis and treatment, many are the individuals involved in both field and laboratory studies.

The Department of Neurology, Mental Health and Rehabilitation of the Secretariat of Health and Welfare was established about five years ago. Other than the clinical research carried on by its Director, the National Institute for Neurological Diseases and Brain Research constitutes the major mental health research activity supported by the national government. It has recently moved to new quarters. The present director was appointed two years ago and activities of the institute are not known to this group.

7.2.2. Secretariat of Public Education

The Subsecretariat for Technical and Advanced Education, one of the branches of this Secretariat, has jurisdiction over the universities and advanced thecnical schools of the country, in some of which biomedical research is being conducted.

The universities and institutes of higher education of Mexico are linked together through the Association of Universities. The institutions are divided into nine regional groups, one of which includes only the National Autonomous University of Mexico (UNAM), another which encompasses only the Instituto Politécnico. The other seven regions take in the remaining institutions (although there are about 61 schools of advanced training listed for Mexico, only about 33 are at the University or truly technical level). This Association passes on the budgets of all the

universities, except that of UNAM, before they go to the subsecretary and to the Secretariat of Finance and Congress for final decisions and implementation. The UNAM negotiates its budget directly with the Secretariat of Finance since it is an autonomous national institution. Either as part of these institutions, or as an independent entity, there are in Mexico 21 medical schools and two schools of homeopathic medicine. One of the medical schools is part of a private university, the Universidad Autónoma de Guadalajara, and one of the schools of homeopathy is also private. Four of the medical schools are Federal - The Medical School of UNAM, The School of Rural Medicine, The School of Homeopathy of the Polytechnic Institute, and The School of Military Medicine. All others are dependencies of the States. The Federal Government, through its Subsecretariat of Technical and Advanced Education, helps support the state schools as well as the national ones.

Outside Mexico City, biomedical research is engaged in by relatively few investigators. A few well-trained individuals in Guadalajara, Veracruz, and Monterrey are involved in research. They have made remarkable progress, but their work continues to be hampered by lack of funds, sufficiently trained people, and equipment. The major educational institution under this secretariat which supports biomedical research is the National Polytechnic Institute in Mexico City. The principal subdivisions are the National School of Biological Sciences and the Center for Research and Advanced Studies.

The first of these is a very fine school for the preparation of professional bacteriologists, parasitologists, pharmaceutical chemists, biologists, and biochemists. Since 1937 it has been training good

technical people in these fields, many of whom now form the staff of other universities. Research has always had an important role in its program. Beginning in 1962 it initiated a broad postgraduate program leading to the doctoral degree.

The Center for Research and Advanced Studies was inaugurated in 1963 to train carefully selected postgraduate students in 10 - 12 scientific disciplines and to sponsor high level research in these fields. At present, there are Departments of Biochemistry, Physics, Physiology, Electrical Engineering and Mathematics. It is planned to add one or two additional fields each year until all of the most important branches of science are included. Although the initial financing of the Center by the federal government was through the administrative channels of the Polytechnic Institute as well as directly, the Center is now completely autonomous of the Institute, having its own Board of Directors. The Subsecretary of Technical and Higher Education is the President of the Board and the Director of the Polytechnic Institute serves as its Vice-President. The budget, now slightly more than one million dollars per year, is paid directly to the Center by the federal government. This institution has also been receiving some support from private foundations and from grants of the National Institutes of Health of the United States Public Health Service. The fact that the buildings of the Center are situated on the grounds of the Polytechnic Institute should mutually benefit both institutions. In this way, the Center has continuing relations with the staff of the Institute, thereby avoiding the often disastrous consequences of isolation. The Institute staff can likewise obtain the collaboration of the Center's staff. It is interesting to note that the

Center represents the first investment of the Secretariat of Public Education in education and research related to medicine. The Center is unique in having a completely full-time professional staff. The salary level is the highest in Mexico, comparable to those of similar centers in Europe. This has been effected to insure the quality of the staff and its continuity.

With the inauguration of the Center, the Mexican Scientific and Technical Documentation Center (established through UNESCO) was transferred from the University of Mexico (UNAM) to its buildings. It was supposed to continue giving the identical services that had been previously made available to scientists throughout Mexico and to those of other countries. It is the opinion of many people that the Documentation Center is now actually serving more as a library of the Center for Research and Advanced Studies, that fields not in the direct interest of the staff of the latter (i.e., medicine and public health) are not being well documented, and that it is difficult to get the kind of services that were previously rendered. The Center for Research and Advanced Studies is a rare institution in Latin America and should be expected to produce excellent research as well as to train specialists who will be responsible for raising the level of higher education both in Mexico and other countries of the hemisphere.

7.2.3. National Autonomous University of Mexico (UNAM)

Charles V of Spain issued the charter of the University of Mexico in 1551. In 1553 it opened as the Real y Pontificia Universidad de Mexico, actually the first university of Latin America.

It functioned as a seminary until 1933 when it was secularized. As has happened in many of the universities of Latin America, the National Autonomous University of Mexico had its doors closed several times during its long history. It finally achieved its present legal autonomy in 1929, a status which has kept it free from the machinations of politicians or competing institutions.

With the tremendous increase in population in Mexico since 1930, and with the great social and economic progress of the country during the same period, the demand for university and advanced technical training has likewise been intensified. Only 1% of Mexican youths between 17-24 years of age have the opportunity to receive any type of higher education, in contrast to 40% of the same population group in the United States. Thus, since about 1940 the UNAM has felt the need to expand its facilities to take care of the ever-increasing number of students. After much deliberation in governmental circles, planning for a University City finally was initiated and in 1950 the cornerstone was laid. By 1953 almost all of the research institutes were transferred to splendid new buildings. In 1954 the first 5,000 students were transferred to the new quarters; in 1955, an additional 8,000 and in 1956, 10,000 more students were brought over. By 1964, the enrollment of the UNAM was 70,000.

To serve a much larger student body many concomitant changes had to take place in the University practices. Among these have been: improvement of the salaries for instructional and administrative staff; increase in the number of full-time and half-time teachers and investigators; stimulation of research activities; and stabilization of the positions of directors of schools and of institutes so that changes cannot be made at

the whim of political figures. Freedom of thought was also stimulated among the staff and students and both groups have their voice in university affairs. A "College of Directors of Faculties and Schools" was established to discuss the shortcomings and needs of the University. Although this body is not included in the basic law setting up the structure of the UNAM, it was established by the Rector to serve as a means of sharing problems and ideas. The coordinators of the sciences and humanities also attend the meeting of this body as well as meetings with the directors of research institutes.

The University now consists of five faculties, eleven schools, five institutes of research in the humanities, five research institutes in the sciences, and three specialized institutes or centers in applied scientific fields. The investigators in the institutes generally serve as teaching staff of the faculties and constitute the major full-time component of the university. The Institute of Geology, under various auspices, had been engaged in research before the beginning of this century. In 1929 it was incorporated into the University at the time the latter was given its autonomy. The Institute of Biology of the UNAM was founded the same year. All the remaining research institutes were founded after 1940. Biomedical research has been carried out primarily in the Institute of Medical and Biological Studies (organized in 1942), the Institute of Biology (1929), the Institute of Chemistry (founded in 1941), and in various departments of the Faculty of Medicine.

There was a Chair of Medicine as early as 1578, which became the School of Surgery in 1770. In 1933, when the University was secularized, medical training was reorganized and was given in the Establishment of Medical Sciences. It subsequently became a Faculty of Medicine and in 1955,

it moved to its present site in the University City. At the time of its transfer a complete revamping of its curriculum and organization along modern lines took place.

Almost all research institute investigators are on full-time assignments. Salaries have improved and are still going up. They appear lower than they actually are since most staff members assume administrative and other responsibilities beyond the scope of their regular position, earning up to 50% more than the basic salary. The outlook for equipment for university laboratories has been improving and noticeable changes for the better are expected during 1965.

A five-year program in biochemistry leading to the M.A. and Ph.D. degrees is being initiated. The Faculty of Medicine is responsible for the Biochemistry Graduate Program and will confer the advanced degree to the graduates. This program not only represents a major advance in higher education in the sciences, but also opens the possibility of establishing a major Latin American Center for training in biochemistry. This program will take advantage of the specialized staffs of the School of Chemistry, the Institute of Chemistry, the Department of Biochemistry of the Medical School, and the biochemistry groups of the National Institute of Nutrition and of the National Institute of Cardiology. The Rockefeller Foundation has, since 1941, been helping four of the five units that are cooperating in the new graduate plan and it has recently invested additional funds. Further support is being sought from the Pan American Health Organization, UNESCO, and from other U.S. sources. There are now about 15 doctoral degree candidates in chemistry, all on small three-year fellowships and working full-time. However, enrollment is expected to reach a maximum of

fifty. This will require a new building and more fellowships, equipment, and staff.

Building on the experiment in biochemistry, the new President of Mexico is anxious to offer possibilities in postgraduate education at Universities throughout the country. Six to seven universities will initially get support for such programs while the others will get special subsidies but only at the undergraduate level. At the present time only UNAM and the Instituto Politécnico give doctorate degrees.

There is a need to increase the number of doctors from the present level of about 25,000 to 40,000. At present, there is a ratio of one doctor per 500 inhabitants in Mexico City while there is only one per 5,000 in the provinces. To meet the need, there are now 8,000 medical students enrolled in the Faculty of Medicine and 1,100 staff members. About 700 medical students graduate a year, but about 100 - the output of a large medical school - emigrate to the United States and remain. With a population growth of about 1.5 million per year the need for doctors will be going up even more. How to cope with these problems is a subject receiving considerable attention by the Faculty of Medicine and by the UNAM administration. The alternatives are to set up a second medical school within the UNAM or to increase the facilities at UNAM to absorb additional students. Which ever course is followed, the number of students is expected to double by 1967. Mexico faces the world-wide problem generated by the propensity of physicians to remain in metropolitan areas. Provision of adequate medical services to rural areas is a major aim. The present requirement of UNAM for students to spend six months in a rural area before graduation helps only slightly in orienting doctors to

that type of practice.

At the present time, public health is taught at UNAM through the coordinated efforts of several schools or faculties - Engineering (Sanitary Engineering), Architecture (Rural Housing and Hygiene), Social Sciences, and Dentistry. Courses will be included in the Faculty of Medicine as well. There is no direct relationship between the UNAM and the "Faculty" of Sanitary and Public Welfare Sciences of the Secretariat of Health and Welfare which is not a Faculty, in the usual sense.

A reorganization of research so that it is well balanced with teaching activities is a goal of the Medical Faculty. To this end a Medical Research Council of the Faculty is to be formed. It will be composed of the Dean, 4 or 5 investigators and some members who are not engaged in research. A Council on Hospital Education is also under organization to help set norms for clinical training, which will include adequate control by the Faculty over a teaching hospital. At present, clinical training for interns and others is given in about 30 hospitals over which the medical school has little or no control.

7.2.4. Autonomous Institutes

7.2.4.1 Children's Hospital

This Hospital, established by presidential decree in 1943, has as its functions medical care, research, and training. Sixty-five percent of the present budget of $2.3 million is derived from the federal government through the Secretariat of Health, while 35 percent comes from service charges and grants. It is autonomous, not being directly under any Secretariat, although the Secretariat of Health and

Welfare is Chairman of its Board of Directors.

There are about 200 members on the clinical staff including interns and residents. Six of the staff are on full-time appointments. Due to shortages of nurses, there are only 90 out of the 120 authorized. The patients of this hospital (about 700 outpatients daily) are primarily referred from other pediatric hospitals in the city. There are 12 new pediatric hospitals in Mexico City and their referrals are swelling the outpatient load of the Children's Hospital.

Research activities are coordinated by the Institute of Scientific Research of the Hospital. The Institute is directed by an advisory group composed of five of the 20 full-time research staff. Research is in progress in the fields of virology, nutrition, cancer, hematology, and nephrology. Key people on the staff have had training in some of the best centers in the United States. This research group now receives seven NIH/USPHS grants. Salaries of full-time staff are supplemented to a reasonable level by grant funds.

The training program of the Hospital is closely related to the UNAM, the staff often having dual assignments. This program has served not only Mexicans but others from Latin American countries, the U.S., and Europe. Its high standards in research training and service continue to be maintained. It publishes the "Boletín Médico del Hospital Infantil de México".

7.2.4.2. The National Institute of Cardiology

This autonomous Institute was set up in 1944, as a result of presidential decree. The Secretary of Health and Welfare also serves as chairman of its Board of Directors. It is involved

in both basic and clinical research related to cardiovascular diseases; it gives postgraduate training in cardiology, biochemistry and morphology to persons enrolled in the Masters degree program at the UNAM; and it has its own clinical facility a small part of which is devoted to private patients. The Instiute has four full-time clinical investigators and 18 full-time investigators in the basic sciences (immunology, biochemistry, physiology, pharmacology, embryology, pathology, etc.)

The major part of the budget comes from the federal government through the Secretariat of Health and Welfare, but additional funds are secured from various U.S. foundations, private donations and from private patients. Clinical research is now stressed, the basic laboratories having difficulty securing funds for equipment and its maintenance.

7.2.4.3 Institute of Nutrition

In 1946, this newest of the autonomous medical research institutes was established through presidential decree. As in the case of the two previous Intitutes, the major part of the $1,120,000 budget (about 60%) is derived from the federal government, through the Secretariat of Health and Welfare, the Secretary serving as Chairman of its Board of Directors. About $160,000 (or 17%) comes from foreign foundations or grants, $80,000 from Mexican foundations, and a similar amount from patients (Hospital for Nutritional Diseases) and from charges for local services. This Institute has recently secured sizeable grants from the Wenner Gren Foundation of Sweden ($400,000) and the Jenkins Foundation which will permit the construction and equipping of a new research building.

The functions of the Institute are (1) medical care of nutritional diseases, (2) teaching of medicine and basic sciences to professionals, technicians, students and nurses as an affiliate of the National University, (3) scientific research in specialized clinical subjects and in basic sciences, and (4) study of the nutrition of the Mexican population and factors affecting it, including medical, public health, social and economic aspects.

The research of the Institute of Nutrition was clinical in nature during its early period, studies being carried on of the adaptations of population groups who have lived under poor nutritional conditions for generations in 32 areas of Mexico. In recent years, more basic research is under way. To develop good research teams, several people have gone to U.S. laboratories for training, monetary support for this coming primarily from U.S. private foundations. The Laboratory of Biochemistry alone has five U.S. trained Ph.D's. During the past three years 15 persons have received training in the U.S., always with the stipulation that they return to their own institution. The Rockefeller Foundation supplied 70 percent of the support for the trainees. The Kellogg Foundation provided support for four Ph.D. biochemists on the full-time research staff. The Department of Biochemistry has over 25 full-time professionals on its staff who are involved in research and training. Since its inception, the Institute has been publishing its own journal, the "Revista de Investigación Clínica". The Institute has served many of the governmental Secretariats and Departments in special problems or teaching programs relative to human and animal nutrition. The Institute has a Research Committee composed of 5 of its staff, which reviews research proposals

before receiving final approval by the Board of Directors.

The Institute's Hospital of Nutritional Diseases has 90 beds with an outpatient load of about 2,000 patients per month. The complete studies of all patients often serve as the basis for research programs.

The teaching activities of the Institute are numerous. As an affiliate of the National University, it gives the major portion of the training in biochemistry in the University's advanced course (two years) for physicians, chemists, and biologists who are to become instructors and investigators in this field. In this endeavor it collaborated with other departments of the School of Medicine, with the Institute of Chemistry and Institute of Biology of UNAM, and with the Children's Hospital and Institute of Cardiology. The Institute of Nutrition also runs a special two-year teaching program for nutritionists in collaboration with the School of Public Health (Secretariat of Public Health and Welfare) and with the cooperation of the Children's Hospital. It has been giving shorter training programs for technicians in nutrition and for various specialized personnel in different fields. Some of its programs are in cooperation with international organizations such as UNESCO.

7.2.5 Institute of Social Security (IMSS)

During the past 35 years Mexico has been undergoing very marked changes. Along with modern communications, there has been a large movement of population to areas surrounding the big urban centers in search of jobs relative to rapid industrialization. This has accentuated some of the public health problems. The citizens were aware of the inadequate medical care available and the government realized the importance of good health to the developing economy. In 1944, the

Mexican Social Security Law became effective. Through the years various groups of workers were incorporated into the plan. The IMSS at present cares for approximately six million people - 2 million employees and 4 million dependents - and it is constantly undergoing expansion. At the present time, it does not cover Federal Employees, the Armed Forces, workers on the railroads or in the petroleum industry or self employed professionals and businessmen. The Federal Employees (about 2 million, with dependents) are covered by a separate system (Instituto de Seguridad y Servicios Sociales de los Trabajadores de Estado - ISSTE) as are the Armed Forces (2 million people). The railroad and petroleum workers also have separate programs but these are gradually becoming incorporated in the larger Social Security system. In summary, the IMSS, ISSTE and Armed Forces programs care for only somewhat over 10 million of Mexico's 40 million inhabitants.

When the Social Security system was established research was not one of its aims. In staffing some of its hospitals, however, persons with strong research interests have been employed and they are incorporating scientific investigation into their program. One such installation is the Pediatric Hospital in Mexico City. This Hospital, originally built by the Secretariat of Health, was sold to the Social Security Institute for $4.8 million less than two years ago. This Hospital attracts a group of well-trained, research-oriented men.

In mid-1964 a research committee was established, consisting of the Director and four other persons, which is concerned with the approval and supervision of research and with the problems that may arise in connection with the welfare of patients under study. The research now

under way is essentially clinical in nature but it is expected that more basic research will be initiated in the future. No special funds are alloted for research purposes, the costs having to be covered from the regular budget. It is expected, however, that this problem will soon be solved.

Although there are no formal relationships with the National University at the moment, the Pediatric Hospital is in the midst of making necessary arrangements so that it can serve as a teaching and training installation for the Medical School. It has 470 beds with 92-94 percent occupancy of children up to 16 years of age. It sees 400 out-patients daily. There are 25 new, plus 15 emergency, admissions daily. On the staff there are 78 full-time physicians, the others working on a part-time basis. The Hospital is hoping to inaugurate the "geographic full-time" policy which will keep the staff at the hospital throughout the day and thereby improve the opportunities for service and research.

7.3 Comments on Organization and Implementation of Biomedical Research in Mexico

Mexico has difficult problems relating to the preparation of sufficient numbers of personnel trained in medicine, public health, and allied fields to care for its rapidly increasing population. These have already been discussed. The desire to attract doctors to areas away from the major urban centers and to upgrade the medical schools and schools of basic sciences in all parts of the country has also been mentioned. Without exception, directing personnel of all pertinent government secretariats as well as staff seem to realize the value of

research in achieving the desired aims. However, there has never been a meeting of minds at top echelons to coordinate efforts in various sectors. The basis for this lack of coordination is difficult to pinpoint exactly. It may be due to the desire of government secretariats, institutions, departments, or individuals to retain their autonomy, and to avoid any possibility of greater control by Ministries. In this connection the Secretariat of Health and Welfare feels that the three autonomous institutes - the Institute of Cardiology, the Institute of Nutrition, and the Children's Hospital - have too much autonomy and that it would be best if the Secretariat of Health had more influence in terms of budget and program. This Secretariat also feels the University is overly concerned with research and research training. The Secretariat would prefer to have control of all such activities in the health-related fields, no matter where the investigators were employed. The Secretariat of Public Education too feels responsible for elementary, secondary, technical, university, and postgraduate education and feels it is not altogether just to have the National University completely autonomous with no budgetary or administrative control by the Secretariat. These attitudes, which are not unique to these Ministries or to Mexico, make research institutions understandably wary of "coordination." Thus, the National University maintains its own prerogatives and appears to have little direct involvement with the Secretariat of Health. For example, it questions the wisdom of establishing a degree-giving "Faculty" of Sanitary and Welfare Sciences by the Secretariat of Health, particularly when the proposed Faculty will conduct no research.

It is interesting to find that the School of Public Health is under the Secretariat of Health and Welfare and not within the University. The three autonomous institutes maintain their own independence, but they collaborate with both the Secretariat of Health and Welfare and with the National University in that they run courses for, and programs with, the Secretariat of Health while also serving as postgraduate teaching centers for the University. The Secretary of Health and Welfare is chairman of the Board of Directors of each of the Institutes and in that way has some direct liaison with them.

The general political structure and traditions of Mexico have important effects on research. For example, the President of the country can make decrees without the need for congressional approval or review. During his six years as president, he is extremely powerful. The various Secretaries whom he appoints can seek special favors which he can grant at will. Thus, seven months after the establishment of the Center for Research and Advanced Studies of the National Polytechnic Institute by presidential decree in 1961, another decree was issued moving, and transferring the responsibility for the Center of Scientific and Technical Documentation from the National University to this Research Center.

Such an environment makes it necessary for those in charge of institutions to exploit every possibility of enhancing position and prestige. The essential elements of this system make it difficult for the various key persons to join forces. Competition rather than cooperation is fostered.

Nevertheless there is widespread agreement on some key issues. All groups concerned agree that there is a pressing need for increased

numbers of doctors and of public health services, especially in rural areas. The Medical Faculty of the University is contemplating how to cope with the very much increased student enrollment. They will either enlarge their facilities to accomodate them or possibly set up a new school. The Faculty requires each graduating medical student to spend at least six months in a rural environment before he can qualify for his degree. It is hoped this setting might attract some of the young doctors.

There is also general agreement on the need for expansion of graduate education. The University has been giving postgraduate training in both basic and clinical fields as well as some special courses. Its research institutes have full-time staff and offer great freedom to investigators. The University of Mexico has also helped to get some postgraduate work going in Universities outside of Mexico City. People with advanced training will help both to staff new schools of medicine and of related fields, and to upgrade the teaching in existing facilities.

However, some differences exist on basic issues. The Secretariat of Health feels the Universities are too concerned with scientific research and training. It wants to see a large number of people in the field quickly. To this end, the "School of Public Health" was transformed into the "Faculty of Sanitary and Welfare Sciences". The "Faculty" is offering a Master of Public Health degree and will soon be inaugurating a doctoral program. Original research is not required, laboratory training has been reduced to a minimum, and courses in statistics are only of a rudimentary nature. Part of the training involves field programs in which the individuals must work in rural areas throughout the country. The University believes that high standards should be maintained for the doctoral

degree, and that the welfare of the country will be best served by turning out a smaller member of very highly trained leaders. This is a common issue in countries faced by problems comparable with those of Mexico.

So far as the content of research is concerned, Mexico has established diverse means of attacking important domestic health problems. Thus, the Institute of Public Health and Tropical Diseases is involved in epidemiological studies of the diseases of importance in Mexico. Its laboratories, the Laboratories of Public Health, and the Registry of Pathology are involved in service and training activities related to the needs of the country. Other centers also work on applied public health problems.

Mexico has taken extensive measures to expand opportunities for higher education in the sciences. There appears to be no general lack of funds for local fellowships or for equipment. Mexico has institutions capable of giving training in almost all fields in the undergraduate and graduate levels. In general, foreign training is sought only after the person has taken full advantage of the opportunities in the country. His foreign experience is used for very specialized studies with internationally-accepted experts. In contrast with domestic training, almost all foreign training is accomplished under the auspices of foreign private foundations (almost entirely U.S.) and through NIH/USPHS postdoctoral fellowships. The only exception to this situation is in the case of the fellowships given for foreign study by the Instituto Nacional de Investigaciones Científicas (INIC). While the effort to train people internally is logical, there are specialized areas in which training abroad is productive. These opportunities can not now be exploited adequately, even

though some funds from foreign sources are available. It would seem that a somewhat heavier investment in foreign training by Mexican sources would be in the national interest.

Mexico has been enjoying political stability for over 40 years. The President has a secure six-year term. Each President naturally appoints his Secretaries who, therefore, change every six years. There is longer continuity of career people in the government service. This general political stability is reflected in the stability of many institutions - including universities and research institutes. The National University has an ever-increasing number of full-time staff with dedication and pride in their work. This certainly holds true for the autonomous institutes as well. Each of these institutions has appointed its own advisory committees to care for a variety of its activities including research. They have found that without such organization and delegation of power, their work is markedly slowed down. Many of the universities outside of Mexico City, like the Universidad Veracruzana, Universidad de Nuevo León and the Universidad Autónoma de Guadalajara are improving their faculties, curricula and facilities, increasing the number of full-time positions, and establishing centers for scientific research.

Private institutions have developed, like the Instituto Tecnológico y de Estudios Superiores de Monterrey (founded 1943) and the Universidad Autónoma de Guadalajara (founded 1935) which have been making a concerted effort to raise and maintain their standards. The Technological Institute has over 170 full-time professors, a large proportion of whom are either studying or have studied abroad, primarily under the exchange programs this Institute maintains with various institutions. It is

considered the MIT of Mexico. The Autonomous University of Guadalajara is not only enlarging its physical plant, but is actively engaged in trying to develop its various disciplines with the cooperation of specialists from several universities in the United States as well with the help of private foundations, U.S. government agencies, and international organizations. It is also trying to stimulate philanthropy among the Mexicans in support of the University. The Rector of this University, who is promoting its development, is also the Head of the Department of Scientific Research. It can be expected that research will be fostered in this institution.

In recent years a number of very fine training centers in the biomedical fields have been set up which have been serving not only Mexicans, but scientists from all of Latin America as well as from North America. The Institutes of Cardiology and of Nutrition and the Children's Hospital are some of these; the Tropical Medicine Training Center in the Department of Microbiology and Parasitology of the Medical Faculty of the National University is another; the new Center for Research and Advanced Studies of the National Polytechnic Institute is completely devoted to advanced training and research. All such institutions are engaged in the organization of research and the allocation of funds for it.

A large number of scientists who have had advanced training in North American and European Institutions and who have become accustomed to research as an integral part of their professional activities, are becoming leaders in science. This group may well be the most important factor in the future development and organization of research. They are on the staffs of the centers and Institutes mentioned above. They give

guidance in organizing programs. They get together to have their voices heard in terms of policies. They are involved in training others who will probably absorb their points of view. These people will be the future leaders in the scientific field. It is they who in 1958 founded the Academia de la Investigación Científica (Academy of Scientific Research). Almost inevitably they will have a voice in broader decisions concerning budget, salaries, etc.

While many factors favor the development of research in Mexico, some factors tend to retard this development. Attitudes towards the education and training of scientists are one of these adverse factors. The professional degree of prestige is still that earned in the medical school. Whether or not an individual is interested in the practice of medicine, he often attends this faculty to secure the only degree that will premit him to earn a living while carrying on work in the biomedical field. It is almost unheard of to find persons who are not M.D.s on the staff of the faculties of medicine. Wherever biomedical research is carried on, the investigators are almost invariably physicians. They may have earned a Ph.D. degree in a North American university but this would be a second degree incidental to advanced training. Persons with only the Ph.D. degree in the biological or biochemical disciplines find employment in other faculties, usually with lower salaries. The tradition which limits the role of the Ph.D. increases the demand for M.D.s, sometimes for tasks that the M.D. is not best prepared to perform. The country sorely needs more physicians for tasks which they alone can perform - the practice of medicine and the teaching of clinical medicine.

In page 167, the Instituto Nacional de la Investigación Científica

(INIC) was mentioned. This institution, created in 1950, can be considered the only one established by the federal government which has been involved with the development of scientific manpower. It replaced an earlier organization known as the Commission for the Promotion and Coordination of Scientific Research, first established in 1942. The principal purpose of this new organization (INIC) was to make possible the undertaking of research among its activities. The Instituto has been referred to at times as the National Research Council of Mexico and has participated as such in major international scientific efforts. In 1961, the Instituto was again reorganized so as to be able to consider realistically the needs of the country and to use its funds for research training that would bring about fruitful developments. The aims of the Institute have been listed as follows:

(1) To stimulate competitively a more widespread and active interest in the sciences in such a manner that help given to a few will affect positively a considerably larger number of people.

(2) To assist a limited number of carefully selected students and researchers to carry out studies in the pure and applied sciences.

(3) To promote and support the scientific training of persons in fields in short supply but of importance to the development of the country.

(4) Encourage the development of scientific and technological schools and centers in the provinces.

(5) To stimulate and coordinate the interest, efforts, and support of persons and institutions, both Mexican and foreign, that are involved with the training of scientists and technicians or with the improvement of the scientific milieu of the country.

The above aims seem well conceived and, if the Institute could be given full support to carry them out, would have a salutary effect on the scientific endeavors of Mexico. Unfortunately, the budget given the

Institute at the time of the most recent reorganization until the present year was $120,000, the same amount that had been granted during the previous ten years of activity. This past year the budget was increased to $280,000, a sum still inadequate to do more than move superficially in the directions stipulated by the aims of the organization. The Institute has spent approximately 70 percent of the funds on 91 fellowships at the master and the doctoral levels both in Mexico and abroad. Nine departments or institutes were given grants for some aspect of their scientific endeavors, and nine scientific publications received monetary grants. The INIC also made a commitment to prepare an exhaustive inventory of the scientific institutions and scientists in Mexico, as well as of the persons or institutions, national or foreign, supporting the development of scientific research in that country through grants, fellowships, or other types of economic aid. It is expected that this compilation will be initiated in 1965.

INIC and the support it has given to the development of science are not well known. It would be well if the purposes and activities of the Institute were to be extended, if the membership were to be representative of the entire country, and if the budget could be increased. Possibly after the inventory of scientific personnel and of granting entities active in Mexico is completed, the INIC may assume a more active role in expanding and coordinating the research activities of the country. At present, almost all scientific research in the biomedical field is carried on in Mexico City. As the number of trained scientists in Mexico increases and they are better distributed in other parts of the country, the INIC will probably assume the responsibilities of a true National Research Council.

7.4 Institutions Visited and Persons Interviewed

Secretariat of Health and Social Welfare

Dr. José Alvarez Amézquita, Secretary of Health and Social Welfare

Dr. Miguel E. Bustamante, Subsecretry of Health

Institute of Public Health and Tropical Diseases, Secretariat of Health and Social Welfare

Dr. Gerardo Varela, Director

Dr. Manuel Martínez Báez

Faculty of Sanitary and Social Welfare Sciences, Secretariat of Health and Social Welfare

Dr. Pedro Daniel Martínez, Director of Faculty

National Registry of Anatomic Pathology, Secretariat of Health and Social Welfare

Dr. Gabriel Alvarez Fuertes, President (also Director General of Scientific Research in the Secretariat)

Pediatric Hospital, Institute of Social Security

Dr. Oscar Criollos, Subdirector

National Institute of Nutrition

Dr. Salvador Zubirán, Director

National Institute of Cardiology

Dr. Edmundo Calva, Chief Department of Biochemistry

Dr. María Victoria de la Cruz, Chief, Department of Embryology

Dr. Salvador Franco Browder, Investigator, Department of Biochemistry

Dr. Jorge Soni, Chief, Department of Hemodynamics

Children's Hospital

Dr. Rigoberto Aguilar Pico, Director

Dr. Manuel Ramos Alvarez, Virologist

Dr. Fernando Espinosa, Sub-director

Secretariat of Education

Dr. Victor Bravo Ahuja, Subsecretary for Technical and Advanced Education

Center for Research and Advanced Studies, Secretariat of Education

Dr. Arturo Rosenblueth, Director (also Head of the Board of the National Institute of Scientific Research)

National Autonomous University of Mexico

Dr. Ignacio Chávez, Rector

Dr. Donato G. Alarcón, Director of the School of Medicine

Dr. Ignacio González Guzmán, Director of the Institute of Medical and Biological Studies

Dr. Roberto Llamas, Director of the Institute of Biology

Dr. Alberto Sandoval, Director of the Institute of Chemistry

PERU

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8. PERU*

Perú is a country of contrasts, geographically, climatically, economically, socially, between the modern and the medieval, between overcrowding and isolation. The coastal strip, 1410 miles long and varying between 10 and 100 miles wide, is a desert watered by 52 small rivers, and contains almost one quarter of the population. The sierra with 10 peaks over 20,000 feet in height occupies 40 per cent of the land area and has 70 per cent of the population. To the east the montaña is tropical rainforest and has about one-half million inhabitants. The total population in 1950 was approximately 8.2 millions, in 1960 10.5 millions and is expected to rise to 14.5 millions by 1970. Approximately one-half of the population, for the most part Indian living in the sierra is outside the money economy. In the coastal regions the rural-urban migration is intense, Lima itself having over 1.5 millions, many of whom are slum-dwellers. These estimates are only approximate for as Luis Alberto Sánchez has written "statistics in Perú are a form of poetry."

Gross National Product in 1957 was $1.8 billions, 17.6 per cent of which was derived from exports (cotton, sugar, fish-meal). In 1961 50.8 per cent of the population was attending a school, 30 per cent had completed primary schooling, 3 per cent were attending and 0.8 per cent had completed secondary or technical schools, and 0.5 per cent were attending universities. In 1957 the ratio of physicians to population was 3.7 per 10,000. The mean annual mortality rate was 139 per 1000 population.

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* Prepared by Dr. J.C.S. Paterson. Based on a site visit on 22-30 November 1964.

Governmental crises have been a way of life since the Second World War and military coups frequent. It is thought that the army accounts for 30-35 per cent of the national budget. The present government under President Belaunde Terry appears, however, to be much the most stable of recent years and is pressing forward with many reforms, especially agrarian reform and a plan to open up the tropical montaña by construction of a roadway, the "Carretera Marginal de la Selva" between the rivers Plate and Orinoco. It is recognized in the Ministry of Health that if this be undertaken there will be a considerable need for research into the mosquito-borne diseases, especially malaria and the virus diseases.

8.1 Structure for health activities and research

A great many things are in operation which receive support from a variety of sources but no central agency appears to have any measure of this. Support is derived from the United Nations Special Fund, UNICEF, FAO, PAHO, from the U.S. Government through the National Institutes of Health, National Science Foundation, NASA, the Department of Agriculture, the Air Force and Navy, AID, from the Rockefeller, Ford and Kellogg Foundations, the World Population Council, and from France, West Germany and Japan.

In the Peruvian Government there is an "Oficina de Planificación" which is supposed to be concerned with buildings and research but apparently the latter is in name only and this Office does not actively support research. Neither does the Ministry of Education. The Ministry of Health and the Army support a little research and the Ministry of Agriculture a good deal, especially in the Agrarian University. The Peruvian Atomic Energy Commission receives support from the International

Atomic Energy Agency and apparently is an active organization that would like to see more development of research in Perú. This attitude is quite common in many circles and there is much evidence that genuine attempts are being made to raise local funds to support, if not in all cases to match, funds derived from overseas. In some instances these local funds are derived from governmental agencies, from industries, and through the use of University budgets, which, in the case of the National Universities, are tax-supported.

The "Fondo Nacional de Salud y Bienestar Social" (National Health and Welfare Fund) was established in 1952 and derives its funds from a 3 per cent tax on all earned wages, and hence is independent of ordinary governmental appropriations. This "Fondo" has responsibilities in health, social development, research and training, and in the provision of facilities for these activities. Its total budget is of the order of $20 millions. The "Fondo" has a ten-member directorate composed of representatives of industry, commerce, the universities, unions, etc., and a professional director. Throughout its 12-year history there has been strong political control of the "Fondo" and a tendency to use the funds for political objectives. Funds for research and training have been given to the universities annually but their use has not been specified. It has also given funds annually to the Instituto de Beneficencia, a charitable organization dealing with welfare, in support of its efforts to aid the indigent. The previous Director, who in 1962 tried to earmark $1 million specifically to support research, had requested the assistance of NIH in setting up an adequate organization. This would have required a change in the law governing the "Fondo". In the wake of changes in government, this may yet reach fruition. At present, it is strongly held that research

needs to be done in the epidemiology and pathology of endemic diseases, in nutrition, in adaptation to high altitude, in sociology and demography. There is also a strong feeling that there are differences in the national and university responsibilities. For example, it is the responsibility of the universities to train personnel and to generate new knowledge, and that it is the national responsibility to establish local health units and facilities and to spread knowledge. It is in consequence somewhat difficult to be specific about the role of the "Fondo" at the moment in the structure of biomedical research, but it seems highly probable that in the future its role in support of research will grow.

In 1964 the "Asociación Peruana de Facultades de Medicina," with representatives from each of the 5 Faculties of Medicine, was formed and on September 18 its Council of Directors was officially installed. Prior to that it had held its first seminar on the curriculum, the needs for establishing a cadre of professors and the minimal requirements for a Faculty of Medicine in Perú. Although not directly concerned with the research structure, the formation of this Association represents a considerable advance in national inter-communication, and it did recognize a need to discover and foster potential investigators among the students.

It is clear that whereas a good deal is going on in Perú there does not exist at a National level any body charged with establishing or coordinating research policy; indeed, there is no body with full information about what is already going on. For these reasons by Resolution dated 24 February 1964 a Committee was formed to consider the establishment of a National Research Council; this Committee was enlarged on 16 July 1964. The force behind this Committee is principally the Ministry of Health assisted by the Peruvian Atomic Energy Commission. It is believed that

this Committee might find it necessary to obtain outside help in the preparation of all of the background material that would be needed in order to reach decisions on the scope, composition and responsibilities of a National Research Council. This is an important step forward.

8.2 Present biomedical research programs

8.2.1 At the present time biomedical research is very limited at the Ministry level. Much of the work of the Ministry is devoted to maintaining levels of immunization as high as possible and, in turn, the National Institute of Health is almost wholly devoted to the preparation of vaccines and to the standardization of local biological and medicinal products.

In recent years the Ministry has cooperated actively with PAHO and Tulane University in trials of Flury E and poliomyelitis vaccines in the Puno area, and with Harvard and Cornell Universities in evaluation of Incaparina and Peruvita as dietary supplements.

Presently, the Ministry has been offered a grant by the Ford Foundation to study population dynamics. Its other main interests are in plague and Chagas' disease and in planning for the "Carretera Marginal de la Selva."

8.2.2 There are 5 University Medical Schools in Perú: "San Fernando" (University of San Marcos) and "Cayetano Heredia" (Peruvian University of Biological and Medical Sciences) in Lima, "San Agustín" in Arequipa, "La Libertad" at Trujillo, and "San Luis Gonzaga" at Ica. With the exception of "Cayetano Heredia" all of these are national universities, and as such, depend upon tax funds.

Biomedical research in the universities in Lima has, to a considerable extent, taken advantage of Perú's special situation in which there is a population living at altitudes over 13,000 feet.

A good deal of support in terms of research grants has been given to both the San Marcos University and the Cayetano Heredia by the National Institutes of Health and the Department of Defense. Research has not been very strong at the other universities in Perú.

Clearly, the disruption of the medical faculty at San Marcos University 3 years ago had a major effect upon research. In 1950 the principle of student participation in the University Government was terminated by the dictator General Manuel Odría. The students again requested a 1/3 voice in university government in 1961 and this was approved by General Pérez Godoy despite the objections of the Medical School faculty. The consequence was the resignation of about 450 members of the faculty and the establishment of the "Cayetano Heredia" School.

The Deanship at San Marcos is now a full-time appointment for 3 years. A new dean will be elected this year. The members of the faculty are subject to reappointment every 5 years and the opinion was expressed that this was probably good for research since it kept the faculty on their toes! Certainly, there have been no student strikes during the past 3 years. However, research has suffered both in quantity and quality.

8.2.3 One non-governmental institution where excellent research is going on is in the Nutritional (metabolic) Service of the British-American Hospital. In addition to the clinical-laboratory studies (metabolic diseases) in progress in the specially designed wards of this service, a very fine field study of long duration is in progress

on plantations northeast of Trujillo in which fish-meal flour is being employed in controlled studies of human food supplements. This work is partially supported by NIH research grants.

8.2.4 The Faculty of Veterinary Medicine of San Marcos University is quite isolated from the rest of the faculties, thereby giving it relative independence. In many respects, this is the most active research sector of the University. Although it dates back to 1940, it was incorporated as a College in the University in 1946 and occupied its new buildings in 1959. Its budget has increased during the past 10 years from about $47,000 per annum to more than $225,000, derived from the San Marcos tax funds. Losses of live-stock from infection (Aftosa is the most important cause of loss) amount to about $20 millions per annum in Perú, and the school is actively studying this problem, teaching veterinarians, and conducting extension courses. Recently an International Post-Graduate Training Program was inaugurated.

Research is supported by a number of governmental and other agencies: SIPA (Servicio de Investigación y Promoción Agraria), Agropecuarian Bank, Fishery Board of the Ministry of Agriculture, Peruvian Poultry Association, and others. Rockefeller funds from the U.S. and an NIH grant to study pulmonary adenomatosis in sheep have been put to good use.

Just recently in association with the Food and Agricultural Organization and the United Nations Special Fund, a laboratory has been constructed with Rockefeller funds on the altiplano at Huancayo thus forming a Veterinary Institute for Tropical and High Altitude Research. Total funds made available by FAO and the U.N. Special Fund amount to $937,400. The tropical station will be established at Pucallpa. These

stations are both close to SIPA farms and the investigational and field work will comprise these main topics: physiology; microbiology and virology; biochemistry and nutrition; and animal reproduction.

8.3 Factors favoring biomedical research in Perú

Enthusiasm and a realization of the role that research can play in a country's development are the main factors favoring research at present. This latter has been demonstrated many times by international and foreign organizations and by inter-university cooperation.

In addition there are now more well-trained scientists in advisory positions than before; there is also a realization that the growth of population may well outstrip all developmental efforts. Improved professional communication both within Perú and between Latin American countries is likely to provide an important stimulus. The mere fact that the establishing of a National Research Council is under consideration is a hopeful sign.

8.4 Factors inhibiting scientific research in Perú

Political instability and governmental irresponsibility have certainly been major factors in recent years, but all of this goes much further back and is deeply rooted in the country's history. The enormous and illiterate Indian population living in a state of peonage under the hacienda system, coupled with the very low rate of immigration, unwillingness to assimilate migrants and even natives, and the inability of the military to develop a social philosophy, are the sort of deep-rooted factors which contribute to present unrest. These resulted in conflict

between the Aprista movement and the conservatives, the paradox of the university reform movement and inability to develop a scientific tradition. Poor educational facilities subsume much, if not all.

The low ratio of physicians to population is something that is unlikely to change and may even become worse. Consequently, what is needed is something other than merely to emulate research institutions in more developed countries. Lack of understanding of the role of science and of a national policy are important but can be corrected.

8.5 Institutions Visited and Persons Interviewed

Pan American Health Organization, Zone IV

Dr. Bogoslav Juricic, Chief, Zone IV
Dr. Alvaro J. Simões, Country Representative in Peru

Ministry of Public Health and Social Welfare

Dr. Javier Arias Stella, Minister of Public Health and Social Welfare
Dr. Carlos Quirós Salinas, Director-General of Health

National Fund for Health and Social Welfare

Dr. Octavio Mongrut Muñoz, General Manager

National Institute of Public Health

Dr. Oscar Miró-Quesada Cantuarias, Director
Dr. Herman Battistini, Head, Division of Diagnosis and Research
Dr. Aristides Herrer

National Institute of Nutrition

Dr. Carlos Collazos Chiriboga, Director

National Institute of Neoplastic Diseases

Dr. Eduardo Caceres G., Director
Dr. Tewfick Majluf, Radiologist

National Institute of Occupational Health

Dr. Ramón Vallenas, Director

School of Public Health

Dr. Mario León Ugarte, Director

Facultad de Medicina, Universidad Nacional Mayor de San Marcos

Dr. Alberto Guzmán-Barrón, Decano

Facultad de Medicina, Universidad Peruana de Ciencias Médicas y Biológicas

Dr. Alberto Hurtado, Decano

Facultad de Medicina Veterinaria, Universidad Nacional Mayor de San Marcos

Dr. H. Ruíz Urbina, Decano
Dr. Manuel Moro Sommo

Veterinary Institute for Tropical and High Altitude Research (VITHAR); Food and Agriculture Organization of the United Nations; U. N. Special Fund; Faculty of Veterinary Medicine, University of San Marcos

Dr. P.D.L. Guilbride, Project Manager

Institute of Tropical Medicine, University of San Marcos

Dr. Alberto Cornejo Donayre

British-American Hospital

Dr. George G. Graham, Pediatrician

VENEZUELA

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9. VENEZUELA*

Venezuela is a country of approximately 8.5 million inhabitants, of which 4 to 5 million live in larger population centers and the rest in very small communities and in the country. It is estimated that there are about 37,000 towns in Venezuela with less than 200 population. It was estimated by several people that with industrialization, efficient exploitation of the country's mineral wealth, and modernized agriculture, the country could easily sustain between 80 and 100 million people. There are approximately a half million very primitive habitations in Venezuela, called "ranchos" which consist usually of four posts, a straw or leaf roof, and partial walls made out of the same material.

Venezuela's great wealth is petroleum, discovered in 1914. Currently it is the world's second largest producer of oil. Large deposits of high-grade iron ore have also been recently discovered and are being exploited. Thus, Venezuela has moved in 60 years from a pastoral to a modern economy. The Venezuela unit of currency, the Bolivar, is one of the world's hardest, being supported by Venezuela's extensive foreign exchange reserves and gold holdings. The per capita income of Venezuela, over $1000 per year, is by far the highest in Latin America. The cost of living is also high because Venezuela imports most consumer goods, but real incomes are nevertheless relatively high and rising. An attempt is now

* Prepared by Dr. Dieter Koch-Weser. Based on a site visit to Venezuela 29 November - 11 December 1964.

being made to establish local industries and reduce the cost of living for the Venezuelan worker.

The total national income is approximately 30,000 million Bolivares (circa U.S. dollars 6.0 billions). The total national budget is approximately 7,000 million Bolivares (U.S. dollars 1.4 billions). The total national research budget is approximately 40 million Bolivares (U.S. dollars 8 million). That means that only approximately 0.5 per cent of the national budget and 0.1 per cent of the national income is spent for research, an extremely low figure even if compared with the other Latin American countries. Of the total national budget of 7,000 million Bolivares, approximately 700 million go for education, 600 million for health, and 500 million for defense.

Considering the wealth of the country, it is noteworthy that illiteracy is approximately at 45 per cent in a country with an average per capita income of more than $1000. However, the last two elected governments are working very hard to improve this situation. A sign of success of this effort is the fact that Venezuela is the only Latin American country which has met the goals set by UNESCO about ten years ago.

The population is a homogenous blend of Indian and white (mestizo) which comprises the bulk of the population. In recent years and particularly since World War II, European immigration has been important, with the largest number of new Venezuelans coming from Italy, Spain and Portugal.

The death rate in Venezuela is the lowest recorded of any other country in the Americas, 7.7 per 1000 per year as against an average of approximately 10. Its birth rate, 45 per thousand per year, is one of the highest, and Venezuela has the highest percentage growth rate of population of any South American country, 3.74 per cent a year. The average is 2.3 per cent.

As in most Latin American countries there is a relatively small very wealthy cultured and educated upper class and a very large part of the population living in extremely poor socio-economic conditions. Due to the rapidly developing industry, particularly oil, there now is, in addition, a growing industrial middle class. Most of these industrial workers are covered by an extensive and compulsory health care plan which, however, does not extend into the "hinterland". Reaching far into the interior of the country is the government rural health service, which has worked very efficiently in several fields, practically wiping out malaria and reducing greatly the incidence of tuberculosis and leprosy.

Since the source of wealth, relatively great for Latin American standards, is oil and since its exploration and exploitation occurred in a somewhat unpredictable fashion, there has not yet been time to utilize this wealth in organized and rational fashion for the whole country. Venezuela has had a chaotic history, a chaotic economic development and with that a chaotic development of science. It has been rapid but unorganized and uneven.

9.1. Structure for health activities and research

The Venezuelan government and its various agencies have paid more attention to public health activities than to research, and perhaps rightly so. There are 58 primary sanitary units in the principal cities and 27 secondary medical centers usually consisting of a small hospital and a preventive medical clinic in which vaccinations, etc., are given. All units are staffed by at least one physician. In addition to this and making excellent use of paramedical personnel, there are 450 rural health dispensaries in which the physician only visits from time to time but in which well-trained technicians, public health nurses, and sometimes even trained lay persons are doing excellent work in case finding, emergency treatment, continuous treatment supervision, etc. At present the government has well elaborated plans to decentralize even further as far as health activities are concerned but to maintain strong central planning. For that purpose they also have regional health officers in the 20 states and 3 federal territories who have local authority for the independent execution of the centrally planned measures. This organization and the totally or partially successful campaigns for the eradication of infectious diseases have greater priority than the development of scientific research.

Until a few years ago research in Venezuela was clearly the result of the personal aspirations, know-how, and perseverance of outstanding individuals, who quite often were also wealthy. The government first openly and officially supported research with the

founding in 1954 by H. Fernández Morán of the Instituto Venezolano de Investigaciones Cientificas (IVIC) as a neurological and brain research institute. This situation still prevails today since, of the approximately 30 million Bolivares which the government spends for all types of research activities in the whole country, more than 25 per cent goes to this Institute. Most of the other research funds are given to the universities which have agreed to spend 10 per cent of their total government allotment on research. However, probably not more than 2 to 4 per cent of this allotment is spent for expense clearly identifiable as research since the immediate pressure for salaries and other necessary non-research expenditures is overwhelming great.

There is an urgent and recognized need in Venezuela for an official organization to consider questions of national science policy. While some qualified observers believe that this function might be performed best by a ministry of science, more lean to the opinion that any such organization should not be a ministry and that it should guide rather than control science. There is wide agreement that the ideal solution would be the establishment of a "national research council," and indeed plans for the same are reasonably far advanced.

A group of university scientists, industrialists, and members of the chamber of commerce got together to discuss the relationship between science and the development of Venezuela. They decided that a survey was necessary which then would possibly lead to the foundation of a national research council. The Ministry

of Health supplied the salary for a full time person to lead the survey. As a result, the committee agreed on a proposal for a national research council which will be presented to the President of Venezuela during the month of January 1965.* There is good reason to believe that during the year 1965 such a council will be established.

The proposed council would be responsible directly to the President of the Republic and would not only finance research but also raise the status of research, influence teaching and research patterns in universities, develop closer relationships between domestic and foreign investigators by fostering two-way exchanges, and would in general stimulate the interest of the Venezuelan government in research. There is wide-spread opinion that a national research council could deal effectively with the complicated problems of research priorities and of manpower priorities. The council could also help to establish research in Venezuela institutionally as contrasted with the existing pattern which places much heavy emphasis on individuals. Many excellent institutes and laboratories cease to function satisfactorily after their founder has disappeared from the scene.

In contrast with every other country in Latin America, Venezuela has enough wealth to support a healthy and ample research effort. Additional funds could be used effectively, but the relative

* Bases Para La Creacion de Un Consejo Nacional de Investigaciones Cientificas y Tecnologicas en Venezuela. Informe que Presenta la Comision Preparatoria Designado al Efecto. Caracas, Venezuela, Junio, 1964.

scarcity of well trained investigators who are willing to devote full time to research is a more significant factor.

9.2. Present biomedical research programs

Under the present circumstances biomedical research is done essentially under three organization set ups:

9.2.1. The Ministry of Health

The Ministry of Health supports biomedical research activities either in its own institutes or in the university departments which are supported by this Ministry. Among the Ministry of Health Institutes, the Institute of Nutrition, the Institute of Malariology, the Institute of Leprology, and the Institute of Tuberculosis are doing excellent work in public health and, as a by-product, in public health research, by using the very effective coverage of the country provided by the rural health units. The effectiveness of these Institutes is hampered by insufficient budgets, including such limited funds for salaries that many of the staff must spend several hours a day in private practice. Also under the Ministry of Health is the National Institute of Hygiene. The budget of this institute is approximately 2 million Bolivares yearly. The Institute has a number of official functions: it is the main center for vaccine production for Venezuela; it is responsible for the control of pharmaceutical and food products; it does routine virus diagnosis for a number of government hospitals and clinics; it trains post-graduate public health students and also undergraduate medical

students in preventive medicine. In addition, it conducts research. The staff of the Institute is small, each section consisting typically of one professional plus one or two technicians. Given the range of functions and the limited staff and budget, it is remarkable that research can be carried out. In spite of these obstacles, the virus section has, in cooperation with investigators from IVIC, done creditable research on the epidemiology of the Venezuelan equine encephalitis, a serious health problem for Venezuela.

The School of Public Health has a total budget of approximately 2 million Bolivares yearly and a staff of five full time and numerous part-time people. The salaries in the school are relatively good for senior full-time people, approximately 5000 Bolivares per month. The school has a somewhat hybrid activity, giving some public health training to government physicians but also, providing general post-graduate courses in internal medicine for the medical school. The only project which could be called research in the school is work on the utilization of synthetic food products.

The Ministry is responsible for administrating graduate fellowships. The total number given to individuals in the health and health-related professions is 290 per year. Of these, 220 are fellowships for training in Venezuelan institutions, and 70 for training abroad. The central problem in administration of the fellowships seems to be the scientific competence and the objectivity of the selection process. The proposed National Research Council might provide a more generally acceptable procedure for selection.

9.2.2. The Universities

Venezuela today has 5 national universities: Universidad Central in Caracas; Universidad de Zulia in Maracaibo; Universidad de los Andes in Merida; Universidad de Carabobo in Valencia; and the Universidad de Oriente located on several campuses in the eastern provinces. Two small private universities are located in Caracas. The five national universities all have faculties of medicine, but, biomedical research activities are almost entirely located in the Central University in Caracas. Within this university there are now two medical schools, the old traditional one and the new one in the Hospital Vargas. The medical schools, as part of the university, are supported by the Ministry of Education. Only very few individuals do research in the health sciences, and the Departments of Tropical Medicine in the old medical school and of Preventive Medicine in the new medical school also receive support from the Ministry of Health. The main problem of this university, as of most other Latin American universities, is the student problem. The number of 5000 students in 1958 has risen to 22,000 students in 1964, there is overcrowding of laboratories, excessive demands on the faculty for teaching, and poor quality of students. This is the result of the inability of the universities to refuse the demands of the politically very powerful student unions, who continuously press for an increase in students and for rules allowing the students to repeat the same year several times if they do not pass. At present the Central University has 300 first year medical students and 400 repeaters. The university graduates about 180

physicians each year.

With this amount of teaching most departments do not have funds or time for research.

Most biomedical research in the University is concentrated on tropical medicine and physiological sciences. The Department of Tropical Medicine in the Central University functions also as a department of preventive medicine and therefore is partially supported by the Ministry of Health. With a total budget of approximately 1.2 million Bolivares its Director maintains an excellent institute both for research in the many tropical diseases of Venezuela and for the training of physicians to practice in the interior of the country.

The second major site for research, the Institute of Experimental Medicine, is a grouping together of the departments of physiological sciences. It contains sub-departments of physiology, biochemistry, pharmacology, and pathological physiology. This is the oldest research institute in Venezuela, founded in 1939 by a Spanish immigrant, Dr. Pi Suñer. Its budget is 800,000 Bolivares yearly and it receives in addition approximately 200,000 Bolivares from the Committee for Development of Humanistic and Scientific Research. Its director is one of the planners of the National Research Council.

University research funds are distributed by the Committee for Development of Humanistic and Scientific Research, whose chairman is a professor of biochemistry. This committee received approximately

1.5 million Bolivares yearly from the University. Seventy per cent of this amount is used for fellowships, almost all of them for training in foreign countries. These are available for all academic levels from postgraduate students to full professors. At present there are about 80 faculty members abroad representing disciplines ranging from biology through humanistics. In the biomedical sciences, basic scientists receive fellowships more frequently than those in either clinical medicine or public health.

The distribution of research funds and fellowships poses difficult questions. Clinicians say that not only is it difficult for them to work on a full-time basis in the university but they also are discriminated against in the awarding of fellowships. One group tries to overcome this handicap by voluntarily contributing part of the income from private practice for the acquisition of laboratory equipment, consumable supplies, and even for the payment of salaries of the laboratory technicians. A different criticism against the expenditure of research money within the university is that not so much money should be expended for basic and clinical research but that a country like Venezuela needs more assistance for research in public health planning. Others feel that more emphasis should be given to collaborative research such as those sponsored by the Pan American Health Organization on mortality, anemias, etc. One department maintains excellent training courses in preference to elaborate research activities, which are planned to begin only after the teaching program is fully established.

On the whole, however, the primary impression in the medical school is not dissatisfaction with decisions relating to research, but rather that there is no organization, supervision, orientation, or even training for research activities. The faculty of the school is fully occupied with teaching. Only some individuals and small groups of investigators with unusual ambition and drive manage to do research.

9.2.3. Instituto Venezolano de Investigaciones Cientificas (IVIC)

The greatest concentration of biomedical research is in the Instituto Venezolano de Investigaciones Cientificas. It was founded in 1954, mostly for research in neurology and almost as a personal institute for Dr. H. Fernandez Moran, who is presently professor of Biophysics at the University of Chicago. The Institute was subsequently transformed into a general medical research institute, but the budget which formerly had been the equivalent of U.S. $6 million a year in 1957 was reduced to $3,700,000 in 1958. It has subsequently dropped to approximately $2,300,000 at the present time. IVIC is directly under the Ministry of Health, while the universities and the other research institutes are under the Ministry of Education. The Institute in general does not give the impression of being in financial difficulties. It is very well built and most laboratories are very well equipped. The main criticism leveled against this Institute as a whole is that it is somewhat isolated both geographically and ideologically from the scientific life in Venezuela. There is, however, no doubt that during the past years the Director has

considerably reduced this isolation, both by working very actively in the general organization of Venezuelan science and by taking a stronger stand in advocating more coordination and cooperation between universities and IVIC both in graduate and postgraduate training.

Essentially all investigators in IVIC have full time appointments which is almost necessary since the very beautiful installations of the Institute are located on a mountain top about 10 miles outside of Caracas. Most investigators live there, many of them in houses provided by the Institute, and the whole settlement is quite self-contained with stores, shops, clubs, etc. Salaries are, for Latin American standards, quite excellent, ranging from the equivalent of U.S. dollars per year 8000 for junior investigators to U.S. dollars 16,000 for senior investigators.

In 1959 when the present Director was appointed to IVIC the Institute's personnel included very few scientists and with the scarcity of Venezuelan investigators he had no choice but to staff it almost entirely with foreigners. Quite a number of these are still at the Institute but almost all of them have made Venezuela their home and do not plan to return to their countries of origin. It is also a policy to appoint as many Venezuelans to positions in the Institute as possible, and there are already more Venezuelans than foreigners in the leading positions.

In addition to the government budget of approximately 10 million Bolivares yearly, which the Director said was very much increased this year, the Institute has been receiving as a whole and

for individual investigators considerable support from European and American governments and foundations. The West German government has, for instance, given money to build a laboratory building for virology.

IVIC is often cited as one of the "places of excellence". It is attacked by many scientists for isolation, "unfair competitive ability to attract the best scientists of the country", "obtaining the lion's share of government research funds and therewith depriving others," and "lack of cooperation in training scientists for the still underdeveloped universities and other institutes throughout the country". On the other hand, there is no question that IVIC, by maintaining its high standards of excellence, has contributed to the stimulation of research in Venezuela and has provided some of the central leadership so badly needed there.

9.3. Factors favoring biomedical research in Venezuela

The great natural wealth of Venezuela is, in contrast to other Latin American countries, already at the stage of development which would allow sufficient support for biomedical research activities.

There is a growing awareness of the direct and indirect contribution science can make to the development of the country. This is evidenced by the active participation of industrialists, of business people and of organizations in planning for the National Research Council and in supporting already some of the research activities in the country.

Consequently, the social position of the scientist, which was very poor in Venezuela and continues to be very poor in most Latin American countries, particularly in contrast to the position of the practicing physician, is improving very rapidly.

There is a growing understanding among scientists for the absolute need to separate science from day-to-day politics and an awareness that scientific activities cannot be supported and organized on a purely individual basis and they must be planned and coordinated centrally.

With a good number of excellent scientists, including many with training in either Europe or the United States, there is good leadership material for developing scientific institutions in the future.

9.4 Factors which tend to inhibit biomedical research in Venezuela

As far as government support of research is concerned, there has not been in the past, great understanding for research and there has been no policy of sustained, consistent support for science. There has been a tradition opposing intellectual and scientific activities, and a degree of inertia and apathy. Today, however, with a growing awareness of the importance of education in national development, the responsible government officials seem to have sympathy for the need of improved schools, universities, and public health facilities. This may well foreshadow increased support for science.

The prevailing policies of government present some difficulties for research. Since the distribution of the limited budget for research is controlled politically, there is a tendency to give the money to individuals rather than to worthwhile projects. Furthermore, universities and government laboratories, the political instability and therewith the instability of jobs has often impeded long-range planning necessary for scientific work.

There is doubtlessly a deficiency of qualified individuals both to do research and to train others to do research. The practicing physician in Venezuela can easily become a relatively wealthy individual and for that reason even relatively good salaries in scientific positions hold no particular attraction for them. This is particularly evident with the young Venezuelans who after training abroad, return to their country and devote either very little or no time to the continuation of their investigations, because in private practice they are financially much better off and have a higher social status.

In spite of the existence of a few scientific positions that are well paid, some scientists are too often forced to work at three or four different jobs to make ends meet. The unavailability of truly full-time positions with truly full-time salaries, particularly in the clinical fields, drives even research-minded physicians more and more into the private practice of medicine. Only unusually dedicated individuals, who are often considered somewhat eccentric by their colleagues, sacrifice their own wealth if they are independently rich or lower their standard of living. This leads to

very poor utilization of people and research equipment.

Whole institutes are very often burdened with extensive service and teaching functions in addition to their research activities. Since service and teaching activities cannot in most instances be postponed, research suffers.

Although Venezuela is a relatively "rich country", in terms of gross national product per person, it does not follow that support of science is at an optimum level. It is true that many of the outstanding individuals have what they need, which is more than can be said of many Latin American countries. But many competent people have neither adequate salaries for full-time work nor adequate funds for technical help and supplies. Finally, the wisdom of the distribution of funds to the scientific community and within the scientific community has been questioned.

A major obstacle to the development of biomedical science in Venezuela has been the absence of a strong central voice for science. There has been no means of mobilizing the case for science and presenting it effectively to interested parties - the Venezuelan government, business interests, private foundations and foreign governments.

9.5. Recommendations

A National Research Council could impress upon the government and the public the importance of scientific research for the country as a whole. As one scientist has remarked, "If each scientist would not fight for

a little pie for himself, all could work together to get a larger one." A council could state the case for expenditure of a more reasonable share of the national budget for scientific purposes, and for concentration on training of scientists within Venezuela and abroad. It could stimulate further the interest of private individuals and organizations in the moral and financial support of scientific efforts. Such a council could also influence the policies of foreign donors. For example, the U. S. investment in Venezuela is very large as far as commerce and industry are concerned but the cultural and scientific links between Venezuela and the U. S. are very weak. Scientific collaboration could be more effectively stimulated by an effective council.