THIRD CULTURAL NETWORKS OF PHILIPPINE PHYSICAL, LIFE, AND SOCIAL SCIENTISTS

Thesis for the Degree of Ph. D.
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Florence E. McCarthy
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This is to certify that the

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THIRD CULTURAL NETWORKS OF PHILIPPINE PHYSICAL, LIFE, AND SOCIAL SCIENTISTS

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John W. Useem
Major professor

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ABSTRACT

THIRD CULTURAL NETWORKS OF PHILIPPINE
PHYSICAL, LIFE, AND SOCIAL SCIENTISTS

By

Florence E. McCarthy

The study has two primary levels of analysis. One is the analysis of a particular segment of Philippine society; i.e., academic institutions and their influence on science, including patterns of institutional linkage within the Philippines and to institutions abroad. The second level is a descriptive analysis of the types and patterns of personal scientific networks created and maintained by Philippine academic scientists, involving other Philippine scientists and scientists in other countries around the world.

The two interests are seen as being mutually related, as the institutional framework and environment sets the stage for, and has great influence on, scientific work in general in these institutions. The institutional environment also directly influences the specific responses of Philippine scientists to their work situation as manifested in the type of research being done, for example, or in the relative importance of external scientific communication and ties. While some attention is given to scientific networks within the Philippines, the primary concern is with the patterning of scientific ties outside the Philippines to the larger world-wide scientific community.

Drawing on the literature of social networks, quasi-groups, and non-groups, the concept of "personal network" is developed to distinguish the individualized scientific ties of Philippine scientists

to scientists abroad, from the more established institutionalized linkages of universities abroad. While interrelated, the establishment and maintenance of personal networks as compared with institutional linkages are quite different and serve different functions. Among Philippine scientists, it is found that different types of personal scientific networks exist. Such types are extensive, intensive, or nascent ties. In addition, it is found that the centrality or importance of scientific networks to scientific self-identities vary as well. As explained in the text, scientists with intensive ties, coming primarily from the physical sciences, are more likely to consider their personal networks more central to their scientific identities than are Philippine scientists with different kinds of networks, coming from either the life sciences or the social sciences.

Data are based on open-ended, pre-tested interviews of one hundred productive, academic, Philippine scientists from ten selected universities. Scientists were sampled from the physical, social and life sciences.

THIRD CULTURAL NETWORKS OF PHILIPPINE PHYSICAL, LIFE, AND SOCIAL SCIENTISTS

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Florence E. McCarthy

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The data considered in the following pages are the result of the cooperation and support of many different people and institutions. Different stages of the field work were supported by the Midwest Universities Consortium for International Activities (MUCIA) as administered through the Institute of International Studies in Education of Michigan State University; and by the National Institute of Mental Health. In addition, funds from the Rasen Foundation made possible my attendance at a month's workshop in Indonesia. My study is related to a larger project on the comparative study of the scientific communities of three countries (the Philippines, Indonesia and India) which is under the general sponsorship of the Rasen Foundation and is coordinated by Dr. John Useem of Michigan State University. Professor Hareja Bashtiar of the University of Indonesia, with Rasen Foundation assistance, and Professor Gurdip S. Aurora of the Administrative Staff College of India, under a grant from Ford Foundation, are carrying out the coordinated studies in their countries.

The Philippine data used in this thesis are drawn from a larger schedule of information derived from informants and 100 in-depth interviews of scientists conducted by myself, Dr. John Useem and Dr. Ruth Hill Useem. The Philippine study of the scientific community was co-sponsored by the Philippine National Science Development Board and by the Institute of Philippine Culture of the Ateneo de Manila University. The National Science Development Board also made a

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generous grant that made more extensive field work possible. In addition, Dr. Ramon A. D. Hermano and Mr. Tony Pido were more than kind in lending us every assistance possible in doing the study.

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CHAPTER I

STATEMENT AND DESIGN OF THE STUDY

A. The Nature of the Study

In an age of increasing international dependency and interconnectedness, American sociology remains primarily inward looking in terms of its own emphasis and orientations. Reflecting the complexity and specialization of American society, American sociology covers many intellectual areas and has no single penumbra of values or interests that directs the entire field.

Since the 1958 publishing of Lerner's stimulating work on The Passing of Traditional Society, there has been a growing interest among some sociologists in problems of developing societies known under various rubrics of "modernization and development," "modernity," and "social change" including such formulations as "convergence" versus "divergence"[1] theories of change.

The interest in social phenomena outside the United States has come to be known generally as comparative sociology. The area includes:

[1]The diversity of thought stems from assumptions made regarding the impact of industrialization, primarily, on developing societies. The convergence position holds that industrialization and other processes of modernization leads to the homogenization of societal norms and values and resulting human behavior. The convergence position is held by such sociologists as Alex Inkeles (1960) and Wilbert Moore (1963). Other scholars contend that cultures being flexible and adaptive will modify or re-interpret modernization processes to meet socio-cultural situations. Divergent theorists while not expressly known as such include Reinhard Bendix (1956), Lloyd and Susanne Rudolph (1967) and Joseph Gusfield (1965).

1) the comparative study of phenomena in a series of different societies, 2) the exploration of a society or some segment of it by a foreign scientist and 3) the investigation of patterns engendered by the intersections of societies (Smelser 1966). Most of the theory and concepts utilized in comparative studies are derived from a Western setting and orientation. There frequently appears to be a greater interest in establishing the hegemony of American sociology and its attendant theories and concepts, than in ascertaining the actual content or processes inherent in non-Western social phenomena. Often what should be questions open to empirical testing are assumed as given in comparative studies. Perhaps less culture-bound approaches will develop as American sociologists become less intellectually imperialistic, and as scientists in other countries initiate their own studies. Until such time, however, the field of comparative sociology lacks appropriate comparative theoretical concepts and perspectives.

From a comparative perspective, there are a number of vital issues that have remained unexplored in the present literature in the sociology of science. For example: 1) What is the process of science itself within the so-called "developing" countries? How do differential policies and emphases regarding development and modernization in the emerging nations affect what science is in those countries? 2) Within the world community of scientists, what are the networks among and between different scientists of various nations of the world? To what extent is there agreement on the norms and values of science by scientists throughout the world? How does the state of local science affect a man's view of science as an ideal? 3) What are the linkages of the local, intra-national scientific community to other segments of

society? Is there, in fact, a national scientific community? How does differential government policy affect which sciences are favored within a country, and which are de-emphasized? 4) What are the generational differences among scientists regarding their perceptions of science, their general life styles, and the interpersonal relationships between older and younger generations? 5) What are the social roles of scientists? How do scientists participate in the civic culture of their larger societies? What public roles do they perform, how are these roles linked to their own scientific roles?

The present study has two primary concerns. One is an analysis of a particular segment of Philippine society; i.e., academic institutions and their influence on science, including patterns of institutional linkage within the Philippines and to institutions abroad. The second is a descriptive analysis of the types and patterns of networks created and maintained by Philippine academic scientists, involving other Philippine scientists and scientists in other countries around the world.

The two interests are seen as being mutually related, as the institutional framework and environment sets the stage for and has great influence on scientific work in general in these institutions. The institutional environment also directly influences the specific responses of Philippine scientists to their work situations as manifested in the type of research being done, for example, or in the relative importance of external scientific communication and ties. External can mean outside one's university but still in the Philippines, or outside the Philippines itself. While some attention is given to scientific networks within the Philippines, the primary attention in

later chapters is on the patterning of scientific ties outside the Philippines to the larger world-wide scientific community.

The analysis in the following pages endeavors to bring some understanding to such questions as:

1) the relationship of various societal factors such as geographical location, governmental priorities and policies, university orientations and emphases, and funding policies of both Philippine and foreign foundations to the growth and development of Philippine science, and the resulting scientific third cultures.
2) the patterning of scientific life within different university settings.
3) the nature and type of local, national and international scientific networks that are encouraged by and result from the Philippine social context.
4) the identities of Philippine scientists as they relate to scientific third cultures.

This approach, it is hoped, will put in clearer perspective a small portion of the total picture of science in relation to a developing society.

As mentioned, the analysis works on two different levels. One level is the consideration of macro, societal and institutional factors and their differential effects on Philippine universities and Philippine science. At this level, the attempt has been to understand such general questions as:

1) What is the relationship of Philippine societal conditions influencing science, to the development of a scientific

atmosphere and scientific community in the Philippines?

2) What roles do universities play in the scientific environment in the country?

3) What influence do different university sponsors, sources of funding, goals and orientation have on the scientific community in the Philippines?

4) What are the various third cultural patterns of institutional linkages between Philippine universities and foreign institutions? How do such linkages contribute to different scientific environments in Philippine universities?

5) What are the patterns of linkages between different types of universities and other sectors of Philippine society? For example, how do universities relate to government, industry, other universities, and to resident representatives of foreign governments, foundations, agencies, and universities?

The second level deals with scientists themselves. It focuses on:

1) the distribution of scientists in different types of scientific disciplines and universities, and the response of scientists to different university environments.

2) the patterning of scientific careers including the introduction of, access to, and eventual participation in scientific third cultures, including the primary focus or orientation of Philippine scientists to their work.

3) the response of scientists to third cultural opportunities in terms of: a) types of scientific third cultural

networks that develop, b) participating as compared to non-participating scientists in third cultural networks, c) variations in the importance of personal scientific networks to Philippine scientists.

The research being reported here is part of a larger cooperative, three-country study being done of the scientific communities of India, Indonesia and the Philippines. This larger study deals with the configurations of the respective scientific communities, their relationships to various institutions within and without their national boundaries, and the national and world-wide patterning of scientific networks. Colleagues engaged in the larger study are: Dr. Harsja Bachtiar and Mr. Bennie Hoed of Indonesia; Dr. Gurdip S. Aurora of India; and Drs. John and Ruth Hill Useem who participated in the Philippine portion of the study. The data collection of Philippine academic scientists was a team effort. The investigation of the medical scientists in the Philippines was done by the Useems following the completion of that portion of the study dealing with university non-medical scientists.

B. The Philippine Study Design: The Ideal and the Actual

The main focus of the original study design centered on "new" scientists, part of a segment of the modernizing Philippines, yet embodying in their own experiences and adjustments the larger critical societal issues of modernization and development. However, extensive reconnaissance of actual conditions in the Philippines, and the general size of the scientific community, led to an expanded sampling base. From focusing on younger scientists only, the final sample drawn included scientists from many different age-grades and scientific

generations. While maintaining the same institutional focus; i.e., universities, scientists sampled came from all levels of the general academic scientific community.

Modification in the sample was necessitated also by the lack of a general knowledge base in the Philippines regarding science and scientists. That is, until one has to actually apply what in the States is called "standard sampling and research techniques," one is not aware that the methodology of sociology can be as limited in applicability cross-culturally as are many sociological theories. Random and proportional sampling simply assume a knowledge base cross-culturally that provides the researcher with a universe from which to draw a sample.

However, in countries like the Philippines such basic knowledge is either not known or is not available. For example, most recent information on the scientific community in the Philippines was a survey done by the National Science Development Board in 1965. There was no substantial additional information available, however, on more recent modifications in the scientific community involving such items as increase or decrease in numbers of scientists by scientific discipline. Missing as well were lists of professional societies or groups, and updated membership lists and names of the officers. The journals that exist often are not published regularly, or do not provide biographical data which allows one to discern the scientific discipline of the author, his age or professional status.

The lack of essential general information made it difficult to determine the actual size of the total academic scientific community, from which to draw a sample. Before a sample could be drawn, a

"universe" of academic productive scientists had to be constructed.

In this study, "science" is taken to mean the use of replicable and set methods of investigation in the production, discovery, modification, and/or synthesis of knowledge. Such a definition finds such diverse fields as education, social work, and public health included in the study. In a developing country like the Philippines, it is often the case that disciplines such as these are involved in research, gathering benchmark information within their respective areas. This function is not usually performed by counterpart disciplines in the West. An inclusive definition like this, allows for the recognition of such diversity.

The focus of study is on individuals who are, or have been, "productive" scientists, as opposed to persons trained as scientists who are now or have been exclusively engaged in teaching or administration. "Productive" in this sense means a Philippine scientist who has a minimum of one publication based on some kind of research work. A minimal criterion such as this is thought to be discriminating enough so that one is actually dealing with "scientists" rather than teachers or administrators. The definition of a one publication minimum avoids on the other hand, the difficulties inherent in attempting to define a scientist by the criteria of "degree-earned," specific function, research, or field. The publication minimum is taken to be indicative of a basic commitment to science, as in developing countries it is often difficult to get research done, or results published. Also this criterion allowed flexibility in drawing a sample so that individuals doing research and publishing could be included who might otherwise

not meet the criteria of degree earned, type of research being done, or primary job being done.

Scientists included in the study were selected from the major areas of science, the physical, life and the social sciences. A broad definition of science was used to incorporate disciplines engaged in scientific research, but often not considered "scientific" by Western standards.

1. General Parameters of the Philippine Scientific Community

According to the figures reported by the National Science Development Board, as of 1965, there were 81,600 scientists and engineers employed in the Philippines. (1965, III)[2] Distributed by scientific discipline there were:

13,100 physical scientists

44,000 engineers

15,000 life scientists

9,000 social scientists

Of the total figure, industry is the largest employer of scientists. Approximately 91 percent of all engineers, 70 percent of all physical scientists, and 40 percent of all life scientists are employed by industry. Government is the next largest employer of scientists, with the academic community coming third.

[2] The report also gave a figure of 121,000 technicians employed in various segments of society.

Within the academic community there are approximately 13,224 academic scientific personnel employed. (NSDB 1965:19)[3] Of this number 8,752 have bachelor degrees, 1,753 have master's degrees, 819 have Ph.D. degrees and 1,900 have other kinds of degrees. By scientific field, 31 percent of academic scientists are in social science, 10 percent are in engineering, 11 percent are in mathematics, 11 percent in biological science and 16 percent in medical sciences. (NSDB 1965:19)

The National Science Development Board's manpower survey also reports that although the majority of scientists and technologists are employed in industry and government, the locus of research is in the academic sphere. (NSDB 1965:20) This is supported by the figures cited in the survey for main activity or function of scientific academic personnel which showed the following distribution:

11,661 engaged solely in teaching

290 reported doing research as a primary activity

952 noted doing both teaching and research

119 reported extension work as their main activity

202 reported other types of main activities.

Of the 13,224 academic scientific personnel employed, 1,242 were reported engaged in some type of research activity. However, not all persons listed as "personnel" had faculty appointments. Some were research assistants, or students working on projects. In addition, because not all universities and colleges were sampled in the present

[3] Scientific academic personnel includes laboratory technicians, research assistants, other technical assistants and staff as well as educated scientists. This partially accounts for the high proportion of those holding bachelor degrees being included in this category.

study, some productive scientists in other non-sampled institutions were excluded.

With this rough approximation of the general numbers of academic research scientists a way was then devised to establish a universe of productive scientists; i.e., those having a minimum of one publication. Given the lack of general information regarding scientists, particularly their publications, it then became necessary to go through all Philippine scientific journals to gather names of publishing scientists. Journals from the 1965-1970 years were selected as it was thought the turnover in faculty was such that scientists publishing before that time and not since were perhaps no longer at the same university in the Philippine scientific community. The names of publishing scientists gathered in this way became the universe from which scientists were later chosen for the sample. Approximately 981 publishing scientists were located in this way.[4] However, the universe constructed is not necessarily assumed to be representative of the total scientific activity in the Philippine academic community. However, given that no other lists existed or a more complete source of information from which a sample could be drawn, the above procedure represented the best that could be done under the circumstances.

As a way of further delimiting the scope of the study, only academic scientists from selected universities were included in the

[4] The discrepancy between the figures in the survey done by the National Science Development Board and this study is due to a number of factors: 1) the NSDB's university sample was proportionately larger than the present research sample. 2) The NSDB sample included a wider range of individuals, research assistants and technicians, as well as those holding academic positions. The research being reported here used the criterion of one publication rather than job description.

sample. No attempt was made to cover the entire range of scientific activity in the Philippines. For example, medical colleges, and medical scientists were considered separately.

C. Selection of Institutional Focus: Universities

As a way of limiting the scope of the study, only the educational sector of the society has been considered as a source of scientists to be interviewed. The Philippines in this regard has a situation unique in Southeast Asia; the number of institutions of higher education compares favorably with or is better than, a number of the more-developed countries in other parts of the world. As of 1970, there are 37 universities and 527 other institutions of higher education in the Philippines. Of these, there are six state colleges and universities; 31 private universities, and more than 514 private colleges. (NSDB 1969: 5)

In addition, the number of students enrolled in institutions of higher learning is extremely high. (UNESCO 1967:537) Of the 255,346 persons enrolled in collegiate courses:

22,419 are enrolled in the six state-supported schools.

57,574 in the ten sectarian private institutions.

4,560 in the two, private-foundation universities and

170,793 are enrolled in the twenty, privately-owned stock corporations. (NSDB 1969:16)

These figures indicate that roughly 89 percent of the total enrollment in higher education is in private schools. The UNESCO report also indicated that most students are enrolled in universities rather than in colleges. (UNESCO 1967:539-540) While the Philippine

government finances the bulk of primary school education, the greatest share of the burden for higher education falls on private institutions. The above breakdown of enrollments points to a critical factor used in drawing a sample of universities, that is, types of universities. Universities may be classified by sponsorship or ownership. Among the different types are: 1) public, state-supported universities and 2) private universities. As the bulk of higher education occurs in private institutions in the country, it is no surprise to find a variety of types of private institutions. Among the varieties of private universities are: a) private sectarian; i.e., church-related; b) private foundation; i.e., privately-owned corporations operating the school on a non-profit basis; c) private stock corporations which pay dividends, and are considered by Philippine law as business enterprises. For purposes of the study, the two categories of private stock corporations and private foundation were collapsed into a single category of private-profit making universities, to distinguish them from private sectarian universities.

Given the number of institutions of higher education, a number of criteria have been set up to delineate the institutions from which to sample scientists. One decision revolved around focusing on universities rather than colleges. The basic distinctions between universities and colleges have been outlined in Philippine law. Technically, a university, is a more complex institution offering a wider variety of programs and having more facilities than a college. To qualify as a university, a status which is granted in the Philippines either by State Charter or through the Bureau of Private Schools, an institution "must operate a four year undergraduate course in the liberal arts and

sciences and must have a recognized post-graduate course in liberal arts or science or education leading to a master's degree." (UNESCO 1967:576-577)

An additional criterion for university status involves "at least three professional colleges, one of which must be in technology, agriculture, or medicine; it must have a professionally administered library of at least 10,000 bound volumes and books." (UNESCO 1967: 576-577) Also the university must undertake research and operate at least two graduate departments under a qualified staff. Part of the evaluation of the staff is to be based on their scholarly publications and research activities as well as by leadership in their discipline. (UNESCO 1967:576-577)

Other factors determining which universities were selected involved giving preference to those institutions reporting research expenditures in various fields,[5] and having high standing in academic circles as determined by being recipients of foreign support for faculty and curricular development. Other factors taken into account were the number of graduates winning scholarships for advanced education abroad;[6] membership in various academic associations and in the accrediting association; and good academic reputations as noted by various knowledgeable members of the academic community.

The final factor in selecting universities dealt with the distribution of universities throughout the country. Approximately half

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[5]These figures were generously supplied by the National Science Development Board from their latest reports.

[6]Dr. Vitaliano Bernardino and the staff of the Philippine American Foundation kindly gave their time and effort in making this information available.

of the total 38 universities are located in the Greater Manila Area, particularly the private stock corporations (12 out of 20). The rest of the institutions are scattered throughout the islands, with the next biggest concentration of universities being in Cebu, then Iloilo, Mindanao and the Eastern Visayas. It was considered quite important to include universities not in the primate area of the country to see how geographical location influenced scientific activity.

The sampling frame used was based primarily on geographical region, and type of university ownership. Regions were determined by collapsing the ten census regions in the Philippines to three major categories; 1) regional universities including those institutions not in the Greater Manila Area, and excluding state-supported schools, 2) cosmopolitan universities comprising institutions located in the Greater Manila Area but not those part of the state-supported complex, and 3) primate universities. Primate universities refer to the state-supported complex including the primary university campus in the nation's capital; and the primary college of agriculture complex located outside Manila.

The geographical location, as will be discussed later, is an important factor in the orientation of a school both towards the Philippines and towards the outside. While distinct from type of ownership, both are highly interrelated in influencing the nature and extent of university scientific environments, scientists' responses to their work situations, and the type of networks developed both within and outside the Philippines.

The sampling frame is as follows:

TABLE 1: Philippine Universities Included in Sample by Type of Ownership and Geographical Location

Type of University	Type of Ownership			
	private profit	private sectarian	state supported	total
Regional	0	3	1	4
Cosmopolitan	2	2	0	4
Primate	0	0	2	2
Total	2	5	3	10

By type of university there are four regional universities in the sample; four cosmopolitan schools, and the two primary institutions of the state-supported complex. The data in Table I have not been organized to provide a comparative analysis of Philippine universities per se. Rather the two factors of type of ownership and geographical location will be considered regarding how they influence the type of scientific atmosphere that develops in certain universities. The primary concern then is the impact of different university scientific environments on institutional links, and types of scientific networks established in the Philippines and abroad.

In regard to ownership two privately-owned, profit-making institutions are in the sample, five private sectarian schools, and three state-supported universities; one of them being a regional campus.

A sample of 100 scientists was drawn from among the ten universities selected.

D. Selecting the Sample of Philippine Scientists

In selecting the sample of productive scientists, an attempt was made to approximate the configuration of the Philippine academic scientific community as found in the reports of the National Science Development Board. That is, of the 1,242 persons reporting some research activity in 1969, 1,130 were located in universities. (NSDB 1969:40) Of the 1,130 university faculty mentioning research activity of any kind, the distribution by scientific field is as follows: Approximately 230 persons in the physical sciences, 700 in the life sciences, and 200 persons in the social sciences. (NSDB 1969:40)

The physical sciences include scientific disciplines such as: physics, chemistry, mathematics, engineering, geology, geography, metallurgy. The social sciences refers to sociology, economics, agricultural economics, anthropology, education, home economics, psychology, communications, social work, science education, public administration, business administration, folklore. The life sciences include agriculturally-related disciplines of agronomy, plant physiology, plant pathology, agricultural botany, animal husbandry, animal nutrition, agricultural engineering, agricultural chemistry. Life science also refers to non-agriculturally related disciplines such as botany, zoology, marine biology, biology.

Not included in the sample are the medical sciences which were considered separately: Medical sciences includes numerous disciplines pharmacy, human nutrition, and biochemistry. Other specific disciplines are included in medical science as well besides those mentioned. The differences in tradition, organization, and patterns of linkage to other Philippine and foreign institutions, besides limitations in time, accounted for the medical sciences being studied separately.

Regarding the diversity of scientific disciplines present in the Philippines, the effort was made to have represented in the sample scientists from well-established and developed disciplines, as well as those disciplines not as well developed or established. The attempt was made to capture the range and variety of scientific disciplines. Development is conceptualized as having two distinct aspects. The first is the degree of institutionalization of a discipline in society. This refers to the social anchoring of a discipline in society and includes: the amount of funds allocated by government to a discipline; the nature and extent of influence in government; the proportion of prestige and monetary rewards received as part of the pay-off obtained from delivery systems existing between scientists and users of science in the society. Also included would be the length of intellectual tradition in the Philippines, and the total numbers educated and part of the discipline.

The second aspect refers to the internal organization of a discipline or the degree of establishment enjoyed by different disciplines. This refers to such items as the number of professional organizations; scientific societies established and maintained; the number of journals and publications of the discipline; the frequency and number of local, regional, and national meetings; the extent and nature of national networks; the degree of general independence of the discipline, which involved the differential ability of a discipline in developing and maintaining its own intellectual standards and critical capacities free from external control and direction of Western or non-Philippine influences.

After choosing the institutions to be represented in the study, the factor of scientific discipline by major area of science was used as part of the sampling frame in selecting the publishing and active scientists from among the faculties of the different sample universities. The sampling frame then looked like the following:

TABLE 2: Distribution of Science Faculty by Type of University and Major Area of Science

Type of University	Major Area of Science: Physical		Social		Life		Total	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Regional								
Silliman University	33	26	84	66	11	9	128	100
University of San Carlos	no information available							
Xavier University	"		"		"			
Mindanao State University	"		"		"			
Cosmopolitan								
University of Santo Tomas	110	21	307	60	97	19	514	100
Ateneo de Manila University	31	30	66	65	5	5	102	100
University of The East	118	18	496	77	27	4	641	100
Philippine Women's University	no information available						192	
Primate								
University of Philippines (Diliman UPD)	157	35	197	44	95	21	449	
University of Philippines, College of Agriculture (UPCA)	105	25	103	25	210	50	418	100

In the regional university for which there are data, it is evident that the majority of science faculty are in the social sciences; secondly, in the physical sciences, thirdly in the life sciences.

The cosmopolitan universities in general, have the same relative distribution; i.e., the majority of science faculty are in the social sciences; there are some in the physical sciences, and few in the life sciences.

The Diliman campus of the state-supported complex (abbreviated as U.P.D. in the following pages) has a more evenly distributed but generally similar placement of its faculty. It is the college of agriculture (abbreviated in following pages, U.P.C.A.) that has half its science faculty in the life sciences, in keeping with its primary function. In the physical and social sciences, the division is equal.

Looking at Table 2 regarding major area of science, it is interesting to note that except for the college of agriculture the physical sciences have more faculty than the life sciences. However, as compared to the numbers in the social sciences, neither the life nor the physical sciences are that well represented. In most non-state supported schools for which there is information, the social science faculty represents from almost two-thirds to over three-quarters of the total science faculty.

TABLE 3: Number of Persons in Academic Scientific Community Engaged in Research by Major Area of Science*

	Major Area of Science							
	Physical		Social		Life		Total	
Engaged in Research	No.	Per-cent	No.	Per-cent	No.	Per-cent	No.	Per-cent
	250	21	200	18	700	61	1130	100

*Figures taken from Volume 3, Survey of Scientific and Technological Manpower; Educational Institutions and Private Foundations, National Science Development Board, Quezon City, 1965.

Table 3 gives an approximation of the distribution by numbers of academic scientists in the NSDB survey reporting some kind of research in the major area of science. It is interesting to note that 61 percent of the 1,130 persons doing some research are in the life sciences. Although many more social scientists are affiliated with universities as seen in Table 2, few are doing research.

In terms of the distribution in the major areas of science of men and women scientists, the following table summarizes such information.

TABLE 4: Number and Percent of Persons in the Philippine Academic Scientific Community Engaged in Research by Gender and Major Area of Science*

	Major Area of Science							
	Physical		Social		Life		Total	
Gender	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Male	76	33	160	80	511	73	747	67
Female	154	67	40	20	189	27	383	33

*As reported in National Science Development Board, Science Policy and the Organization of Science, Quezon City, 1969.

Table 4 shows the breakdown by gender and by area of science of those reporting research activity, as reported by the NSDB (1969). While numerous factors contribute to the distribution shown above, a few can be mentioned here. One is the general degree of establishment and development of the major areas of science in the Philippines. In comparison with the social or physical sciences, the life sciences have enjoyed preferential funding and support from the Philippine government and from many foreign governments and foundations. (NSDB 1969) One of the results of such benefits to the life sciences has been the provision of facilities and equipment for doing research, training

students, and providing consultant services to Philippine farmers, government and industries. In addition, adjuncts of being relatively well-established are higher salaries, and generally better conditions for scientific work.

The factors mentioned above apply particularly to the agriculturally-related disciplines. The above conditions encourage men to enter such fields of study, particularly where field work is an integral part of one's activities. The opinion was often expressed that it was difficult to train women for field work, not because of any lack of talent, but simply because of certain Filipino values which do not look favorably on women doing work which requires travelling alone in unknown areas, for long hours.

There are women in the life sciences, especially in non-agriculturally related fields. They do research. In these fields, as in many of the physical sciences, much of their research is done in laboratories, being experimental or clinical in nature and not requiring extensive field work. In addition, many of the physical sciences are predominantly composed of women. Chemistry, pharmacy besides nursing and some of the medical sciences are cases in point. Part of the predominance of women in these fields is that they are not only precursors to medical school, but they also provide in themselves, a means of employment. That is, one could teach chemistry, or be a laboratory technician, or a pharmacist if one were unable to go on to medical school for some reason.

Another factor related to the establishment and development of certain areas of science is that where such areas are not as well established, salaries and benefits are less; there is less opportunity

and facilities for research and so on. It appears in the Philippines, that many women are employed to complement their husbands' earnings. As one respondent said, "Women can afford to go into academic science, because their husbands are also working. It is difficult for a man to take the same kind of position because the salary is not enough to support a family."

The following table summarizes the primary characteristics of the selected sample of productive scientists.

TABLE 5: Characteristics of Selected Sample of Philippine Scientists by Major Area of Science

Characteristics	Major Area of Science			Total
	Physical	Social	Life	
Total	26	31	43	100
1. Gender				
Male	22	19	30	71
Female	4	12	13	29
2. University Affiliation				
Regional	7	11	12	30
Cosmopolitan	6	5	3	14
Primate:UPD	8	9	8	25
UPCA	5	6	20	31
3. Highest Degree Earned				
M.A./M.S.	6	5	15	27
Ph.D.	20	26	28	73
4. Place of Education for Highest Degree				
Philippines	4	6	8	18
Southeast Asia	1	0	1	2
Australia	0	0	1	1
India	0	0	1	1
Europe	4	1	1	6
United States	17	24	31	72

1. Summary

The basis for selecting a sample of scientists put primary emphasis on productive scholars; i.e., those having at least one publication. Productive scientists were considered from the major areas of science. However, to limit the range of the study only certain Philippine universities were chosen as institutions from which scientists were to be selected. Universities were chosen on the basis of type of ownership or sponsorship, regional location in the country, general academic reputation, and investment and support of scientific research.

Following the general outlines of the Philippine academic scientific community doing research as reported by the NSDB, one hundred scientists were selected from among approximately 900 scientists in ten universities having at least one publication, as found in some Philippine scientific journal.

a. Definition of Terms

1) "productive scientist"--any academic person from the physical, life (excluding medically related) or social sciences who has a minimum of one publication. A "publication" includes any article based on research, and circulated among colleagues in mimeograph form, as preprints, reprints, think pieces, or in formal journals. A graduate thesis is not considered a publication, but an article or book based on the thesis is so considered.

2) "science"--any academic discipline having established methods of inquiry geared to the pursuit of new knowledge, whether it be by discovery, modification, reformulation or synthesis of existing knowledge. For example, education is considered a science to the

extent that educationists are doing research. Although, under some circumstances, law research could be considered a science, it has been excluded from the present study. This definition seeks to avoid the troublesome and often specious distinctions made between "applied" and "basic" research. It also attempts to be broad enough to include the social sciences and those who do research in developing countries in areas not often considered "scientific" in Western countries.

3) "institutionalization"--one aspect of the degree of development of scientific disciplines. Institutionalization refers to the degree and type of anchorage a discipline has in society, involving such things as ties to government, industry, private sector; plus the length of an intellectual tradition in the Philippines, and the total numbers who are part of the disciplines.

4) "degree of establishment"--refers to the internal organization of a discipline. This includes such items as the number and complexity of professional organizations and scientific societies established and maintained; the number of journals and publications of the discipline; the frequency and number of local, regional, and national meetings; the extent and nature of national networks; the degree of general independence of the discipline from control or excessive dependence on the scientific community of foreign countries.

E. Ethnography

Approximately half of the data collected in the study were ethnographic in nature. Basic ethnographic work was done: 1) on the history, social structure, and current socio-political situation in the Philippines; 2) on the educational system, and on science and the

science establishment of the country; 3) on each individual university chosen as a focal point from which scientists were selected for the sample.

In regard to the last item, acquaintance with the universities began through literature and information, plus informant interviews with knowledgeable people in education. Later, after specific universities had been selected, letters of introduction were written by the Director of the Institute of Philippine Culture, to which the researcher was affiliated, to the Presidents or Rectors of the sample universities. These letters of introduction explained the project, and asked for help and cooperation of that institution in participating in the study.

Some time later the researcher wrote again to the institutions asking for needed information such as faculty lists, and asked approval of a suggested time for a visit to the university. (For the universities in the Greater Manila Area much the same procedure was used although in some cases a trip to the school was substituted for the second letter.)

The actual interviewing began in December 1969 in a few institutions in the Greater Manila Area. The Useems joined me in January 1970 and from then until March 1970, an extended trip was made to cover sample universities in the Visayan and Mindanao regions. We interviewed in sample institutions in Los Banos and the Greater Manila Area during summer and early fall 1970. Following the departure of the Useems, I continued interviewing until November 1970.

The ethnographies of universities included:

1) Formal visits to the Presidents, Rectors, Vice Presidents, Deans and Department Chairmen.

2) Informant interviews with other university officials such as heads of research units, student affairs and librarians.

3) General visits with students, non-sample faculty members, spouses of faculty, visiting professors and foreign students.

4) Obtaining detailed information through additional histories, catalogues, reports and annual reports regarding the university.

5) Noting detailed descriptions of the physical lay-out of the university, of the surrounding or nearest towns or neighborhoods and

6) Attempting a general assessment of the relationship of university to surrounding town, and general area.

In summary, the ethnographic information focused on: 1) the institutional environment in which scientists were located; 2) the relationship of the institution to surrounding areas; 3) the patterns of institutional linkages abroad; 4) the nature of institutional goals and organization, research funding, salaries, teaching loads, extra-curricular activities, and the ensuing institutional atmosphere regarding teaching, research, administrative and other duties.

F. The Interview Schedule and the Interview Situation

Respondents were asked to participate in the study in two ways. One, by filling in the Self-Administered Questionnaire (SAQ) described below. The other by participating in an in-depth interview lasting from between two to three hours per respondent.

The interview schedule for the in-depth interview that was finally adopted for use evolved over a long period of time, beginning with numerous drafts done in the States. A month was spent with colleagues in Indonesia to further develop the questionnaire and to insure comparability and understanding of the general areas to be covered. Further modifications, pruning, and re-working of questions was done in the Philippines in light of two series of pre-tests that were done. Four pre-test interviews were done with a version of the interview schedule developed by the group in Indonesia. Later after re-doing the questionnaire again, an additional six pre-test interviews were done in a non-sample Philippine agricultural university. Successive changes were made after each series of pre-tests.

Although the main areas were firm, the schedule never did have a "final" form, as throughout the interviewing some questions were dropped, modified and reworked, or new ones added as situations changed. For example, when questions were no longer relevant regarding the national presidential election, the questions were changed to deal with student unrest. As the researchers learned more about the scientists and the scientific community and as alternative sources for gathering data were available some topics were dropped, and others added about which less was known.

The in-depth interview schedule dealt with scientists recruitment and socialization into science and to their present university. Questions were asked regarding the range and variety of work activities in which scientists are presently engaged. Specific questions were also asked about teaching, research, administration, consulting and other activities in which scientists were involved.

Other questions were asked regarding the scientists local, national, and international networks, his cognitive map of science, and the degree of establishment of his discipline, including societal generations within his field. Questions were also asked regarding his view of the future of his discipline in the Philippines, of the society itself and of his own future.

Types of questions included both open-ended, and pre-coded response questions.

Because of the length of the primary questionnaire, basic demographic and professional information such as memberships in professional societies, career and educational histories, bibliographic information, income, and research experience were separated out and put together into a format which the respondent could fill in at his leisure, and return at the time of his in-depth interview. Such a procedure using the SAQ provided the investigator with a way of obtaining some insight into the respondent as a person before the in-depth interview, and helped in working into the primary interview itself.

1. The Interview Situation

The sample scientists were first approached with an explanation of the project, and its support from sources both within and outside the Philippines. In addition, the "bona fides" of the researchers were established by letters of introduction from the Director of the Institute of Philippine Culture to which the investigators were affiliated, or by letter from an official of the National Science Development Board. Before seeing any of the respondents, permission was gained from university officials to go ahead.

If the scientist agreed to participate in the study, he or she was given the SAQ to fill in, and an appointment was made for the in-depth interview. Given the hospitality of the Filipino people, care was taken to stress that the interview should be at the convenience of the scientist. Because of the length of the interview, often two different appointments were made, depending on the person's schedule.

Most often the interviews were held during the day at the office of the scientist. Occasionally they were at the homes of the respondents, or in the accommodations of the interviewer. Everything possible was done to keep the interview situation as relaxed as possible. Copies of the interview schedule were given to scientists who requested them.

a. Methodological Note on the Interviewer as Participant in Third Cultural Settings.

The eighteen months spent in the Philippines provided a new socio-cultural environment in which I also participated, if only temporarily, in the Philippine scientific third culture. The reconnaissance period in which I had to become acquainted with Philippine society, structure, norms, values, history and current political situation provided an important overview of the society and culture essential to the research project. Without such an overview, nuances of language, areas of sensitivity, styles of address and a basic understanding of Philippine norms and values would have been lacking.

Becoming more culturally sensitive carried over in numerous ways into the study itself, not only in formulating questions to ask, but in the interview situation as well. An example of the latter is that

originally it was feared that being young, female and with lower status than scientists in the sample I would be interviewing might make interviewing problematic. It was thought that perhaps I would have difficulty getting access to scientists, arranging interviews, or getting pertinent information from respondents. Such difficulties never arose, however. In fact, an element never thought to be problematic became an increasingly sensitive issue as time went on. This was the fact of being American in a society that is becoming increasingly anti-American.

During the time I was in the Philippines, college and university students, radical groups, farmers and workers movements became more socially visible and much more active. While most of the provinces remained peaceful, the Greater Manila Area was increasingly the scene of riots, demonstrations, strikes and marches which often originated in educational institutions and spread throughout the cosmopolitan area.

Such events restricted mobility in and around the Manila area, and, at times, made interviewing virtually impossible as well. In addition, in a period when the society was becoming more sensitive to and objective in evaluating Americans and the "American presence" in the Philippines, one's own position as an American became a sensitive area where previously it had not been so.

The respondents in the study, however, did not cease cooperating with the study or diminish in their hospitality or friendliness. Rather, such tension as there might have been was carefully guarded or hidden. Even among the most radical younger scientists, unfailing courtesy and a willingness to talk and discuss issues in science and society prevailed.

One became quite aware of the increasing unrest and tension in the society, and different events did make work impossible. Philippine scientists themselves did not reflect this unrest in their own behavior towards me as an American. However, many of them were uneasy in terms of what such trends might mean for themselves and their families.

In certain other ways, one became quite aware of being in a third cultural situation. Language was one such indication. I became very aware of the style of speaking English used by many Philippine scientists in talking with me. That is, how they talked reflected their knowledge that Americans value direct, straight-forward speech, and that in American society this is synonymous with being truthful. I found that many Filipinos, knowing of the American expectation and value placed on this kind of talk, would speak this way, but only about that portion of the total information they chose to disclose. This is not to infer that Filipinos were being untruthful but rather that they were making adjustments to an American expectation while preserving a Filipino trait of tact and reserve. The same Filipinos would not have used the same manner of speech talking to other Filipinos whether speaking in English or in another Philippine language. Among Filipinos, the emphasis is on indirection, circumvention and allusion in keeping with the Filipino values of smooth interpersonal relations. (Lynch 1968, Hollnsteiner 1968)

Being part of a team of researchers was most beneficial in the opportunity it provided for continuous discussion and exchange of ideas. Out of such exchange, for example, came the frequent modification of the interview schedule which helped keep us up-to-date with

societal events, and with areas in which we lacked information and needed to know more.

G. Review of the Literature as Relevant to Scientific Third Cultures

1. The Sociology of Science

The sociology of science, in dealing with science as an institution, reflects its own Western origins. Much of the literature has considered science in its Western setting, and in terms of Western values. There has been little concern with comparative studies, other than various consideration of manpower problems (Harbison and Meyers 1964, Brown and Harbison 1957) or in the adjustment of the foreign educated to their parent cultures (Useem and Useem 1955). Science, whether considered as a social system, (Storer 1966) an estate (Price 1965), or a community (Hagstrom 1965), has been investigated largely in terms of its internal structure, norms and values. In these respects it has been implicitly assumed that science as a community of like-minded scholars, adhering to similar norms and values, is a homogeneously entity. Another implicit, although unstated, assumption has been that the model or configuration of science, its norms and values is what it is in the West, not what it is in other parts of the world.

In addition, there has been little concern in the studies done to date with the international linkages of scientists and the various scientific communities, or with the delineation of the communal boundaries of science itself. While Barber (1963), Merton (1963), and others speak of the relationship of science to society, there has been little empirical investigation attempting to illuminate these linkages. Some exceptions are studies dealing with science policy,

and the relations of science to government (Greenberg 1967). Other studies have focused on the role of scientists in industry (Glaser 1963, Pelz and Andrews 1966, Strauss and Rainwater 1962) or in the universities (Barber and Hirsch 1962). There has been some attention paid to the effect of scientific breakthrough on society. However, in the area of the social roles of men of knowledge (Znaniecki 1965) in relation to modernization and development, there has been a paucity of interest.

In the literature there are certain clusterings of studies that raise interesting theoretical questions for this comparative study. One such area are those studies indicating variations in behavior and responses among scientists to the hypothesized norms of science. Hagstrom, for example, writes of problems in the establishment of priorities, the conflict it can engender, and the ways in which deviations from the norms are controlled by other scientists. (Hagstrom 1965:278).

Almost as interesting as the data themselves is the response of scientists to Hagstrom's questions regarding priority problems. There is a tendency to discount such problems, to gloss over them as being trivial, or to treat them as a joke. (1965:279)

Merton's article on the "Ambivalence of Scientists" (1965) makes the basic point that "potentially contradictory norms develop in every social institution," and that "in the institution of science, conflicting norms generate marked ambivalence in the lives of scientists .....This ambivalence affects the actual as distinct from the supposed relations between men of science" (Merton 1965:119). Merton uses one example, the claiming of priorities in cases of multiple scientific

discovery, to show the socially-patterned sources of one possible kind of ambivalence (1965:121)

Rainwater and Strauss found that chemists in industry shift in their definition of suitable forms of recognition and prestige from those forms relying solely on their contributions to knowledge, and from those given by their professional society, to a greater identification with contributions they make to their company or agency (1962: 121). Forms of recognition become realized in higher salaries, improved working conditions and increased participation in decision-making processes (Rainwater and Strauss 1962:171). Reif has also been quite explicit in delineating conflicting areas within scientific endeavor, and has spoken of the inverse relationship of isolation and adherence to the norms of science (1965:133-155). This part of the literature suggests that the idea of the norms of science being universally adhered to is more of an ideal type than a description of reality.

Another interesting part of the literature in the sociology of science deals with structural variations within science, and in the relationship of society to science and its influence on participation in science and adherence to scientific norms. Crane, for example, has noted the function of editorial gatekeepers (1969:195) and institutional affiliation (1965:699-714) as differentially operating so as to prohibit scientists from equal chances at channels of recognition, or in performing their scientific roles.

Turner (1960), Hargens and Hagstrom (1967) have considered "sponsored" as compared to "contest" mobility as a way of explaining how different social opportunities, for example, in education, can structure the recruitment of new scientists. Sponsored mobility has

been suggested as an important variable in the question of when one received one's Ph.D. versus productivity in getting one's first position, and at other stages in academic careers.

Merton (1949), Barber (1963), and Storer (1968) have all written about the norms of science. The work of Storer, being most recent, builds on the work of the others, and suggests scientific norms to be:

1. universalism--of knowledge and its applicability separate from the personal characteristics of the investigator.

2. organized scepticism--questioning of knowledge in established and replicable ways, it is both a state of mind and an organized process.

3. communality--i.e., sharing of knowledge with no restrictions such as national boundaries, ideologies, and so on.

4. disinterestedness--scientists are not to profit from research, that is, recognition should not be the primary goal underlying scientific work.

5. rationality--the belief in the moral virtue of reason.

6. emotional neutrality--there should be no distorting of data, or inflexibility in approach.

The norms of science are to provide for any scientist, acceptable guidelines regarding attitudes and behavior including (1) scientific knowledge itself, (2) interaction among scientists, and (3) the psychological state of the scientist himself. Adherence to such norms thereby provides the necessary support for sustaining the social system of science and the realization of its primary aim which is the production of new knowledge.

The writings focusing on science within developing countries also contributes some interesting insights. Ribeiro (1967) and Sinha (1965), among others, both point to the different societal environments in which science is being developed within developing countries. It is suggested that science was basically an importation by colonial masters into most societies except for China, India and perhaps Japan. Rather than being part of a social movement, science becomes the purview of an elite class of both foreign colonialists and educated nationals, who often become increasingly isolated from the great majority of the population. Such isolation prevents the penetration of science in society, or its establishment in the country. (Monthly Symposium, 1968)

Matejko (1967:367-376) and de Solla Price (1963:102-106) have discussed the problems facing researchers in developing countries: no clear delineation or separation of duties, conflict between teaching and research, no time for research, lack of imaginative administrators, and traditionalism in universities. Coupled with the lack of adequate facilities, scant financial support, and few established sources of recognition and support in developing countries, the conclusion of de Solla Price is that science in these countries will remain <u>dependent science</u>.

2. <u>The Third Culture</u>

One of the primary organizing concepts for the present research is that of "third culture." Stemming out of the traditions of anthropology and sociology in the study of cross-cultural relations, the construct "third culture" is an attempt at reconceptualizing many of the concepts and processes developing as interaction increases across

national and cultural boundaries. "Third Culture" in this sense is a rubric for the patterns of "relationships, (including norms and values) created, maintained and shared, generic to communities of men who relate their societies, or segments thereof, to each other" (Useem 1963).

Anthropological antecedents to a third cultural approach are found in the writings of Kroeber (1960) and Hewes (1965) both of whom were searching for new formulations regarding the growth and spread of cultures. Kroeber, in speaking of cultural contact in its broadest forms, asserted:

> What counts for total comprehension of the story of man's doing...is...the concatenated masses of culture and the interactions of these...interrelations of transmittal and absorption of content, along with regrouping and refashioning according to national and supernational style of civilization. (1960:381)

Gordon Hewes more clearly delineates the process by which cultures developed and cultural contacts occurred. In this regard, Hewes proposes the idea of "ecumene" as both a "class of cultures of a given order for cultural evolutionary purposes" and as an "historical entity, functioning...as a real sociocultural, not sociopolitical, system" (1965:73). It is this latter notion that has particular relevance to the third culture concept. An ecumene or ecumenical system is defined as:

> ...a set of functionally interconnected civilizations, linked by actual roads, sea-routes, and other channels of transport and communication over which move agents of commerce, diplomacy, warfare and religion, such that constituent civilizations tend toward a common and advancing technological base, and come to share various styles, scientific, philosophical and religious ideas, political forms and so on. (1965:74)

Although Hewes mentions that "the ultimate actors and carriers of all these systems are individual human beings," (1965:75) it is not within the scope of his paper to consider the processes by which individuals actually pass along the ecumene, or the patterns of behavior, norms, and values which may result from such interactions.

It has been the task of sociologists, particularly the work of Charles P. Loomis, to present a conceptual scheme of the human process by which systems are linked. Loomis has developed the notion of "systemic linkage" to conceptualize how members of at least two social systems could be related. (1959, Loomis and Beegle 1950) Systemic linkage has been defined as the

> process whereby the elements of at least two social systems come to be articulated so that in some ways and on some occasions they may be viewed as a single system. (Loomis 1959:16)

In regard to linkages, two levels may be noted, one of articulating roles of two or more systems, the other of bridging systems which imply non-role related processes such as communications systems or even psychic mobility or identification. Loomis' ideas are particularly applicable to the concept of institutional linkage as used in this thesis.

The work of John and Ruth Useem involves further extension of the concern with cross-societal patterns of interaction. The concept "third culture" is an attempt to conceptualize patterns created by the increasing movement of persons across traditional political boundaries who, by virtue of shared interests which bring them together, generate new forms of human groupings (1963:481-498). The foundation for these

groupings arise out of the interaction of people who share some common interests, but not others, and who, in the process of interacting, create and establish new values, outlooks and behavior patterns which are generic to none of the parent cultures involved. Basic to this idea are the following assumptions:

(1) Men in the middle who relate their societies to others are mediators, and the resulting new patterns evolving cannot be adequately understood without some understanding of the first cultures in which individuals are socialized. (Useem: 1969)

(2) Traditional concepts of "culture" and "community" have been redefined at a higher level of abstraction to circumvent traditional definitions which tied culture to geographical boundaries, and communities to sustained face-to-face interaction. Culture as used in a third cultural approach emphasizes its malleability and flexibility based on the notion that man creates his own reality in exceedingly creative ways.

"Community" as used in the third culture implies shared interests as the reasons which brings people together, not kinship or location, although the latter can and often do reinforce the "community." Inherent in this definition also is the notion of the ability of people, widely scattered around the world, to maintain and sustain shared interests via communication systems add other ways not necessitating continuous face-to-face contact.

It is assumed that the norms, values and shared expectations generated in third cultures are passed on, and have to be, to newcomers; that this in fact is one of the functions of any culture. Participants in third cultures may be from two societies only, thereby

forming what is called a "bi-national" third culture; there may be third cultures created involving persons from a number of societies hence is termed "multi-national," or some types of third cultures may involve people from all over the world, and so can be considered as "world-wide" third cultures.

The scope of third cultures mentioned above assumes the structual anchorages in participating societies. That is, third culture endeavors to relate new dimensions of social structures, via the medium of individuals holding established roles within one social grouping. This raises some interesting questions regarding institutional patterns of linkages both within the Philippines and abroad to other institutions.

Limitations in the use of third culture in the present study are related to its basic assumption, one of which links culture with established social systems or structures, including definitions of concepts related specificially to established and formally organized forms of human interaction. Hence the terminology and analytical capacity of the construct is limited to established systems. In this sense, the third culture construct is inadequate for the analysis or conceptualizing of non-formalized patterns of interaction, which is in fact what scientific networks are.

Third culture as a concept, as it now stands is more in keeping with the traditional sociological approach which focuses on organized, non-random patterns of interaction. It is only within a system that is well developed that one can speak of "roles," "role behavior," "role stress," "obligations," "responsibilities," and so on.

The basic dilemma inherent in third culture is that ideally it attempts to conceptualize what in reality are newly forming, flexible,

and nascent forms of human interaction. However, the elements of the concepts used in discussing or summarizing social phenomena are inappropriate. The inappropriateness arises as the terminology used in conjunction with the concept third culture derives from the analysis of traditional forms of social organization. That is, one can talk of roles in terms of universities for example, but it is not an appropriate term to be used in connection with networks, which imply boundary-lessness and lack of enduring forms of social interaction as found in industries, family, universities and so on.

The point is this: some third cultures within developing countries, especially in the area of science are not based on formal organization such as are diplomatic corps, missionary groups, or colonial governments. Rather as the data will show, third cultures as created and maintained by individual Philippine scientists are often separate and independent from the institutions in which scientists are located. That is, some scientific third cultures are carried by individual scientists independent of an institution. (Indeed, some universities hamper or frustrate individual efforts to maintain contact outside the Philippine) In these cases, the third cultures are <u>anchored in individuals</u> and <u>not in organizational anchorages</u>. Hence new terminology needs to be developed to handle these kinds of third cultural phenomena.

As will be shown also, there are numerous institutional links which form part of institutional third cultures which do not involve university productive scientists. Such institutional third cultures are carried by roles, for example, an administrator or President. <u>It is the position that is the link</u> in these third cultures, not the

individual. The linkage most often continues between institutions whether or not there is a change in personnel. This could not happen in personal scientific networks, where the ties depend on the specific individuals involved.

In other words, while there are many types of third cultures; i.e., "colonial," "modern" involving bi-national, multi-national or world-wide linkages, there needs to be a distinction between institutional linkages and the personally-created networks of individuals. The next section will consider "networks" in this light.

3. The Literature on Networks, Quasi-groups, Non-groups.

Of critical concern in the following pages are the variety and extent of scientific networks found in the Philippines, linking Philippine scientists to one another on a local and national level, and to other scientists around the world.

The theoretical concern with social networks (Boissevain 1968), non-groups (Mayer 1966), and quasi-groups (Bott 1957) appears to have developed among social anthropologists as a means of breaking away from the perspective inculcated by the structural-functional approach to the analysis of social systems, particularly as used in the analysis of less complex or primitive societies. As Boissevain points out, social anthropologists and sociologists have "so defined their subject matter that they deal only with groups and enduring social relations" (1968:542). The development of progressively more complex social phenomena whether blurring the edges of social units within societies (Srinivas and Beteille 1964), or creating units cutting across established societies, groups, or traditional boundaries, necessitates new

modes of investigation. Prior approaches are seen as leading to "group fulfilling prophecy" (Boissevain 1968:542) or groupology, and as being inadequate in explaining other types of social interaction (Mayer 1966:97).

By other types of interaction, scholars generally appear to mean those patterns of social interaction that are open, fluid, ill-defined and constantly changing, which may or may not endure and evolve into more formalized structures such as groups. The thrust of this intellectual concern focuses on the "process of creation" of forms of social interaction which precede formalized groups, yet are beyond random or simple individual interactions (Boissevain 1968:544-545).

For example, Barnes in focusing on face-to-face relationships uses the concept social field to differentiate various patterns of social interaction (1954). One such social field is one "that has no boundaries or coordinating organization...A network of this kind has no external boundary, nor any clear-cut internal divisions, for each person sees himself at the center of a collection of friends" (Barnes 1954:33). His definition of network which becomes the classic definition is:

> ....a set of points some of which are joined by lines. The points on the image are people, or sometimes groups and the lines indicate which people interact with each other (Barnes 1954:43).

The work of Adrian Mayer points to different levels of focus in the use of networks. On one level, he discusses "quasi-groups" or the "core of those involved in various action-sets linked to a particular ego" (Mayer 1966:113). An action-set are all those joining together

for some particular cause, political election, etc. In his analysis, an action-set would be bounded; i.e., the pattern of links would pass among and between ego and others brought together temporarily by ego for a particular purpose (Mayer 1966:113). A network however, would be unbounded in the sense of referring to a "n" number of units which could possibly be included in an action-set (Mayer 1966:100). A quasi-group then, would be those people participating in many action-sets.

In another article, Mayer delineates the "village-outward" kind of study in an effort to "distinguish different fields of interaction in various frames of reference" (1962:268).

Important for the present study is the realization that linkages are used to explain interaction among more established forms of role relationships of an irregular or transitory kind. Second, the use of personal network is used as a way of separating out particular kinds of interrelationships in regard to different frames of reference. In this sense a frame of reference could be a marriage system linking numerous Indian families over a wide area; or an economic system also involving many participants. A particular network within a certain system would depend on the person who is taken as the focal point in the analysis of the network from his perspective. In the literature, such a concept of network seems analogous to the notion of field theory of Kurt Lewin.

An important extension of the uses of network has been done by Edward Jay (1964). In his article, Jay makes the point that there have been two somewhat different uses of the term "network." One use is that found in the works of Bott and Barnes which conceptualizes

network "as a piece of totality of relationships" (Jay 1964:134). Such a network consists of a unit or units looking outward towards other units, some of which are also looking towards each other, some are not (Jay 1964:134). In this sense, such networks are ego-centric, as one unit is considered the focal point in the tracing of the network. Implied as well is the general equality of all units in the network (Jay 1964:134).

The other use of network is partially hinted at by Mayer in speaking of frames of reference as mentioned above, and is more clearly seen in the work of Cohn and Marriott (1958). There they utilize the term network to denote the vast systems of relationships which link whole regions within India. Examples would be marriage or trade networks. Within such networks are "centers" or "denser" areas of relationships. Boundaries for such networks would be demarcated by the totality of relationships of a certain kind (Jay 1964:138). In other words the focus moves <u>from an ego-centric one</u>, to the consideration of the <u>type of relationship</u> involved as being critical. Inherent in such latter usage is the absence of any particular central force or ego sustaining the network. This does not imply homogeneity among participating units however, but leaves open the question of centers or variations in the clustering of units. This usage of network will be defined as a "collectivity" particularly in regard to a scientific discipline as a whole, whether national or world-wide.

Jay makes a particularly useful distinction between what he calls "activity field," which is an ego-centric network, and "network" which he sees as "the totality of units connected by a certain type of relation" (1964:138). With this distinction, one can then distinguish two

levels in the focus of networks, one on the individual or unit centered "field," the other on the network formed by the type of relationship being considered.

As applied to the Philippine data, the above distinctions have great utility. That is, there are two levels from which the data may be considered. One is that of the individual scientist and his perceived scientific network, which will be termed hereafter as personal network. The other is the generalized scientific grouping itself. The term "collectivity" will apply to the more generalized patterns related to scientific groupings as a whole. Each level can be considered in terms of different focal points; i.e., local, national or international foci. A collectivity or network could be considered in terms of different foci, and can be summarized as follows:

Levels of Science by Different Points of Focus

	Points of Focus		
	Local	National	International
Levels of Science			
"personal network" (specific)	<- - - - - - - - - - - - ->		types of Scientific Third Cultures
"collectivity" (generalized)	<- - - - - - - - - - - - ->		

For the more detailed explication of variations within personal networks for example, the distinctions of "extensive," "intensive," and "nascent" types of networks are used. These varieties of networks are discussed at length in Chapter III. In general, it can be said that in comparing personal networks of different scientists, some have only newly-developing or discontinued networks; other scientists have well-established and definite ties, while still other scientists are

somewhat in between. Such a consideration also facilitates the analysis of different types of scientific third cultures that are developed which, by forming different types of networks, bring scientists together in a variety of patterns. It is the variety in the patterns that is of particular concern in this thesis.

4. Summary

The review of the literature pertinent to this study draws on three bodies of knowledge: the sociology of science, the sociological construct, third culture and the literature dealing with networks, quasi-groups and non-groups. Each area contributes to the theoretical orientation of the study. From the literature on the sociology of science comes basic knowledge regarding the organization of science as an institution with its attendant hypothesized behavior, norms and values. Much of the literature in this field is Western-biased. However, a thorough familiarity with this body of knowledge provides an inherent, although not necessarily manifest, comparative base for much of the analysis and interpretation of the Philippine data. Knowing about the institutionalization of science in America for example, can highlight those areas in which the institutionalization of Philippine science varies and is different. Such knowledge contributes to conjecture or explanation regarding these differences and variations.

The literature dealing with third culture provides a framework for two different levels of analysis in the Philippine data. One level deals with patterns of institutional linkage among segments of Philippine social organization, and among Philippine academic institutions

and institutions abroad. This analysis draws heavily on what has been the more usual area of concern of third cultural studies; i.e., institutional linkages carried by individuals filling established and institutionalized roles in a variety of cross-cultural settings.

However, inherent in the construct third culture is its applicability to many different kinds of third cultures, which often refers to differences stemming from the multiplicity of participants, for example binational, multi-national, and/or world-wide third cultures. An additional referent proposed in these pages, focuses on more nascent forms of third cultures which are newly created, flexible and tenuous in nature that have as their anchoring points the individual and not something as established as an institutionalized role. This notion focuses on what is conceived of as being a little explored domain of sociological analysis, that area existing between random individualized behavior and formalized patterns of more enduring social relations.

This concern with newly forming, tenuous third cultures provides an important theoretical dimension to the study of Philippine scientists. The use of the concept third culture contributes a way of looking at the cross-cultural patterns formed and forming among Philippine universities and individual scientists outside the Philippines. The concept provides an analytical base for institutional linkages, as well as those patterns being developed by individual scientists.

The literature dealing with networks, quasi-groups and non-groups offers an analytical base for understanding and conceptualizing the patterns of relationships that exist among many Philippine scientists within the Philippines and abroad, that do not as yet enjoy any particular degree of institutionalization, but which with time may occur.

The concept, network, allows one to make a much needed differentiation in the patterns of scientific relationships observed in the Philippines.

Interwoven in the following chapters is an analysis of ten selected Philippine universities in regard to institutional environment, institutional linkages and geographical location and their effect on the university setting for science. The university setting is in turn considered in regard to the recruitment of scientists, including sponsored versus contest mobility, and the response of scientists to university settings.

Chapter III considers in more detail the nature of scientific third cultures; the variations among Philippine scientists; differing characteristics of those participating in scientific third cultures vis-a-vis those who are not; the functions that scientific networks serve; and the centrality of networks to the scientific identities of Philippine scientists.

In general, the study moves from an institutional analysis of the influence of universities on science, to a concern with the personal involvement and responses of Philippine scientists to existing conditions for science. Of interest is the variation in response, taking some scientists into active and personally developed scientific networks within the Philippines and abroad, while other scientists develop a more localized or national focus, and stay outside international networks and concerns.

CHAPTER II

ACADEMIC INSTITUTIONS AND THIRD CULTURES

A. The Academic Institution in the Context of Philippine Society

In attempting to understand the Philippine scientific community in relation to modern third cultures, one is continually impressed with the complex interplay between academic institutions and the interpersonal networks of individual Philippine scientists. The universities in the study function in intricate ways to provide more than just a context in which scientists live and work. An analysis of the institutional web and the dynamics of institutions in scientific third cultures will be the focus of this chapter. The personal networks of scientists will be considered later.

The importance of academic institutions, particularly universities, spans a number of areas. Universities provide a means of mobility to newly-educated people, and also act as cultural mediators between the society in which they are embedded and their cultures of origin and links abroad. Institutions weave, develop and maintain their own networks abroad, yet at the same time provide a Philippine context for the education, development and sustenance of Philippine scientists. To the extent that universities have linkages abroad, they become increasingly vulnerable to events in Philippine society which take an increasingly nationalistic and anti-foreign turn.

Historically, academic institutions have provided windows on the world for their host society, and in this regard Philippine universities are no different than elsewhere. Under the Spanish, education, being quite restricted beyond primary school, was indicative of and provided one means of achieving status for all those not of Spanish blood or origin. Besides providing an indication of social superiority (often economic well-being, and land ownership were correlated with education), higher education under the Spanish enabled a number of Filipinos to travel abroad and to acquire there the language and ideals of reform and revolution, along with an advanced professional education.

Under the Americans, education was instrumentally used to widen the base of the Ilustrado or local elite class with Filipinos who owed their "good fortune" and allegiance to the Americans. In addition, the widespread establishment of English-speaking schools and colleges served as a means of social control by sensitizing generations of Filipinos to American norms, values, behavior, and an American version of modernity.

With Independence in 1946 the Philippine government continued the tradition of an instrumental approach to education but with significant differences. For one thing, education, particularly as it relates to science, has been closely aligned with national goals and with the development and modernization of the country. While wishing to meet national priorities, the government has had to rely in part on old colonial traditions for the production of educated Filipinos. The tension thereby created stems from having to rely on old patterns of education for the production of trained people to be used in new ways

in the Philippines. However, the problem is not restricted to education alone, as virtually all Philippine institutions are basically colonial in origin or adaptation and design. In addition, the leadership of the country remains that of Filipinos of the Ilustrado class, an isolated self-generating elite that education has reinforced with new members.

Hence one of the pervasive issues facing Philippine society today is how to break away from or re-interpret an established colonial legacy involving societal institutions, language, values and attitudes and move to new values, attitudes, and institutions more adequately representing the "Filipino" people and culture. The search for "Filipino identity" or culture has become one of the primary preoccupations of the society, particularly among younger generations of Filipinos.

Within this larger societal context, each university is having to evaluate its own linkage patterns in light of these current issues, and is attempting to determine how to remain international in a time of high nationalistic fervor and how to continue to provide education that enables Filipinos to venture abroad in face of stiff demands for a national language and national relevance.

The importance of academic institutions in scientific third cultures increases to the extent that other societal units have not or are only weakly developed. For example, if Philippine industry or government bureaus are not actively engaged in science or scientific works, the chances of their having scientific third cultural linkages abroad are quite slim. This, then limits the opportunities for Filipinos to enter third cultural situations which brings them in contact

with foreigners and which may offer possibilities for education or employment abroad, or support and encouragement for their scientific work in the Philippines. An additional factor is that there is not a strong or well-developed Philippine professional or scientific community that can provide strong additional avenues or channels into scientific third cultures. This means that the university and its ties become even more critical in establishing and maintaining contacts abroad.

Another reason for the importance of academic institutions in Philippine society relates to the mobility of academic personnel. There is not much interinstitutional mobility among academicians within the country. Faculty usually spend a lifetime in one institution. Partially this is due to the absence of strong professional groupings that could otherwise provide greater job opportunities by lobbying with the government and forging ties to industries. However industrialization itself is limited in scope and variety. Relatively few industries contain positions for scientists. Jobs that are available are often more technical than scientific in nature. Under these circumstances, the academic institution becomes a critical factor in directing and influencing the kind of career a scientist has, including contacts abroad with other scientists. A Philippine scientist cannot easily move on to other Philippine universities when conditions in one institution become intolerable, or when a scientist is frustrated by the lack of funds and facilities for research. There are only limited opportunities and positions available, and this encourages faculty to acquiesce rather than push for change. It also produces certain work environments which, in turn, influence and

direct the type of scientific work being done. There remains the choice of migrating, and for many scientists this becomes an important alternative to Philippine conditions.

The limited number of academic positions available, the fact that institutions provide the channels to get education abroad, the cultural values of loyalty and obligation, local family and kin ties and factors of personal security all contribute to little inter-university mobility.

Without a strong societal image of science or professional societies, or scientific work, there is little to offset the universities' definition and/or utilization of faculty. As most of the universities see their role as being primarily teaching and not research, with the administrator and not the scholar as the image of success, there is little demand for research or scholarly work. There is not a "publish or perish" tradition to keep scientists under pressure to produce. Rather the atmosphere is conducive to "keeping" faculty rather than driving them out. It is possible to get promoted without publishing in all but one of the sample universities. Seniority, service to the institutions and to the community are considered more important than publication for promotion and/or recognition from the university administration. Research and publication are not crucial to most academic institutions. Given the lack of other scientific bodies or traditions to offset those mentioned above, it becomes increasingly the academic institutions themselves that establish the criteria and measures of science and scientific work. The confluence of societal and personal factors tend to turn academic institutions back in upon themselves in terms of utilizing, encouraging or evaluating scientists. In addition, however, they remain one of the few

societal segments in the Philippines that have primary access to the scarce resources of science and scientific training opportunities abroad. So while academic institutions do much to provide what little scientific atmosphere there is in the Philippines, their own demands define how scientists are used and valued. On the other hand, the links abroad which keep most non-Philippine supported institutions financially alive, also provide the avenues by which Filipinos are educated abroad.

B. Institutional Context, Networks Abroad and the Entrance of Filipinos Into Science

1. Academic Institutions and Recruitment Into Science

There is a distinct relationship between academic institution and the entrance of Filipinos into science. Universities generally recruit their own best graduates with bachelor degrees as faculty, thereby offering academic positions to talented individuals who might not otherwise have considered academic careers. Of the one hundred scientists in the study, sixty of them received their Bachelor's degrees from the same institution with which they are now affiliated.

Of the forty persons who received their undergraduate education in schools and colleges other than where they are now located, twenty-one individuals reflect special circumstances. Three are foreigners, born and educated in Germany. Eight are working in a university that has only recently been established and from which the first senior class has just graduated. Two belong to a research-oriented institute that has no undergraduate work attached to it. An additional eight went originally to the Diliman campus of the State University and are presently located at the University of the Philippines College of Agriculture.

Among institutions continuing to employ their own graduates, the State university and its college of agriculture, have the highest percentage of retention. Of the twenty-five people interviewed from the college of agriculture, twenty had received their bachelor degrees from that same institution. For the five who received their bachelor's degree elsewhere, four received it from the main branch of the State university in Manila. Only one person has a bachelor's degree from an institution outside state-supported schools.

Altogether twenty-three of the twenty-five on the main campus of the State university received their bachelor's degree from that same institution. The two scientists who did their undergraduate work elsewhere in the Philippines, both did their master's work at the State university. In spite of this, however, both of them remarked that they still were considered as "outsiders" by many of the faculty because of this difference in educational background.

These figures and the supporting interview data show the trend mentioned earlier, that institutions recruit their own best undergraduates as faculty members, start them teaching as instructors in various departments and eventually send them abroad for advanced training. This is the initial step in entering a scientific third culture.

2. Institutional Links to Universities Abroad

The nature and extent of the links forged by Philippine universities abroad are the outgrowth of the particular sponsorship and historical experience of each university. In this regard the (1) sectarian; i.e., church-related (2) profit-making, privately owned,

and (3) state-supported universities represent the primary forms of sponsorship which influence institutional ties abroad.

a. Sectarian Universities

The sectarian universities, whether Catholic or Protestant, have always had a dual function. On the one hand deeply involved with education, these universities nonetheless also serve as a home base or established place for, by and large, permanent missionary personnel. The foreign faculty who teach in these universities have in the past come with the idea of staying permanently or making their career in that particular institution. They also come with the ideals of missionary educators.

Over a long period of time, relatively more foreign faculty came to the Philippines to join sectarian university faculties than Filipinos were sent from these institutions for advanced education abroad. The staffing of such universities by mainly foreign personnel meant that sending Filipinos out for education evolved at a much later period in the development of these institutions. Rather, a "foreign" atmosphere was created on the campus and it was the foreigners who established and maintained the contacts abroad, not Filipinos. In addition, foreign faculty assumed positions of academic and/or administrative power in the universities which resulted in institutional links abroad often becoming coterminous with the networks of foreign administrators.

In terms of specific ties to universities abroad, the newer linkages are predominantly to universities in the United States, but with no specific clustering on any specific American institutions. The faculty members that have been or who are now abroad have attended

universities widely scattered across the United States. To illustrate this point, there are twenty-two Filipinos of the science faculty of Silliman University who have had advanced education abroad. These twenty-two individuals have gone to eighteen different American universities, with only four schools being included twice--Stanford, Pennsylvania State, Cornell and the University of Arizona. An additional sixteen people are currently doing graduate work in universities abroad. It appears that this university sponsors individuals abroad wherever such people can gain admittance.

Some institutions encourage advanced study of their faculty at a variety of institutions, not only in America but increasingly in European and Southeast Asian institutions as well. A diversity of schools precludes the importation of the viewpoint of a single university and assures a wide variety of perspectives. For the faculty themselves, there are certain disadvantages involved. For example, each foreign-educated Filipino may be one-of-a-kind in terms of his experience abroad at a particular institution. There is little folklore, tradition, support or a group spirit built-up under such conditions among fellow faculty members in their university regarding mutual experiences abroad, which can be passed on to others going abroad.

1) The Protestant University

At the time of interviewing there were thirty-five foreign faculty members at Silliman University, all from the United States. Six of them were visiting professors, and twenty-nine were permanent. This represents about 15 percent of the total faculty of some 228 members. Many of these visiting or permanent foreign faculty received their

advanced academic training in American theological seminaries or religiously-oriented institutions, but not those to which Filipino staff members have gone for their own education. In the Philippine science faculty, eighty-eight (69 percent) received their highest degree from institutions in the Philippines. Thirty-eight (31 percent) were educated abroad, thirty-six in the States, one in Europe and one in Asia.

2) Catholic Universities

Catholic universities have a somewhat different pattern. Very often priests are trained before coming to the Philippines, or are sent abroad from the Philippines after a number of years of service. In either case, it is difficult to say whether the universities attended abroad by priests are the result of links forged between the academic institutions involved, or due to ties between religious societies, or between religious societies and particular universities abroad. There appears to be a great deal more focus on and exchange with fewer universities abroad than is the case with other sectarian universities in the sample. This includes the education of Filipinos, either priest or lay faculty, and/or foreign priests themselves who are sent abroad and then return to the Philippines to work.

To illustrate the type of linkage abroad, of the science faculty of 88 at Xavier University, a provincial university in Cagayan de Oro, fifteen persons were listed as having advanced education abroad. These fifteen people, including five Jesuit fathers, were educated in eleven universities, with Cornell, Fordham and Georgetown university each listed twice. The fifteen individuals educated abroad represented 18 percent of the total science faculty. Seventy-two faculty have

received their highest degrees in the Philippines. This represents 82 percent of the science faculty. Out of a faculty of 158 people, ten persons were listed as being permanent foreign faculty, and three were noted as visiting foreign faculty. Combined, this represents approximately eight percent of the total faculty that are either permanent or visiting foreign faculty members.

At the larger cosmopolitan Jesuit university, Ateneo de Manila, approximately 102 or 55 percent of the total faculty are in science. Of this number, 70 persons are listed as having advanced education abroad. However, eleven American universities account for over half of the degrees earned. In order of attendance: 14 faculty members received their advanced degrees from Fordham; 4 each at Georgetown, University of Minnesota, Cornell and Harvard; 3 each at Hawaii, Indiana, and Boston University, and 2 each at New York University, Chicago and the University of Santa Clara. Taking the 18 Jesuit fathers listed, 7 received their advanced degrees from Fordham, which represented half of those attending that university. Three out of the four faculty receiving their advanced degrees from Georgetown University were also Jesuit fathers. Faculty also had been trained at eight universities in countries other than the United States, including schools in Australia, Japan, Pakistan, Australia, Germany and England.

Among the total faculty, approximately 17 percent of 31 persons were noted as foreign faculty at this university.

b. Private Profit Universities

The privately-owned, profit-making institutions are the most limited in their ties abroad of all types of Philippine universities. More recent in origin than either sectarian or state-supported schools,

the privately-owned, profit-making institutions by design have been inwardly looking. That is, they have been created to meet specific needs within Philippine society, primarily that of making education accessible to a segment of the population that could not afford it otherwise. Their curricula are organized to be as economical as possible, which results in service-oriented courses and/or technical fields being more heavily stressed than the traditionally "academic" areas.

These schools also have the increased difficulty of not being eligible for support from the Philippine government or from the U.S. government, the international governmental agencies or most American foundations. This has meant that such schools remain on the fringes of the ecumene resulting in few visiting faculty or educational exchange programs. With restricted access to channels abroad, there is little institutional support for faculty development involving advanced education outside the country. Faculty who desire this training have to either leave these schools and go elsewhere, where institutional connections are better, or they have to apply on their own through such available programs as Philippine American Foundation, the Asia Foundation or particular foreign universities.

Indicative of the trend within one such profit-making, privately-owned university are the figures taken from the catalogue of the College of Liberal Arts and Sciences of the University of The East. On this faculty, 29 persons have received some advanced education abroad. No two people went to the same institution abroad; i.e., twenty-nine people went to twenty-nine different schools. Twenty-seven were in the United States, one was in Egypt, one in Pakistan. Unlike the

faculty of other Philippine universities, a high proportion of faculty that went from this institution took only Master's degrees while abroad. This was the case for 25 out of the 29 people. One degree was a Bachelor's degree in engineering from Chicago; two were Ed.D.s and one was a Ph.D. These figures show the limitations perhaps of institutional support available. That is, lacking much regularized contact abroad, the privately-owned universities cannot provide their faculty with channels for advanced education abroad. Hence faculty at these institutions have to make their own arrangements. Very often these arrangements provide for earning one degree; i.e., the Master's, but makes no provision for the doctorate.

In a sense these twenty-five people represent a potential for additional education. Rather than personal limitations, it can be suggested that it is the limitations of the university itself that finds so many people stopped at the Master's level. It is difficult to internally finance expensive faculty development programs abroad when an institution is heavily reliant on student fees as its main source of income. In addition, there is less incentive for such a program in an institution that is concerned more with local graduates who can perform well in their community than with graduates who would fare well by international standards.

c. State Supported Universities

The State-supported universities and colleges have had the advantage from the outset of their establishment in regard to contacts abroad to other universities. Being the central educational facility under the Americans implied that the way was opened and tradition established for institutional, governmental and foundation assistance

to continue or develop further even after Philippine Independence. The investment of large sums by Rockefeller, Ford, AID and the international agencies into various campuses of the State university complex is a case in point.

At another level of involvement, under the auspices of either the American government or foundation contracts, specific American universities have become involved with the State university in faculty development programs, technical assistance, and exchange and visiting professors programs.

Turning to the data on advanced education outside the Philippines, for the main State university campus, 30 percent or 469 faculty members out of 1,557 received advanced education abroad for their highest or last earned degree. One hundred and sixteen foreign universities were attended, but of these, fourteen universities have graduated 253 or 54 percent of the total, reflecting the direct and long association of some American universities in some aspect of the Philippine State university. The following distribution occurs of universities from which numerous Philippine faculty members have received their advanced degrees.

TABLE 6. Numbers of Filipino Science Faculty from Main State University Campus Earning Advanced Degrees Abroad by American University Attended, 1969.*

American University Attended	Numbers of Filipinos from State University Campus Earning Advanced Degrees Abroad
Cornell	43
University of Michigan	28
University of Hawaii	19
Stanford University	19
University of Illinois	19
University of Wisconsin	18
Harvard University	17
University of California	15
University of Chicago	15
Michigan State University	14
Columbia University	13
Syracuse University	11
Johns Hopkins University	11
Northwestern University	11

* Figures taken from the University of The Philippines Catalogue, 1968-1969.

In addition fifty-nine American universities had only one person listed as a graduate while the other remaining 43 institutions had from two to nine graduates.

Altogether, 21 out of the 116 universities from which Filipinos received advanced degrees, were located in countries other than the United States. Five institutions in England, four each in India and Canada, and two institutions each in Pakistan and Germany were listed as granting degrees to Filipinos. In addition, a single institution in Australia, Scotland, Italy and France have also been attended by faculty of the State university.

This diversity developed due, in part, to several factors. First there was not the same tradition of long-staying American faculty holding positions of authority and leadership as there have been in

other academic institutions. Within a relatively short time of its founding, the State university and the college of agriculture began to channel Filipinos into administrative positions within the university structure. In addition, Filipinos were sent overseas for undergraduate work and later for their advanced work as a way of developing a Filipino faculty. The Filipinization of this university and college was the earliest effort in the country to transfer positions of responsibility from Americans to Filipinos.

Second, the Americans who came after the initial founding groups were often short-timers, temporary personnel or visiting faculty. This had the advantage for the State university of having a continuous rotation of persons and hence series of networks being established involving foreign academic people who had once worked in the university but who had returned to the States. In contrast to foreign faculty who came to the Philippines to stay indefinitely and thereby closed off or only minimally maintained contacts in universities in the States, the temporary visiting professor keeps his contacts more viable because of his expectation to return to academic life in the United States.

While there are forty-eight visiting faculty members listed in the 1968-1969 catalogue of the main campus of the State university, this represents only 3 percent of the total faculty of 1,557. The primary college of agriculture catalogue notes the presence of 29 visiting foreign faculty, which represents approximately 6 percent of the total faculty of that college. This is lower than figures cited for the sectarian universities earlier.

What the constant turnover and exchange of professors has meant for Filipino staff members desiring education abroad, is an increased opportunity to study at an institution in the States that already has some association with their own university in the Philippines. This has been the case for Cornell in agriculture, Wisconsin in economics and business administration and Syracuse in the college of forestry.

The diversity of links and continual association of Philippine universities with institutions abroad has additional consequences for ensuing scientific third cultures and networks. One, mutual association between institutions can lead to tailor-made academic programs for Filipino faculty to be educated abroad. Two, greater equality may develop in a modern third cultural sense whereby Filipinos have equal say in developing university assistance programs, including the right to select among suggested visiting foreign professors. Three, for people moving between universities, whether Filipino or American, there are fewer unknowns and problem areas inasmuch as a body of folklore, information and experienced people develop who share the same experiences and can ease in many ways, the transition to and from the institutions involved. Four, this process of mutual interaction and continued association <u>is</u> what leads to the development of institutional third cultures.

3. <u>Summary</u>

This section has briefly considered some of the factors contributing to the development of institutional third cultures among Philippine and foreign institutions. In the establishment of inter-institutional linkages it was pointed out that connections developed in some Philippine universities first by foreigners who were semi-

permanent faculty. Depending on the type of university, the Filipinization of administrative positions and thereby participation of Filipino administrators in third cultures evolved at different points in time. The sectarian universities, for example, have been much slower in Filipinizing their administrative structure than has the State university.

The numerous programs involving faculty, technical assistance and curricular development are elements which bring different universities and governments or foundations together and provide the nexus in which institutional third cultures develop.

Another point is that Philippine universities recruit their best undergraduates as faculty members. The opportunity for these individuals to continue their advanced education abroad depends in large measure on institutional linkages abroad. Inter-institutional links provide a primary means of introduction into what basically is a third cultural situation for individual scientists; i.e., advanced education abroad.

C. Sponsored Mobility -- Foreign, Philippine, Foundation

The insights of Ralph Turner (1960) regarding societal variations in the patterning of mobility are indeed relevant to conditions in the Philippines. In counter distinction to "ascribed" and particularly "achieved" mobility, Turner writes of another distinctive process which he labels "sponsored mobility." Rather than the conditions of a "contest" in which all participants are encouraged to compete until the very end when a few "winners" are named, sponsored mobility works out of a different context. Such a context generates an early screening

of all potential candidates for or in a system to determine and select out a certain few whose success in the system is guaranteed once their selection is determined. Sponsored mobility implied limited opportunity in a system, or limited rewards, for which screening or selection is done as an antecedent to access to limited opportunity or rewards. Once selected, the obtaining of the desired end, whatever it is, is ordinarily assured.

The conditions of sponsored mobility are much more operable in the Philippines than is the American ideal of achieved mobility. The Philippines remains too much a feudalistic society to allow for achieved mobility to be very frequent or the primary vehicle of access to the centers of power. In addition, the configuration of Philippine values which emphasizes personal loyalty and obligations are realized in a social system based primarily on vertical, rather than horizontal, patterns of interaction. This also precludes the possibilities of much achieved mobility. The hierarchical patterns of relating, means that opportunity and rewards as coordinates of power are controlled and managed by successive positions upward. Hence one is always reliant on others more privileged and powerful for one's own small gains. Planning for dependency is embodied in such larger traditional systems as the compadre arrangement, the political process, or the "hacendero-tenant" relationship.

The configuration of sponsored mobility as it functions in academic institutions has already been mentioned. However, upon closer analysis of what actually occurs within universities, further differentiation is needed in terms of types of sponsorship. It has been stated earlier that entree into scientific third cultures occurs

with advanced education outside the Philippines in more advanced centers of science. This training is usually reserved for promising young undergraduates who are hired by their own alma maters, and sent abroad only after a number of years of teaching. Except for privately-owned, profit-making institutions, advanced work abroad is highly probable by the fact of being hired by a university, as this has traditionally been the primary way new scientific personnel has been added to university faculties.

A closer look at the process of sponsorship is needed, however, in the relationship of Philippine faculty to various centers of power. That is, the average Filipino faculty member has only limited access to other institutions abroad. While it is the faculty member who spots and recruits the best students in a department as future staff, these same faculty members do not determine where or when a young instructor should be trained. These kind of decisions are only minimally controlled at the department level. In most cases, the decision to send someone abroad is made at the higher administrative levels of the university. Therefore, a faculty member can only do his best to influence the proper authority regarding sending particular young instructors abroad. Depending on the type of university, these authorities may be Americans or well-placed Filipinos. In any case, given this system, direct sponsorship of a Filipino abroad by another Filipino is indeed rare. What occurs instead is that particular faculty members are noted for "encouraging" students to continue in a certain field. However, it is the institution itself, a government agency or foundation that provides the actual support for the person abroad. It is the person representing the supporting university,

agency or foundation that then incurs the obligation and loyalty of the person being sent. To the extent that the institutional representative is a Filipino or a long-staying and well-established foreigner, the greater is the personal obligation and loyalty generated. This is an additional reason why many Filipino academicans remain for a lifetime in the same university. Such obligations and personal loyalty are more binding in many instances than are formal contracts.[7]

To summarize, the average Filipino faculty member is locked into an institutional system where power and privilege are reinforced by interpersonal norms of obligation and loyalty. Because few faculty have direct access to institutions abroad, they have to proceed through persons of power who do have such ties in order to act on a student's behalf. The subtle nuances of reciprocity and obligation work both up and down a hierarchy, and the institutional support for a talented young instructor's education abroad is only one of many ways that people in power reinforce their positions by using their office to insure support in the future from individuals favored in the present.

Hence, in addition to Turner's original idea of sponsorship there also exist varieties based on access to or control of power. Turner bases his analysis on the assumption that both selectors and those to be selected belong to the same larger system or society. His model is

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[7]Of course the sample represents only those scientists who initially return to the Philippines rather than stay abroad. The data reveal nothing about those Filipinos who did not return. It would be interesting to know the extent to which shifts in power structures in Philippine society and universities, issues such as "filipination," or finding their own financial support or other factors play a part in Filipinos deciding to stay abroad and not return.

inappropriate, then, in situations where participants are from different cultures or societies, as in the case of the Philippine scientific community.

One who has direct access to a system or reward can "sponsor" another to partake of it. However, in situations where one does not have direct access to desired ends, one acts as a mediator between the candidate seeking education, for example, and the administrator who can arrange it. Administrators in some universities keep their eyes open for talent and do their own recruiting, particularly in their own fields. This is direct sponsorship, and includes individuals who have power to deal with foreign institutions directly. In other instances, faculty members encourage and prepare young instructors for going abroad, but the institution sponsors their education through the university's own connections to other universities abroad or by other ties they might have to foreign governmental agencies, foundations and so on. In still other cases, faculty desiring education abroad apply on their own for extra-institutional programs such as to the Agricultural Development Council, Colombo plan, the Fulbright program, or Asia Foundation scholarships. Many also apply directly to universities in the States for assistantships and then apply for travel money from their local university or some foundation.

Hence the data show various means by which respondents have been assisted in obtaining their education. They are: 1) direct sponsorship 2) mediated sponsorship; i.e., interest in a field being "encouraged" and helped by a faculty member or profession 3) institutional assistance 4) direct application for general fellowships or assistantships either in the Philippines or to universities abroad.

Table 7 shows the distribution of the sample by type of university in regard to direct and mediated sponsorship.

TABLE 7: Type of University and Forms of Sponsorship Abroad for Philippine Scientists

Type of University		Sponsorship: Direct: Yes: No.	Yes: Percent	No: No.	No: Percent	Not* Applicable: No.	Not* Applicable: Percent	Mediated: Yes: No.	Yes: Percent	No: No.	No: Percent	Not* Applicable: No.	Not* Applicable: Percent
Regional	30	1	3	22	73	7	23	9	30	8	27	13	43
Cosmopolitan	14	0	0	12	86	2	14	5	36	1	7	8	57
Primate U.P.D.	25	2	8	21	84	2	8	10	40	11	44	4	16
Primate U.P.C.A.	31	11	35	16	52	4	13	11	35	7	73	13	42
Total	100	14		71		15		35		27		38	

*Not applicable includes respondents who have not been abroad or for whom no information is available.

Looking at direct sponsorship of respondents abroad, it is clear that this occurs more often in the State college of agriculture (U.P.C.A.) than anywhere else. Eleven of thirty-one respondents or 35 percent were directly sponsored abroad. This trend is in keeping with the history and tradition of inter-institutional linkages of the college to institutions abroad. Of the State university respondents (U.P.D.) only 8 percent went abroad under direct sponsorship. No one went this way from the cosmopolitan universities, and only one respondent from regional universities was directly sponsored abroad.

Turning to patterns of mediated sponsorship, one finds that about

35 percent of all scientists in the study had some professor or teacher who had personal concern for them and encouraged their interest in science. For the other two-thirds of the sample, mediated sponsorship was either not applicable (38 percent) or had not been the experience of some respondents (27 percent).

By type of university, the State university (U.P.D.) had the highest proportion of its sample scientists (40 percent) who experienced some form of mediated sponsorship. Over one-third of the sample in cosmopolitan universities (36 percent) and in the State college of agriculture (U.P.C.A.) (35 percent) also acknowledge such an occurrence. Such was the case for 30 percent of scientists from regional universities as well.

The sources of support by which scientists went abroad for their advanced education ranges from: 1) Philippine university or government support; 2) American foundations or government grants; 3) Asian or international organizations; 4) assistantships or fellowships won by individual scientists; 5) grants from religious orders, or families; 6) combinations of the above. For twenty respondents there was no information or the question was irrelevant to them. Table 8 shows the means of support for education abroad of scientists by type of university and supporting organization.

TABLE 8: Sources of Support for the Advanced Education of Scientists by Supporting Organization and Type of University

Type of Organization	Type of University							
	Regional		Cosmopolitan		U.P.D.		U.P.C.A.	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Philippine University[8]	5	17	2	14	7	28	11	39
Philippine Government	2	7	0	--	0	--	1	3
American Foundations	0	--	1	7	3	12	3	10
American Government	1	3	2	14	5	20	5	16
Asian Organization	2	7	0	--	0	--	0	--
International Organization	0	0	0	--	0	--	2	6
Assistantship	1	3	1	7	0	--	4	13
Fellowship	3	10	2	14	1	4	0	--
Religious Order	3	10	1	7	0	--	0	--
Family Support	0	0	1	7	0	--	0	--
Combination of Above	3	10	2	14	4	16	2	6
Total	20	67	12	84	20	80	28	90
Not Applicable	10	33	2	14	5	20	3	10
Grand Total	30	100	14	100	25	100	31	100

The distribution of support by organization for the advanced education of scientists abroad supports the generalizations made in the last section regarding institutional third cultures. That is, Philippine universities in general, and the State university complex

[8]University support may involve grants given by outside agencies, universities, or foundations as part of faculty development programs, or training grants. However, since the university controls the dispersal of the grants, it is considered part of the funding resources of the university.

in particular, are the main sources of support by which scientists receive financial assistance in the pursuit of advanced education abroad. This is the case for 5 scientists from regional universities, 2 from cosmopolitan institutions, 7 from the State university and 11 from the State college of agriculture. However, other institutions also play an important part in providing resources for advanced education abroad.

By type of university, in regional institutions other than support from one's own institution, support came from fellowships (10 percent), religious orders (10 percent), the Philippine government (7 percent) or an Asian organization (7 percent). For a third of the respondents (33 percent), the question of support was not relevant.

In cosmopolitan universities the main sources of support are universities (14 percent), American government (14 percent), fellowships (14 percent) and some combination of support which is usually a travel grant from the university or Philippine organization to supplement a fellowship being offered by a foreign university. Only 14 percent of the scientists from cosmopolitan universities had not been abroad or had not had any external means of support for their advanced education.

Respondents from the primary campus of the State university complex receive support from their own university (28 percent), from the American government (20 percent), from American foundations (12 percent), from fellowships (only 4 percent), or some combination of sources (16 percent). Of the twenty-five respondents from this institution, 20 of them (80 percent) have been abroad under some kind of support, 5 respondents have not.

The proportion of respondents receiving some kind of support for their advanced education abroad is even higher in the primate State college of agriculture. In that institution 28 of 31 respondents (93 percent) have had some kind of financial support for their education abroad. This was not the case for only three respondents. The sources of support came primarily from the college itself (39 percent), from the American government (16 percent), from assistantships (13 percent) and American foundations (10 percent).

In regional universities, the lack of inter-institutional linkages with foreign universities, agencies, and governments; financial problems, and curricular emphases on non-science areas all contribute to proportionately fewer scientists gaining support and going abroad from these universities. One-third (33 percent) of the scientists from regional universities have had no support for their education abroad, or have never been abroad for their education. Not only do proportionately more regional scientists receive their advanced education in the Philippines, they are more likely, if they do go abroad, to go to a South Asian or Southeast Asian institution rather than to America or Europe. (This will be considered in more detail in the next chapter.)

1. Summary

The data presented in this section suggest that beyond certain levels, science is not a self-generating institution in the Philippines, excluding the medically-related disciplines. Except for a few fields where graduate programs exist, most advanced education particularly on the doctoral level in the sciences has to be obtained outside the Philippines. Until very recently, the majority of Filipinos went to

the States for this education, a pattern having many implications for third cultural links between the two countries, and for the affairs of science within the Philippines. Not only is the Philippine government attempting to adapt science to aid in the development and modernization of the country, there is the added problem of utilizing and retaining Filipino scientists in the country. This involves blending the realities of the local scientific environment with the more or less ideal circumstances (referring to equipment, facilities and research time) under which Filipinos were educated abroad. In many ways, Philippine scientists are a new but largely non-political elite for whom there exists little precedence regarding integration into and utilization by the larger social structure.

Chapter III will consider in more detail the types of third cultural involvement that some scientists develop. Not all Philippine scientists create or participate in international scientific networks. They, too, shall be considered. Both patterns however, can be viewed as essentially adaptive mechanisms by which scientists attempt to fashion a reasonably satisfactory scientific life for themselves. Education abroad is not universally alienating. It may be for some individuals. However, the response of such individuals to the social scene may be quite varied. That is, being alienated does not thereby indicate what kind of response a scientist will make to surrounding social conditions. A scientist may be alienated from his science and give up research work, for example, but turn to university or civic affairs, or politics within the country. Or a scientist may be alienated from the country itself which may or may not be due to scientific conditions, and decide to migrate. The variations in response will be taken up in Chapter III.

D. Geographical Location, Institutional Environment and Influence on Scientists Upon Their Return to the Philippines.

The purpose of this and the following two sections will be to consider how university structure and milieu mediate and direct the style of scientific life fashioned by different scientists. In this section the focus of scientific endeavor will be considered by type of university; i.e., regional, cosmopolitan, and primate university complex. In terms of scientific focus, or the main direction of a scientist's work, there appears to be two main directions: one is a primarily Philippine focus, the other is an international one. In addition, there are a number of scientists who for various reasons, have never been or have ceased being active researchers.

1. Vignette of Returning Philippine Scientists

For any traveller, the anxiety and trepidation of leave-taking is perhaps matched only by the anticipation and joy of return. The excitement of seeing family and friends again is mixed with concern over changes--in them, in the job, in the local community. The returning Philippine scientist is little different. However, one of the unanticipated consequences for many of them is the fact that they have changed much more than the surrounding environment to which they are returning. University, classroom, the tempo of life appear untouched or only minimally different. They return full of plans for "doing something for my country," or "making a real contribution to my discipline," only to find that such enthusiasm is not generally welcomed by university administrators, department chairmen, or even former

colleagues. As one respondent put it, "We all return expecting a brass band to greet us, and instead nobody cares."

Some of the problems encountered by returning Philippine scientists, for example, are that one's academic achievement abroad is not usually met with much university recognition or even promotion. Numerous respondents mention this, that their colleagues who remained behind have been promoted, while they themselves re-enter the university at the same level or are only minimally advanced beyond the level they had when they left. The classes are the same, as are the teaching assignments. There appears to be little structural flexibility for making possible the introduction of new knowledge, techniques, or procedures. There are added frustrations caused by the lack of equipment, facilities and research funds. Salaries are poor and demand "deficit living" in terms of remaining in the university while raising a family.

The university that often chose the person to go abroad and assigned the field of study in terms of strengths and weaknesses of the university faculty, seldom appears to give much thought to how to utilize trained faculty when they return. The status gained by having an additional Ph.D. on the staff often seems to be the extent of the university's concern for sending people abroad. As one scientist put it, "They would suck me dry if I'd let them. The administration would have me teach twenty-four hours a day, seven days a week. That's their definition of a good faculty member."

Frequent also are the comments of scientists that "there is no time for research, for reading, for my own work." Administrators are seen as having little understanding of certain fields, or of the

proper balance between teaching and other aspects of scientific life.

This is, in very broad outlines, a composite of many of the reactions of the scientists in the study to their universities when they first returned from abroad. It is not meant to be representative of the experiences of all scientists. However, for many of them, it was situations such as these that led them to ask "Why am I here?" and "What am I going to do?" It was within contexts like that described above that scientists then began to fashion some type of scientific life for themselves. For scientists for whom the above vignette is not descriptive, their return and adjustment to even the most "positive" environment necessitates asking the same questions and developing some kind of scientific work situation also. The purpose of the vignette is to highlight in composite form, the variety of problems facing Philippine scientists upon their return to the Philippines. It is the variety of responses and different university settings that will now be considered.

2. University Setting Including Geographical Location in Regard to National Centers of Power

a. Regional Universities

The Philippines, being composed of 7,000 islands spread [in chain-like fashion] over a thousand miles north to south, presents special problems of communication and transportation for people not on the island of Luzon. Especially for universities and scientists, the island locations and distances between them makes quite difficult any easy and sustained contact among scientists not in the same university. Meager salaries and the lack of university travel funds restricts scientists who wish to visit other scientists, attend scientific

meetings or conferences. Air travel is expensive, and while boats are available, they are slow and consume valuable leave time with frequent stops and their leisurely pace.

In the past, the different origins and foci of universities, and the lack of mutual interests bringing them together, contrived to keep academic institutions as self-contained units. This separateness was further influenced by the type of institution it was, based on ownership, and/or its primary source of financing. For example, "diploma mills," are generally considered as having little to offer state or sectarian schools. As mentioned earlier, financial support has been especially powerful in influencing the "academic environment" that an institution develops and tries to maintain. Changes in curricula, or those to meet pressing social conditions are undertaken only after careful consideration by Superiors, funding sponsors, foreign Boards of Directors, party politicians and so on.

In the past as well, geographic isolation has kept the four regional universities in the study removed from the centers of national power, touched relatively little by Philippine events centering in the nation's capital, Manila. With the exception of Mindanao State University, the impact of non-Philippine origins and financial support encouraged the other three universities in the south to be outward looking. Even Mindanao State University is politically isolated from the Center enough so that it is quite difficult for this institution to obtain its full, annual budgetary allotment from the National Government.

For scientists working in regional universities, Manila as the center of power, plays a different role for them. That is, even though

the universities do not have strong ties to the center, individual scientists do, or would like to. In Philippine science, the center is the Greater Manila Area, particularly the State university complex found in Luzon. From the point of view of the regional scientist, Manila appears as the "Mecca" of science, as the source of journals, research funds, recent literature, people to talk to. In effect, it is the place where scientific action is in the country.

Such views were often stated by respondents mentioning the isolation of their institution, of having "to go to Manila in order to talk to people," or to "read journals," or "to catch up on what's going on." These feelings appear heightened by the atmosphere on each campus.

While three of the four regional universities were founded by foreigners, and while they have maintained strong external ties abroad, the academic atmosphere on these regional campuses appear out-of-date in terms of what is happening in American or foreign institutions. Therefore, the returning Filipino is caught in an added dilemma. The reputation of his local university, in part, has been based on the very fact of its being foreign, yet his own experience abroad shows him the local academic scene is indeed behind the times. Hence, the scientist is in a situation where his university is neither tied into Philippine society, nor up-to-date or congruent with events in foreign ones.

Factors such as the slowness of the mail, the difficulty and expense of travel, the lack of regular publication of Philippine journals or the holding of professional meetings, the absence of active professional societies, the scarcity of other similarily trained scientists, all contribute to a frustrating situation for many scientists in regional universities.

b. Cosmopolitan Universities in Relation to National Centers of Power

Cosmopolitan universities were categorized as those institutions located in the Greater Manila Area that are not part of the State university and college system. Four universities fall into this category; two sectarian and two privately-owned, profit-making schools.

1) Cosmopolitan Sectarian Universities

These two universities provide interesting contrasts to one another. One school, University of Santo Tomas, was founded and run by a once-powerful, Spanish priestly Order in the Philippines; the other, Ateneo de Manila, is also run by a Catholic Order but this is largely staffed by American priests and has enjoyed for many years good reputation, power and influence in Manila and among certain classes in particular.

During the recent years, independence from and antipathy toward Spanish priests, the lack of strong third cultural ties abroad, and the shifting clientele of students serviced by the University of Santo Tomas has encouraged it to quietly go its own way, except for the segment of society that comes within its own orbit. Part of a teeming metropolis, yet drawing many of its students from the provinces, this large institution has generally been ignored by, and has had little institutional tie-in to, the present national Philippine centers of power.

Medicine has been the most active part of the school, producing many doctors, and running good hospitals. As stated earlier, however, the central academic legacy of this university has been in the fine arts and humanities, and theology in addition to medicine. Hence

scientific ties have been slow to materialize either within or outside the Philippines. In addition, the continued administrative control by Spanish priests until 1970, served to curb the initiative of those Filipino faculty interested in greater participation in scientific affairs, and limited the role of the university in society. However the university does play an important part in providing educational opportunities to large numbers of the middle and lower middle class.

For four of the five scientists who had been abroad, working in this academic institution puts them only on the edges of the Philippine scientific community. They are isolated from greater participation in the affairs of science in the country for a variety of reasons, for example, because of heavy administrative duties and teaching loads. As one respondent said

> Three-fourths of my time is spent in teaching; one-fourth in other duties like supervision and consultancy. I teach six courses. I want the students to get a proper background, so I teach the courses, there is no one else.

Another scientist stated

> To do research I would have to find someone to teach my courses. . . Since I've been back I haven't written any papers. How can I? There are tests and quizzes for eight courses, besides being department chairman.

Poor research facilities, limited research funds, the general stature of the university are additional problems that limit the participation of these scientists in scientific activities in the country. Regarding research, one respondent averred, "If we could start research (in my field) in the university this would be one way to attract other researchers in the field." Another scientist said simply

> There is no research being done by the staff . . . There is no time for writing papers. We are so short-handed there is no time off to take courses.

The problem as one scientist saw it

> If we can get faculty, that's the problem. We couldn't get anyone to teach (some specialized courses) at our pay scale level . . . . People in other schools are too busy . . . they look down on us because our program is not up to theirs.

A certain inter-institutional competition and antagonism was also noted by scientists at this university. "There are only small numbers at the meetings. The Ph.D.s are tied up at U.P. In our field there is an elite crowd. They bunch together." Faculty of the State university are perceived as controlling the scientific associations and disciplines in the country, and many faculty of the Spanish university are put-off by the constant references of State university faculty to their experiences abroad. In addition, the State university campus is seen as a hot-bed of radicalism and communism in the country. As one informant said, "I wouldn't hire a graduate from the State university. There are too many radicals and communists out there. Their students would only cause trouble as teachers here."

In general, affairs of state and science frequently pass this university by, although there are now efforts being made to alter this recent history. For example, a research center has been established and funded by the university to encourage research among the faculty. New emphasis is being placed on seminars and guest lectures to stimulate interest and to up date the scientific knowledge of the graduate faculty. In addition, a new Rector has been appointed, the first Filipino priest to hold this position in the history of the university.

At the time of the study, the Ateneo de Manila University has a distinguished position in the Philippines. Providing education that

would get its limited number of graduates accepted in schools abroad has given this university high prestige and ties into many of the most powerful families in the Philippines. As a mediating institution for aspiring wealthy Filipinos desiring prestige education abroad, this university has created a reputation of scholarship in the country that presents tremendous advantages for its faculty.

While not directly linked to political parties and government itself, the university faculty is becoming quite active as consultants, seminar leaders, and resource people to large industries in the country, including the nation's sugar planter's association. In addition, several companies are supporting research projects of the university faculty.

The pressure on faculty in this institution is to preserve American academic standards but in a Philippine context. That is, classes are to maximize quality of instruction yet the teaching, committee, administrative and other duties of the faculty are quite demanding. In addition, while a certain emphasis is given to research, the areas of teaching, civic, and community service and service to the university are also highly valued by the administration. Regarding recognition for research one scientist shrugged and said, "Maybe it would count in promotion. It is one of the criteria, but it is not highly ranked. Teaching is emphasized mostly."

In the past, administratively controlled by American priests, the school has remained small, expensive and elite-oriented. "When I was outside, I had the impression it (Ateneo) was designed for the rich. I don't think that object will change, although there are some scholarship students taken in." Such a position offers little problem

as long as a pro-American feeling is pervasive in the general Philippine society. However, recent issues of Filipinization, the growing isolation of the Philippine elite from the great masses of Filipinos and anti-West-pro-Filipino as the new motto of modernity has put this university in a precarious position in terms of its status in the society. Within the university as well there is growing internal stress regarding the role of the priests, particularly Americans, and lay American faculty. One respondent summarized the situation in this way

> I'm in favor of Filipinization. But I'm not in favor of Americans being ousted outright from their positions. If there is a Filipino equally qualified with an American, I think the Filipino should get the chance.

He went on

> I think the lay-religious relationship is cordial. However, I was just invited to a meeting of lay faculty members alone. Not all of them share my opinion. They feel they are second rate to the religious...I think the pressures will increase as it increases in the general society.

What also becomes problematic is financial support for the university from both internal and external sources. This, in turn, will effect the resources available for faculty research.

2) Privately-owned, Profit-making, Cosmopolitan Universities

These two universities, and others like them, are without foreign domination, yet are generally ignored by other academic institutions and sections of the Philippine government, who are interested in socially useful and applicable research. In spite of being Filipino-owned, they are still pejoratively known as "diploma mills." Among the owners of these universities are some of the top-ranking Filipino

families in the country, many of whom have intricate political connections. In spite of this, however, the student bodies of these universities have become part of the center of much of the anti-government and anti-American feeling that is growing in the country. While institutionally not directly involved in larger societal issues, many students and some faculty from these universities are extremely active.

For full-time faculty, their role is defined as full-time teaching, with their salary computed by the course taught, not on a salary basis. The heavy teaching loads, crowded classrooms, multi-shifts, the stress on undergraduate and technical courses, and lack of facilities make research nearly impossible. As one respondent put it

> The atmosphere here at U.E. is not good for research... I do like teaching but the environment here is not so good. Research is writing textbooks....But I have been able to squeeze from the university a reduced load from a 24 unit load to only 9 hours in class.

Success in these institutions is primarily through administrative positions, not scholarly ones.

In the Greater Manila Area, these schools also remain on the peripheries of power. Both scientifically and politically they are not the benefactors of many external grants for scientific work. Not having strong academic ties abroad or within the country gives the faculty, in many cases, unwarranted low self-esteem. Numerous privately-owned, profit-making universities have separate, autonomous, non-profit professional schools, primarily in the medical sciences where the financial and research traditions are somewhat different. Being non-profit, for instance, allows a medical school to obtain tax benefits from the Philippine Government, and financial assistance from external sources.

c. Primate University Complex in Relation to National Centers of Power

Regarding the local cognitive map of Philippine scientists, certainly the State university and college complex located in Central Luzon is now the center of Philippine science. However, for scientists located in different institutions of the state-supported system, the action is neither the same nor equally distributed. Those disciplines or research institutes most closely aligned with government priorities, for example, receive more financial assistance than do other disciplines not as central to government priorities.

There has been a shift in strength within the main university campus from traditional academic departments to various applied research and action-oriented units. This has meant a relative decline in some traditional fields, in particular, some of the biological and physical sciences. Social scientists, if action-oriented and properly allied, can move into the institutes or create their own ties into Philippine government or industry. Even technical fields, such as engineering, are building bridges to industry and government. But many of the faculty that seem to be especially hampered are scientists in the life and physical sciences.

From scientists in the "out" fields in the state academic complex, the same complaints are heard as are heard from scientists in other parts of the nation. That is, there are no funds for research, facilities are inadequate, there is too much teaching and committee work and too little understanding and support from the general administration. A scientist summarized numerous statements we had heard to the same effect when he said

> I would like to do less teaching and more research. I have requested a lighter teaching load, (it's now 12-15 hours a week). When people come back from abroad they have two choices, teaching or research. Most want to do research. They ask for projects. But there are too many students and it is the university's interest to say that it is primarily a "teaching university," and so it relegates research to a minor position. . . . There is no equipment either for fundamental research. Even in teaching you can't teach in the areas of your training. So it goes wasted. Most often you teach general courses which any M.A. could teach.

Regarding the administration and promotion, a respondent had this to say

> Even if the salaries are low, the university could at least promote people. But its promotion is lower in the natural sciences as compared with the humanities and social sciences. The administrators are mostly social scientists, that's why. The Dean . . . is a social scientist for example. That's why the Ph.D.s in the chemistry department left. Especially when the President (of the university) is a politician. Politics always comes in.

The agricultural college has more recently come into its own with independent outside aid and support, and national recognition for the relevant research work it has done. What specifically this means for scientists at this institution will be used as point of contrast in the next section.

d. Summary

This section has attempted to deal briefly with factors influencing scientific life in the Philippines, namely geographical location and the ensuing ties of universities to Philippine centers of power. The next section of this chapter will take up more explicitly the responses of scientists to their university environments.

3. Responses of Scientists to University Environment

In dealing with institutional and environmental factors such as type of university and geographical location as they affect universities, a context has been established within which to view the differential patterning of scientific life. Of particular concern in addition to general patterns, are those relating to scientific third cultures.

For many Filipinos, advanced education outside the Philippines is their introduction to third cultures. However, continued participation and "active status" in scientific third cultures is not guaranteed by education alone. Given the nature of any culture, and in particular scientific third cultures, the very nature of the scientific interests which bring people together necessitates constant effort and exchange on the part of scientists involved. That is, being trained as a scientist does not automatically confer lifelong "membership" in scientific third cultures. Because some third cultures are composed of networks and not of "organizations," there is no membership per se. Rather individual scientists by training, are introduced to a series of potentialities for developing ties and relations with other scientists. But it is not "done for somebody." Each scientist has a series of options to maximize the potentials available and develop extensive and far-reaching networks, or at another extreme, ignore them completely.

There are numerous intervening variables which affect a scientist's participation in third cultures. Two intervening variables have been considered previously; i.e., geographical location and type of university in which scientists work. In addition, field of science,

type of research undertaken, research funding, equipment and facilities all come into play. Nor can such factors as teaching, consulting, administrative duties and other demands on scientists be ignored.

a. Type of Response to Scientific Context of Universities by Focus of Scientific Work

In the beginning of this section it was mentioned that there appears to be two main directions that scientific life takes in the Philippines: one, is a primarily Philippine focus, the other is an international one. For still other individuals, the conditions facing them are such that they never do become active research scientists, or cease being so. This could be considered a third trend among Philippine scientists.

By "active research scientists" one is referring to individuals who continue to read the literature and attempt to keep up with events in their field, who attempt to do some research if only a modest undertaking, who continue to write and publish, and who seek out others to talk to about science whether in their own university, region or country.

An "active scientist" is one who still considers science to be among his primary concerns and one who acts in terms of this concern. By this definition, a scientist in the remotest university, lacking much of what he needs to be fully productive, can nonetheless still be considered active.

A Philippine focus would refer to those scientists who turn their scientific concerns and energies inward to the local community, region, or nation. These scientists respond to their environment by trying to synthesize science with local, regional or national concerns.

Other scientists react to their situations by looking outside the country in terms of ties, support and shared interests. That is, for a number of scientists in the sample, the fact of being a one-of-a-kind scientist with little or no intellectual support in the Philippines, encourages rather than hinders their scientific activity abroad. They usually develop an international focus in their work.

These are the three general trends. Within each there are additional variations. For example, in the category of non-active scientists there are those who have never been active scientists; those who have ceased to be so. In addition, there are a number of scientists who are in the process of reprofessionalizing after absence from their fields for a variety of reasons, such as family matters or shifting scientific interests. Still others have the potential for being active scientists but are lacking, at present, additional education, experience, and/or time and opportunity.

Variations among scientists with a Philippine focus in their work are those having a local scientific network only, local and regional civic networks, and national scientific networks. A local scientific network refers to scientific activity confined within a single university setting, with primary intellectual support and stimulation being derived from other members of the faculty. The main focus of research that this type of scientist does, deals with the specific discipline of each scientist as applied or related to specific problems or conditions of the area.

Local or regional civic networks are forged by some respondents to industries, large agriculturists, professional or civic community groups, or regional government programs, all located within the

community or region. In some cases, being educated, having a position in a university, having useful skills and talents, give a number of scientists a visibility in the local area that they would not have otherwise. These kinds of networks are also established by scientists whose research is directly applicable or relevant to certain business concerns, farmers or agriculturists, or regional industries.

A national network refers to ties that include both local university and region and extends to areas in the rest of the country as well. These ties might include civic as well as scientific links. The point is that scientists with these kinds of ties usually are also active in the national scientific community in the sense of knowing other scientists in different parts of the country, attending conferences and meetings whenever possible, and having some role in the professional society (if there is one). This would be a person who would know others and be known by them professionally.

Among the varieties of international networks that develop are: international ties only; a combination of national and international ties, and local focus combined with international networks. International ties are those established by scientists whose main reference group, source of intellectual support, stimulation, and dialogue, and audience, exists outside the Philippines. Such individuals look outside for journals in which to publish their articles; there is little or no scope for the utilization of their knowledge in the Philippines; there are few other Filipino scientists who either understand or share any enthusiasm for their work. In some cases, their scientific speciality is entirely unrelated to the Philippines; i.e., it could be pursued anywhere in the world. For example, these

scientists say:

> My work is entirely unrelated to any particular group within the country or even to the Philippine itself... I am in constant contact by letters with a few institutions. I also get all the publications of these institutions, for example, I get all the preprints from Germany...Communication abroad is no problem....I am the only person in my line in the Philippines. There is no one to talk to here.
>
> For research talk most of it is outside the Philippines ...it takes a particular orientation to be in similar communication...I am the only one in my speciality in the Philippines...There aren't others in my line in the country. There isn't much communication among the trained (people in my field) in the country...Everyone is too busy and overextended...
>
> I am a paper and pencil man. I don't need elaborate funding in order to work. All I need are (foreign) journals...There is a long gap between the work I do and its eventual use by anybody...There is no one else in my specialization in the country. So there is no one to discuss my area with....

In other cases, the central interest of work is found only in the Philippines and as such makes a contribution to world scientific knowledge, as species or conditions are found nowhere else.

> My research is basic to any work in my field. You must first know what you have before you can begin work to control it....There are so many varieties we don't even know about, let alone study....No study has yet been done on this particular variety...I was invited to give a paper in Puerto Rico on the state of my field in the Philippines.

National and international networks, refers to scientists who are involved both in the Philippines and in the larger world community of science. These are scientists who have fashioned scientific lives that involve them in civic and professional networks in the Philippines, and in international networks as well. They are equally at ease in international conferences with other scientists as they are with Filipino farmers. The focus of their scientific work

is often on Philippine plants, animals or local phenomona. But the nature of their work has relevance to scientific knowledge of the larger world-wide science aggregate.

A distinctive pattern combines a local network with international ties. Scientists garner stimulation and support from others in their local university community, but are isolated or have no larger national reference group of scientists with which to work, share, or contribute. There is no supporting national discipline or professional association, or even trained others. This occurs particularly in very specialized areas of science, which are too new or too esoteric to be anything more than importations of science from abroad, without opportunity of becoming established in the Philippines as yet.

> No one in the Philippines is interested....There is no Philippine journal in my field so I have to rely exclusively on foreign journals as an outlet for my research...There would be no one in the Philippines to send my study results to...The professional societies in engineering do not cover scientific topics in their meetings so I could not report to any of these meetings.

1) Scientific Focus in Regional Universities

In Table 9 the data are summarized for the types of scientific focus found among the scientists interviewed from regional universities.

TABLE 9: Type of Scientific Focus by Respondents in Regional Universities

Type of Focus	Respondents in Regional Universities: Number of Cases	Percent
1. Non-active scientists	Total = 8	27
a. Never been active	1	
b. Ceased to be active	2	
c. Reprofessionalizing	2	
d. Potential as yet undetermined	3	
2. Philippine Focus	Total = 15	50
a. Local scientific network	6	
b. Local regional civic networks	4	
c. National scientific networks	5	
3. International Focus	Total = 7	23
a. International network only	2	
b. International and national network	3	
c. Local and international networks	2	
Grand Total	30	100

Of the 30 respondents in the study from the four regional universities one-half of them (15) have primarily a Philippines focus to their work. Over one-fourth respondents (8) have the status of being non-active at the time, and nearly another fourth (7) have an international orientation to their work.

The eight persons categorized as being non-active could conceivably re-activate their scientific work if they so chose. For two in particular, becoming active again would involve returning abroad in order to re-tool, and catch up on new techniques and new knowledge in their respective fields. The two who are now reprofessionalizing have the training they need to remain active--that is, theirs are

more technical fields, more in line with the interests of their university, and hence privy to the literature, facilities and equipment already available. Three scientists with potential need further training in order to have the skills to actively pursue their scientific fields. Two of them are in disciplines where advanced education is necessary in order to be on a par with scientists and scientific knowledge elsewhere. The one scientist who is noted as never being active suffers from insufficient education, even though she has been abroad for part of her advanced education. Her discipline depends, however, on further education in order to participate fully in it. In addition, this person's ethnicity excludes her from access to government scholarships, research support, membership in national professional societies, or opportunity to take the Government Board examinations for professional qualification and licensing in her field. Such restrictions make it doubly hard for her to develop or carry out a productive scientific career.

Turning to scientists with a predominantly Philippine focus in their scientific work, it is not surprising that this is the case for half of the scientists sampled from regional universities. The main point is that they do have other persons to talk to regarding some if not all aspects of their work. While isolated from Manila, and from much of the larger scientific world in terms of attending conferences, or having personal contacts with other scientists outside the realm of their university, they do receive or have access to some Philippine journals as well as foreign scientific journals. These journals are used to supplement their knowledge and research. Their research deals

with the hydrology of local rivers, marketing costs for neighboring farmers, nutrients of local grasses, soil analyses, local folklore and culture and so on. This type of research may eventually lead to national or even international scientific reputations for some scientists. This, however, is not the object of the work for most of these scientists. Basically, top priority is given to work that concerns the solution of local problems or is of local interest. Possible wider relevance of their work, while not ignored is simply not primary.

The two cases with international networks only, represent scientists whose particular fields, while otherwise non-existent in the Philippines except for their own endeavors, put them dead center in a world-wide network of similarity-trained scientists. That is, if anyone wants to know anything about the content of these two fields, with regard to the Philippines, they must contact these men.

In addition, the scientific work these two do makes continually new contributions to their respective fields. The type of work they do does not require advanced education. It is rather of a basic taxonomic nature. (To say that advanced education is not necessary is not to imply that these fields are any less scientific. Quite the contrary in fact. Each of these two individuals have been largely self-taught, however, and have spent their lives working intensively in their specialities). Both these men are actively involved in social causes related to their scientific interests as well, but neither has supporting scientific groups in the country. Under these conditions, extreme isolation geographically and intellectually has little effect on these two scientists. Even advanced education abroad is not

necessary for them as an introduction to third cultures; i.e., the unique nature of their fields and their own passionate concern for their work have led them to create their own networks, and to positions of world standing and prestige.

Scientists in the regional universities with both national and international networks are individuals who: (1) have other similarly trained scientists with whom to associate in the Philippines, with supporting professional societies, and journals; or (2) work in areas of science that have useful applied aspects that tie in with Philippine government or industrial priorities and goals. Factors like these account in part for their national networks.

In addition, the type of research and scientific work in which they engage fits in with and contributes to international science as well as to Philippine scientific and societal interests. For example, the work in rickettsial diseases is relevant to both Philippine and international scientific concerns. Much of the other scientific research being done is of the same type.

Two of the sample have distinctive patterns of communication and linkages that are not shared by others in the area. The nature of the university administrative assignment given one individual results in the majority of his time and ties on the local level being primarily academic, but non-scientific. However, he remains actively interested in science, reads the journals, corresponds with other scientists in his field abroad, and considers as an important reference group a small number of professionals in his field in Manila. Ideally, this person would like to be remembered for his teaching and scientific work, not for his administrative achievements.

The other scientist while working on research of national significance, has few other similarily educated scientists with whom to associate in the Philippines. Therefore the bulk of his scientific life is devoted to research, to his university in teaching and working to develope his own department, and to a few connections outside the Philippines that give him exchange, support and stimulation.

2) Scientific Focus in Cosmopolitan Universities

The fourteen scientists sampled from cosmopolitan universities show the following patterns of responses to their university settings, as summarized in the table below.

TABLE 10: Type of Scientific Focus by Respondents in Cosmopolitan Universities

	Type of Focus	Respondents in Cosmopolitan Universities: Number of Cases	Percent
1.	Non-active scientists	Total = 4	28
a.	Never been active	1	
b.	Ceased to be active	3	
c.	Reprofessionalizing	0	
d.	Potential undetermined	0	
2.	Philippine Focus	Total = 5	36
a.	Local scientific network	5	
b.	Local regional non-scientific networks	0	
c.	National scientific networks	0	
3.	International Focus	Total = 5	36
a.	International focus only	1	
b.	International and national network	2	
c.	Local and international networks	2	
	Grand Total	14	100

In the category of non-active scientists, the one respondent classified as "never been active" is an unusual case representing someone who has almost completely occupationalized his profession. That is, he has never used his science as a way to meet or associate with other similarly educated people either in the Philippines or abroad. Neither has he attempted to use his skills in industry of government through consulting, lecturing, or advising. He has received his entire education in the Philippines, including his doctorate. He subscribes to no journals and reads only those available in the library. He attends no scientific meetings, belongs to no professional societies either in the Philippines or abroad. Instead he has built his life around his classes and his office-cum-laboratory. He regularly and systematically teaches and works in his own area of interest but as something for which he receives a salary and is his duty, not as something in which he is deeply involved.

The other three cases noted as not being active at present are women. Two of them have good chances of re-activating their scientific interests and concerns. One woman has recently finished her doctoral work and is now involved in family matters. The other has been hampered in her research and work by an argument regarding certain research facilities. While trying to arrange to do some collaborative work with other scientists abroad, this person is holding off leaving the Philippines out of loyalty to the university (especially to the previous Rector), and because of family responsibilities. The desire for an active scientific life is very strong in both these cases.

The third respondent noted as not being active at the moment actually fits no category easily. This is a person who has worked in

many disparate areas within and outside of the academic world. She has one advanced degree from the States, but has ceased working in that field and is instead slowly moving toward a doctorate in a new discipline. In the meantime she is acting head of her department, is just becoming involved in a cooperative research project, is close to the previous Rector of the university, and in general has the familial, economic and social status that gives her a certain freedom and independence that other faculty members do not have.

The five scientists in the cosmopolitan sample noted as having primarily a Philippine orientation to their work are not totally without contact abroad, but the primary purpose of keeping in touch with their disciplines is to learn how new knowledge can be useful to the Philippines. Their research involves assessing old and developing new ways of teaching a particular course, writing a new plan for the advanced training of graduates in a particular discipline, developing new computer techniques or moving into the area of pollution. One person is not presently engaged in any research directly, but spends large amounts of time coordinating graduate training with government and social service groups. The majority of ties of these scientists from cosmopolitan universities are into non-scientific but civic groups, agencies, industry and/or government. They serve as consultants, do research, give talks, hold seminars in addition to teaching and doing administrative and committee work in their respective universities. Most of these scientists are also involved and concerned with helping to get their respective disciplines well established in the Philippines. To this end they are active in local professional societies.

Turning to those of the cosmopolitan universities with international ties, three of the five are in the same university. Each however, has his own style or pattern of contacts. One, for example, is a Chinese priest, a one-of-a-kind scientist with no scientific ties back into Philippine society, but with a few priestly ones. For this man, his scientific reference group is a small number of men scattered around the world with whom he corresponds, exchanges preprints and reprints, and in whose journals he publishes. There are not similar opportunities for him in the Philippines. One suspects that the religious order serves as an important mediating cushion in what otherwise would be an extremely isolated life.

Another scientist at this same university is ostensibly much more involved in the affairs of the university, in the local discipline, and industry, and in strong personal and work-related ties to individuals abroad. However, it is this scientist and not the former one that speaks of "intellectual isolation," and problems of having few others with whom to discuss scientific matters.

> ...in the end I wanted to come back to the Philippines....But after being back and getting back in I sometimes wonder if its worth it. I feel so helpless. It is a sacrifice in many ways; first financial and second, in terms of scientific atmosphere. The scientific climate is not the same (here) as in Germany or the States....Even if all the equipment was available it still wouldn't be the same because of the scientific climate. The equipment is only part of it. There is also the need for intellectual stimulation, for people to talk to, everyday; even if they're not doing the same kind of work, but are at least active and interested. More than just a few such people are necessary for such an atmosphere. It is missing entirely here in the Philippines...

The third respondent from this university has non-scientific civic ties and scientific international ones. For her, there are no others in her particular speciality in the country, and few others in the same discipline. Hence, given the nature of her research and work interests, her scientific life has two main dimensions; one into non-scientific but civic segments of Philippine society, where industry, government, organizations and civic associations find her work extremely useful. The other dimension is a scientifically-based network abroad where her work feeds into and is relevant to the general world-wide discipline. Any scientific ties she may have in the Philippines are with other social scientists not members of her own discipline. As she says, "The others in my field are just too overworked. Besides we all have different interests, none of theirs is similar to mine."

Of the two remaining scientists in this category, one also has non-scientific local ties and scientific international linkages. His field is a new one in the Philippines and he feels that it has a bright future. His interests involve, on the local scene, a two-fold challenge of creating interest in his field among various industries and yet, at the same time, producing trained people to meet these demands. In addition, he has become a "living link" between his own university and certain industries in terms of relating university research facilities to industrial problems, and industrial research support back to his university. His international ties are extensive enough so that he does not feel isolated, and has managed to go regularly abroad.

The remaining scientist in this category is a unique person who has both national and international ties which criss-cross and weave in and out of administrative as well as scientific activities. A well-known scientist in the Philippines, and someone with continued research support from abroad, this person is interested in relating industrial research work to theoretical issues in her field. In addition to doing research, being a Dean of a college, and working on a voluntary committee of the national professional society to suggest curricular changes, this individual also writes a column in one of the local newspapers and maintains an extensive correspondence abroad to other scientists.

3) Scientific Focus in the Primate University Complex

In comparing the distribution of cases as represented in the following table, some revealing differences appear between units of the primate university complex.

TABLE 11: Type of Scientific Focus by Respondents in Primate University Complex

Type of Focus	Respondents in Primate University Complex: University (U.P.D.) No. Cases	University (U.P.D.) Percent	University (U.P.C.A.) No. Cases	University (U.P.C.A.) Percent
1. Non-active scientists Total =	3	12	10	32
a. Never been active	0		4	
b. Cease being active	0		0	
c. Reprofessionalizing	0		0	
d. Potential undetermined	3		6	
2. Philippine Focus Total =	4	16	11	36
a. Local scientific			0	
b. Local regional civic networks			4	
c. National scientific networks	0			
d. Local scientific and/networks civic	4		7	
3. International Focus Total =	18	72	10	32
a. International networks	2		0	
b. International and national networks	9		6	
c. Local and international networks	4		3	
d. Local civic and international scientific networks	3		1	
Grand Total	25	100	31	100

Non-active scientists: On the primary university campus of the State complex (U.P.D.), 12 percent of the respondents are non-active at the present time. They are young, recently-returned scientists who are still trying to determine their future course of action. For example, one physical scientist is considering how to become (and since the interview has become) more directly involved in social issues. From his point of view, the university is "too isolated from the rest of society." Another physical scientist has become embroiled in a

departmental struggle and, in addition, is becoming increasingly "nationalized" due to the influence of his students. He has managed to begin some research, supported by industry and government yet is unsure of his scientific future in the country. Whether he remains in the Philippines depends on his evaluation of the possibilities of remaining a viable scientist given Philippine conditions.

The third as yet non-active person is a social scientist just returned from the States to her old unit in the university. Certain family considerations will demand her most immediate attention, and it will be a number of years before her career takes shape.

At the primate State college of agriculture roughly a third (32 percent) of the respondents are non-active at the moment. Among them are four individuals who have never been active and six whose potential is as yet undetermined. Of the four who have never been active, two are in fields peripheral to the primary interests of the college. This is not the case with the other two. However all four people are in basically service courses; that is, two of the sample are working more as technical assistants within a prominent department than as independent scientists. The other two are in departments that are considered ancillary or supporting units to the rest of the college.

The common difficulty of being peripheral in an institution is that of being ignored and continually on the short end in terms of funds, promotions, and recognition. To be peripheral in the college of agriculture is similar to being isolated in a small remote place in the country.

Of the six whose potential is as yet undetermined, four have recently completed their advanced education abroad. It is too soon to

tell what kind of scientific styles they will develop. The other two scientists are at critical points in their careers, one thinking of leaving due to problems created by being a basic scientist in an atmosphere of applied research, and disagreement with departmental and other faculty members over life styles. Such an individual has been typed as living a life of "injured merit," i.e., someone who has worked dutifully and hard in her own area, accomplishing a good deal of research, active in teaching and working with students. In general, she is an active scholar, but unrewarded and unrecognized by the general university community.

The other scientist at a critical point in his career is a talented person assigned to work in an area that has great potential significance for the Philippines, but is as yet unrecognized and thereby unsupported by the university. Not having the funds to remain scientifically active in the area of work assigned to him, this scientist is working in another area of interest while waiting for some word on the future of research funding in his assigned area.

Scientists with a Philippine Focus: Of the 25 scientists interviewed at the Diliman campus, four (16 percent) have primarily a Philippine focus to their work. Two are from technical departments that are moving in the same direction as are the institutes on campus; i.e., deeper involvement with the public sector. The other two with a Philippine focus to their work are men who are at the top in their respective fields. They have held or presently hold top administrative posts in the university. They are respected scholars and teachers. They are widely published and have far-reaching scientific reputations within the Philippines. In addition both have civic ties that find

them consulting for industry and government. For these scientists the future is problematic in a different way then it is for most respondents. That is, how does one move on when you are already at the top of your field? Migration is a possibility for both. However, neither appear to be inclined in that direction. One individual has forged a tie with a major Philippine industry that will provide him with ample research support and opportunity. The other individual contemplates shifting his research interests to a more international focus in the years to come, but can do this without leaving the Philippines.

Eleven scientists (35 percent) from the state college of agriculture (U.P.C.A.) have primarily a Philippine orientation to their work. In general, these eleven scientists are able to gain research support from Philippine industries, serve as consultants to government as well as to industries, to small and large farmers, and move also within a professional milieu within the country. Many of the agricultural sciences have viable and active professional societies which bring scientists together from all over the Philippines for meetings and conferences. There are journals, communication, and in general professional support for one another. In addition, there is an Association of Colleges of Agriculture of the Philippines (ACAP) which brings together eighteen of the better agricultural schools in the country in mutual faculty exchanges, joint research, and meetings. In summary, for many agricultural scientists like these eleven, a full and active scientific life can be developed and maintained without having to turn outside the Philippines.

Scientists with an International Focus: That 18 of the 25 scientists (72 percent) in the sample from the primate university (U.P.D.) have an international scientific focus in their work is in keeping with general conditions and with the status of the university in the country. Not only has it had the most extensive and intensive support and ties abroad, the State university and its faculty continue to be "the" university to visit, and "the people to see" for almost any travelling foreigner passing through the Philippines. This campus of the State-supported complex is readily accessible to visitors, just as the faculty are nearby to attend as consultants or speakers at various conferences and seminars. Having official status as the State school, requests or invitations sent to the Philippine government to attend conferences abroad for example, are passed on to the university. Once on a "circuit" no matter what kind, a person usually tends to stay, and is then continually asked to attend, to represent, to speak for and to be the Philippine "authority" at many different functions. The requests can come from agencies or groups increasingly removed from a person's original field, and he becomes known as a "general expert" rather than as a specialist. Caught in this routine, a few individuals become "science statesmen" abroad. Such activity often not only takes scientists away from more directly related scientific activity, but also involves fewer and fewer Filipinos in some international circuits.

One outcome of this general emphasis on some State university faculty to the exclusion of others is that certain people are over-used, while talented others are ignored or under-utilized. A small in-group of internationally known scientists come to represent the

larger Philippine collectivity, receive most recognition, yet often are over-extended, and over-worked.

Interesting patterns in the types of networks being forged abroad are found in those nine scientists having national as well as international ties. There are three different patterns apparent in their networks. One is that being created by scientists whose work in the Philippines prompts them to turn to non-academic institutions abroad. For example, a particular research problem undertaken by a Filipino scientist was of a type not being done in universities abroad, but was being pursued by industries in Europe. Therefore his ties shifted from scientists in the academic world abroad to scientists in industry also working on similar problems.

The same is the case for a second scientist. A third respondent is involved in a network unrelated to his original discipline but relevant to an administrative position he now holds.

A second trend is represented by three of the nine Filipino scientists who participate internationally in principally administrative networks, but the institutes they represent are also relevant to their own scientific training. Hence they are moving in administrative, yet science-related networks.

The third trend finds three other Filipino respondents having purely international scientific networks that have grown out of their work in the Philippines.

Of the nine scientists, six are actively engaged in helping and supporting their respective disciplines in the Philippines. In addition, all of them have ties into civic areas of the society as consultants, lecturers, advisers to industries, government, civic

groups and associations.

Of the remaining nine scientists having an international focus to their work, seven of them have only select ties into their local professional societies in addition to international scientific networks, or they have no local supporting professional societies at all, as in the case of two respondents. If this is the case, they then have civic ties of some sort similar to those mentioned earlier in terms of consultancies and so on. These scientists have to rely entirely on professional support from outside the Philippines.

Turning to the figures for the state college of agriculture, ten scientists (32 percent) have primarily an international focus to their work. Of the ten respondents, six have both national and international networks which combine professional and civic involvement nationally, and professional involvement internationally.

Examples of this type of scientist are those mentioned earlier who are equally at ease talking with farmers or giving papers at international conferences. Most of these scientists at the college of agriculture are doing work relevant in some way to Philippine problems. However the nature of the work and the scientific disciplines represented by these scientists lend themselves also to contributions to international scientific knowledge generally.

Three scientists at the college are working in areas of science that find support from among other scientists on campus, but have little or no professional support from within the Philippines as a whole. Another scientist in much the same situation has civic ties into the local area besides international networks, but enjoys little professional support from elsewhere in the country.

4) Summary

To review the data discussed in this section, the following table is given:

TABLE 12: Response of Scientists to Scientific Environment by Type of University and by Type of Scientific Focus.

Type of University	Type of Scientific Focus							
	Non-active		Philippine		International		Total	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Regional	8	27	15	50	7	23	30	100
Cosmopolitan	4	28	5	36	5	36	14	100
U.P.D.	3	12	4	16	18	72	25	100
U.P.C.A.	10	32	11	35	10	32	31	100
Total	25	25	35	35	40	40	100	100

Briefly one notes that of the 100 scientists included in the study, twenty-five can be considered as non-active scientists at the moment; thirty-five have primarily a Philippine orientation to their scientific work; and forty enjoy an international focus to their work.

By type of university, one notices that non-active scientists constitute the highest percentage (32) at the primary State college of agriculture. Slightly more than a fourth of those at the Regional and Cosmopolitan universities are not presently active whereas only 12 percent (3 scientists) are not actively engaged in research at the Diliman campus of the State University.

Factors related to the number of non-active scientists at the State college of agriculture are:

a) the nature of their assignment in the university; i.e., either as technicians or in non-supported areas of dominant departments;

b) they came from fields peripheral to the main orientation of the college or university and hence were unsupported and unrecognized; c) they were themselves undecided how to best maximize their scientific skills and training, whether to leave or stay in the Philippines, and if to stay what role to take in the light of present Philippine conditions.

In regional and cosmopolitan universities non-active status appears related to scientists: a) who have not finished with their advanced education and are thereby limited in participating international networks; b) who are over involved in teaching or other duties with insufficient time for research; or c) who do not have equipment, facilities, financial support for certain kinds of research. (For example, agriculturally-related disciplines are by and large better supported throughout the Philippine than any other area of science. Hence scientists in these fields are more likely to receive some kind of research support than are scientists from other disciplines.)

Scientists with primarily a Philippine focus in their work also vary by type of university. Fifty percent from regional universities, slightly more than a third at both the primary State college of agriculture and the cosmopolitan universities, but only one-sixth at the Diliman campus of the State University have a Philippine focus to their research.

The high involvement of scientists in regional universities in Philippine-related research is in keeping with the orientation of the universities with which they are affiliated. That is, among the regional universities, one, Mindanao State University, is primarily concerned with the integration of a cultural minority into the

mainstream of Philippine society. Another (Xavier University), is dedicated to improving the agriculture and general standard of living of the people in its region of the Philippines. The third university (Silliman), is concentrating on extension programs to its surrounding areas, and the fourth, while an urban university (University of San Carlos) is slowly reaching out in the area of urban problems. Disciplines related to the main interests of these universities get much of the funds and resources available for research. In some regional universities this means that the biological sciences are favored; in another agriculture and social science; in a third, social science, primarily; in the fourth, technical fields and social science.

By university type, the main campus of the State University (U.P.D.) has the highest percent of its respondents involved in scientific work with an international focus (72 percent). This is due, in part, to the interplay between type of scientific discipline and patterns of foreign assistance. That is, in colleges, institutes and schools within the university, the availability of foreign research assistance allows individual scientists to pursue a wide variety of research interests, which may be quite unrelated to Philippine problems but which are funded nonetheless. If scientists are reliant on the Philippine government as their primary source of research support, their work must be predominantly applied in nature. Government funds for basic research are quite limited. (Roughly 11 percent of the total funds available for research was allocated in 1966 to the Philippine National Research Council which handles basic research funding in the country.)

With proportionately more foreign assistance going to the State University complex for research and development, it is not surprising that scientists on the main university campus are international in their research focus. Also the other factors mentioned of accessibility to foreign visitors, the greater opportunities to be on international circuits, and to acquire one's advanced education abroad, all serve to foster and sustain an international orientation among scientists in the State University.

E. Chapter Summary

This chapter has delineated types of institutional linkages among Philippine universities and universities abroad, including different types of sponsorship of Filipinos abroad for advanced education. Also considered is the geographical location of universities, their institutional environment and influence on the scientific lives of Philippine scientists.

In response to institutional environments, Philippine scientists have made different kinds of adjustments, and have fashioned different kinds of scientific lives. One trend is the data as shown by 35 scientists who have developed a Philippine focus in their scientific work. Another trend is shown by 40 scientists whose work is primarily international in focus. Twenty-five scientists in the sample were not actively engaged in any scientific research at the time of the study.

The following chapter will consider in more detail, personal social factors of types of scientific third cultural networks that

are being fashioned by Philippine scientists. In addition, the characteristics of scientists with third cultural scientific networks will be compared with scientists who do not have third cultural scientific networks.

CHAPTER III

PERSONAL SOCIAL FACTORS OF THIRD CULTURAL NETWORKS

The previous chapter discussed the various combinations that networks can have for the scientific work of Philippine scientists in terms of a Philippine focus, an international focus or a combination of both. In that chapter the interplay of institutional and social-environmental factors and scientific atmosphere were considered, particularly as they combined to influence the type of response scientists made to different university scientific environments.

The focus of this chapter will be on scientific third cultural networks, their patterning and variety. Networks are the vehicles or nascent forms of social organization by which third cultures develop, are shared and maintained. These networks will be considered from the viewpoint of scientists themselves, and will include: 1) the characteristics of scientific third cultures as they relate to total scientific disciplines or <u>science collectivities</u>, and to the <u>personal networks</u> of scientists themselves; 2) the purpose or functions that networks have for different Philippine scientists; 3) the different modes of participation in scientific third cultures and the different networks that develop, as well as 4) the centrality of third cultural networks to scientific identities of respondents; and 5) a comparison of respondents with and without third cultural scientific networks.

For the modalities that center around different kinds of scientific networks, a number of factors will be considered for each modality. They are: gender of respondents, university affiliation, type of research being done, field of science, highest degree earned, place of education for highest degree, sources of research funding, and average age. Unique cases or those which fit no modality will also be considered.

A. Characteristics of Scientific Third Cultures

1. Science Collectivities and Personal Networks of Scientists

In conceptualizing the patterning of science around the world, a basic distinction needs to be made between the distribution of a science itself; i.e., the collectivity, and the personal network that any particular scientist may have.

The collectivity represents the ecological distribution of a science, where it is located geographically or centered in various countries; which countries send their people to which centers for training; and the general distribution around the world of trained scientists in a particular field. The collective distribution may not form a complete linkage system. For example, science centers in mainland China are not part of a world linkage pattern, but by and large are separate entities going their own way, doing their own research, and training their own people. A language problem further curtails the translation and communication among different scientific communities such as the Russians, the Chinese and the Japanese. However, in speaking of a scientific discipline as it is dispersed around the world, the term science collectivity includes and refers to the world wide patterning of that science.

The personal network of a scientist is not necessarily coterminous with the science collectivity of a certain discipline. In the Philippines, for example, the political restrictions prohibiting contact and communication with Russia and other Iron Curtain countries excludes Russian and other centers of science from the personal networks of Philippine scientists. While Russian centers are part of the larger world collectivity of different scientific disciplines, it is possible for Philippine scientists to know of these centers but not to have ties to them.

A scientific network represents the specific ties and cognitive map of a particular scientific discipline from the perspective and experience of a scientist himself. It may encompass much of the world science collectivity (an extensive network) or it may be limited to only a small part of the total (a nascent network). An intensive network may include 1) high involvement with everyone in a numerically small discipline; i.e., where network and collectivity may overlap, or 2) high involvement with only a few of the total collectivity of a scientific discipline. Such distinctions will be discussed in greater detail later in the chapter.

2. Elements of Scientific Third Cultures

Scientific third cultures are anchored in trans-societal scientific networks as they interwine, change and develop, as active scientists sharing similar interests come together, interact, collaborate in research, exchange articles and preprints, share knowledge, and train one another's students. Networks in general refer to non-institutionalized forms of interaction which are apt to be tenuous,

fluid and individually created. They are different from and more flexible than the forms of interaction found in organizations, formal groups, or other formalized social groupings. The concept network deals with the configuration of the sheer numbers of interacting people involved, and their distribution; much like the "points in a grid" as Barnes (1954) originally defined it. Third Culture conceptualizes the forms of behavior that develop in the process of scientists interacting with one another, and include as well the shared norms and values that also develop to guide and foster interaction among scientists. The term "culture" is considered an appropriate word to summarize the process that is occurring. That is, as in any culture, what guides human behavior, the norms and values and other social forms, are continually changing and taking on new meanings and definitions for the participants as situations change. So, too, this occurs with the process of interaction among scientists joining from countries and societies all over the world in a continuing but flexible, and changing process of creating and sharing scientific knowledge.

Turning to characteristics of scientific third cultures, the following should be noted:

a. What a scientific third culture is perceived as being at any one time depends on the perspective of the scientist involved. That is, where one is, in terms of analyzing a scientific third culture, influences one's view of the network and its primary reference points. For example, the centers of most scientific disciplines exist outside the Philippines. Therefore a scientific third culture from the perspective of a Philippine scientist involves looking beyond the confines of the Philippines.

b. Which countries are perceived as being centers of science, who participates in, and the nature of the ties fashioned within networks are also largely influenced by factors only partially related to science itself. That is, the perceptions of and participation in scientific third cultures are influenced by historical colonial patterns, by neo-colonial conditions and present-day policies of nations. What a network is or may become also depends on the institutional affiliation and geographical location of the scientist himself.

c. Scientific third cultures transcend any one grouping in a nation. That is, being a scientist in one of the centers of science does not automatically mean that one belongs to a scientific third culture. The obverse also applies, that is, one is not automatically excluded from participation in scientific third cultures simply by fact of geographical location outside a center of science. The point is that scientific third cultures are created by individuals irrespective of geographical location. A close corollary to this is the following.

d. Being part of a scientific third culture implies an awareness or consciousness of participants regarding others in the network. This does not mean that everyone a scientist knows in a network, knows each other. It does mean, however, that networks as artifacts do not just happen, rather they are consciously developed and maintained. While it has been pointed out that "introductions" to scientific third cultures may be "inherited" for example, that being educated abroad is an intrinsic part of being hired in certain Philippine universities, active participation in third cultural networks cannot be inherited but must be individually activated.

e. There is not a single "scientific third culture." Rather there are any number of them depending on scientific discipline, the different participants involved in them, the ecological distribution of the collectivity and network members, the type of research being done, or interests bringing them together (for example whether discipline or non-discipline related, administrative rather than scientific) and other variables.

f. Third cultures also are not necessarily perceived by all the participants as positive or "good." As enacted by some scientists third cultures become avenues for neo-colonialism, and are viewed as exploitation by other participants. The values, and artifacts carried by third cultures may also be appraised by one side or another as inimicable or conflicting to certain national values or cultures.

g. In addition, there is not just one type of third culture. That is, there are different patternings of the third cultures that vary with historical and societal circumstances. For example, the colonial third cultural patterns in the Philippines were based on relationships that were inherently superordinate - subordinate in nature. That is, the Americans controlled the major positions in Philippine government, including science, and the subsequent interaction with Philippine scientists was predicated on this power. Filipinos did not have control of science as it existed in the Philippines at that time, as it was the Americans who decided which Filipinos should go for what training, in what fields, at which schools. Americans controlled the careers and opportunities of educated Filipino scientists when they returned to the Philippines. It was primarily American scientific interests and networks that linked the

Philippines with the world of science. Filipinos who developed their own networks, and attained some international reputation based their work and their scientific identities on the American model. Philippine science during the American period was very much an American "import."

As will be discussed in more detail later, with the development of more established and independent Philippine scientific disciplines there is a shift in the patterning of relationships between Americans and Philippine scientists. From patterns of superordinate - subordinate relationships, the patterning becomes based more on equality and reciprocity between and among participants, including scientists from other countries besides America. The shift in the basis of the relationships comes as certain Philippine disciplines begin to be known internationally for making significant contributions to not only Philippine problems, but to general scientific knowledge as well. That this often involves the focusing on Philippine problems, centered on applied rather than basic research, with pay-off to national government delivery systems are only further indications of the independent nature of such scientific disciplines. Independence then involves Philippine scientists choosing their own research problems, gaining their own funds, publishing where they will, and having the freedom to participate or not in networks abroad and on their own terms if they do choose to establish contact with scientists elsewhere in the world. Relationships based on patterns of equality and reciprocity are indicative of the norms of "modern third cultures."

3. Functions of Networks for Philippine Scientists

For Philippine scientists, being part of a scientific third culture enables them in varying degrees, to participate in scientific

affairs outside the Philippines. For some scientists this means receiving science journals only, or simply following the main international literature in the field. Other Philippine scientists rely on scientific third cultural networks to provide them with knowledge, and professional ties abroad including membership in foreign scientific societies, attendance at international scientific meetings, meeting scientists from other countries, exchanging reprints, materials and information. For still other Philippine scientists, third cultural scientific networks provide them with continuous personal contact and support as well as professional ties.

In varying degrees, participation in scientific third cultures offers the "stimulation and support" necessary to maintain the morale of many of the scientists in the sample. Continuous exchange of letters, materials, reprints and preprints provides much of an intellectual dialogue otherwise missing for some scientists within the Philippines. It is often mentioned by Philippine scientists that even with others in their same scientific fields, there is little criticism or exchange of opinion regarding someone's work. "There is one big problem with the technical people in this country, I think, they don't talk to each other often enough or lengthily enough." In addition, it is often noted that Philippine scientists rarely ask one another for reprints of articles, or ask about another's research activity.

> I guess there are about three other people that I can talk to on certain matters, but not anything that really matters to me about problems I'm confronting in my research....On my last article I didn't get any requests for reprints from within the Philippines, but maybe 40 or 50 from outside...

Under these circumstances third cultural contacts are often the only

way that Philippine scientists can obtain a respected appraisal of their work.

Contact abroad often augments the local situation in such a way that numerous scientists mention their willingness to remain in the Philippines so long as they felt they were able to function as scientists and yet "do" something for their country. One way that ties outside the Philippines augments the local situation, is by providing access to equipment and facilities not otherwise available. This allows some kinds of research to continue in the Philippines that would not otherwise be possible.

Supplementary to personal support and communication, scientific third cultures provide for continuing professional ties. In addition, networks involve an intellectual give and take, and a certain reciprocity. Along with all that Philippine scientists receive from networks, they also are publishing their findings, exchanging articles, materials, and opinions, going as visiting professors, and collaborating in research. One of the most important functions of international networks is that it provides the opportunity for Philippine scientists to contribute to world science, an opportunity that is dependent on third cultural participation. Without belonging to some network, it is extremely difficult to publish abroad, to keep up with the field, to receive outside funding, collaborate in research, make one's work known, or otherwise gain international reputation.

Contributions include the specific work of Philippine scientists but can also involve knowledge regarding the influence of Philippine conditions on certain scientific processes or research. As one visiting German professor stated, regarding some joint research being

done between scientists in a German university and Philippine scientists

> I've done this experiment hundreds of times in Germany, If I hadn't done it here myself in the Philippines, I wouldn't believe there could be such variation possible in the experiments. If I hadn't come here I wouldn't have believed it possible.

(The German professor is referring to the differential effects Philippine climatic conditions had on a frequently done experiment in Germany which yielded different results when done in the Philippines.)

Networks bring together scientists sharing similar interests some of whom do collaborative research together in spite of the distances separating them. Ties abroad also allow for close personal ties involving more than the scientific selves of individuals involved. A close friendship made while a student abroad, or developing with a person sharing similar scientific interests are frequently maintained and continued.

The discussion of functions of networks for scientists has mainly focused on what networks themselves provide or make available. However, much of the actual benefit derived from them is influenced by the university setting in which a scientist finds himself. The complementarity of personal scientific networks and institutional linkages abroad constitutes the foreign scientific resource base that a scientist has. Where universities have strong institutional ties abroad, there appears to be less need for highly personal scientific networks abroad in some cases. But more than that, the nature of the personal networks changes, given the institutional setting in which scientists work. Where a scientist is one-of-a-kind, networks can

become a critical lifeline in sustaining a scientific identity.

> There are few people to talk to here in my field. For exchange of information, I have to rely on friends abroad who write, send journals and reprints of articles.

In other instances where the institutional setting is relatively congenial to and supportive of science, personal networks abroad tend to be adjuncts to a full Philippine scientific life. In such instances, networks are not so much lifelines as they are ancillary sources of contact and interaction.

> Our department is composed mostly of young men. The department supports and helps you improve. It is a good work environment and there is ample scope for each person to work....The results of your work and efforts are in rank, promotions, money and reputation. I have been generously rewarded with all of these. There is nothing which I lack....(From) correspondence, journals, reprints you get an idea of what problems are being worked on (abroad).

Different institutions for example, depending on their sponsorship and connections abroad, have access to certain foreign agencies, foundations, and governments which deal in large grants for "institution building." Institution building often defines a "proper" institution in a Western sense, but nonetheless makes available curriculum and faculty development programs, building programs, and technical assistance including library grants, facilities and equipment for research. Institutional linkages often constitute broader contact with the outside world involving numerous Philippine faculty and staff in many and varied ways. That is, rather than being the personal domain of a single individual, institutional links are usually more position-related and less person-dependent, thereby enabling more people to partake of them. In some cases, it does happen that a single individual comes to dominate and control the institutional linkages of his

university as if they were personal networks. Access to foreign resources then becomes an additional source or indication of internal power for such individuals who control institutional linkages.

The limitations of institutional linkages are that they are more subject to national societal conditions than are personal networks. For example, the growing anti-American feeling in the Philippines makes it extremely difficult for universities to accept American aid of any kind. As one scientist remarked, "We were hoping to get a Ford grant, but then all the trouble with the students started, so we've had to drop the idea for the time being." Even though the assistance is of critical importance in augmenting other university resources in keeping certain programs of the university running, the strong feelings of students and some faculty against any American aid, makes this linkage system an extremely sensitive issue on some Philippine campuses.

> ...I think the University was mistaken in turning down the Dow Chemical company contract. There has been another contract turned down...sponsored by the U.S. Air Force....I thought the President (of the University) was pressured by the students to turn it down. I thought it was a mistake because we need the information, too...

Personal scientific networks on the other hand, are less visible and can be maintained in spite of the general tumult in the society.

Personal scientific networks are limited, however, in various ways as well. For example, they are limited to whom you know within a particular field or speciality of science. If one has to change fields, as often happens in the Philippines, it is difficult to establish new networks, or maintain the old ones. As one scientist mentioned:

> I used to write to my professors and some friends about my work. But I stopped when I began working in this other field. I don't know anybody yet in this new area, although I've written to some people.

Another limitation of personal networks is that they can be "owned" by particular individuals. A single scientist well tied in with colleagues abroad, may not extend the benefits of his network to others, nor may others participate in it. In this sense institutional linkages are broader as they tend to involve a whole field or department such as economics, agronomy, engineering rather than single individuals.

In summary, scientific networks have a number of functions for participating Philippine scientists. For some, third cultural scientific networks augment the local scientific environment in which critical facets of science may be lacking. For others, networks abroad are an added dimension to an otherwise full scientific life. Networks for these individuals are often less a necessity than they are an extension of one's scientific world. For still other scientists, third cultural scientific networks are of secondary or minor importance to them, due to a variety of reasons, but which at a minimum brings scientific knowledge into the country to them.

As will be discussed later, among scientists having no third cultural ties, there are a few who consciously eschew scientific third cultures as they are seen as being basically imperialistic and neo-colonial. These scientists think that Philippine science should be more relevant to the pressing social problems of the society. It should be more indigeneous and self-contained, and it should be less dependent on foreign influence and domination.

4. Variations in Participation In Scientific Third Cultures

Not all scientists in the sample are active participants in third cultural networks. Of the one hundred Philippine scientists interviewed, fifty-nine have some kind of third cultural involvement. Forty-one (41) scientists have none.

Scientists with no third-cultural networks at the time of the study are, by and large, those whose scientific activities and identities are contained solely within the Philippines. This includes scientists who have the potential of creating third cultural ties at some later date, but have not done so due to absence from the field, reprofessionalizing inexperience, and newness in science.

Also included in this category of non-third cultural ties are those scientists who only receive knowledge from abroad but who do not reciprocate in kind. This would encompass those who receive foreign journals in order to keep up with events in the field, and who use this knowledge in terms of specific Philippine problems and concerns.

Included also are those few who eschew all foreign contact as being inherently against the best interests of the Philippines. These few might become the core of what may become national disciplines. The scientists themselves are highly nationalistic.

Basic to the difference between Philippine scientists with third culture networks in contrast to those without them is an expanded awareness or broader outlook regarding science and their own scientific identities. For some of those without third cultural ties, science appears to be less an end in itself and more an instrumentality in achieving other ends. For some, science functions as an occupation,

and in this regard obviates what Storer and others postulate as being the norms of science. In general, these are scientists whose scientific focus and identity are bounded by the Philippines itself, and who receive sufficient support and stimulation from within the country to make outside contact unimportant or unnecessary. This is in contrast to scientists with third cultural ties who have a Philippine focus to their work, but who also maintain ties abroad.

In comparing specific characteristics of scientists with or without third cultural networks, Table 13 summarizes the data. Of the 100 respondents in the study, fifty-nine have third cultural networks and forty-one do not.

TABLE 13: Characteristics of Philippine Scientists as Participants or Non-Participants in Scientific Third Cultural Networks.

Characteristic	Scientific Third Cultural Networks: Third Culture No.	Third Culture Percent	Non-Third Culture No.	Non-Third Culture Percent	Total No.	Total Percent
Total	59	59	41	41	100	100
Gender						
Male	46	65	25	35	71	100
Female	13	45	16	55	29	100
Average Age	43	--	37	--		
(Range)	(27-68)		(23-67)			
Highest Degree Earned						
M.A./M.S.	8	31	18	69	26	100
Ph.D.	51	68	23	32	74	100
Place of Education for Highest Degree						
Philippines	7	39	11	61	18	100
Southeast Asia	1	50	1	50	2	100
Australia	1	100	0	--	1	100
India	1	100	0	--	1	100
Europe	5	83	1	17	6	100
United States	44	61	28	39	72	100
Area of Science						
Social Science	18	58	13	42	31	100
Physical Science	12	46	14	54	26	100
Life Science	29	67	14	33	43	100
Type of Research						
Applied	32	60	21	40	53	100
Basic	22	67	11	33	33	100
No Research	5	36	9	64	14	100
University Affiliation						
Regional	13	43	17	57	30	100
Cosmopolitan	8	57	6	43	14	100
Primate U.P.D.	20	80	5	20	25	100
U.P.C.A.	18	58	13	42	31	100

a. Gender: Of the twenty-nine women in the sample, the split is about even between those having third cultural networks and those who do not. The figures are 13 or 45 percent with networks abroad and 16 or 55 percent with no such ties.

Among the sixty-seven males in the sample, the split is roughly two-thirds to one-third. That is, forty-six males or 65 percent have some kind of ties abroad, while 25 or 35 percent do not.

b. Highest Degree Earned:

In the study, twenty-six scientists have master's degrees only, while seventy-four have doctorate degrees. Of those with master's only, roughly one-third; i.e., eight or 32 percent are involved in networks abroad. Two-thirds, 69 percent or eighteen scientists with master's degrees have no such active ties abroad.

Among the seventy-four scientists with Ph.D.s, fifty-one of them or 68 percent are involved in third cultural networks abroad, while twenty-three or 32 percent are not.

While not mandatory, holding a doctorate's degree increases the likelihood of Philippine scientists participating in networks abroad. This is due to the increased scientific qualifications for participating in networks by scientists. That is, advanced education provides the scientific knowledge for one to communicate with others in the same speciality. This depends on the type of scientific speciality in which one is working. In more taxonomic areas, for example, the latest in scientific knowledge is not necessary in order for Philippine scientists to discuss their work with others. In fields such as theoretical physics, or mathematics, however, recent and up-to-date knowledge is necessary in order to maintain contact abroad.

c. Place of Education for Highest Degrees:

Of the forty-one Philippine scientists with no active third cultural ties abroad, eleven were educated in the Philippines, one in Thailand, one in Europe and twenty-eight in the United States. This distribution corresponds to that of scientists with third cultural scientific networks, except for the following:

1) In the total sample there are eighteen scientists who received their advanced education exclusively in the Philippines. Eleven of these eighteen or 61 percent are not involved in scientific networks abroad; seven of eighteen or 39 percent do have some type of ties abroad.

2) Considering the participation in networks abroad, of those educated in the States, forty-four of the total of seventy-two or 61 percent, have scientific ties abroad; twenty-eight or 39 percent do not.

The data show a strong tendency, but not an overwhelming trend, regarding either degree earned or place of education and third cultural participation. That is, roughly one-third of the scientists having only master's degrees are involved in scientific networks abroad; while roughly a third with Ph.D.s do not have ties abroad. In addition, close to 40 percent of those educated in the Philippines are participating in networks abroad, while roughly the same percent of those educated in the States are not actively involved at all. Reasons for such discrepancies point up the importance of ecological factors in the patterning of scientific activity. That is, explanation of the variation in the data involves factors such as type of

discipline to which scientists belong, the relative priority of various disciplines in governmental planning and support; the degree of establishment and institutionalization of the science, including the type and state of delivery system, the location of universities and so on.

d. Area of Science:

While the proportion of life scientists in the total sample is fairly high; i.e., 43 percent, the proportion of life scientists participating in scientific third cultural networks is also high. Of the forty-three life scientists in the sample, twenty-nine or 67 percent are participants in third cultural networks, whereas fourteen or 33 percent are not.

The social sciences are represented in the total sample by thirty-one respondents. Among social scientists, eighteen of them or 58 percent are participants in scientific third cultures. Thirteen scientists or 42 percent are non-participants.

Among the twenty-six physical scientists in the study, twelve of them or 46 percent are participating in some kind of scientific network abroad. However, fourteen or 54 percent are not presently active in such networks.

A factor that helps explain the pattern of participation in the physical sciences is that of obsolescence in scientific knowledge and technique in different fields. The physical sciences are more emphasized and deal more with the forefront of knowledge in developed countries than in developing nations. In the latter, the life sciences are more emphasized and given greater support. What occurs is a rapid expansion and turn-over in knowledge and technique in the physical

sciences in the more advanced countries not matched elsewhere. For physical scientists in the less advanced countries, there is greater probability, therefore, of becoming obsolete sooner unless they can keep right on top of changes and developments in their field of specialization. However, it is harder to keep up with rapid changes in these fields, as compared to others, because the journals are less satisfactory as sources of information and recent developments. Preprints, reprints, correspondence are more valued sources of information. In addition, having access to these sources requires being on a network in order to receive them.

As compared with other scientists, the physical scientist in the Philippines has a more difficult time in staying up with his field, in remaining up to date in terms of knowledge and technique, and in doing the type of research that is of international stature. Given the lack of many local journals in their particular fields of specialization, the physical scientists do not have the alternative of publishing in specialized Philippine journals, as do other scientists. Hence, the added dilemma of having to do research of international worth in order to publish at all. With these problems and the added difficulties involved in shortages of facilities, equipment, and funds, it is not surprising that slightly more than half the physical scientists in the study are not active in international scientific networks.

Many developing countries are more dependent on the West in the physical sciences than in either the agriculturally-related life sciences, or in the social sciences. In the latter two areas, information and knowledge relevant to Philippine conditions often contributes to general scientific knowledge. Given the nature of the disciplines

themselves, this is less often the case in the physical sciences.

e. Type of Research:

In the study, a total of 53 percent of the scientists are doing applied research; i.e., work of immediate use to the Philippines. Of these, thirty-two scientists or 60 percent of them have networks abroad; twenty-one or 40 percent do not.

Thirty-three are doing basic research; twenty-two of them or 67 percent are involved in third cultural ties, eleven of them or 33 percent are not. The eleven scientists doing basic research, but not actively involved in networks abroad, represent somewhat of an anomoly in terms of other trends in the data.

Much of the analysis so far has pointed to the proclivity of scientists doing basic research to look outside the Philippines for scientific dialogue and support. It has also been assumed that scientists doing basic research are more from the physical sciences than from the other major areas of science. An analysis of the interviews of the eleven respondents doing basic research but without contact abroad, shows interesting patterns of variation.

1) Non-Participant Scientists in Third Cultures Doing Basic Research

For one thing, the type of research being done by such scientists which they labelled "basic" research, is more fundamental or theoretical in nature rather than basic in the "pure" science sense. That is, the work is "basic" to the development of knowledge in respective disciplines in the Philippines, but often involves work that is tangential or fringe to the interests of the larger international science collectivity. Such knowledge may indirectly be of international

scientific value eventually, but is not part of the international "hot spots" or major areas of interest. Examples of such work are those dealing with parameters of oysters, varieties of phytoplankton in a Philippine bay, the ecology of a particular variety of tree borer, and the hydrology of Philippine rivers.

There are other research problems being done which may have greater direct impact in international circles than those projects mentioned above. These projects involve work in graph theory, toxins of certain Philippine fungi, basic research in amines, and in hydrocarbons from cocoanut oil.

However, inherent in both types of research mentioned, is the fact that none of these projects are highly controversial in their respective disciplines, nor are the researchers in danger of being "scooped" or preempted by work done elsewhere in the world. Hence, there is not the pressure of priortiy problems nor, as an extension of this, a reliance on immediate knowledge or up-to-the-minute information on the status of work being done by others in the same problem area.

In addition, most of these eleven scientists are, on the average, five years younger than other scientists with no third cultural networks. It is interesting to speculate whether or not these scientists represent new patterns in Philippine science; i.e., a movement toward the development of indigenous Philippine science, with research problems, education and other accoutrements of science being Philippine-oriented and contained.

The factor of age also indicates that it is too early to tell what the future will be like for many of these scientists. At 32 years on the average, many of them have just returned from abroad and their

scientific careers have not been long enough as yet to have earned them much scientific recognition of any kind.

By field of science, of the eleven scientists doing basic research but without ties abroad, four of them are from the physical sciences; six are from the life sciences and one is from the social sciences. In regard to education; four have master's degrees and seven have Ph.D.s. Three of the master's degree holders are affiliated with regional universities; four scientists are from the primate college of agriculture (U.P.C.A.), three are affiliated with the primate university (U.P.D.), and one is from a cosmopolitan university.

Many of these scientists appear to have high potential for scientific involvement abroad if they so choose. However, because most of them come from scientific disciplines that already are or are becoming well-established in the Philippines, they have the opportunity of becoming highly nationalistic yet scientific as well. As one respondent said,

> I would refuse any scholarship abroad. I want to finish my degree here. Going abroad removes me from the problems of my society and coopts me into American imperialism. I want no part of it.

His sentiments are shared by a small but growing number of younger scientists who belong to disciplines that are fairly well established in the country. Indicative of an "independence movement" in the sciences from foreign domination is the positions of some of the younger scientists. That is, there is a combination of scientific and political ideals that guides and mutually influences their behavior. The fact that their fields of science are developed enough to offer them a place, advanced education, and, in this sense, a future, makes them

more critical of foreign influences in Philippine science. On the other hand, politically, many of these same scientists are quite radical in their assessment of Philippine society. In this sense they are anti-government, anti-elite and anti-the-existing-political-system. The ironies arise because they are involved in societal issues. They are involved as individuals; but this extends into their work as scientists. They would like to continue to use their scientific skills for the benefit of the country, yet at the same time they are working for independent science as well as a changed Philippine society. (An interesting note on the third culture: Many of the ideas and heroes, both ideologically and politically come from the West, particularly the States. However, the model of a good society and the means to get there derive from Mao. In either case, the Philippine radicals are part of a revolutionary third culture which brings them information, ideas, and models from which they fashion their own radical stance in the Philippines.)

These scientists have the skills and knowledge to direct their work and to contribute to society, and the Philippine society on certain levels is willing to accept, use and support their science. However, the tension arises because the same elements that support science will react negatively or repress, if sufficiently threatened, the political beliefs and activities of these young scientists.

One can compare the situation of these young scientists of the present day, with the situation that faced Philippine scientists before them. Under the Americans, Philippine scientists educated abroad returned to government positions, or to teaching posts in a system where the Americans were on top, and the basic definition of the scientific enterprise was American.

Even after political independence, Philippine science remained largely dependent science, relying on foreign universities for the education of Philippine scientists, accepting the foreign definition of research problems and science model as their own, importing and grafting science as it existed abroad on to the Philippine system with little concern with "goodness of fit."

This is not to say that Philippine science did not develop; some disciplines did very well. In fact, it is within these areas that new opportunities now exist for new definitions of these sciences to arise, and for new relationships to be forged abroad. Such relationships will be based on the independence of certain disciplines from foreign domination. The new relationships will be largely equalitarian and reciprocal rather than embodying the superordinate-subordinate pattern existing in colonial situations.

f. University Affiliation:

The distribution of the sample by university type consists of thirty scientists being in regional universities; fourteen affiliated with cosmopolitan universities, twenty-five coming from the primate university (U.P.D.), and thirty-one scientists affiliated with the primate college of agriculture (U.P.C.A.). By and large, most respondents are faculty members with a variety of duties involving teaching, committee work, and consulting. However, a number are primarily in administration as departmental chairmen, (17), Deans, (8), or Directors of various institutes, (9).

By participation in third cultures, the most unequal incidence is found in the Diliman campus of the state-supported complex. Of the twenty-five scientists interviewed, twenty of them or 80 percent have

third cultural ties abroad, while only five or 20 percent are at the present time without such ties. This pattern is much more clear-cut than it is in other universities. In the state-supported college of agriculture (U.P.C.A.), the distribution is more evenly divided. Eighteen scientists of thirty-one or 58 percent have networks abroad, while thirteen scientists or 42 percent are not involved. In regional universities, of the total thirty respondents, thirteen or 43 percent have third cultural ties, while seventeen or 57 percent have no such networks.

Of respondents in cosmopolitan universities eight scientists or 57 percent are participants in third cultural networks. Six scientists in these universities or 43 percent are non-participants in scientific third cultures.

These figures follow what has been described earlier as the institutional environment of different universities. As mentioned, three of the four regional universities in the sample are sectarian institutions with the primary means of institutional support coming from outside the Philippines. The institutional links that do exist are primarily concerned with finances, policy, building programs and only tangentially concerned with science. The fourth regional university while a Philippine state university, shares in common with the others a primary concern with institution building, involving for example, buildings and undergraduate curricula rather than developing disciplines or scientific activity. Under such conditions science per se is of low priority.

In addition, the three regional sectarian universities are isolated by Philippine law from support from the Philippine government,

and until recently, by policy from support from United States government and many agencies as well. The regional State university is hampered by geographical isolation in its relationships with the Philippine government. Hence for scientists affiliated with these universities, it is more difficult to rely on institutional links to maintain contact abroad. Scientists also are not under pressure to publish or perish, to do research or to remain active, hence it is largely through their own effort that ties are established abroad. Given these circumstances, the fact that almost half of the scientists interviewed from these schools have ties abroad, is as much an indication of a commitment to science as anything else.

As mentioned earlier, institutional links not being coterminous with personal networks means that in an otherwise satisfactory scientific environment, outside support and communication is not as important for individual scientists, and as such, is not as sought after. For the college of agriculture, for example, the links abroad are mediated and maintained primarily by administrators of the college. These administrators, once active scientists themselves, have a basic understanding of the scientific process and are quite effective in melding local needs with external foundation or government grants. (The role of the science administrator in developing countries is extremely critical in the development of the scientific community in nations. Individuals have the delicate task of getting support, either national or foreign, for local science; a task which requires balance between government priorities, for example, and personal preferences of scientists involved; compromise between national

priorities and scientific ones, and national desires and foreign programmatic pressures.)

5. Variations in Scientific Networks Abroad

In analyzing the data of scientists with networks abroad, three patterns of involvement become apparent. They involve patterns of extensive, intensive, and nascent involvement in scientific networks outside the Philippines. Such categories are heuristic devices to highlight the variations shown by the data. Quite generally, the distinctions differentiate among broad, relatively diffuse ties; those of a more narrow, or concentrated nature, and those ties extremely sparse, tenuous and fragile in nature. The three categories also refer to the patterning of the interaction among scientists in the same network, and to the larger science collectivity.

a. Extensive Ties

Scientists with extensive third cultural networks are individuals with comprehensive knowledge of their field, of its active center, of the people in it, of the latest problems and issues of interest. They themselves are often well-known, internationally-recognized scientists holding pivotal positions in scientific networks. These are the scientists who are a "must" to be seen by any foreign scientist in the same field travelling through the Philippines. They themselves often do lots of travelling, to attend international science meetings, to teach as exchange professors and so on. These Philippine scientists follow the work in their fields through the international scientific literature, by going to international meetings, by exchanging reprints and preprints with others in the same field. It often appears,

however, that personal contact and communication with scientists from all over the world are their primary sources of information for keeping abreast of events in their fields. They are usually in correspondence with fellow scientists from all over the world, and in this sense their actual ties match fairly closely the distribution of the total science collectivity for that field. Such ties, however, are often focused on work-related problems and do not generally carry over into non-scientific personal dimensions of the self.

As will be pointed out later, scientists with extensive third cultural networks often are deeply involved in problems and research related specifically to the Philippines. Such commitment frequently results in the formation of scientific identities to which third cultural networks are quite secondary. In such cases, in spite of numerous ties abroad, the basis for who one is as a scientist, is shaped, reinforced and based upon conditions and institutions in the Philippines.

Another interesting variation noted in scientists with extensive third cultural networks refers to those scientists in top priority fields in the Philippines. That is, the agriculturally-related life sciences are among the best developed and most established scientific disciplines in the Philippines. For scientists in these fields, the opportunities for being introduced into third cultures, and for forging networks abroad is much greater than it is for scientists in most of the other disciplines. To a certain extent, the development of an international reputation of a whole field of Philippine agricultural science, carries certain individual scientists in that field to international prominence as well. However, as will be pointed out,

scientists carried to the top by the general development and international recognition of their fields, do not necessarily have strong ties abroad. Nor do they necessarily consider their third cultural scientific networks to be central or primary in the definition of their own scientific identities.

b. Intensive Ties

Intensive ties are usually the result of continual effort on the part of a particular scientist. For many Philippine scientists, intensive ties are of critical importance in keeping "scientifically alive." Not only do these ties pass along the latest information in a field, they also provide meaningful support and stimulation that is otherwise missing in certain disciplines in the Philippines. Contrary to scientists with extensive ties, most scientists with intensive scientific third cultural networks consider them of primary importance in shaping and sustaining their identities as scientists. Such reliance on networks abroad is encouraged by the lack of development or institutionalization of their sciences in the Philippines. This is the case for many of the physical sciences, and for many fields in the life sciences that are peripheral to Philippine national or university priorities.

Intensive networks usually encompass fewer scientists, but in contrast to the casual basis of many of the relationships of scientists with extensive ties, intensive ties are more focused, regular, and sustained and involve other scientists as persons as well as scientists. Other dimensions of the self are known to each other, for example, family affairs, personal problems beyond purely scientific matters. In contrast, extensive ties are usually focused more specifically on

scientific matters only.

Intensive networks often lack a "goodness of fit" with the larger science collectivity of a particular field. Rather, they are more particularistic to the interests and personal efforts of scientists involved in them. Intensive ties often circumvent world centers in a certain field and create a network tangential to the larger science collectivity.

Scientists with intensive third cultural networks are often engaged in collaborative research with scientists outside the Philippines. Regular contact is maintained through correspondence, visits, and, like other scientists, through the exchange of reprints, preprints, and other materials.

Like other scientists, scientists with intensive ties also go to international meetings when they can, keep up with the literature in their field, correspond with other scientists, and publish abroad.

Other types of intensive ties besides collaborative research may involve: 1) joint authorship of articles or textbooks, 2) close professor-student ties that have moved to new levels of cooperative work, 3) individuals sharing the same esoteric research or work interests, or 4) reliance on personal contact primarily because of the nature of the research problem which is not reported in the general literature.

The primary differences between scientists with intensive ties and those with extensive ones are: 1) scientists with extensive ties have broader and more far-reaching contacts, but they are more casual and limited in content to the extent they exclude non-science related matters. Intensive ties on the other hand involve scientists more

deeply with fewer people, and include personal as well as scientific aspects of the self.

2) In contrast to scientists with extensive scientific networks, scientists with intensive ties consider their third cultural scientific networks central to their identities as scientists. Without constant and sustained access to the scientific world outside the Philippines, these scientists either would seriously consider leaving the Philippines, or would cease being active scientists. This is not the case for most scientists with extensive ties. The lack of contact abroad would not seriously hamper their work nor disrupt their identities as scientists.

In two cases, Philippine scientists have a combination of extensive and intensive ties. Such combinations involve an active and wide knowledge of their respective disciplines, but include also more personalized ties with a few others which take the form of a generalized network with a particular few highly significant others.

c. Nascent Ties

Nascent ties refer to scientists who: 1) are beginning to form third cultural ties; 2) are not very active, but who have modest connections abroad which serve some supporting function other than just providing knowledge about their field; 3) are at a cross-roads in their careers, either just returned from abroad, just reactivating a scientific interest, still involved in or not finished with their advanced education, or poised at some significant point of decision that will have far-reaching effects on their futures as scientists.

Philippine scientists with nascent ties have published, do read the journals, perhaps even correspond infrequently with a few other

scientists abroad. They may or may not have had the opportunity to attend international meetings; if they have gone it has probably been only once.

Although not as developed as the networks of scientists with extensive ties, scientists with nascent networks are much more similar to the former scientists in the patterning of their networks than they are to scientists with intensive networks. That is, nascent networks are primarily work-related, based on the exchange of articles, reprints and materials, carried on through the journals or casual correspondence and infrequent contact. They are not highly personalized ties.

d. Discipline-Related and Nondiscipline Related Networks

For the majority of scientists having networks abroad, their foreign counterparts who participate in the same networks are also in academia and in the same scientific discipline. However, this is not true for five of the fifty-nine Philippine scientists having networks abroad. Their networks are centered in non-academic areas such as foreign industry, or business. Four of the five Philippine scientists for which this applies have extensive networks abroad. The remaining Philippine scientist with non-academic related ties abroad has intensive ties to a few industrial scientists working on the same problem.

6. Characteristics of Scientists Having Extensive, Intensive, or Nascent Networks Abroad

To compare the salient features of scientists with varying types of involvement in scientific networks abroad, the following table has been prepared. Percentage figures given in the table are for the sample as a whole. However, separate tables will be given to consider first those scientists having third cultural networks.

TABLE 14: Characteristics of Philippine Scientists by Type of Involvement in Scientific Third Culture Networks

Characteristics	Involvement in Third Culture: Extensive		Intensive		Nascent		Total Involved		Total Not Involved		Total in Sample	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Total	22	22	14	14	23	23	59	59	41	41	100	100
1. Gender												
Male	13	18	13	18	20	28	46	65	25	35	71	100
Female	9	31	1	3	3	10	13	45	16	55	29	100
2. University Affiliation												
Regional	3	10	2	7	8	27	13	43	17	57	30	100
Cosmopolitan	2	14	4	29	2	14	8	57	6	43	14	100
U.P.D.	9	36	5	20	6	24	20	80	5	20	25	100
U.P.C.A.	8	26	3	10	7	23	18	58	13	42	31	100
3. (Average Age)	(44)		(39)		(38)				(37)			
(Range)	(33-68)		(33-47)		(28-58)				(23-67)			
4. Highest Degree Earned												
M.A./M.S.	3	12	--	--	5	19	8	31	18	69	26	100
Ph.D.	19	26	14	19	18	24	51	68	23	32	74	100
5. Place of Advanced Degree												
Philippines	5	28	--	--	2	11	7	39	11	61	18	100
Southeast Asia	--	--	--	--	1	50	1	50	1	50	2	100
Australia	--	--	--	--	1	100	1	100	--	--	1	100
India	--	--	--	--	1	100	1	100	--	--	1	100
Europe	1	17	2	33	2	33	5	83	1	17	6	100
United States	16	22	12	17	16	22	44	61	28	39	72	100
6. Field of Science												
Social	7	23	4	13	7	23	18	58	13	42	31	100
Physical	3	12	5	19	4	15	12	46	14	54	26	100
Life	12	28	5	12	12	28	29	68	14	32	43	100
7. Type of Research												
Basic	6	18	8	24	8	24	22	67	11	33	33	100
Applied	14	26	5	9	13	24	32	60	21	40	53	100
No Research at Present	2	14	1	7	2	14	5	36	9	64	14	100

a. Gender

The breakdown by gender of the fifty-nine Philippine scientists participating in some kind of third cultural scientific network abroad is forty-six males and thirteen females. This represents 65 percent of the seventy-one males in the study, and 55 percent of the twenty-nine females.

Of particular interest is the category of extensive networks. For women participating in scientific third cultures, their ties abroad are extensive rather than intensive or nascent. Nine of the thirteen women or 31 percent of women in the sample have extensive networks abroad. This is in comparison to three of them or 10 percent having nascent ties; and only one having an intensive network.

In contrast to the females, thirteen males or 18 percent of those in the total sample have extensive ties abroad. However, all except one scientist having intensive networks are male. This is as much a reflection on the status of women in Western science as it is a phenomenon inherent in the Philippine scientific community. The number of women having extensive ties abroad also reflects the non-bias of the Philippines towards women, which allows them to excel and therefore have far-reaching ties abroad. The Western bias against close friendships or relationships across gender lines makes it extremely difficult for non-Western female scientists to develop intensive networks abroad. In addition, relatively few Western women are in science, or in positions to develop or maintain networks.

b. University Affiliation

1) Primate University Complex

TABLE 15: University Affiliation by Type of Third Culture Network

University Affiliation	Type of Network: Extensive No.	Extensive Percent	Intensive No.	Intensive Percent	Nascent No.	Nascent Percent	Total No.	Total Percent
Regional	3	23	2	15	8	62	13	100
Cosmopolitan	2	25	4	50	2	25	8	100
U.P.D.	9	45	5	25	6	30	20	100
U.P.C.A.	8	44	3	17	7	39	18	100
Total	22	37	14	24	23	39	59	100

From the table it is evident the primary State universities (U.P.D. and U.P.C.A.) have a greater proportion of its scientists in extensive and intensive networks, than do any of the other universities in the sample considering just those participating in third cultural scientific networks. Forty-five percent or nine of the twenty scientists from the State supported university (U.P.D.) have extensive networks abroad. Five scientists or 25 percent of scientists from the State university having third cultural networks are categorized as having intensive ties. Six scientists are categorized as having nascent ties outside the Philippines.

The State college of agriculture, (U.P.C.A.), has a total of eighteen scientists with third cultural networks, and thirteen who have none. Of those with networks, eight (44 percent) have extensive ties, seven (39 percent) have nascent ties and only three (17 percent) scientists have intensive ties.

A number of comments can be made in interpretating the above facts. One, as mentioned before, networks cannot be inherited or created for

someone, rather they are dependent on an individual's own effort. In the case of the college of agriculture, although a greater proportion of its faculty have gone abroad for advanced education than have faculty from other Philippine universities, this does not guarantee third cultural ties for them upon their return to the Philippines. Two, there is not a clear one-to-one correspondence between institutional third cultural linkages to institutions abroad and faculty third cultural ties. One can not assume either that institutional or university third cultural linkages will automatically involve the faculty. However, given the concentrated and well developed third cultural linkages of the college of agriculture to universities, foundations and governments abroad, scientists at the college can utilize the benefits of the institutional linkages abroad (e.g., books, journals, research facilities). These facilities and the generally supportive atmosphere on campus for research encourage the development of extensive or nascent ties; i.e., those focused more on science only, than on the more person-focused intensive ties.

The Diliman campus of the State University also has received large amounts of foreign assistance and support for faculty development programs. However, the particular role of this university as the "national university" with all the present turbulence of anti-Americanism and supra-nationalism, makes sustained or active university third cultural links abroad quite problematic. (Other campuses of the State supported complex are also part of the national university, but their location outside of Manila has made them less subject to student unrest.)

Hence while societal conditions and pressures make institutional links quite delicate for the State university to institutions, schools, and foundations abroad, there are not the same pressures on or difficulties present for the personal networks forged by university scientists to scientists outside the Philippines. Of the total of twenty-five respondents in the study, twenty of them or 80 percent maintain some kind of third cultural tie abroad. The more active participation of these scientists in maintaining contacts outside the Philippines may also be encouraged by the general scholarly atmosphere present on the university campus. As discussed earlier, the shift away from many traditional academic departments as the center of the university to a concentration of activity and funding in semi-autonomous research institutes may be an added pressure on university scientists to look outside the country for scientific help and support. Faculty have the advantage also of being from "the State university" and this prestige and visibility plus the ready accessibility of the university to visitors in the nation's capital may also be factors which encourage the establishment of third cultural networks abroad.

2) Regional Universities

In the regional universities, Table 14 shows a total of 13 scientists out of 30 or 43 percent have some kind of scientific third cultural network outside the Philippines. The smaller Table 15 shows that of the thirteen having third cultural ties, 3 scientists or 23 percent have extensive ties, 2 of them or 15 percent have intensive networks and 8 scientists, or 62 percent have nascent networks overseas. Such figures would be expected given the relationship of regional

universities to international and national funding agencies, foundations and governments. Being sectarian universities in a country that follows the American model of separation of Church and State, or being a State-supported school but isolated geographically from the centers of power, makes some kinds of institutional linkages quite difficult for these universities to develop, and puts added pressure on scientists in these universities to create their own visibility and subsequent networks.

3) Cosmopolitan Universities

Only eight out of fourteen scientists interviewed from the four cosmopolitan universities have scientific networks outside the Philippines at the present time. Four of the eight come from a single university; two each come from two other universities. In one cosmopolitan university none of the scientists interviewed had networks abroad.

What is most interesting to note in Table 15 is that of the eight scientists with networks abroad, four of them or half, have intensive networks outside the country. Except for the State university, this is the largest proportion of scientists in that category. Two scientists have extensive networks abroad, two have nascent ties only.

This distribution further supports the observation made that there is no assured overlap of institutional linkages abroad and personalized networks fashioned by individual scientists. For two cosmopolitan universities, the institution itself has greater and more varied links abroad than do any of its faculty. In these cases, the administrative officials of the universities, most of them priests, become the links

between the local institution and foundations, agencies and other universities abroad. The scientists in these same institutions being Filipino and non-priests, lack the ease of access or entree that the Fathers have to some institutions abroad.

It is also the case that in some instances, policies or actions on the part of university administrators have worked to frustrate the efforts of its faculty members to establish contacts with other scientists outside the Philippines. Thus in one particular case, a respondent returned to a cosmopolitan university with materials for continuing a research project begun abroad, but was so thwarted by administrators, bureaucratic policies, and lack of autonomy that the materials spoiled before they could be used, bringing to a close the scientist's participation in that research project.

On a general level, heavy teaching loads, e.g., 24 units, no time for research, pay cuts for those who teach less in order to do research, committee work and university administrative tasks, all work against the possibility of Filipino scientists creating networks abroad from cosmopolitan universities.

This is not to say that only cosmopolitan universities discourage the attempts of their scientists to do research and establish contacts abroad. Some scientists in almost every university included in the study, including the State university and college of agriculture, have had similar difficulties. What this points to is that institutional links abroad are not coterminous or equally matched with those of individual scientists. To repeat, institutional links bring organizations together linked by roles, as conceptualized by Loomis as "systemic linkage." Networks, on the other hand, refer to non-

institutionalized, and known patterns of interaction that develop that are not part of any bureaucracy, but rely on the shared personal efforts and interests of individuals involved for continuation.

c. Average Age

The average age of scientists in each category of networks finds those with extensive ties to be five years and six years older than scientists with either intensive or nascent ties abroad. Scientists having extensive networks are on the average 44 years old, while those with intensive networks are only 39 years old. Scientists with nascent networks are 38 years old on the average. Scientists not involved in scientific networks are on the average 37 years old.

Age seems to follow other characteristics distinguishing each category of scientists. For example, many of the scientists with extensive ties abroad are some of the most distinguished and well-known Philippine scientists presently active in the country. Being close to middle age matches their own professional careers which are peaking at this point or rapidly approaching it. In this regard, the five years seniority they have over other scientists in the sample may be one factor in distinguishing them from other scientists. Five years represents that much more experience and professional life as active scientists.

However, when one considers the range of ages represented in each type of network, the importance of age is mitigated. That is, the age of scientists having extensive ties abroad ranges from 33 years to 68 years. For scientists with intensive ties the range is 33 to 47 years, and 28 to 58 years for scientists having nascent networks abroad. From age alone one cannot predict the type of

network a scientist might have with scientists elsewhere. (The range for scientists without third cultural ties is an even greater 44 years; i.e., from 23 to 67 years.)

d. Highest Degree Earned to Date

As expected, most scientists with networks outside the Philippines have doctoral degrees. Of the total of fifty-nine scientists having some kind of third cultural network, fifty-one have Ph.D. degrees. In the total sample, seventy-four scientists have doctorate degrees. Those having doctorate's with third cultural ties represents 68 percent of the sample. However, of particular interest are those scientists having master's degrees only who also have networks abroad.

1) Master's Degree Holders

Three scientists having extensive networks, have master's degrees. They are scientists with international reputations, pivotal figures in their networks, and tops in their fields. Along with two other scientists, they will be considered in greater depth in the next section. However, it should be noted that these scientists represent a unique pattern in comparison with the vast majority of other scientists in the sample.

There are five others with nascent networks abroad who also have master's degrees. These are scientists who are just beginning their scientific careers. They form an interesting group, for in many ways they appear to represent new trends in the patterning of Philippine science abroad.

In terms of their internal anchoring, all five of them are working in "hot" fields in the Philippines. That is, they are in veterinary

medicine, and agriculturally-related life sciences which are top priority fields in the planning of the government. Given the priority status of these fields and the resultant opportunities that exist, these five scientists have a good chance of eventually becoming well known in the Philippines and perhaps abroad as well.

In a country such as the Philippines, in scientific disciplines that may not be well established in terms of tradition, numbers, societies, and professional status systems, there is a greater possibility for younger talented scientists to quickly rise to the top, do outstanding work, and become known.

The five scientists having master's degrees that are involved in nascent networks abroad received their master's training from universities in Thailand, India, Australia, the United States and the Philippines. In this regard, four of the five represent part of the newer third cultural networks that are developing in South and Southeast Asia. Particularly in scientific fields that are problem related and influenced by specific conditions of countries, such as tropical agriculture, new networks are being developed by younger generations of scientists. Part of the stimulus for such new patternings of networks stems from the type of research that is being done.

Scientific fields that are most related to specific conditions or problems of a country often encourage applied rather than basic research. The nature of the problems involving investigation are those often already considered and/or passed over by scientists in more developed countries. Hence researchers in countries like the Philippines have to fall back on, seek help from, and exchange ideas and information with scientists in other countries that have much the

same conditions and face similar types of problems that they do. While certain kinds of research may be important and relevant to some countries, the main thrust in the specific sciences involved may be quite different in other centers of science. For this reason, the focus of research in world science collectivities for fields such as veterinary medicine and agriculturally-related life sciences may be quite different from similar disciplines in the Philippines.

2) Doctoral Degrees

Turning to Philippine scientists with doctoral degrees, all of the scientists with intensive networks have their doctoral degrees. This would follow other characteristics already noted about them. For example, scientists with intensive ties are often closely bound to a few others with whom they share a particular research interest, or a specialized area of some science in which there are relatively few others. Rather than broad interests, theirs are often more narrowly defined, requiring advanced education to even get into that area of science. Other factors such as the type of research they are doing, or would like to do, and their field of science have relevance to the patterning of their networks.

3) Summary

Most interesting in terms of degrees earned, are the eight Philippine scientists who are participating in third cultural networks who only have master's degrees. Three of them are extensively connected abroad, and five have nascent ties. Four of the five young scientists who are just beginning their scientific careers represent possible new third cultural patterns being formed in Southeast Asia.

They also are working in scientific disciplines that are among the top in priority for support from the Philippine government.

However, the majority of scientists having doctoral degrees also have some kind of scientific third cultural tie (68 percent). Of the seventy-four scientists in the study having doctoral degrees, fifty-one have third cultural networks abroad.

e. Place of Education

TABLE 16: Place of Advanced Education of Philippine Scientists by Type of Scientific Third Cultural Network

Place of Advanced Education	Type of Network: Extensive		Intensive		Nascent		Total	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Philippines	5	71	0	--	2	29	7	100
Southeast Asia	0	--	0	--	1	100	1	100
Australia	0	--	0	--	1	100	1	100
India	0	--	0	--	1	100	1	100
Europe	1	20	2	40	2	40	5	100
United States	16	36	12	27	16	36	44	100

Of the fifty-nine scientists having some kind of third cultural network outside the Philippines, forty-four of them or 74 percent received their advanced education in the United States. This compares with twenty-eight educated in the States who do not have third cultural networks. By type of scientific network, sixteen or 36 percent of the forty-four educated in the United States have extensive networks abroad. Twelve scientists or twenty-seven percent having intensive networks were also educated in America, as were sixteen scientists or 56 percent having nascent third cultural ties.

In proportion to the total numbers of scientists in each category of networks, those educated in the United States represented a substantial majority. For instance, of the fourteen scientists with intensive networks, twelve out of fourteen were educated in the States; the other two received their education in Europe. Sixteen of the twenty-two scientists with extensive ties also went to America for their advanced education and one went to Europe. (Five of the twenty-two received their advanced degrees from institutions in the Philippines.)

The twenty-three scientists presently having nascent ties abroad have received their highest degrees from a great variety of countries. While sixteen out of twenty-three received their advanced degrees from institutions in the States, two received higher degrees from European institutions; two from the Philippines, and one each from institutions in Thailand, Australia, and India.

In total forty-four scientists received their highest degree from the States; seven from institutions in the Philippines; five from Europe, and one from institutions in each of the following countries: Thailand, Australia, and India.

In comparing the three categories, of particular interest are the differences between the two categories extensive and nascent ties with those scientists having intensive networks abroad. The latter are all Western-educated, while the geographical distribution of institutions in the former two categories is more dispersed around the world. The clustering of intensive ties in Western institutions follows suit in regard to the nature of the ties themselves. As mentioned in the section on networks, participants in intensive scientific networks

were related as teacher-student in the past, or as colleagues doing joint research, or as members of a highly specialized yet small scientific group. Whatever the type of relationship now existent, the critical factor permitting scientists to maintain intensive ties is the similarity in scientific interests and education. That is, without highly specialized education, the plasma physicist, social psychologist, or physical organic chemist would not have the scientific skills and education necessary to develop or maintain intensive networks abroad. It is the case that intensive ties involve highly focused work-related exchanges and communication, in addition to other aspects of the self.

One can contrast the patterns of those who have intensive relationships and are Western educated with those five scientists receiving their highest degrees in the Philippines. The latter scientists have extensive networks around the world that are based primarily on the fact that they are the only scientist or the most active in the Philippines in their particular disciplines. They are one-of-a-kind scientists. The nature of their work is such that anyone in the world seeking knowledge about Philippine birds, butterflies or many biological specimens would have to contact one of these scientists. The fact that their research work is taxonomic as compared to the basic research of scientists with intensive ties, is an additional factor making a foreign degree unnecessary for them in regard to their third cultural networks. Given the unique nature of the scientific work they are doing, and the position they have in the Philippines, a foreign education has not been necessary for them as an introduction to scientific third cultures. Instead they have been able to build

their own networks and continue to remain relevant and up-to-date with knowledge in their fields due to the nature of their work. Basically, their work involves little risk of becoming obsolete either in terms of knowledge or technique.

In addition, these five scientists are not reliant on sophisticated and highly complicated machinery or equipment. Most of their research requires field work which is less expensive than is the equipment and facilities required for the research of most scientists having intensive networks abroad. Indeed, one of the reasons intensive ties develop is as a way for Philippine scientists to continue work in their fields by having access, through colleagues abroad, to machinery and materials not otherwise available to them in the Philippines. Much of the exchange among scientists with extensive ties is of Philippine specimens and species. It often involves a Philippine scientist providing local Philippine materials, not available elsewhere, to colleagues abroad who, in turn, do analyses or provide services not available in the Philippines.

One of the scientists having extensive ties abroad, but a Philippine education, represents a somewhat different pattern than that discussed above. The ties of this person are non-discipline related but are professionally anchored. This scientist is not presently doing research but is editor of a new professional magazine in the field that will have wide circulation beyond the Philippines. In addition, the Philippines has become "the Asian Center" for this profession, a distinction which has catapulted Philippine members of the profession into the international limelight. What occurs then is that international agencies such as the United Nations, and/or the

international society of this profession and related fields, choose the Philippines as the place for their international meetings and conferences. This, in turn, puts tremendous pressure on members of the local discipline to organize, arrange for and expedite the staging of such conferences. In this way, Philippine members of the field become widely known in the profession, achieve international stature, and a place on the world-wide professional circuit. Yet such positions and the networks developing from it are often due more to the confluence of circumstances; i.e., the recognition of the national profession, than to the actual accomplishments of the Philippine scientists involved.

This case represents another trend in the development of scientific third cultural patterns abroad. Such a trend pertains to the development and/or world-wide recognition of a Philippine discipline or profession which often is unrelated to the actual performance of present members in the field. The circumstances resulting in such recognition or the momentum of development might have begun long since, yet carries present generations of Filipinos in that profession or discipline into the international limelight as well.

The future of networks developed under these conditions depends, in part, on what happens to the Philippine profession in relation to professional groupings elsewhere around the world. Until the time that some other Asian country surpasses the Philippines, or until newer generations of Philippine professionals succeed the present group, the ones now with international reputation and networks will probably remain known and in the international circuit.

Networks of this type are not based primarily on the exchange of

knowledge or scientific services related to individual research or interests. Rather these ties are professionally-related, involving administrators, practicioners, auxiliary agencies, and members of the profession who may have no educational affiliation at all, but who work for government or private agencies. Such networks involve professionals, not necessarily scientists, from many segments of society. They involve professionally-related rather than research related exchanges and focus. Such networks are often carried by professionals who represent the collective identify and achievements of their national profession rather than their own personal professional accomplishments.

The personally-based ties abroad of the scientist who exemplifies the pattern just discussed are quite slim as compared to the professionally derived networks of the same scientist. She personally knows very few scientists abroad in the same field with whom she is in regular contact. She is not doing any research at present. So her ties abroad consist of an exchange of greetings at Christmas with her major professor, and receiving a few journals. However, professionally, this person is quite busy locally in various government and private agencies and in training students in the field. In the last year, Manila has been the site for four major international conferences in her discipline which has actively engaged much of her time and energy and as an offshoot of this activity, made her known internationally. If the conferences had not been held in Manila, it is doubtful this person would be internationally known at all.

f. Area of Science

A general hypothesis for this part of the data is that the more established and institutionalized a discipline or area of science in a country, the greater are the possibilities for third cultural involvement both within a country and outside it. There are numerous disciplines in the Philippines for which this is the case. The fields of economics, public administration, statistics, demography, and agriculture are cases in point. These fields have developed within the Philippines under the aegis of both Philippine and foreign assistance, much of it American. Such assistance has involved, over long periods of time, money, faculty development programs, visiting faculty, exchange professors, and grants in aid for research, buildings, libraries and other facilities. The foreign investment has resulted in the presence now of educated counterpart Filipino faculty who are dominating the fields. The era of the American presence in these disciplines is largely over, except for an occasional exchange professor. The point is, that disciplines are becoming "Filipinized" in terms of not only personnel, but in educational focus, research interests, and issues of social relevance. This is not to say that Americans are no longer welcome on faculties. The difference is that in some institutions Filipinos decide whether Americans come or not, for what specific functions, and in what specific roles. The trend is for foreign faculty to have the designation of faculty member, and they are largely treated as such, not as special persons. These kinds of shifts are part of developing modern scientific third cultures. The joint effort at "discipline-building" provides the foundation for the formation of institutional third cultural linkages, and for the

establishment of interpersonal scientific third cultural networks as well.

Looking at the distribution of persons with scientific third cultural ties by area of science, one finds that much of the Philippine scientific third culture is carried by individuals in the life sciences, particularly in those disciplines related to agriculture. This correlates with the more established and better supported environment enjoyed by these sciences as compared to either the physical or social sciences. The data lend further support to the above hypothesis. Table 17 shows the distribution of scientists having third cultural networks by area of science.

TABLE 17: Area of Science of Philippine Scientists by Type of Third Cultural Network

Area of Science	Third Culture Network: Extensive		Intensive		Nascent		Total	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Physical	3	25	5	42	4	33	12	100
Social	7	39	4	22	7	39	18	100
Life	12	41	5	18	12	41	29	100
Total	22	37	14	24	23	39	59	100

The table shows that twelve out of the twenty-two scientists having extensive networks abroad come from the life sciences. This represents 41 percent of all life scientists having third cultural ties abroad. Five scientists having intensive networks abroad are also from the life sciences, as are twelve scientists (41 percent) participating in nascent networks abroad.

Turning to the distribution of scientists in the social sciences by type of third cultural network, the following distribution appears.

There are eighteen social scientists having some kind of third cultural network abroad. Table 17 shows that seven or 39 percent have extensive ties abroad. Four social scientists or 22 percent participate in intensive networks abroad.

The distribution of physical scientists by type of scientific network abroad finds in Table 17 three scientists or 25 percent with extensive ties abroad. Five scientists have intensive networks abroad which is 42 percent of the total physical scientists having third cultural ties. Only four physical scientists (33 percent) have nascent ties abroad. Table 14 shows that of the twenty-six physical scientists in the sample, the twelve having some kind of third cultural network abroad represents 46 percent. Fourteen physical scientists have no involvement abroad, which represents 54 percent of the total.

One of the reasons for fewer physical scientists participating in third cultural networks is that proportionally the physical sciences are smaller than the other major areas of science in the Philippines. In addition, the physical sciences are not as well established or institutionalized as the other sciences, hence their networks abroad are also fewer. Another factor may be that most Philippine physical scientists have less to contribute to world science, as compared to the life sciences, in the form of novel or distinctive information relating to a tropical environment. Exceptions are the three physical scientists with extensive networks abroad, all of whom are chemists, a field that is among the best developed in the physical sciences. All three persons have a variety of ties with scientists in Japan, Southeast Asia, Europe and the States. The nature of their work in

"active" and "current" problem areas of the larger science collectivity puts them on the map for other scientists working on similar problems. Working with Philippine materials and under Philippine conditions has the potential of making contributions to world-wide scientific knowledge as well. Hence their work and scientific interests have world-wide relevancy in terms of the larger science collectivity.

g. Type of Research

The data relevant to type of research being done by scientists with different third cultural involvement may be summarized as follows:

TABLE 18: Type of Research Being Done by Type of Scientific Third Cultural Networks

Type of Research	Third Cultural Networks: Extensive		Intensive		Nascent		Total	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Applied	14	44	5	16	13	41	32	100
Basic	6	28	8	36	8	36	22	100
No Research at Present	2	40	1	20	2	40	5	100
Total	22		14		23		59	

More scientists with extensive (44 percent) and nascent ties abroad (41 percent) are engaged in applied research, than are in basic work (28 percent and 36 percent). Scientists with intensive ties abroad are proportionately doing more basic research (36 percent) than applied research (16 percent). Five scientists are not engaged in any research at the time of the study. The table

below considers type of research in terms of those scientists not presently engaged in third cultural networks outside the Philippines.

TABLE 19: Type of Research by Scientists with No Third Cultural Networks

Type of Research	No Third Cultural Networks		
	No.	Percent	Total in Sample
Applied	21	40	53
Basic	11	33	33
No Research at Present	9	64	14

Of the fifty-three scientists in the total sample, twenty-one are doing applied research who are not connected to networks outside the Philippines. Thirty-two scientists or 60 percent of those doing applied work are participants in scientific networks abroad.

In regard to basic research, eleven scientists or 33 percent of those doing basic work are not engaged in ties abroad; twenty-two scientists or 67 percent doing basic research are associated with foreign scientists in scientific networks.

Fourteen scientists in the total sample are doing no research at present. Nine of these individuals or 64 percent also are not active in networks overseas. A total of five (36 percent) do have ties abroad but are doing no research.

The distribution of type of research is in keeping with other characteristics already mentioned about scientists with intensive networks; i.e., the absence of scientific support in the country, no one else to talk to, reliance on others for materials and services, research orientation not of top priority to the national government or international agencies.

The applied emphasis in the research of scientists with extensive and nascent ties abroad, (Table 18) is connected with these scientists coming mainly from the life sciences (see Table 17 in the preceding section). The interplay between governmental priorities, historical emphasis and tradition, and the resulting degree of institutionalization of the agriculturally-related life sciences in particular, goes a long way in explaining this particular patterning of scientific networks abroad.

For instance, if one considers the third cultural participation of scientists from the primate State college of agriculture (U.P.C.A.), one finds that fifteen out of eighteen scientists have either extensive or nascent networks abroad. Only three scientists have intensive ties. Given the strong institutional links of U.P.C.A. abroad, one would expect the participation of scientists and their involvement in scientific third cultures, because even if of their own doing, the visibility of the college would seem to make easier the establishment of extensive networks abroad.

Another factor appears to be at work. That is, in the growth of national scientific disciplines there appears to be a point where a critical mass of scientists comes into being within a country with attendent support and encouragement sufficient to be scientifically self-sustaining. Self-sustaining refers to necessary research support, funding and facilities which encourage a local scientific environment to develop. Included also in environment would be the professional supports of science; i.e., professional, active societies, regularly published journals, intra-national exchange and discussion among Philippine scientists. In addition, the sources and opportunity for

the continuous advanced education of new scientists must also be available, either within the country or on a long term basis to institutions abroad.

A critical factor as well is the presence of a mutual "delivery system" linking scientists in meaningful and understood ways to other segments of society. A delivery system involves the production of "useful" knowledge, as defined by the user or recipient of knowledge, in exchange for regular financial support and recognition which allows scientific work to continue. This mutual reciprocity provides stability and position for national scientists, yet as the same time, produces useful results for national governments and/or industries; results which also justify the expenditures and investment made by government and industries in science. With a delivery system established, participating sciences have a place in the national framework. When this occurs, the frustrations of individual scientists are lessened. They have research money, recognition, professional and public support, and work that interests them. In addition, even though the research most often being done is applied in nature, it is of a quality and nature that often has international applicability and gains international recognition.

The national scientific environment and the participation of scientists in national delivery systems also influences the type of third cultural patterns that develop. For example, scientists of disciplines well established in their own countries approach third cultural scientific networks more on a <u>reciprocal</u> basis than on a <u>dependent</u> one. That is, the more established a discipline is within a country, the more reciprocal the third cultural networks that

develop. This is in accordance with the nature of extensive ties. Such ties encompass the mutual exchange of articles, materials and information by Philippine scientists to scientists all over the world. These same scientists are on international "circuits," attend international meetings and conferences, and go as visiting professors to other nations. They are not dependent on others for analysis of materials, equipment or knowledge. Rather they are acting as prominent scientists in their own right. Many of them with extensive ties abroad are among the most internationally prominent Philippine scientists of the present time.

The point is this: scientists working in well established and well institutionalized disciplines are likely to be doing applied or nationally relevant research. Such work, however, is often of a type that earns international recognition for scientists. Because of participation in a local delivery system, funds, equipment and facilities are made available as part of the "pay off" to scientists doing nationally relevant work. Such support may tie them into the national structure, with its attendant problems, but it gives scientists the backing needed to be free from scientific want in their work, and hence free from dependency on foreign scientists and the science establishment abroad. Therefore, the scientific networks that these scientists develop are more likely to be reciprocal in nature rather than dependent.

An additional point is this: for many scientists from well-developed disciplines in a nation, third cultural networks are sometimes not central to their identities as scientists, or are only minimally important. That is, in situations where the national

environment is supportive of some disciplines, and where there is an established delivery system with high pay-off to the supporters of science, the need for and importance of international scientific networks is less. For example, looking at the nascent networks that are fashioned abroad, one is aware of the difference in function they serve and meaning they have for various scientists. Twelve of the twenty-three scientists having nascent ties abroad are from the life sciences. For these individuals, foreign contact is supplementary to, but not central to, their work as scientists. No matter which university they are in, life scientists in the sample are, by and large, the best supported financially, including equipment and facilities, than are any other group of scientists.

In contrast are the four physical scientists who have nascent networks abroad. Their ties are slim because of a paucity of research information to share. Because of the lack of support, exchange, and assistance within the Philippines, these scientists are more reliant on their ties abroad to sustain their own identities as scientists. The same may be said for social scientists in relation to their ties abroad.

The intensive networks developed by Philippine scientists are often not as scientifically reciprocal or independent as are the extensive ties of other scientists. "Dependent" as applied to the tenor of intensive networks implies seeking abroad what is lacking in the Philippines for the continuation of one's work. The fact that equipment, facilities and research support is lacking for many Philippine scientists is related to their field of science, and the relative development of their discipline, including delivery systems

and the professional accoutrements of science.

As mentioned earlier, a higher proportion of scientists from the physical sciences are involved in intensive networks abroad than are scientists from either the social or natural sciences. The social sciences came next, with few life scientists having intensive ties abroad. Given what has been said previously, it is not surprising to find this distribution.

The physical sciences on the whole, in the Philippines, are the least well developed among the major areas of science. They were not part of the central focus of either the Spanish or the Americans. Few physical scientists were educated under the colonial system, an historical situation which contributes to the lack of establishment of the physical sciences now in the present society. There are few active professional scientific societies; few truly scientific meetings held; and very few regularly published journals. In addition, there are few if any other similarly trained scientists to talk to. Besides this, the institutionalization of the physical sciences has lagged behind the other major areas of science, due to their high cost and the lack of viable delivery systems. That is, it is not yet evident to officials in government, industries, or the universities, the contributions the physical sciences can make to the development of the Philippines. Because of this lack of understanding of the potential inherent in the physical sciences, the Philippine government, as the main source of financing, has not made the investment in the physical sciences that it has in other areas of science. The possible contribution by other societal segments such as industry has been limited by the foreign domination of most Philippine industries.

Except for a few Philippine-owned corporations, most industries are owned by or are subsidiaries of American firms. In these latter firms, there is little interest in, or positions available, for research. Problems that arise are usually sent abroad to the parent company for solving. Most foreign-dominated concerns are also exploitative or extractive industries which take primarily raw resources from the Philippines, and ship them abroad for much of the processing necessary. Without much facility for processing in the Philippines, there is also less need for industrial research scientists.

What develops in such a situation is a cycle of non-cooperation and misunderstanding. The Philippine government puts its money where the pay-off appears high. The physical sciences are considered high cost and low pay-off, hence very little is given to them. The physical scientists in turn, feel isolated, abandoned, and frustrated. Their response is often to turn outward, to not even attempt to secure a place in, or some rapport with, industry or government. Basic research is continued, often dealing with Philippine phenomena, but not with the Philippines in mind as the end user. To the extent that needed facilities and equipment are available or can be supplied from abroad, along with support and stimulation, a fairly satisfactory scientific life is possible for some physical scientists. However, if necessary national facilities and equipment are not available, and outside contact proves insufficient, frustration rapidly mounts, ultimately making physical scientists likely participants in the brain drain.

Intensive networks are often dependent ties--dependent on scientific and personal support and communication; dependent in terms of

getting information, knowledge and news of the field; dependent in the sense of being critically necessary for the maintenance of the scientific identity of many scientists. Ties abroad, for many Philippine physical scientists are all they have; their only connection to science or other scientists with similar interests. Hence the tendency for these ties to become personalized as well as professionally based. Such intensity is not as necessary for scientists with extensive ties for their scientific environment in the Philippines is much more rich and rewarding.

Another factor in the differences between scientists with extensive networks and those with intensive ties is that of gender. As mentioned earlier, thirteen of the twenty-two scientists with extensive ties are women, while only one out of fourteen scientists with intensive ties is female. Given that Western science is primarily male-dominated, with an anti-female bias strong in some countries like the States, it is easier for non-Western male scientists to develop intensive networks with Western male scientists than it ever would be for non-Western female scientists.

It is possible, however, for female non-Western scientists to participate in extensive networks where less of the personalized aspects of the self come into play. The proscription in both societies is less against a colleagial relationship than it is against friendship between men and women. Within the Philippine scientific community, however, there is little evidence of an anti-female bias. For one thing, many sciences are female dominated such as chemistry, pharmacy and some of the social sciences. Women scientists are highly placed in terms of administrative positions, which are considered the prestige

positions in the society. They are called upon as consultants; they represent the Philippines in international conferences and meetings; they have positions of power and influence in both the science community and in their universities. Many of them have outstanding national and international reputations.

h. Sources of Research Funding

The following table summarizes the data dealing with the sources of research funding of scientists having different third cultural networks.

TABLE 20: Sources of Funding by Type of Third Culture Scientific Networks

	Type of Network					
	Extensive		Intensive		Nascent	
Sources of Funding	No.	Percent	No.	Percent	No.	Percent
Foreign Only	5	23	2	14	4	17
Philippine Only	9	40	8	57	13	57
Both	5	23	2	14	3	13
No Funding Necessary	1	5	1	7	2	9
No Research	2	9	1	7	1	4
Total	22	100	14	100	23	100

The analysis of sources of research funding reveals that of the fifty-nine scientists having some kind of scientific network abroad, thirty of them or 51 percent receive research funding only from sources within the Philippines. Consistently, no matter what kind of network, sources within the Philippines provides much of the research funds available. That is, nine of twenty-two or 40 percent of all scientists having extensive ties have Philippine sources for research support. The same is true for eight of the fourteen or 57 percent of scientists with intensive ties, and for 57 percent or thirteen of twenty-three of

those scientists participating in nascent networks.

While it might be expected that scientists with intensive ties abroad would be the recipients of substantial foreign research support, this is not the case. From the high percentage who rely on Philippine sources only, one can infer that perhaps intensive networks carry particularistic kinds of information and services, excluding funds in basically a dependency structure. However, the very lack of development--i.e., establishment and institutionalization of certain disciplines to which scientists with intensive ties belong, may also be a factor in not gaining research support. Underdeveloped disciplines are hampered in competing for research funding by their lack of development, hence have difficulty competing as equals or on a reciprocal basis with sciences abroad. Lacking strong foundations in the Philippines also makes underdeveloped disciplines more vulnerable to the interests and preoccupations of sponsoring agencies from which some funds are available.

It is also known that funds available in the Philippines for research are heavily weighted in favor of applied rather than basic research. Therefore, while the main sources of funds for research for scientists with intensive ties is also the Philippines, there is proportionally less available for them, if they are doing basic research or are from the physical sciences which are not priority fields.

Turning to those scientists having either 1) foreign sources only for research or 2) both Philippine and foreign sources, one notices the following: Of the twenty-one scientists who fall within either of the above categories, fifteen of them or 71 percent are affiliated with a main branch of the State university complex. Only four

scientists or 19 percent having either foreign only or both Philippine and foreign sources of support come from regional universities. Only two scientists or 10 percent of scientists from cosmopolitan universities fall within this category.

The large numbers from the State university are primarily from the college of agriculture where eleven of the fifteen scientists are working. The source of funds are primarily indirect to the scientists themselves, but come as the result of institutional links between the college and foreign universities and foundations. Once such funds are made available to the college, research priorities are set, and multi-disciplinary committees are established which then distribute funds for particular research projects. In this way, many scientists are able to be funded for research at the college who would not perhaps be able to carry out their research. Besides the research funding of specific projects, there is enough for piggy-back research, funded from foreign foundations and university grants but not part of the central problem areas of the research committees. This is as close as one gets in the Philippines to research on "soft" money.

i. Summary

The purpose of this section has been to show the variations in the types of scientific third cultures that are being developed and maintained among Philippine scientists. Factors influencing the various types of networks were discussed. They include: gender, education, area of science, research funding, university affiliation and age. Various connections and processes of interaction among universities, government and industry were also analyzed as they influence the patterning of scientific third cultures in the Philippines.

7. Centrality of Scientific Third Cultural Networks to Scientific Identities of Philippine Scientists

One of the most fascinating discoveries of the study, which served to confirm some of the doubts raised regarding the sociology of science, concerns the variety of responses of scientists to the environment around them, to science, and to their own scientific identities. In looking at the commonalities and differences among Philippine scientists having various third cultural networks abroad, the question arose of the importance of networks to the scientific identities of the scientists involved. An interesting trend is apparent among the cases; some of the respondents while internationally reknown are primarily Philippine in orientation and identification. Who they are as scientists is based and depends on the situation and environment within the Philippines. If conditions prevailed in which all scientific ties abroad were discontinued, there are numerous scientists in the sample for whom this would not be critical. Who they are as scientists, in terms of values, reputation and name is not derived from nor hinges on their scientific networks. Many such scientists have extensive networks around the world, but the importance of these networks is not central in their own conceptualizations of who they are as scientists.

Mention has already been made of the different functions networks have for scientists. That is, some Philippine scientists have devoted much of their professional lives to problems in the Philippines, and their rise to international prominence has been more by happenstance than by their own efforts. Still other Philippine scientists view their ties abroad as means of accruing knowledge that is of relevance to their own work. There are numerous scientists for whom their ties

abroad are of extreme importance. The fact that networks are so variously weighed and valued raised the question of why this is so, and leads ultimately to the question of the role of contact with international science and foreign scientists in the scientific identity of Philippine scientists. In considering the importance of scientific networks to the identities of scientists, a number of hypothetical questions were raised:

1) Does their scientific identity hinge on their third cultural ties?

2) If conditions changed in the Philippines and the choice was to switch scientific orientation and work to meet new conditions or leave the country, would the scientists in the sample leave or stay?

3) Is there scientific support, delivery systems, and pay-off for them as scientists in the Philippines?

The one modality readily apparent in the data is among those scientists whose scientific identity <u>does not</u> hinge on their networks abroad; who would change orientation and work if conditions demanded it, but would stay in the Philippines; and who, by and large, have the scientific support and receive the pay-off they need to remain active and reasonably contented scientists.

In contrast are the scientists for whom scientific networks are crucial to who they are as scientists. For these scientists, their scientific identity depends on the values and model presented by their networks. From these ties comes the intellectual support, information and reinforcement that meaningfully answers the question for them, "Who am I as a scientist?" These are scientists who would choose to leave the Philippines rather than lose, or face the prospects of losing, their ties abroad. There is not sufficient scientific support and stimulation within the Philippines to sustain them. Hence for them,

their ties abroad are "lifelines" to the outside world of science. In terms of meaningful scientific contact, the networks abroad are the primary means of contact for some Philippine scientists, and without such ties there is a strong possibility they would cease being active scientists.

For a few scientists in the sample, it is unclear how they would respond to the situations and hypothetical questions raised earlier, just as it is difficult to ascertain the importance of their networks to themselves. From the interviews it is hard to determine because the respondents themselves are ambivalent and unsure just what they would do.

The breakdown of the scientists as to whether or not networks are 1) central 2) non-central or 3) indeterminate, is summarized in the table below.

TABLE 21: Centrality of Scientific Networks to Philippine Scientists

Central		Non-Central		Indeterminate	
No.	Percent	No.	Percent	No.	Percent
13	22	44	74	2	4

From the table it is obvious that for almost three-quarters or 74 percent of the sample having some kind of network abroad, their third cultural ties are not central to their scientific identities.

The data can be further analyzed in terms of "centrality" by looking at the responses by type of scientific networks. The following table summarizes the data.

TABLE 22: Type of Scientific Network by Centrality of Networks to Scientific Identities

Type of Network	Centrality of Networks: Central No.	Central Percent	Non-Central No.	Non-Central Percent	Indeterminate No.	Indeterminate Percent	Total No.
Extensive	4	17	18	78	1	4	23
Intensive	8	57	5	36	1	7	14
Nascent	1	5	21	95	0	--	22
Total	13		44		2		59

From Table 22 it is clear that scientists with nascent and extensive networks follow more the same pattern than do scientists with intensive networks. Of the thirteen scientists for whom third cultural ties are critical in their self conceptions as scientists, eight of them or 57 percent are scientists having intensive networks abroad. One scientist with intensive ties is undecided, and for the five remaining scientists with intensive ties (36 percent) such ties are not central to who they are as scientists.

The proportions are the reverse for scientists with extensive networks abroad. Of the twenty-two scientists having extensive ties; only four of them or 17 percent have ties central to their identities as scientists. For seventeen scientists of the same type of network, their ties are not central or of paramount importance to them. This represents 78 percent of the scientists having extensive ties abroad.

Scientists having nascent ties abroad are even more unequally divided. Twenty-one of the twenty-two scientists in this category, or 95 percent of them do not rely primarily on their networks abroad for shaping their identities as scientists. For many of them, this response is to be expected, and is more a matter of circumstance rather than choice. Many of them are quite young and just beginning

their careers as scientists; many have not yet completed their advanced education. Still others have not had the opportunity to go abroad or develop ties outside the Philippines as yet.

For a few scientists, however, having few ties abroad has been a matter of choice, and a Philippine focus and concentration have been purposively developed. Joined by some scientists who eschew all third cultural ties, these individuals are the nucleus of what may become indigenous Philippine sciences; i.e., disciplines growing and developing along distinctive Philippine lines.

8. Centrality of Third Cultural Networks and Implications for the Norms of Science

The seeming contradiction between the extensive involvement of numerous Philippine scientists in scientific networks abroad and yet the little commitment to them raises questions regarding numerous ideas in the sociology of science. For example, it is usually assumed in the literature that adherence to the norms of science is preferred by scientists. The socialization undergone during one's advanced education or training in a Western country is to be indelibly imprinted on the mind and thereby on subsequent behavior of all scientists. Dissatisfaction on the part of these scientists when they return home, is assumed to be due to the discrepency between the normative structure of science that they have learned and the situation at home. Little thought is given to the internal conditions themselves and the problems they produce making even nationally-oriented science difficult if not impossible. Frustrations may be caused, not by the violation of universal norms of science, but by the inability of scientists to interpret such norms or make satisfactory contributions to national problems and science.

The tenor of the comments found in the data reveals these themes: there is a concern with helping one's country and one's discipline, and while conditions may not be ideal, the orientation and focus of work of most scientists is the Philippines. (Chapter II discusses the subject of orientation.)

The point is, even as ideology, there is not a single or universal interpretation of the norms of science, just as there is not a single ideology of communism or Christianity. The imposition of such a single interpretation of ideologies and beliefs constitute much of recorded history. Most ideology embodies a theoretical or wished for ideal type, but the enactment of ideological principles involves accommodation to various environmental conditions and situations. Such accommodation and modification results in an approximation that becomes the actual form ideological principles acquire.

The norms of science, as ideology rather than reality, undergo the process of approximation in differing social-cultural environments. The different structuring of science in terms of financing, autonomy and type of research, besides other conditions influencing the environment for Philippine science, all require the acculturation of idealized notions of what science ought to be. The critical factor for Philippine scientists appears to be the adjustment to conditions of science at home, the actual situation, rather than adjustment to an ideal form.

Science, like any other ideology, undergoes changes in the process of realization. Hence what science is, and what scientists are, and what science is to scientists in the Philippines, is quite different from what science is idealized to be.

The fact that one cannot generalize about all Philippine scientists in regard to their evaluations of ties abroad is further indication of why one speaks of scientific third cultures. That is, there is not a single set of values dictating what science is. Rather, science becomes what scientists make it, working from the bottom up, as it were. This is the essence of any cultural enterprise--the creative response to differing environmental, including societal, conditions.

One is not less scientific or less a scientist just because his/her orientation is a national rather than an international one. Inherent in the notion of modern third cultures (as compared to colonial third cultures) is the idea of equality and reciprocity among participants. From the Philippine data, it is apparent that those disciplines that are the most developed in the country are composed of scientists who are not only strongly national in their orientations, but have the most reciprocal ties abroad as well. Hence, nationally-oriented scientists and nationally-established scientific disciplines provide the scientific independence necessary to shift scientific third cultures from colonial to modern status.

CHAPTER IV

SUMMARY AND IMPLICATIONS

The preceding analysis has focused on some of the institutional and structural conditions affecting science in the Philippines. Of particular concern has been the environment for science in selected Philippine universities and the impact these institutional contexts have had on scientific linkages and networks abroad.

In the study, an attempt was made to conceptualize and analyze new patterns of cross-cultural relations emerging from the interaction of Philippine scientists with scientists around the world. The concept "network" was used to signify newly-forming, highly fluid and tenuous forms of social organization that embody interaction that is more than random, individualized behavior, but less than the formalization that even group behavior shows. The point of such an analysis has been to demonstrate that the interest in a level of reality separate from that incorporated in standard sociological institutional analysis can yield additional insight and new modes of analyses. Much of what are the most interesting patterns of the Philippine scientific community exist outside of what usually is the object of sociological analysis. For example, the network analysis brought to light variations in the patterns of scientific interaction that transcends institutional anchorage. That is, it was found that institutional linkages abroad are not necessarily coterminuous with networks of individual scientists.

The interplay between an institutional analysis of selected Philippine universities and the various patterns found in scientific networks brought greater clarity to understanding the role of universities in providing, abetting or hindering scientific endeavor, and in influencing and shaping the function and importance of networks to scientists.

The concept third culture has been modified and used to describe the processes involved which yield particular patterns of behavior, norms, and values as persons from different societies interact over continuous periods of time. This construct was considered essential in discussing the various shapes networks and linkage patterns take, given different intellectual and historical traditions within universities, given different degrees of establishment and development among scientific disciplines, and given the different interests and orientation of Philippine scientists themselves.

The melding of these intellectual orientations into a concern with scientific third cultural networks found the patterning of scientific interaction abroad to be quite varied. Philippine scientists having extensive ties abroad are often those with well-established reputations, educated and working in areas of science that are established and developed enough to promote patterns of reciprocity and exchange, replacing, in these disciplines, much of the colonial scientific legacy in the Philippines of superordination-subordination.

Patterns of dependent science were manifested by scientists coming from disciplines tenuously placed and supported in the Philippines. These scientists were more apt to rely on their contacts

abroad for information, communication and exchange, for joint research, data analysis or experimental and technical assistance to offset the lack of these items in the Philippines. In these ways many Philippine scientists are dependent abroad. These men and one woman are mainly from the physical sciences, one from the social sciences.

However, factors mating the apparent alignment abroad relate to the financing of research and the importance of international contacts to Philippine scientists. It was noted that a large proportion of research support for both applied and basic research comes from the Philippine government. However, the bulk of the funds available go for applied research. This is approximately 89 percent as compared to 11 percent for basic research. This means that although physical scientists are dependent in many ways on ties outside the Philippines, the main source for research support remains Philippine.

Regarding the centrality of networks to scientists, it was instructive to note that 74 percent of those having some kind of third cultural network abroad did not consider them central to their identities as scientists.

These two factors have been singled out from among many, because they raise some pertinent questions regarding the implications of these data for world-wide science. That is, the Philippine data seem to show marked variations by institutions, e.g., government and universities; by societal conditions, e.g., anti-American feelings, unrest, national priorities, patterns of research support, and by the response of scientists themselves to scientific third cultures. Forty-one scientists did not participate in third cultural networks

at all. Of those who did, it is apparently more an instrumentality to acquire information and knowledge than as an end in itself. Even among those scientists most dependent on international networks to sustain their scientific work, five out of fourteen indicated that their networks were not central to their scientific identities. One of this same group was undecided.

This leads one to speculate that there is much more diversity and adaptation occurring within the institution of science, especially in developing countries, than is implied in much of the literature in the sociology of science. That is, even in cross-cultural studies there has been the tendency to use a Western model of science as a yardstick by which to measure science and the scientific communities in developing countries. The data discussed here show, in the Philippines at least, strong adaptive measures being undertaken to incorporate science into the national goals and fabric of the society. Those disciplines of the agriculturally-related life sciences are the ones which enjoy the greatest support from government, and are in turn, the ones most closely involved with and subject to governmental priorities. However, scientists from these disciplines are the ones that enjoy the greatest degree of reciprocity and equality in the scientific networks abroad.

The occurrence of these patterns offers additional variance, at least in a small way, to the various assumptions made about the homogeneity of the international scientific community, about the structuring of international science, and about the response of scientists to their home environments. Even among those scientists least supported by surrounding Philippine conditions there was an

almost universally stated desire "to try and do something for my country and my discipline." This merging of scientific and nationalist interests, while fraught with disconcerting implications perhaps, may nevertheless point to the existence of many diverse patterns in what often is subsumed under the general rubric of science in developing countries.

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