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ABSTRACT

This study aims to a) assess the experience of recent Ph.D. recipients, b) explore the origins and uses of some financial and non-financial resources, and c) examine the perceptions and use by graduates of the research efforts within the University of Michigan. The students' relationship to research was assessed by awareness of research projects, recognition, and self-ascribed categories of involvement with research, association. Data were gathered by questionnaires mailed to recent Ph.D. recipients in 18 departments of arts and sciences at the University. In the questionnaire, about 152 separate items were examined concerning four dependent variables: time, interaction, pre-professional experience, and openness. Significant differences appeared between the non-research group and one or more of the research-connected groups on 69 items. Correlations of scores indicate that research does appear to exist as a separately identifiable activity in student experience. Recognition and association do provide a means of assessing relationships with research more sensitive than mere identification as a research assistant. A 139-item bibliography, tables, illustrations and appendixes are included. (MJM)

ABSTRACT

GRADUATE EDUCATION AND SPONSORED RESEARCH: THE PERCEPTION, INFLUENCE, AND USE OF RESEARCH IN THE EDUCATIONAL EXPERIENCE OF RECENT PH.D. RECIPIENTS

by

William Edgar Toombs

Chairman: James I. Doi

Research within the university has a long tradition. However, the infusion of large amounts of outside funds, particularly from federal sources, is a post World War II phenomenon. In a number of major universities this input represents the largest single fiscal change in four decades. At the root of the new concentration of public interest in higher education lay a confluence of economic, political, and social trends. Many of these trends have run their course. Further claims to public support by the universities for academic research will have to be established on their own merits. This requires a fuller understanding of the relationship between education and research. Limited examinations have been made of the effects of research funds on the institutions, on the disciplines and professions, and on student support. The effect of research on the educational experience of students has not been treated fully.

This study developed a framework of assumptions within which the question could be raised, examined the perception of research activity by students, and assessed some of the effects upon the pro-

fessional socialization. The sample consisted of recent Ph.D. recipients in eighteen departments in the arts and sciences at a major research university. A point of departure is a suggestion from the writing of Talcott Parsons that socialization involves the differentiation of experience in an expanding action system and the integration of that experience into concepts and attitudes. It was hypothesized that respondents who had been more involved with research activity would exhibit more differentiated experience and a more integrated view of that experience. Relationship to research was assessed by 1) student awareness of research projects, recognition, 2) self-ascribed categories of involvement with research, association. The variables used to reflect the graduate experience were time structuring, interaction, pre-professional activity, and openness. Data was gathered by mailed questionnaire.

The findings show extensive awareness of research activity with 70% reporting familiarity with projects. Over half reported the utility of research for one of these major categories; support for living expenses, support for direct costs, source of data or information, source of techniques and methods, source of theory and concepts. For one sixth of the respondents the research contact was the major source of assistance. There was modest and selective support for the general hypothesis with interaction relating most strongly to research activity. Some findings suggested that the educational role of research in the natural sciences is quite different from the role in the social sciences. The study concludes that increased educational utility from research activity should be the basis of experiment as well as analysis.

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by
William Edgar Toombs

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Doctoral Committee:
Professor James I. Doi, Chairman
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CHAPTER I

THE SETTING: HIGHER LEARNING IN THE SIXTIES

A. CONFIDENCE AND CONVICTION, 1961

1.- The Prevailing Mood

Speaking to the annual conference of the American Association for Higher Education in 1961 Charles Frankel, the educational philosopher, noted that it was a time of "happy crisis."[1] The comment carries all the vigor of a man armed with trusted weapons and confronted with a challenge whose hazards are formidable but known. The unknowns are the skill, judgement, and courage of the protagonist, qualities he is quite willing to put to a fair test. The crisis before the colleges and iniversities in that year was "happy" because the problems were identified and the climate of public support most favorable. The phrase captures well the mood of the early sixties on most campuses; - a mood of confidence and conviction.[2]

Crises of one kind and another had built confidence: The flood of World War II and Korean veterans had erased the fear of large numbers,

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[1] Charles Frankel, "The Happy Crisis in Higher Education" in Goals for Higher Education in a Decade of Decision, 1961, American Association for Higher Education, Washington, D.C., p. 4.

[2] Ibid. "We do, then, have a burdensome, difficult set of crises to deal with, but they are old issues. It is fortunate, it is a happy crisis when we are aware, as we are now aware, that we have these problems. It is also fortunate that, for the very first time in the history of American higher education, a very large and broad public is looking upon all of us with considerable curiosity and interest." p. 11.

of faculty shortages, of space problems, and of short range financial difficulties by proving that such demands could be met. The Sputnik surprise and the critical manpower shortages were on the way to being solved.

A sense of conviction came to the profession on the one hand from that timeless stability which seemed inherent in the humanism of the liberal arts tradition and, on the other, from the contemporary brilliance brought to the scientific fields by rigorous research. There might be debate on the relative eminence of each tradition but there was never a doubt that each had its role to play.

2.- Tested Premises and Proven Principles

Most important in 1961 was the fact that all these problems had been met by application of those principles and premises that were part of the conventional arsenal of American higher education;[1]

a) Selection for admission to higher learning is based upon ability and open to all who can pay their way. The economic limitation was being reduced by new loan and scholarship programs.

b) A good college education requires study in the arts and sciences over a four year curriculum oriented toward professional school, graduate school, or the life of a well-rounded gentleman.

c) Higher education is a primary avenue of upward social mobility. The aspirants have a great deal to gain personally and are motivated by their own internalized goals.

d) Learning is primarily a product of formal teaching in a classroom setting. The objective is the transmission of a well formed body of knowledge and technique to the initiates.

e) The curriculum is the province of the faculty. They determine its structure by balancing faculty needs and interests with what they perceive to be the needs of contemporary students as they prepare for an adult role.

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[1]Paul Woodring, The Higher Learning in America: A Reassessment, McGraw Hill Book Co., N.Y., 1968. This experienced observer offers a more detailed list under the title "The Conventional Wisdom of Academia."

f) Fiscal practices and management policies are the province of the governing board and such administrative officers as they may require.

g) Graduate study in the arts and sciences is an unstructured program aimed at the preparation of scholars at a leisurely pace or the preparation of research scientists at a somewhat more rapid pace. The time and course requirements cannot be determined in advance. Certain traditional requirements in the form of language competence and examinations are common to all fields.

B. ACADEMIC RESEARCH: THE SPECIAL PREMISE

1.- The Research Idea

At the top of any list of accepted premises for higher learning, today or in 1961, stands the idea of research, free inquiry into the nature of physical, social, natural, and personal phenomena toward a goal of understanding. Practical applications of knowledge are merely incidental to the primary purpose of the search. This is the "purest" kind of research and therefore the most important. Permission to share in the world of academic research and contribute to the creation of new knowledge is the ultimate aim of preparatory study and is reserved to those holding a research degree, the Ph.D. or D. Sc., and their apprentices. Research, in the sense that it is a search for truth, has its own intrinsic value whether or not it is recognized openly by the society.

2.- A New View of Research

a) Within the University: Among all the premises of higher learning none was changing so rapidly as research in the university. Even before 1961 the events of the world and the needs of the nation pressed research activity on the campus to a new position, a position of primacy among the traditional functions of the university. The new importance was evaluated by Clark Kerr in his classic Godkin Lectures at Harvard in 1963.[1]

> "Two great impacts, beyond all other forces, have molded the modern American university system and made it distinctive. Both impacts have come from sources outside the universities. Both have come primarily from the Federal government. Both have come in response to national needs. The first was the land grant movement . . . The second great impact began with federal support of scientific research during World War II."

While the precipitating force may have come from outside the university, the ideas about research were among the long standing and largely untested assumptions of the academic community: Research is intrinsically beneficial and merits acceptance _a priori_. The more there is and the more widely it can be spread the better will be the quality of higher education. Teaching and research go together for involvement with research improves the teaching capacities of the faculty, enriches the intellectual climate in classroom and laboratory, and provides a timeliness that enlivens studies. For the student, particularly the graduate student, exposure to research either by employment or by sponsorship provides apprenticeship training, contact with mature scholars, and a means of financial support. Ultimately the benefits of research redound to society at large, either indirectly through trained people or more directly through the linkage between the analytical and intellectual resources of the universities and the most urgent needs of society. When secure in its freedom of inquiry and properly financed, university research is an important, perhaps the most important, source of new knowledge. By tradition research was regarded as particularly vital to advanced teaching. ". . . the combination of research and teaching is the lofty and inalienable

[1]Clark Kerr, _The Uses of the University_, Harper Torchbooks, Harper and Row, New York, N.Y., 1963, pp. 46-47.

basic principle of the university," in the words of Karl Jaspers.[1] Under the impact of societal demands, however, research in the academic setting had begun to take on a life of its own. More and more research appeared at the top of the list of functions at a modern university.

b) Academic Research and Society: The new emphasis upon knowledge and its enormous value to modern society had an internal impact on the activity within the university but it also promised to transform the university's relation to society. From an emphasis on the importance of new knowledge and the university as the source of this touchstone to progress, it was only a short step to the idea that intellectual constructions are the prime movers of society. The idea grew rapidly that the university was the source of this new dynamic.

> "Knowledge has certainly never in history been so central to the conduct of an entire society. What the railroads did for the second half of the last century and the automobile for the first half of this century may be done for the second half of this century by the knowledge industry: that is, to serve as the focal point for national growth. And the university is at the center of the knowledge process."[2]

The words are those of Clark Kerr on the implications of the new Federal grant university he saw emerging in the first years of the decade. Daniel Bell carried this idea to the edge of mythology as he described the university as the primary institution of the emerging "post industrial" society: ". . . a change has taken place in the character of innovation in the centrality of knowledge. It is not the "explosion" of knowledge . . . that has made the university so important but a change in the character of necessary knowledge, the fact that theoretical knowledge has become

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[1]Karl Jaspers, The Idea of the University, Beacon Press, Boston, Mass., 1959, p. 45.

[2]Kerr, The Uses of the University, p. 88.

the shaper of innovation."[1] Here is the ultimate manifestation of Francis Bacon's aphorism "Knowledge is power," not with the philosopher become king but rather with the university institutionalized as the Crown! Charles Muscatine saw even more in the new role of the university. With the idea that "Knowledge is power" goes a consideration of "Knowledge as power" thrusting the university into yet another responsibility, that of social criticism. "In an environment that promises to be almost totally compacted of knowledge, the edges of educational institutions will naturally become invisible." To retain its identity and autonomy the university must make Criticism, "informed and unconstrained evaluation . . . the characterizing activity of the university."[2]

For a time, until perhaps 1968, it did appear that institutions of higher learning might well play the central role in the last three decades of the century.

C. THE FOUNDATIONS OF PUBLIC SUPPORT: 1961

1.- Answers to the "Happy Crisis"

While those in higher education felt secure in their principles and confident of their methods, two quite immediate requirements had to be met if colleges and universities were to keep up with the increasing

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[1] Daniel Bell, The Intellectual and the University, The City College Papers #4, Library of City College of New York, N.Y., May 12, 1966 Address, p. 2. A more complete development of the idea in relation to the university itself is formed in Dean Bell's, The Reforming of General Education, Columbia University Press, N.Y., 1966, p. 301. The notion of the "Post Industrial Society" is developed in an essay, by Bell in Eli Ginzberg (edit.) Technology and Social Change, Columbia University Press, N.Y., 1964.

[2] Walter J. Ong, S.J., Knowledge and the Future of Man, Holt, Rinehart, Winston, N.Y., 1968. Symposium on the Sesquicentenial of St. Louis University. See Charles Muscatine, "The Future of the University as an Idea," pp. 42-46. See also Robert Paul Wolff, The Ideal of the University, Beacon Press, Boston, Mass., 1969, pp. 41-42.

numbers and the new demands being made upon them. The first of these was public recognition of the urgency in these needs. The second was financial support on a scale hitherto unknown from federal and state sources. This support was to develop, in effect, the methods and principles already in the hands of those in higher education. With the construction of more facilities, more financial aid to students by direct or indirect means, more research grants to assist faculty development, and a modest share of untethered funds for institutional expansion the imminent crisis could be met in the democratic tradition. It is the chronicle of the nineteen sixties that a major part of this did happen. Higher education had unprecedented support in an atmosphere of unusually favorable public opinion to solve the issues of the times on the educators' own terms.

The unusual amount of support and the lack of externally imposed constraints on its use reflect only part of the story. The rationale for such new public investment came from a rare confluence of social, economic, and political factors on a national scale. What has come to be called the expansion of knowledge, particularly in the technological and scientific forms, generated a demand for trained manpower at unanticipated as well as unprecedented levels. To this demand was joined the notion that economic growth was not only sustained but also prompted by the existence of more highly trained personnel. The requirements of global defense policies and national goals in the reaches of outer space brought increased political interest in higher education. Back of these trends stood the hard demographic facts. Large numbers of young people, along with their parents, saw more education as the most dependable road to social, vocational, and personal advancement.

This sudden focusing of national trends upon higher education is far clearer in 1970 than it was in 1961.[1] There are now reasons to doubt the durability of this accidental alliance.

2.- The Case in Point: Academic Research

The paragraphs above summarize a general view of higher education in the past decade: Those in the field felt secure in their principles but lacked resources to fulfill them. The necessary resources came from public funds in large amounts to provide unquestioning support of those principles. This condition was possible only because of a unique coalition of trends which focused attention on institutions of higher learning. Each of these features can be found as specific evidence in the events and outcomes related to that most important premise, academic research. The amount of support is summarized later in these chapters but the condition under which it was given were as unusual as the amount. At every stage in the authorization process, from proposal to evaluation, it was the expertise of the academic or the scientist that carried the main weight.

> "Viewed as a process of public administration this system is unique," says Carl Kaysen, "There is no other large government program which leaves decisions on resource allocations in the hands of the community of beneficiaries explicitly and specifically, rather than maintaining it within the control of the government agencies themselves. The very uniqueness of the arrangement may be a source of instability in it."[2]

From a scientist himself we read that science "has become the major establishment in the American political system: the only set of institutions for which tax funds are appropriated almost on faith under concordats which protect the autonomy, if not the cloistered calm, of the

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[1] Don K. Price, The Scientific Estate, Oxford University Press, N.Y., 1965, pp. 41-42. This coalescence of interest is sometimes referred to as the merging of public and private interests.

[2] Carl Kaysen, The Higher Learning, the Universities and the Public, Princeton University Press, Princeton, New Jersey, 1969, p. 25.

laboratory."[1]

There is another side to this matter, a side which is too infrequently mentioned. When funds come with few limitations then the crucial element in their use is determined by the recipient not the donor. This aspect was noted by one of the most accurate observers:

> "The most significant factor affecting university research programs has not been the Federal government but the standards of excellence and discrimination maintained by the intangible social pressures of the faculty. The most important effect of the federal funds has therefore been to provide momentum in the directions set by cultural values and by forces within the universities."[2]

How did it happen that the esoteric research premise of the academic research world gained public support almost without qualification during the fifties and sixties? Certainly the American political climate had not yet reached the stage where resources could be allocated for university research wholly for its own sake. Academic research became wholly entwined in the public mind with the broad range of scientific inquiry and wholly synonymous with it. To a degree still undetermined but widely criticized, a part of academic research activity became indistinguishable from industrial or government laboratory research activity. For the most part, either because it was indistinguishable from other activity or because it traveled under the banner of a new crusade, "Science," academic research did not have to stand for examination and defense on its own merits. Research in the university drew broad public support for what Kaysen called "instrumental" reasons in testimony before a House committee.

"The argument so far has been couched entirely in instrumental

[1]Don K. Price, "The Scientific Establishment," Proceedings, American Philosophical Society, Vol. 106, No. 3, June 1962, p. 235.

[2]Charles V. Kidd, American Universities and Federal Research, The Belknap Press at Harvard University Press, Cambridge, Mass., 1959, p. 210.

> terms. The value of basic research has been assessed in terms of other goods, for which it is a necessary input: military strength, health, economic growth. This is a narrow view: scientific research can be viewed as itself a desired end product in at least two different ways. First, it may be a significant separate component of national power in our nationalistic, competitive, less-than-orderly world of many nations. Second, it is an esthetically and morally desirable form of human activity and the increase in this activity is itself a proper measure of social and national health. I myself - as might be expected of an academic - share the second view. I am skeptical of the first . . . Nonetheless, I think it is unnecessary to debate the merits of either of these views, since the investment or instrumental aspects are . . . of sufficient importance to provide a basis for policy judgement independently."[1]

The first set of instrumental reasons for joining academic research with all other kinds of research, was clustered around defense needs and represented a natural continuation of wartime associations. But there was the added condition that military needs in terms of computers, electronics, and aeronautics were also important needs for every other sector of society. Defense needs were paralleled by health needs. Then with the middle fifties came the "manpower crunch" and the need for much more extensive training to increase the basic competence of the labor force.[2] The establishment of a program for space exploration under NASA probably represented the broadest kind of scientific commission ever made by any society and, of course, the essence of it was research activity in its applied form but with liberal "spin off" for basic research.

Not only did the number of these "instrumental" reasons increase, the justifications in each case became more refined. Economists saw in

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[1]National Academy of Sciences, Basic Research and National Goals: A Report to the Committee on Science and Astronautics, U.S. House of Representatives, U.S. Government Printing Office, Washington, D.C., March 1965, p. 153.

[2]Dale Wolfle, Director, Commission on Human Resources and Advanced Training, America's Resources of Specialized Talent, Harper and Bros., N.Y., 1954.

education, particularly advanced education, not only the means to meet the requirements of technological growth but a certain self-generating quality that prompted economic advancement.[1] There was a concern for the quality of graduate education as well as the quantity and the Seaborg Report, so called, by its recommendation for "centers of excellence"[2] added still another justification for public support of academic research.

Each of these elements in turn and all in concert pressed for the support of science in all its forms and required no specific response from industrial, governmental, foundation, or academic science.

D. SHADOWS, DOUBTS, AND CHALLENGES: 1965 TO THE PRESENT.

1.- The Uneasy Compromises

There is no questioning the fact that the unique combination of circumstances surrounding higher education and academic research produced success of the kind intended. But that success itself uncovered conditions that, one by one, have brought the university world to a very different kind of crisis in 1971. It is revealing that the same Professor

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[1] Fritz Machlup, The Production and Distribution of Knowledge in the United States, Princeton University Press, Princeton, N.J., 1962. In the early pages of this comprehensive study of knowledge as an economic variable he notes ". . . never before our time was the interest of economic writers so closely concentrated upon the analysis of economic growth and development and thus it is not surprising that there is now such a burst of activity in studying the productivity of investment in knowledge," p. 5. See also R. R. Nelson, M. I. Peck, and P. Kalacheck (edit), Technology, Economic Growth and Economic Policy, The Brookings Institution, Washington, D.C., 1967. This work treats education as a critical factor in the rate of technological advance. Similar emphasis on education is found in a most influential work Frederick A. Harbison and Charles A. Myers, Education, Manpower, and Economic Growth. McGraw Hill Book Co., N.Y., 1964.

[2] President's Science Advisory Committee, Scientific Progress, the Universities, and the Federal Government, The White House Nov. 15, 1960, U.S. Government Printing Office, Washington, D.C.

Charles Frankel whose observations opened our review should now appear as the spokesman for the International Committee on University Emergency.[1]

What happened to the secure premises of higher education? One after another was revealed by the events of the decade to be, on the one hand, a mixture of uneasy compromises, sometimes sincerely made, sometimes merely convenient, and on the other hand, insufficient suppositions around unresolved questions.

a) Selective admission was open to those with "talent" but the criteria and benefits were those of white, middle class America.

b) The four year college tradition was expensive and often unsuited to an individual's development or society's needs.[2]

c) Upward mobility is a false or insufficient goal for the children of the affluent middle class and for those with sensitivity to society's shortcomings. Young people who are pressed into college by the family expectations, the momentum of school programs, or the draft require new motivation to continue their studies.[3]

d) Teaching covers only a small part of the learning experience and it has tended to be at odds with what is otherwise experienced.

e) The curriculum and the management policies of an institution are segments of a "system phenomena." Only the participation of all sectors of the educational community can morally justify its policies.

f) Graduate education is a compromise with an outmoded set of traditions which render it wasteful, irrelevant, and exploitive. It is not even effective in preparing the graduates for the

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[1]New York Times, November 22, 1970,IVp.7. The task force is composed of 100 scholars from 53 institutions in nine countries. The committee intends to combat the dangerous tendency to use political criteria in the evaluation of academic policy and performance.

[2]Earl J. McGrath, The Graduate School and the Decline of Liberal Education, Teachers College, Columbia University, N.Y., 1959. This work was among the first to raise some of the issues in the undergraduate curriculum.

[3]Robert Paul Wolff, The Ideal of the University, Beacon Press, Boston, Mass., 1969. He is critical not only of the premise but the elaborate heirarchy of prestige among institutions produced by it.

primary function they perform, teaching.[1]

g) The interdependence of the major problems in the world demands interdisciplinary analysis. The new methodologies in all fields require wide cooperation among fields at the very time when departments and professional fields are intent on maintaining their privatistic views.[2]

2.- The Research Premise in Question

a) Within the University: Research within the academy, like each of the premises noted above, has come under criticism from students, faculty, and lay observers. The most extreme voices have condemned research broadside both as a principle and as an activity. One part of the objections is made on moral grounds. Focusing on the "impurity" of science, they deny, first, that objective, free inquiry can ever exist. Second, and irrespective of whether value-free research is possible, the university has committed itself to the wrong values electing to follow the convenient morality of business and government rather than the deeper demands of human needs. Typical is this summary paragraph by a student spokesman for the Students for a Democratic Society: "When everything is for sale, police state tactics are unnecessary: all that is needed is purchasing power . . . The university thus becomes an agency of the military not through conspiracy and cabal, but simply through the normal, the accepted, the 'free' play of the free market. The University needs

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[1] Journal and Proceedings of the Association of Graduate Schools, 1965, Remarks of Logan Wilson, President of the American Council on Education, on the topic "Some Problems in Graduate Education," pp. 22-23. "A second wrong assumption underlying most graduate education is that the Ph.D. is in fact a research degree which initiates the holder into a career of productive scholarship and science . . . but for the average man it simply is not so."

[2] Michael J. Brennan, "A Cannibalistic View of Graduate Education" in Proceedings of the Ninth Annual Meeting, Council of Graduate Schools, 1969, p. 31. "Our style in teaching and scholarship fails to link the constancy of the human condition with the immediacy of social change."

funds, industry needs contracts, the military needs information and hardware."[1] Another of the strident voices of criticism fixes the blame on professors noting that: "The university has in large part been reduced to serving as banker-broker for the professor's outside interests." And further ". . . major universities become first captive then active advocates for the military and paramilitary agencies of government in order to get money for research."[2] According to the Study Commission on University Governance at Berkeley, students repudiate that part of the world they find in the university and the university's tendency to reproduce the world.[3] While each of these comments is extreme in tone, they are all representative of the doubts raised by more temperate critics.

Even when it is accepted as an activity appropriate to the university, research as it is presently conducted is perceived as damaging to the institution or wanting in propriety. Faculty self-interests are warped and so are relations with students. "The great emphasis becomes research and publication, even if these roles are not satisfying to the individual . . . The total impact . . . is that the career interests of the faculty are pitted squarely against the educational interests of the students, especially the undergraduates."[4] The divisive effects of the current research management practices even appear within the faculty. "By basing its reward system on 'published research' the university tacitly

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[1] Bruce Levine, "Research: Subsidizing National Consensus," The Michigan Daily, Tuesday, March 12, 1968.

[2] James Ridgeway, The Closed Corporation: American Universities in Crisis, Random House, New York, 1968, p. 215 and p. 8.

[3] Mayer Foote, (et al.) The Culture of the University: Governance and Education, Jossey-Bass Inc., San Francisco, Cal., 1968, Chapter I, passim.

[4] Richard L. Desmond, "Faculty and Student Frustrations Shaping the Future of the University." The AAUP Bulletin, Vol 55, No. 1, March 1969. pp. 23-24.

contributes to the division of the faculty into first class citizens or research luminaries . . . and a second class group which is given the responsibility for instruction, administrative housekeeping, and maintaining continuity in the academic program"[1] One experienced university representative has catalogued a list of what might be called malpractices stemming from research. He includes; the pirating of scientific personnel by salary increases that will eventually come from the public treasury through higher research costs, side bar negotiations by faculty and government negotiators designed to bypass the university administration, faculty disloyalty and disregard for institutional problems, the tendency for research to remove from the classroom both the capable graduate student and the competent professor.[2] To put the harshness of current criticism of research into correct perspective it must be recorded that rebuttal has only recently begun. It takes a great deal more work by way of collecting facts and analyzing faculty outlook to respond constructively to this kind of invective than it does to prepare it.

b) Scientific Research in Society: If academic research comes under constant fire for its role on the campus it also shares the rather general loss of public faith in science by virtue of its professional associations with the wider scientific community. To begin with, public support for scientific exploration on any scale that might require national policy is new to America, less than thirty years old. The interrelationships

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[1]Ann M. Heiss, Challenges to Graduate Schools, Jossey-Bass Inc., San Francisco, Cal., 1970, p. 2. This is cited as one of the important criticisms made of universities by other observers.

[2]John Morse, "A Consideration of Some Ethical Problems" in Harold Orlans, Science Policy and the University, The Brookings Institution, Washington, D.C., 1968, pp. 294-95.

are also enormously complex. Careful study of the role science can, should, and might play has been undertaken only since 1967.

About 1964 doubts and questions about the wisdom of nearly unlimited support for scientific activities began to appear, brought to the public forum by growth rates of 10-12% annually in research budgets.[1] To this was added a new concern among sponsoring agencies for their own technological requirements. The accountability of mission-oriented Federal agencies weighed more heavily. Imposed performance standards made an appearance and attempts at evaluation of "effort" began to develop among federal sponsors. The hard questions for public policy were stated to the National Academy of Science by the House Committee on Science and Astronautics.

> "I- What level of Federal Support is needed to maintain for the United States a position of Leadership through basic research in the advancement of science and technology and their economic, cultural, and military applications?
>
> II- Judgement can be reached on the balance of support now being given by the Federal Government to the various fields of scientific endeavor, and on adjustments that should be considered, either within existing levels of overall support or under conditions of increased or decreased overall support?"[2]

As spokesman for the scientific community the National Academy collected an excellent set of essays from leaders in every field with a generous emphasis upon the academic background.

Not all inquiry was so magnanimous in allowing the universities

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[1] Frederick Sietz, "Science, the University and Society," American Scientist, Vol. 56, No. 3, 1968. The conditions creating these doubts were: 1) Budget problems arising from the Viet Nam War. 2) Some public disillusion with the slowness with which scientific solutions appeared. 3) The incongruence between the funding patterns for research and the pattern of distribution of political power.

[2] Op. cit. National Academy of Science, Basic Research, p. 1.

to reply on their own terms. Project "Hindsight" mounted by the Department of Defense in 1963 "with the specific object of identifying the origins of science and technology embodied in 20 major weapons systems . . ." came to the observation and conclusion that:

> "What must first be observed is that Project Hindsight is not likely to sit well with those statesmen of science who have long propounded the ideology that science pays off best when it is left free to follow its own curiosity. For the major theme that emerges from this first report on Hindsight is that the Defense Department's huge investment in basic research has had little direct consequence for advanced weaponry."[1]

Out of this Congressional questioning we can discern one of the attributes academic research activities must have in the future, political salience. The heart of the matter as it has developed from these first tentative misgivings is: "Why should society support science, particularly basic scientific inquiry where the outcomes are uncertain?" Reagan has consolidated the varied reasons under five categories:

"1. Intellectual and cultural values of science.

2. The utility of basic research as the foundation of all technological development.

3. Research as an essential component of graduate education.

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[1]D. S. Greenberg, "Hindsight: DOD Study Examines Return on Investment in Research," Science, Vol. 154, 18 Nov. 1966, pp. 872-73. See also Chalmers W. Sherwin and Raymond S. Isenson, "Project Hindsight," Science, Vol 156, 23 June 1967, pp. 1571-77. See also U.S. Congress, House Committee on Government Operations, Conflicts Between the Federal Research Program and the Nation's Goals for Higher Education. An Inquiry by the Research and Technical Programs Subcommittee, June 1965. One of the clumsier inquiries. Over 300 persons in the academic and scientific professions were sent a set of equivocal questions and selected portions of their answers published, e.g. "Has the Federal research program caused imbalances by . . . (b) aggrandizing the larger research performing universities . . . and neglecting the smaller liberal arts college . . . (c) causing institutions with established traditions of excellence in certain academic fields to abandon them in order to conform to a research pattern that will give them a bigger share of the research bonanza?" pp. 2-3.

4. The high costs of scientific research, and the unlikelihood of private financing.

5. The political values of science, especially in international affairs."[1]

These five headings are not very different from those offered by Carl Kaysen although he combined 2, 3 and 4 under "utility" and labeled the other two as the "cultural" justification, and "pyramid building."[2]

Response to this question by the spokesmen of science has shown a strong tendency to treat national policy on scientific support as a single policy. Many current books and articles focus on "science policy" as if it were a well integrated phenomenon. In part this unitary view of the activities of science has its root in a developing but still unconfirmed social theory. It maintains that science has become a discrete social system over the past three decades. In a sociological sense it has become institutionalized around the basic need for knowledge in a coherent and continuously developing form. As a social system science displays as interrelated set of norms and values, formal and informal networks of communication, a unique subsystem of rewards and recognitions, a measure of cultural mystique, and a rather rigorous set of prescribed behaviors.[3]

While science was developing internal coherence it was taking a new position as a political entity among the major interest groups of the society. Dean Don K. Price likened the "scientific establishment"

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[1] Michael D. Reagan, Science and the Federal Patron, Oxford University Press, N.Y., 1969, pp. 34-36. This recent work offers an excellent summary of the informed debate which has welled up in the scientific community and in government since 1967.

[2] Kaysen, The Higher Learning, pp. 32-39.

[3] Norman W. Storer, The Social System of Science, Holt, Rinehart, and Winston, Inc., New York, 1966.

in its political form to one of the "estates of the realm." In the medieval setting such estates represented a separate intellectual and social class whose existence was so vital to the survival of the realm that its requests did not require constant and minute justification.[1] A similar and quite interesting view of the activities of science as a social system is contained in Michael Polanyi's essay entitled "The Republic of Science."[2] He perceives the scientific community as a system of autonomous individuals who make their decisions solely on their own judgment but adjust those judgments so that the total effort is coordinated.

This brings us to the crux of the matter for the academic world. If science is in fact an integrated system then the university in its research function is inevitably a part of that new institution. Academic research must cast its lot with all of the other subsystems of science; foundation research, government laboratory research, industrial research, and the separate university research institutes. On the other hand, if there is a flaw in the concept of a national "science policy" then each of these research entities will have to make its justification for public support on its own grounds.

E. THE REFORMULATION OF PUBLIC POLICY, 1971

1.- Strategic Considerations for Higher Education

It is clear from the summary of the past decade that a re-evaluation of the relationship between American society and its knowledge

[1]Price, Scientific Estate, p. 18.

[2]Michael Polanyi, "The Republic of Science" in Edward Shils (edit.) Criteria for Scientific Development, Public Policy, and National Goals, The MIT Press, Cambridge, Mass., 1968, pp. 1-20. The article originally appeared in Minerva, Autumn, 1962.

system is in full debate. The premises for public support, the method by which this support is put to use, and the goals toward which it should be directed are being reformulated. In one area of university activity, academic research, the choice of a strategy by which the needs of institutions can be presented to the public view is important. The university can ally its interests with all the other agencies of science and move for a single national science policy. On the other hand the university can make its own separate case for public support of academic science based on the unique relationship it holds to the educational process.

There are two conditions in the paragraphs above that, taken together, argue strongly for a university approach separated from the rest of the scientific community. First, we noted that the rational for support in the nineteen sixties came from a rare confluence of social, economic, and political interests that focused upon higher education and science as well, in the period from 1950 to perhaps 1968. Far from supporting the knowledge related activities out of altruism or a new appreciation of their great intrinsic value, each of these sectors of public interest was simply acting to fulfill its own immediate needs. The voting public at large needed the educational avenues of social mobility to facilitate readjustment of the veterans after two wars and to fulfill the ambitions of growing affluence. Political leaders needed an assurance of international superiority that could come in a nuclear-space-missile age only through technological supremacy.[1] Industry and business required a new level of labor force competence, far above any that could be achieved by on the job training, and advanced education offered a convenient way to make this quantum jump. The fact that these interests came to bear on higher

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[1]Price, Scientific Estate, p. 31.

education at the same time was accidental.

Now, in 1971, that accidental entente and its unity of economic, social and political purposes has come apart. The social issues;-of the poor, the minorities, and the young, of urban blight and country-wide pollution, of crime and drugs and diversified life styles, defy any single solution by education or by scientific advance. The economic issues of cost control, inflation, conglomerate organization, and global markets have put technology and basic research into the background. Political issues, too, have pluralized to the point where the role of education and science in their resolution is no longer self-evident.

The missing element now for higher education and for academic science is one that has been missing all along, an understanding on the part of the informed public of how intricate the workings of education and science are and what can reasonably be expected of them. Philip Handler fixed the circumstances clearly: "Unfortunately, during this period of growth, the academic scientific community failed to communicate to the public the integral nature of graduate education and the research process. While the press, understandably, publicized the occasional peaks called 'breakthroughs,' there was no equivalent effort to make explicit the manner in which research findings combine to form the mosaic which is the corpus of science and which contributes continuingly to applied research and development."[1] With the supporting allies gone higher education must make its raison d'etre clear in the public eye.

The <u>second</u> condition that militates toward a separate strategy for higher education and academic science is that the unity and cohesion

[1]Philip Handler, "Academic Science and the Federal Government," <u>Science</u>, Vol 157, Sept. 8, 1967, pp. 1140-46.

of the scientific community is more illusory than real. In a sense this illusion was encouraged by the conjoining of public interests that marked the early sixties. Perhaps a separate social system of science - a new estate, a republic of the learned - is emerging but it has yet to gain societal acknowledgement. What is far more visible in the public sphere is the emergence of the scientific subsystems each with its particular adaptive rational for public support; foundation research, governmental research, industrial research, academic research. The common attributes lie more in the areas of methodology and procedure than in goals and values. It is more than mere accident that each of the "reasons" for public support listed by Reagan matches the principle attributes of one or more of the major scientific subsystems.[1]

1. The Intellectual and cultural value of science is served by research foundations and by some university research.

2. The utility of basic research for technological development is served principally by industrial research and the contract R. & D. firms.

3. Research in graduate education; obviously university research.

4. The high costs of research equipment is met principally by government laboratories and federally funded research institutes, often jointly operated by universities and private foundations.

5. The political values of science are served by government and industrial research institutes.

In summary: While the scientific world may sense its unity, the justification for public support at this time must be made by each of the subsystems of science on its own grounds and its own unique attributes.[2]

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[1]Reagan, Science and the Federal Patron, p. 36.

[2]National Science Board of the National Science Foundation, Graduate Education: Parameters for Public Policy, U.S. Government Printing Office, Washington, D.C., 1969. This study is a first step toward an educational strategy but it needs to be supplemented by extensive institutional statements to make the issues clear on the state and local levels.

There are other reasons, too, that recommend a separate strategy for higher education and its academic research. The breadth of university research and its basic nature give it a broad relevance to the issues now coming to the fore, issues that involve the quality of life for the individual as well as on an ecological scale.[1]

2.- Academic Prerequisites

While the university world is developing an independent public claim for support it will also be engaged in redefining the essential nature of the institution. To achieve a coherent definition of itself one crucial area that must be analyzed is academic research; its structure operations, purposes, and values. Higher education has been slow to evaluate any consequences of sponsored research other than the management aspects. Now there is a history of twenty, perhaps thirty, years in which a large introduction of funds has been made in a great variety of forms. What is now wanted is a series of inquiries on how research inputs have affected; (1) the organization, financing, and operations of major institutions, (2) the behaviors, values, and expectations of faculty members both as members of the academic community and as participants in the larger professional community, and (3) the values, expectations, and educational experiences of graduate in their professional preparation. There are also internal factors which press for a clearer understanding of the relationship between research and other events on the campus. Rising costs make the introduction of efficiencies a matter of actual survival. This aspect is treated very

[1] F. A. Long, "Support of Scientific Research and Education in Our Universities" Science, Vol. 163, March 7, 1969, pp. 1037-41. By means of a list of "things to be done" the writer developed a strategy by which universities can develop public support in the public realm for both educational and research activities in the institutions.

directly in a recent essay by Fritz Machlup.[1] Other internal issues that will require more understanding of research are the changing character of the learning situation and the reconstruction of a scheme of university governance.

3.- Summary

In 1961 the representatives of higher education were sure of their premises and principles and knew their needs. Public support came without questioning of those principles, among them academic research. The rationale for public support lay in a peculiar merging of national interests around higher education and science. Doubts about the continued support for science on an unlimited basis appeared at mid-decade. At the same time the premises for higher education itself were called into question. The unity of public interest in knowledge activity lessened under pressure of other issues. Thus, in 1971, the basis for public support of science and education must be reformulated. To present its case for support, particularly support for academic research, the university must take an analysis of its own internal workings.

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[1] Fritz Machlup, Education and Economic Growth, University of Nebraska Press, Lincoln, Neb. 1970. "The prospects are frightening, especially if one realizes that growth and inflation are not the only factors that will swell the education bill. Let us remember the steady increase in the percentage of young people . . . who are sponsored to undertake education beyond high school . . . If student/teacher ratios remain unchanged, the cost per student, increasing by 6 per-cent in the years. These factors alone - disregarding the cost of additional space, facilities, libraries, etc. - would raise the annual cost of higher education by 170 per-cent in the next decade," pp. 99-100.

See also: Francis Keppel, The Necessary Revolution in American Education, Harper and Row, N.Y., 1966, p. 23. Not only are real costs rising but their impact is exacerbated by the rising expectation that public funds should pay for two years of higher education beyond high school, a product of the nineteen sixties.

F. THE NATURE OF THIS STUDY

This study is an increment in the university's search for itself. Academic research, mainly in the form of sponsored research, is the principle variable to be considered. The setting is that of graduate education at the doctoral level, the point at which research activity is most important. The unit of inquiry is the individual, specifically the recent recipient of the Ph.D. (1966-1969) in one of eighteen fields mostly in the arts and sciences. Experience in the doctoral years is conceived as part of a process of adult socialization directed toward a professional status as well as a specific professional role. A group of variables which are reflective of the process have been selected from studies of graduate education during the past decade. In its design the inquiry is straightforward. The respondents are separated by their involvement with research activity in the university into two general classes, those highly affiliated with research and those with no affiliation. The two basic groups, and variations of them by sub-groupings, are compared on each of the process variables to ascertain the points of association and difference. It is hypothesized that those highly involved with research will differ significantly and they will differ in the direction that is inferred to represent more effective socialization as reflected by a very limited set of variables for students in arts and sciences.

The limitations of such an approach are patently visible at the outset. The successful Ph.D. recipients represent only a small part of the total educational activity in graduate schools. Events at a single institution set marked boundaries for any generalizations that might be derived. There is no single precedent for this type of study and, indeed, there are few studies which could be considered components.

It is exploratory in the literal sense. Its aim is to set the issue in a context for further examination although it is expected that considerable descriptive material and a group of limited conclusions can emerge from the analysis. And finally, because the emphasis is placed upon the situational elements of student experience within the framework of the social system of graduate education the conceptual and theoretical outcomes are narrow.[1] The investigator is acutely aware of the whole range of personality change that lies unreported on the one hand and the organizational features that remain untouched on the other.

In the next chapter the size and character of research inputs, the main ideas about academic research, and the research closely related to the topic are reviewed. Chapter III develops the central question into an hypothesis while Chapter IV specifies the design and procedure. In the subsequent chapters each of the variables is reported first in descriptive terms, then analytical. The final chapter is reserved for conclusions and recommendations.

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[1]Howard S. Becker "Personal Change in Adult Life" Sociometry, Vol. 27, No. 1, March 1964, pp. 40-53. The validity of such an approach, as well as the consequences, are treated in this article. "The process of situational adjustment, in which individuals take on the characteristics required by the situations they participate in, provides an entering wedge into the problem of change."

CHAPTER II

RESEARCH AND THE GRADUATE SCHOOL

A. THE DIMENSIONS OF POST WORLD WAR II RESEARCH

1.- Three Fundamental Features

A distinctive feature of the postwar era has been the introduction of research and development concepts into economic, social, and political activity on a national scale. The primary feature of this phenomenon has been the determinant role taken by the federal government, not through a single, central policy but by the accretion of policies in a dozen major agencies. Emerging as it did from the commanding federal position in wartime, federal support of research represents one of a very few major changes in national orientation that did not have complete public analysis before it reached a full state of influence.

A second feature is the undisputed success of the effort. The policies were successful as a stimulus to discovery, to the production of trained manpower, to the advancement of the technological level, and to the diversifying of research interests. This success is attested as much by the admiration of foreign observers as by our own enthusiasm, and the accomplishments themselves. Joseph Ben-David, under the imprimatur of the Organization for Economic Co-operation and Development, has said,

> "A growing volume of information has been published during the last few years to show that since World War II United States scientific effort has greatly surpassed

that of Europe. Investment both in science and education is much higher in the United States than in Europe. As a result these are comparable differences in the 'stock' of highly trained manpower . . . there have (also) been signs that not only did the United States performance surpass that of Western Europe in an extensive type of higher education and applied research but also in research of higher quality."[1]

A third feature is that the conditions of national support that marked the period from 1950 to 1970 are changing. Much of the writing on public policy and science produced since 1967 has been based on the idea that the main features of public support were permanently established. The last two years have demonstrated clearly that this is not true. Consolidation of the benefits from established and continuing research into enduring form and the formulation of new kinds of support will require public understanding of the processes, costs, and risks of such scientific activity. Because federally supported research is still so new there is an amorphous quality to the whole subject. The paragraphs that follow are directed at only three aspects of the matter: (1) the relative position of academic interests within the total fiscal framework. (2) a review of that portion of the literature which treats the issues related to academic research, (3) its relation to graduate education. We pass by the effects upon undergraduate studies, the public service aspects of university research, the consequences of the "project system," and the teaching-research controversy.

2.- Perspectives on Federal Activity

The data on many phases of this subject are available by the volume thanks to the foresight and determination of the National Science

[1]Joseph Ben-David, Fundamental Research and the Universities. OECD, Paris 1966, p. 19.

Foundation, the experience of the National Research Council & National Academy of Science, and the propensity toward detailed reporting in the Office of Education. In all such data there are problems of accuracy arising from different reporting periods, fluctuations in "real" dollars, and variation in the emphasis of different agencies. And, once beyond the Federal Level, the local data are subject to wide differences in definition of terms. Whenever possible the National Science Foundation (NSF) and the Office of Education (OE) data have been used in this study. Abbreviated tables in the text are supplemented by complete data in Appendix A. The magnitude of national research expenditures and their growth rate, the character of activity and performers, and the agencies with whom sponsorship originates are summarized below.

a. The Magnitude and Rate of Change

It may well be that nothing can portray the magnitude of change in research support so effectively as a remark of Enrico Fermi that during his basic research on atomic structure, in the 1920's, work that won him international recognition and timeless fame, he never had a research grant with a value of more than $1,000. When expenditures for research and development (R & D) are compared to total Federal budget outlay, over two and a half decades, there is an almost unbroken pattern of increase to 1965. The R & D share rose from 0.8% of the federal budgetary outlay in 1940 to 1.5% in 1946 and to 2.5% in 1950, the point at which our summary table, 2.1, begins.

We note that by 1965 almost 13% of the total budget outlay for the nation was channeled into research and development in its identifiable forms.[1] Table 2.1 also shows that expenditures for R & D

[1] James R. Killian, Jr. has noted that in 1964, a high year, 3%

TABLE 2.1

FEDERAL OBLIGATIONS AND EXPENDITURES: 1950-1970 (est.)
FOR RESEARCH AND DEVELOPMENT AS SHARE OF TOTAL BUDGET OUTLAY
(Millions of dollars)

Fiscal Year	Total Budget Outlay	Research, Development & R&D Plant	
		Expenditures	Expenditures As Percent of Total Outlay
1950	43,147	1,083	2.5%
1951	45,797	1,083	2.8
1952	67,962	1,816	2.7
1953	76,769	3,101	4.0
1954	71,138	3,148	4.4
1955	68,503	3,308	4.8
1956	70,461	3,446	4.9
1957	76,748	4,462	5.8
1958	82,575	4,991	6.0
1959	92,111	5,806	6.3
1960	92,230	7,744	8.4
1961	97,802	9,284	9.5
1962	106,830	10,381	9.7
1963	111,314	11,999	10.8
1964	118,585	14,707	12.4
1965	118,431	14,889	12.6
1966	134,654	16,018	11.9
1967	158,352	16,842	10.6
1968	178,862	17,030	9.5
1969 est.	183,701	16,553	9.0
1970 est.	195,272	16,922	8.7

SOURCE: NSF 69-31 Federal Funds for Research, Development and Other Scientific Activities, Vol. XVIII. U.S. Government Printing Office, Washington, D.C., 1970.

multiplied by a factor of 15.6X during the period from 1950 to 1970 while the total budget outlay increased by a factor of 4.5X during the same period of time. A careful look at the years from 1965 to the present is instructive. There is a sharp drop in the percentage of the federal budget outlay going to research and development activity. The Vietnam war and the major efforts at deflation explain this decline from 12.6 percent in 1965 to the level estimated for 1970, 8.7 percent. But we also note that the dollar amounts expended for R & D continued to rise for three years after the turning point in the percentage change was reached. This kind of a lag has great importance for educational planning and it promises that the full effects of change in the public research policy will not reach the campus until 1972.

The dynamics of change in research allocations has had effects upon the academic community and they have not had the attention they deserve. A summary of growth rates for various periods and for the major classes of R & D activity displayed in Table 2.2 shows the preferred position university research activities have held in relation to the other participants. For example, in the period 1965-70 academic research in universities and colleges still exhibited a substantial growth rate in basic research, 7.6 percent; in applied research, 8.5 percent; and even in development, 13.0 percent. The speed and magnitude of these changes has undoubtedly shaped high expectations in the minds of faculty who formulated their professional outlook during these years.

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of the Gross National Product went to research and development and that about 60% of the scientists and engineers were supported either directly or indirectly by Federal funds. Woolf, Science As a Cultural Force, op. cit., p. 10.

TABLE 2.2

RATES OF INCREASE IN R&D, BASIC RESEARCH, APPLIED RESEARCH, AND DEVELOPMENT EXPENDITURES, BY PERFORMING SECTOR, 1953-70.

Sector	Annual growth rate (percent)		
	1953-58	1958-65	1965-70
	Research and development		
Total	15.9	9.4	5.9
Federal Government	6.3	12.3	3.4
Industry[b]	18.2	7.8	6.3
Universities and colleges	12.1	17.4	8.0
Associated FFRDC's.	19.3	11.5	2.9
Other nonprofit institutions[a]	14.7	18.3	5.7
	Basic research		
Total	14.8	16.6	6.6
Federal Government	4.5	18.9	5.5
Industry[b]	14.3	10.5	4.8
Universities and colleges	17.7	20.3	7.6
Associated FFRDC's.	18.8	15.0	7.6
Other nonprofit institutions[a]	22.0	14.4	5.4
	Applied research		
Total	15.9	7.4	5.4
Federal Government	6.6	11.7	4.4
Industry[b]	21.4	4.8	6.0
Universities and colleges	3.7	10.2	8.5
Associated FFRDC's.	18.3	10.4	-.4
Other nonprofit institutions[a]	11.1	18.8	3.1
	Development		
Total	16.0	9.0	5.9
Federal Government	6.5	11.3	2.1
Industry[b]	17.6	8.5	6.5
Universities and colleges	12.5	11.3	13.0
Associated FFRDC's.	20.8	9.8	.7
Other nonprofit institutions[a]	11.5	23.4	9.9

[a]Includes funds from the Federal Government for Federally Funded Research and Development Centers administered by organizations under contract with Federal agencies. SOURCE: National Science Foundation, NSF 69-30. National Patterns of R&D Resources, U.S. Gov't. Printing Office, Wash., D.C.

b. Character of Work & Performers

When the total allocation to R & D is broken out into the categories commonly used to describe work, Basic Research, Applied Research, Development, and R & D Plant, for the period since 1956 we perceived some notable differences. The full table, 2.3, is found in Appendix A.

TABLE 2.3.1

FEDERAL OBLIGATIONS FOR R & D: BY CHARACTER OF WORK: (Percentage)

	TOTAL R & D	BASIC RES.	APPLIED	DEVELOP-MENT	R & D
1956	3,276	6.3%	19.7%	65.3%	8.5%
1960	8,080	7.5	16.4	69.4	6.5
1965	15,746	10.7	20.0	61.9	7.1
1970 est.	17,193	13.9	21.5	60.3	4.1

A steady increase in the share of funds concentrated in Basic Research and, to a lesser degree, in Applied Research emerges. In the past decade the growth of Basic Research from 7.5% of the total Research and Development expenditures to 13.9% has been achieved by reductions in the plant expenditures and in the development portions. In the last few years, 1967 and after, we note that, while total expenditures have declined, the amounts devoted to Basic Research and to Applied Research have actually continued to increase. Thus, the class of research most interesting to universities, Basic Research, has continued its growth to the present, 1970, even though total R & D allocations are slightly reduced.

The next logical separation is the division of each class of research or development activity by what National Science Foundation calls the "performers," the institutions or agencies actually carrying out the work. For full table see 2.4, Appendix A.

TABLE 2.4.1

FEDERAL OBLIGATIONS FOR R & D: BY PERFORMER: (Percentage)

	1959	1960	1965	1970 Est.
Federal Intramural	30.1%	22.9%	21.2%	23.2%
Industrial Firms	57.0	64.0	62.0	57.5
Univ. & Colleges	6.3	6.1	8.2	9.9
FFRDC of Univ.	4.6	4.3	4.2	4.6
Other	2.0	2.7	4.6	4.8
Total	$2,988 mln.	7,552	14,614	16,488

Over the years since 1963 the university and college group, which does not include the Federally Funded Research and Development Centers (FFRDC) has improved its position to the point where about 10% of all R & D funds go to academic research. University participation is, of course, not equal in all the categories of research activity. Performance in Development is negligible and in Applied Research it is moderate with about 17.6% of the funds under academic auspices.

When we focus on Basic Research alone and its distribution among performers the following data appear:

TABLE 2.5.1

FEDERAL OBLIGATIONS FOR BASIC RESEARCH: BY PERFORMER: (Percentage)

	1958	1960	1965	1970 Est.
Federal Intramural	37.3%	26.2%	25.1%	25.0%
Industrial Firms	7.4	15.2	17.7	21.4
Univ. & Colleges	37.9	40.0	37.7	35.9
FFRDC of Univ.	10.1	10.3	11.6	12.0
Other	6.7	7.8	7.9	5.6
Total	$335 mln.	610	1,690	2,399

Basic research has been the major field of university activity and, since 1958, there has been some fluctuation. The academic sector has held steadily to about 35-40% of the funds each year. An interesting change among the performers of basic research has been the rise of the corporate unit, either independent of or affiliated with an industry. With high flexibility to meet ad hoc requirements and without the over-burden of educational expenditures the basic research corporation has a special value for mission oriented, efficiency conscious Federal agencies. In the class of Applied Research, the university sector has held steady but the university affiliated Federally Funded R & D Centers have dropped off slightly.

c. The Shifting Pattern of Agency Support and an Exchange Matrix

The relative importance of sponsoring agencies within the Federal complex has changed rather sharply over the era of research expansion. The Department of Defense and the Atomic Energy Commission dominated the early years while the National Aeronautics and Space Administration took the principal role in later years. The Department of Health, Education, and Welfare steadily improved its relative position and, at a very slow rate, so did the National Science Foundation. HEW probably includes the widest range of interests encompassing all the health and welfare activities as well as the school and college programs but, in its heyday 1961-67, NASA was the most free wheeling sponsor. Outer space and the problems of getting there and back left no area of knowledge irrelevant. On the whole there was more variety to the kinds of programs in existence in the middle sixties than there was in the Defense-AEC era. Simple project support and direct fellowships gave way to sponsorship of buildings and equipment, institutional grants, study conferences, and several forms of student support.

TABLE 2.6.1

FEDERAL OBLIGATIONS FOR BASIC RESEARCH:
BY SELECTED AGENCIES: (Percentage)

	1953	1961	1964	1968 (Est.)
Department of Defense	42.5%	20.9	15.4	12.4
Department of H. E. W.	9.8	16.6	17.5	17.7
Atomic Energy Commission	22.9	20.2	15.2	13.8
NASA	10.4	23.0	33.4	34.5
Nat'l. Science Foundation	1.3	9.3	9.9	10.9
All Others	13.1	9.7	8.5	10.7

Finally, there is data collected by NSF to compare the sources of funds with performers in a kind of exchange matrix, (Appendix A,

Table 2.7.) This tabulation shows that the Universities and College contribute only 2.1% of the resources but as performers they get just over 12% of the total resource package. In basic research the universities and college group puts up 10.6% in the form of in-house contributions receiving, in turn, almost 60% of the resources.

d. Summary

Taken together these data fix several important conclusions about research activity in the academic community: 1) Important though its activities are, the academic community does not represent a majority of the activity in any class of research. Distinguished researchers may be at work in a variety of settings from DuPont to Argonne Laboratory. Thus, unlike the condition in Britain where talent is still highly concentrated in universities, our own institutions of higher learning are not the single voice of science.[1] 2) By any standard the universities and colleges have been a principal beneficiary of research and development growth in the past two decades. They have steadily improved their share of the total resources, have done so at a rapid rate, and they get back the greatest return on their own investment. 3) The full effects of the downward trend have touched all other sectors of the research and development community but have not fully reached the universities. Academic research has experienced in 1968-1970 a slowing of the growth rate but no dollar decline. 4) The commanding exchange of resources for performance in the field of research and development takes place between the Federal government, industry, and the universities. The Federal share is so large that

[1] Sir. Eric Ashby, "Science and Public Policy: Some Institutional Patterns Outside America," in Boyd R. Keenan (edit.) Science and the University, Columbia University Press, N.Y., 1966, p. 17.

the future of scientific inquiry and other research as well is clearly a matter of public policy rather than of private investment, a condition not true before 1940 when foundations and industry played a key role.[1]

3.- Research Reflected in the University

a. National Trends

The foregoing data simply record the emergence of research and its development as a distinctive component of national life. The position of the university, significant but not commanding, is clear. Having recorded the national side we now turn to the educational side in order to fix some of the fiscal effects these changes have had on the financial operation of institutions. The data in Table 2.8.1 and in the expanded data shown in Appendix A reflect Federal contributions to college and university operations as they appear in the pattern of current fund income and expense.

TABLE 2.8.1

HIGHER EDUCATION: HISTORICAL SUMMARY OF U.S. INSTITUTIONS: SOURCES OF INCOME TO CURRENT FUND (percent)

	1947-48	1963-64
Income:		
Tuition	32.9 %	19.8 %
Federal Grants	7.9	22.6
State & Local Grants	19.8	24.7
Endowment	4.2	2.3
Gifts & Grants	4.4	5.7
Sales & Services	6.3	5.9
Auxiliary Enterprises	22.9	16.7
Student Aid & Other	1.1	1.5

Between the survey years of the Office of Education 1947-48 and 1963-64 the share of institutional budgets drawn from Federal sources rose from 7.9% of all income to 22.6% of income. These federal contributions

[1]See Price, Scientific Estate, pp. 17-18.

include purposes other than research but that activity is by far the largest element.[1] Expenditures for organized research show a corresponding order of change rising from 8.4% to 21.4% of the total current fund outlay.

A set of data from a smaller group of universities also showed a similar kind of increase. (Appendix A, Table 2.9) Private universities in this survey drew a larger share of their total current fund income than their public counterparts, more than 35% by 1963-64. Although there is a marked change in fiscal patterns, this introduction of a large new source of funds is the distinctive change in the mosaic of higher education over the past 25 years.

b. At One University

The study sample is drawn from a single university which is representative of the changes summarized above. At the University of Michigan the characteristics cited above appear in slightly intensified form. The institution has continuously ranked among the top three research universities for more than a decade. In 1959-60 about <u>18.9%</u> of the current fund income was identified as originating with Federal grants and contracts and by 1963-64 this had reached <u>30.0%</u> then dropping to <u>24.1%</u> in the most recent year, 1969-70. Expenditures for organized research were 20.6% of the current expenditures in 1959-60 and rose to a high of 27.1% of the budget in 1963-64. The year just passed, 1970, is marked by a return to the 20.7% level although the dollar amount has continued upward each year. A summary of the data

[1]An estimate of the proportionate distribution for 1963 showed direct research and development including projects, area programs, grants and contracts receiving 68% of the Federal input, institutional programs such as the NSF base grants 10%, direct training programs 16% and construction 6%. Harvey Brooks, <u>The Government of Science</u>, op. cit., p. 165.

in Table 2.10, Appendix A is displayed below.

TABLE 2.10.1

UNIVERSITY OF MICHIGAN: CURRENT FUND INCOME, SOURCES: SELECTED YEARS (percent)

	1959-60	1963-64	1967-70
Student Fees	9.1	9.6	11.7
State Appropriation	34.2	29.0	27.2
Federal Grants and Contracts	18.9	30.0	24.1
Gifts & Other Grants	11.7	5.2	6.7
Investment Income	2.3	2.2	2.4
Dept. & Related Activity	--	2.3	3.0
Auxiliary Activity	23.8	21.7	24.8

Like other national trends, the altering patterns of federal agency participation are reflected at the University. Table 2.11 shows the declining share sponsored by the Department of Defense, the growth in HEW programs and NASA.

TABLE 2.11

UNIVERSITY OF MICHIGAN: ORIGINS OF FEDERALLY SPONSORED RESEARCH BY AGENCY (in thousands of dollars)

Agency	1959-60 Amount	%	1962-63 Amount	%	1967-68 Amount	%	1969-70 Amount	%
Defense	13,718	69.1	12,666	44.7	15,979	33.5	10,449	23.0
HEW	3,429	17.2	7,043	24.8	18,149	38.0	18,274	40.3
AEC	1,024	5.1	2,705	9.5	2,531	5.3	3,128	6.9
NASA	775	3.9	2,359	8.3	4,292	9.0	4,227	9.3
NSF	671	3.3	2,273	8.0	4,838	10.1	5,177	11.4
Others	225	1.1	1,247	4.4	1,861	3.9	4,003	8.8
TOTAL	19,842		29,293		47,650		45,258	

SOURCE: Office of Research Administration
University of Michigan

Of special significance to the information developed later in this study is the distribution of research funding among the major fields of knowledge.

TABLE 2.12

UNIVERSITY OF MICHIGAN: VOLUME OF RESEARCH BY FIELD OF KNOWLEDGE, 1969-70

	Percentage	Amount
Engineering	24.2	$15,007,347
Life Sciences	34.9	21,678,163
Physical Sciences	18.2	11,299,276
Social Sciences	15.6	9,683,265
Humanities	2.1	1,334,219
All Other Fields	5.0	3,135,948
TOTAL	100.0	$ 62,138,218

SOURCE: Office of Research Administration, University of Michigan

To Summarize: In the span of two and a half decades a new significant class of public expenditures has appeared in the form of Research and Development. The dominant source of funds is the Federal government. Neither the policy nor the activity is centralized but divided among eight major agencies and as many as twenty other offices and divisions. Shifts in national emphasis are reflected quickly in the changing pattern of research expenditures by these agencies. Universities, because of their suitability for basic research, are a significant though not commanding element in this transformation. Income from Federal sources and outlays for research have attained the level of 20 to 30% of the current fund budgets at many institutions. The emergence of research as a discrete item, its rapid growth, and its share in the total fiscal pattern of higher education mark this as the most important transformation of the postwar era in higher education.

How permanent the new conditions may be,[1] what lasting effects

[1]H.D. Babbidge, Jr., and R. M. Rosenzweig. The Federal Interest in Higher Education, McGraw Hill, N.Y., 1962. The authors point out that although Federal involvement with education has a long history it has usually been made in response to wars, social needs, and emergencies. Programs, with few exceptions, have been transitory, p. 17.

might remain with the universities, and the optimum use of these resources are among the questions that deserve early and thorough examination.

B. THE RESEARCH ERA; BEFORE BERELSON

1. The Postwar Outlook

The magnitude and rapidity with which federally sponsored research entered the academic world is clear enough from the abbreviated data above. How did it come about? What were its roots? During the years of transformation how was this phenomenon perceived and interpreted? More specifically, what do the writings on graduate education reveal of the influence this new force had upon the educational process?

At the close of World War II something akin to a public enlightenment took place in the attitude toward science. There was a unitary view of science with basic research, applied research, and graduate education standing in the public eye as a single function. They stood in a common condition having been given both a new meaning and a new importance by the events of the war. In one sense the next two decades, 1946-1966, are a history of the rapid and extensive proliferation of this singular view. New organizational forms like the Rand Corporation, the private research firms, and the university research laboratories came into view. Varieties of goals and interests appeared along with new subfields within the disciplines and new specializations between fields, e.g. computer science.

The principal task for higher education throughout this era was to find an appropriate response to phenomena over which it had little control. It was not a question of planning the directions academic research might go or the magnitude it might assume. Rather it was one of trying to comprehend the significance of an atomic, space, or "technetronic" age.[1] It was not a matter of controlling external developments but of using them with whatever wisdom, or efficiency the academic world could muster. This is a most important point for the university was called upon constantly to react to a set of happenings it had only a small part in creating.

There is a rich literature of this academic response. Beneath the literature there is also a developing ideology on the position of research in the universities. We will attempt to pursue these two subjects in parallel over the next several pages.

2. A Milestone on the Endless Frontier

The research era has a very clear origin. In response to President Roosevelt's brief and basic questions as to how the knowledge and scientific relationships built up in wartime could be transformed into a force for renewal in the postwar world, Vannevar Bush prepared Science, the Endless Frontier.[2] It was a remarkable report, remarkable for its directness and force as well as for its inventive approach. A primary value to the document lies in the fact that it placed the central issues concerning the development of scientific talent into the public forum rather than into the legislative ante-chamber. The principal recommendation was: "The Federal Government should accept new responsibility for the creation of new scientific knowledge and the development of scientific talent in our youth." Basic research was to be lodged in the university community where the "free play of intellect" could

[1] Heiss, Challenges to Graduate Schools, p. 6.

[2] Vannevar Bush, Science, the Endless Frontier: A Report to the President, July 1945, U.S. Gov't. Printing Office, Washington, D.C., 1945.

assure the widest benefits.[1] The means of effecting this change was to be "an independent agency devoted to the support of scientific research and advanced scientific education alone."[2] This agency was the National Science Foundation and its success, even after Congressional pruning has been so significant as to require no recounting here.[3]

The Bush statement is crucial to this study. The implications of the report set out the nature of the relationship between research and education in a form that persisted for two decades. Unfortunately this phase of policy was accomplished more by omission than design and thereby encouraged the continuation of a dangerous simplism. There was no question of its importance. "Scientific capital" was composed of: (1) ". . . men and women trained in science for upon them depends both the creation of new knowledge and its application to practical purposes." (2) ". . . centers of basic research which are principally the colleges, the universities, and research institutes."[4] Lest there be any doubt, James Conant's words are included: "In every section . . . of science . . . the limiting factor is a human one . . . So, in the last analysis, the future of science in this country will be determined by our basic educational policy."[5]

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[1]Joe E. Munster, Jr., and Justin C. Smith, "A Second Look at Government Supported Research," Educational Record, Vol. 46, No. 2 Sprg. 1965. The authors point out that, while the government hired individual faculty, they did not purchase or contract with institutions to any great extent until late in the war therefore the Bush model was essentially new.

[2]Ibid., p. 26.

[3]Dorothy Schaffter, The National Science Foundation, Fred A. Praeger, New York, 1969.

[4]Bush, Endless Frontier, p. 2.

[5]Ibid., p. 18.

However, the committee charged with the "Discovery and Development of Scientific Talent," the Moe Committee, touched only one small corner of educational policy. It emphasized the need for more open opportunity for the talented but impecunious student and it suggested a modest program of national fellowships.[1] The fundamental issue of support for the educational process itself and for the institutions that maintained the learning environment was left untreated. As a result the pattern of emphasis in the total report finally emerged in this form: Federal support for basic research in the academic community is vital to the national interest. A more open search for talent and a program of student support for those who cannot meet the costs of advanced education is also important.

The absence of an explicit statement on support for the educational process itself led to two major inferences which have been a source of considerable difficulty ever since. The first was that support for the individual student is tantamount to support for education. The second was that support for academic research activity is the same as support for the educational process. It is this later notion that we shall refer to as the "Bush assumption" not because it represents the views of the man but because it stems from the report which has come to bear his name. The idea that basic research and graduate education are so intimately related that one is a function of the other, is attractive and convenient. One action yields two benefits: increase basic research funds and you increase thereby the benefits to graduate study even without further special action. Such an idea became the working assumption and the justification of academic research sponsored by

[1]*Ibid.*, pp. 128-68.

outside agencies. It forms the basis of the hypothesis we shall develop later, not so much because it is accurate as because it was the dominant approach to the relationship between research and education for the postwar era. We will find it questioned but not replaced, circumvented but not examined.

3. Response to the Research-Education Dilemma

The first responses to the new conditions of federal participation involved an examination of historical antecedents for analagous circumstances and a thorough airing of the traditional fear of "government control." Hollis P. Allen compiled a summary of all federal activity in education for the Hoover Commission.[1] He noted that institutions participating in federal programs "testify that they have seen few evidences of federal control and that they have remained free agents to determine their own futures in that no federal program has been thrust upon them against their wills."[2] Nevertheless he reflected strong reservations about the educational effects of federal research support.

> "We cannot agree . . . that the federal program of contract research, largely in the natural sciences, is as generally wholesome for higher education in this country as the veterans' program. Of course, insofar as such research is necessary by the federal government it may well be done through educational institutions. All higher institutions should be willing to undertake federal research even to the extent of sacrifice to their general programs when the national defense interest is imperative. Moreover, support of pure research is in line with the aims and traditions of higher education. Although very little of specific controls go with the individual federal research programs, it is believed that the sum total of federal research devoted largely to the medical, physical, and biological sciences cannot do

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[1] Hollis P. Allen, The Federal Government and Education, McGraw-Hill Book Co., N.Y., 1950.

[2] Ibid., p. 280.

other than exert a subtle type of control of educational emphasis which should be noted."[1]

It was beginning to appear that research and education might not be so intimately related that a single support program would serve both.

Richard G. Axt made some assessments of the first effects of federal funds in 1952.[2] After treating the historical precursors of the current programs he identified certain issues as troublesome for graduate education. The dimensions of "imbalance" at that time lay in the support of applied research in engineering and the natural sciences over basic research. He saw the university abandoning its own lines of investigation, basic research, in order to gain applied contracts that might lead in other directions. The magnitude of research inputs to a small number of universities held serious implications for the teaching and educational functions. In a statement whose argument is still not fully answered he observed, "it is by no means clear that an increase in research activity produces a commensurate gain in the quality of teaching."[3]

The solution Axt offered to redress the problems created in the educational process by new patterns of federal support appeared frequently until 1967. A large federal scholarship-fellowship program would somehow erase many educational difficulties. He noted however that:

"Three Characteristics of federally sponsored research presently demand attention: The absence of a

[1] Ibid., p. 281.

[2] Richard G. Axt, The Federal Government and Financing Higher Education, Columbia Univ. Press, N.Y., 1952. Published for the Commission on Financing Higher Education of the Association of American Universities.

[3] Ibid., p. 105.

general federal policy concerning research at universities, the lack of adequate factual data on which such a policy could be based, and the lack of a carefully considered policy toward government research on the part of the Universities. It can be expected that the National Science Foundation will do much to repair the first two needs; the last depends on vigorous action by the universities themselves."[1]

The Carnegie Foundation for the Advancement of Teaching devoted the essay section of its annual report in 1957 to Federal Programs observing in the opening paragraphs:

"Before going further it is necessary to comment upon the term 'federal aid.' A high proportion of the federal money now going to higher education is not 'aid' in any meaningful sense of the word, but rather a PURCHASE OF SERVICES (ital.) by the government."[2]

In a later paragraph the point is elaborated:

"These programs (Research contracts and grants) employ many thousands of research people, supplement the incomes of many thousands of professors, and provide an indirect subsidy for much of the graduate education in certain fields. But such programs may be burdensome to the institutions involved, which sometimes have to contribute rather heavily in faculty salaries, facilities, and supporting services. It is said that the huge research funds flowing from Washington have heavily affected the geographical distribution of talent, the balance among scholarly fields, the balance basic and applied research, and the balance between research and teaching.[3]"

After reviewing other federal programs the report suggested a guiding principle:

"The balance among the various areas of higher education should never be allowed to depend upon popular whims and worries of the moment. This is why some educational leaders argue that if we have concern for the integrity of higher education, we

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[1]*Ibid.*, p. 121.

[2]Carnegie Foundation for the Advancement of Teaching, "Federal Programs in Higher Education," *Annual Report, 1956-57*, N.Y., 1957, p. 11.

[3]*Ibid.*, p. 16.

will form federal support across the board or not at all."[1]

To reassert such a balance the leaders in higher education; presidents, deans, faculty, would have to "put in perspective the cross currents of public discussion concerning higher education and correct the imbalances and absurdities which we perpetrate through our anxieties, our illusions, and our national fondness for cutting corners."[2] The suggestion here for the resolution of the growing differences between research activity and educational activity lay in a comprehensive new kind of support for higher education itself.

In an analysis of the financial prospects for the next decade, 1960-70, the contributors to a symposium guided by Dexter Merriam Keezer reached a somewhat different conclusion.[3] They accepted the primacy of the sponsored research function as a reality in the financial life of the new university based on two conditions: First, "it is clear that we have not yet come to the point of diminishing returns in research activities whether measured in dollars or in terms of national security, public health, or other tangibles, (ital.)."[4] Second: "Major activities in research and development will necessarily be a permanent part of our national pattern . . . In all of this, whether they like it or not, the universities are in the central and important position. The whole research structure is built around them. If this keystone is weakened, the entire structure will correspondingly deteriorate.

[1]Ibid., p. 21.

[2]Ibid., p. 24.

[3]Dexter Merriam Keezer, edit. Financing Higher Education, McGraw-Hill Book Co., Inc., N.Y., 1959.

[4]Ibid., p. 80.

If the keystone were removed, the structure would soon collapse."[1] The main problem with sponsored research lay in the failure of government agencies to reimburse all costs. The analysis offered is worth quoting:

> "For years, in most institutions research was in fact no more than a professional avocation, and it still is in many small colleges. A generation or more ago, in leading universities, research became a part time enterprise along with teaching. But the results were looked upon as a by-product of teaching and the activity as purely an aid to teaching. The research budget, if one lasted, usually consisted of the incremental costs determined as the costs would be determined for any by-product. For research budgets grants-in-aid that covered all or most of the incremental costs were regarded as ample-financing. But as research expanded complaints about inadequate overhead in research grants became more frequent. In recent years research has become a major joint enterprise along with teaching. It is now big business, which in some cases overshadows the teaching function. But the concepts of research and accounting practices have not caught up with the fact that research is now a joint-product enterprise that cannot be supported on by-product cost principles."[2]

Quite in contrast to the Carnegie proposal for educational support, this analysis emphasized a increased allowance for research grants. In doing so the authors accepted a syllogism believed by everyone except those engaged in planning for and administering instruction. "By channeling them (taxpayer-dollars) into the universities they can be made to do triple duty: obtain research, help the universities, and produce more trained manpower."[3]

Within the National Science Foundation itself there was also a strong view that support for basic research should hold unquestioned

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[1] Ibid., Ch. 4. "The Role of Research in the Economics of Universities," C. C. Furnas & Raymond Ewell, p. 8.

[2] Ibid., p. 207.

[3] Ibid., p. 200.

priority. The associate director, Paul E. Klopsteg, emphasized: "A determined and sustained effort in basic research is imperative. 'Knowledge is power' fits the situation precisely and basic research is the key."[1] He proposed no increase in overhead payments to universities and no unrestricted grants for educational functions but rather a search for ways of bringing private and corporate funds into the universities, notably by tax free gifts.

By the end of the fifties federal funding of research and education had caught the attention of economists and the Brookings Institution sponsored several studies. Alice M. Rivlin offered an analysis, mainly historical in tone, which saw the "crisis in education," -- surely the most durable chapter heading of the postwar era -- as a product of increased demand and higher operating costs.[2] In searching for a suitable rationale for a coordinated program of "subsidy" she observed:

> "the federal government provided a little less than one-fifth of the educational and general income of colleges and universities in 1957-58. About three quarters of this was for research and . . . it is hard to decide how much of this federal research money should be classified as aid to education . . . The federal government is presently providing only a very small part of the income of higher educational institutions for purposes other than research. When research is deducted, the federal share of the total is only one twenty-fifth."[3]

Logic would seem to direct that the educational effects of the larger share, the 3/4 for research, be examined before suggesting a program.

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[1]Paul E. Klopsteg, "University Responsibilities and Government Money" in Science, V. 124, No. 3228, p. 919, Nov. 9 and 16, 1956.

[2]Alice M. Rivlin, The Role of the Federal Government in Financing Higher Education, The Brookings Institution, Wash., D.C., Nov. 1961.

[3]Ibid., p. 149.

However, support for construction, block grants to institutions, and direct student aid to undergraduates appeared more feasible.

Her final conclusion is a curious one. Sponsorship of undergraduate was valuable as a means of developing talent, fostering social justice, and maintaining undergraduate institutions. By contrast, graduate education was to be regarded as a personal asset and, falling back on the assumption of the Bush Report, indirect subsidy is recommended.

> "Take, for example, a professor who spends much of his time working with graduate students on research problems and teaching graduate courses closely related to his research interests. Subsidizing this research and compensating him for the time spent on it may be the equivalent to subsidizing graduate education."[1]

It was the study of Charles V. Kidd that set the conditions and problems more clearly than any other.[2] He accurately assessed the situation that lay "at the root of the problem of reconciliation," that is to say the adjustment of federal interests and university interests to the greatest mutual advantage. The problem is that ". . . federal research funds are limited to one function of the university -- the extension of knowledge. In general, the federal agencies are forced, by reason of the statutes under which they operate . . . to view research as separate from the conservation and diffusion of knowledge. The universities, on the other hand, must consider the three functions as intermingled and inseparable."[3]

Kidd's investigation is one of the few to attempt a look at what had become the pivotal question, the effect of sponsored research

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[1] Ibid., p. 147.

[2] Charles V. Kidd, American Universities and Federal Research. The Belknap Press of Harvard University Press, Cambridge, Mass., 1959-X.

[3] Ibid., p. 34.

on the student experience. He gathered information by polling faculty, department heads and deans in a small sample, 191, which drew 131 replies. Kidd concluded that the quality of education available to "the exceptionally gifted graduate student" was increased by federal research funds. In the final conclusions he fixed the problem clearly -- "The interrelated tasks of training and using manpower, strengthening of our total educational structure . . . and fostering the development of highly talented students are emerging as functions that are as significant to the nation as the support of research."[1]

The necessity for a more complete examination of the educational consequences of research policy apparently struck a number of observers at the same time. The Carnegie Foundation for the Advancement of Teaching Sponsored Self-Studies at twenty-six institutions ranging in size from 12 major universities to 4 small colleges. A summary of the findings was given by President Nathan Pusey at the American Council on Education meeting in 1962.[2] A complete report was published the following Spring.[3]

The major questions were whether a heavy concentration on research diverted talent and attention from educational functions, whether there were marked salary differentials attributed to research alone, and whether "Federal dollars are followed closely by Federal control." Among the benefits listed by the participating institutions were increased research capacity, benefits to science faculties, and then:

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[1] Ibid., p. 227.

[2] Charles G. Dobbins, editor, Higher Education and the Federal Government, American Council on Education, Wash., D.C., 1963.

[3] Nathan M. Pusey, Chmn. "Twenty-six Campuses and the Federal Government" The Educational Record, April, 1963, pp. 95-136.

"Graduate students have benefited and postdoctoral fellows have been provided for." The form of these benefits to students as stipulated in quotations from the institutions is chiefly employment on research work. Syracuse mentioned an increased ability to attract high caliber students and the University of California at Davis acknowledged that is was able to initiate graduate programs because of the research contracts. Only M.I.T. cited an effort to bring all graduate students, supported or not, into contact with ongoing contract research. Throughout the report there was frequent emphasis that educational benefits are incidental to the primary research activity.

> "Federal support of university research is the most significant part of the Government's present relationships with higher education. As shown by the self-studies of universities cooperating in this survey, research (ital.) support usually means just that. With few specific exceptions, any educational (ital.) benefits resulting from such support are, in the eyes of the Government, by-products only, and not a primary objective."[1]

Among the problems cited by the twenty-six institutions, the matter of full reimbursement for "indirect costs" was first but the burdensome administrative requirements and unsympathetic Federal auditing practices came in for criticism too. From the report it was clear that most institutions were also wrestling with the question of whether income to individuals from research should be integrated into the financial structure or maintained separately. In most cases the management of research monies was held separate from the tenured ranks and salary scales.

The final pages suggested a major modification:

"Alongside research support, other Federal programs

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[1] Ibid., p. 123.

> in higher education appear as drops in the bucket . . . The institutions participating in this study stressed the need for Federal support of higher education beyond the present limited, and largely research oriented, programs. Basically what is needed, many of them point out, is a different raison d'etre (ital.) fróm that on which most Federal support of higher education is now based. Today the expenditures of most Federal dollars . . . are justified on grounds of the practical results they will achieve . . . But would it not be wiser . . . for the Federal programs to be founded on the recognition that the strengthening of higher education is itself a pressing, perhaps the pressing, national need that justifies the Government-campus relationship.:[1]

Another of the studies sponsored by the Brookings Institution was conducted by Harold Orlans who focused attention on thirty-six quite varied institutions.[2] It is one of the first inquiries into the effects that federal programs may have had upon the student body and upon educational outcomes. The scale was primarily institutional and departmental with the data drawn from faculty impressions but not student responses. In general design the study established three groups of institutions based on size, federal funds, breadth of offering, and federal research income. Comparisons across the groups were made of certain "effects:" the quality of faculty based on rankings, the quality of students based on test scores, (SAT & CEEB) and faculty opinion, the trends in the distribution of faculty and students among various fields, the degree of student-faculty contact as indicated by class size and informal contact, and the distribution of support for students.

Orlans found no evidence that the infusion of research funds had radically altered the relative positions of institutions but he

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[1] Ibid., p. 135.

[2] Harold Orlans, The Effects of Federal Programs on Higher Education, The Brookings Institution, Wash., D.C., 1962.

did discern a concentration of faculty talent of the specialized kind at the few large institutions. Certain of his findings on the characteristics of students and their experiences have significance for this study. There was a general rise in student performance on tests across all fields and irrespective of the type of institution or its relationship to research. The benefits directly attributable to research that filtered down to students were present only at a few institutions and the effects were lost in the general pattern. Although effects could not be demonstrated the belief in benefits was strong. When all federal funds were considered, fellowships as well as research, the faculty at institutions with the most funds tended to see the most benefit. As Orlans observed:

> ". . . faculty in fields with any federal money are so gratified they believe their students must benefit from it. Assuredly, many do, as students in fields without money cannot, but it does not follow that the former are any better students therefor, or the latter any worse."[1]

There was no evidence that students switched fields to follow research funding nor was there any particular concentration of intelligence in the science areas. Student-faculty contact in terms of both classroom meetings and outside associations did show a reduction attributable to research activity. This observation was reinforced by the changes in the distribution of faculty time that were reported at high research institutions where about 55% of faculty time was identified as research activity.

In his consideration of this evidence Orlans felt that another aspect of change in higher education was more significant than research. It is, however, a conclusion based more on opinion than evidence.

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[1] Ibid., p. 36.

"The enormous increase in enrollment is the principal cause, (of reduced contact between faculty & students.) But government research programs which devalue undergraduate teaching and reduce the time faculty need to devote to it are an important contributory factor."[1] The overall conclusion derived by Orlans was that, while the total distribution of academic talent and interests had not been warped by the infusion of federal funds there was within the sciences an undesirable concentration of resources at a very few institutions. A solution was not to be achieved by abolishing the current practices of project research or centers of excellence but rather by programs newly designed to spread the benefits to other geographic areas and to the undergraduate institutions. In essence this was the compromise solution to the research-education dilemna that everyone wished for at the beginning of the nineteen-sixties.

4.- <u>A Summary of the Research Support Question</u>

To summarize: In the immediate postwar period Vannever Bush and his associates crystallized wartime research experience into a set of recommendations for federal support of science, particularly academic science, that aimed at continuous renewal and development of talent through higher education. The proposal rested on an assumption that basic research in a university and educational activity were so intimately related that they could be thought of and treated as a unit.

The rapid rise in the amount of research and the necessity of administering it in accordance with this assumption generated certain recurrent problems or, more correctly, constellations of problems. One of these was the "imbalance" of resources within the academic community.

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[1] *Ibid.*, p. 53.

It appeared among fields as the concentrations of funds shifted from physics, to engineering and chemistry, then to the health sciences and later to the quantitative behavioral fields. Within fields it appeared as certain subfields drew heavy support while others languished and it could be seen among institutions and between geographic regions. The project system by its specificity and its adherence to the 'Bush assumption' prevented the university from redressing these imbalances by internal management. A second theme was the question of appropriate reimbursement to the university by research sponsors for indirect costs, for "real" costs, and sometimes for full direct costs. Sponsors maintained throughout that their support of research activity, whether by contract or by more general forms of sponsorship, entitled the universities to whatever spin-off benefits to education they could glean. Universities, having accepted the Bush assumption that research activity carried its own intrinsic educational values, now found that educational costs associated with research activity were just as real as research costs. The impasse lay in the unwillingness of sponsoring federal agencies to pay a surcharge to support the educational activity of employees who were also graduate students or principal investigators who were also faculty. And it lay in the inability of the universities to absorb these charges into the general institutional fund. In prewar years research drew support from educational funds. Now the balance had tipped and educational costs, if they could be clearly identified, had to come from research or from another source.

It became clear that the relationship between educational activity as a whole and basic research was more complex than had been assumed. Suggestions for redress of the problems included more fellowships, higher cost share payments by federal agencies, institutional grants, support for construction, and special educational support programs. All of these were introduced in some form by Federal legislation in the period 1957-1965: the National Defense Education Act, fellowships; the National Science Foundation and National Institutes of Health, institutional grants; the Higher Education Act, construction and equipment support. There were many changes in the nature of research programs too, with training grants and unrestricted grants appearing more frequently.

Actually there were two ways out of the research-education dilemna. One was a thorough overhaul of research policy to include a full measure of support for the educational facets of such activity within the university. The other, the selected one, was to fill in the gaps with new programs and leave the existing research policies alone. Because opinions tended to polarize around either support for basic research as it had developed in the nineteen-fifties or broad general support for higher education the compromise was reasonably successful. Institutions have been able to meet the immediate issues of the times, and serve the national interests in a remarkable way.

We are left, however, with the crucial question obscured by compromise and still unresolved: how can research activities and educational activities be related most fruitfully? What are the natural relationships between them and which relationships require cultivation? What are the relative cost factors for each? The assumption that research and education are intrinsically related with one a function of the other remains to be examined.

C. AND AFTER: THE ERA OF GRADUATE EDUCATION

1.- The Berelson Studies

After 1960 it is not only convenient but quite accurate to shift attention to the studies and commentaries on graduate education. So rapidly did this aspect of higher education emerge in the public consciousness that the period might well be called "The Decade of the Graduate School."[1] The issue of federal research policy and federal relationships did not disappear. Each was recast in a larger setting. The new federal legislation; the National Defense Education Act, the Higher Education Act, Educational Facilities legislation and a host of other acts added issues ranging from student support through library operations to the agenda of public interests. At the same time the growing "system of science," comprehending as it does far more than academic research, raised the question of a long range federal policy for science. In the remaining pages of this chapter our path lies with the inward scrutiny the academic world directed at graduate education.

The study made by Bernard Berelson in the very late fifties and published in 1960 was a landmark assessment of graduate education.[2] It towers over previous efforts in the field and it set the direction of much study and debate for the decade.[3] The author summarized the

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[1]Within half dozen paragraphs one pair of commentators call the graduate school a "central institution of American life: and an unyielding "imperium," either attests its importance. Christopher Jencks, David Riesman, The Academic Revolution, Doubleday & Co., N.Y., 1969, pp. 514-15.

[2]Bernard Berelson, Graduate Education in the United States, McGraw-Hill Book Co., Inc., N.Y., 1960, Carnegie series in American education.

[3]See Marcia Edwards, Studies in American Graduate Education, A Report to the Carnegie Foundation for the Advancement of Teaching, N.Y., 1944. This study was part of an effort to evaluate some of the effects of the Graduate Record Examination that had been introduced in 1936. While the broad conclusions are not radically different from Berelson's, the derivation of them is much less convincing. See also W. Carson Ryan, Studies in Early Graduate Education, Bulletin 30, Carnegie Foundation for the Advancement of Teaching, 1939; Isaiah Bowman, The Graduate School in American Democracy, U.S. Office of Education Bulletin #10, U.S. Dept. of Interior, Wash., D.C., 1939.

scattered literature, gathered the views of graduate deans and faculty members through questionnaires and interviews, and sounded out the views of a significant sample of 1957 Ph.D. recipients. For good measure he obtained the opinions of the presidents at a selected group of undergraduate institutions and the views held by employers of recent graduates. The effect of so extensive an inquiry was to fix the areas of consensus very clearly and, even more important, to highlight both the areas and the range of conflicting views. The principal conclusions, particularly those dealing with the student and with research, suggest guidelines along which the pertinent studies of the 1960's can be examined.

The simplest over-arching conclusion drawn by Berelson from his review of the past is: "The same issues have always been discussed, largely in the same way . . . Plus ca change, plus c'est la meme chose."[1] This theme is repeated in his assessment of the present: "Through the years there has been a great deal of self scrutiny and controversy over the nature of graduate study . . . from one academic generation to the next, the debate has been substantially the same . . ."[2] Both the agreements and the disagreements were, in 1960, largely unchanged since the turn of the century. The more firmly established features, the central elements in American graduate education included; the primacy of the Ph.D degree, the existence of the graduate school within the university, the dominance of the methods and procedures of the natural sciences, the emphasis on research and research training, and a certain growth in utilitarian tendencies and specialization in many

[1] *Ibid.*, p. 41.

[2] *Ibid.*, p. 217.

fields of study.[1]

In a similar fashion the issues reappear again and again, each identical but with the overall arrangement forming a differing mosaic. The "true" meaning of the Ph.D degree is a matter of constant inquiry while with the MA the question is whether it has any meaning at all.[2] Maintaining "standards" and finding students who are "qualified" has a surprising durability. It continued when students were few and when the pressure of numbers grew very strong. Selection processes are as debatable at the graduate level as they are at the undergraduate level. The preparation of College teachers, whether it should be done and how it should be carried out, is among the regular topic of debates. Sometimes it stood alone but more often it was placed in opposition to training for research.[3] The unceasing flow toward specialization of the disciplines into sub fields and sub specialties has raised fears and sensitivities through several decades. The number of institutions capable of offering graduate work has been argued in its normative aspects (how many can be approved?) and its proscriptive facets (what criteria shall be used to evaluate excellence?). Finally there is the matter of the form and meaning of the dissertation. Should it be a lengthy review or a concise report? Is it a "contribution to knowledge" or a training exercise? "How can the doctoral dissertation be

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[1]See Glenn A. Reed, Criticisms of the American Graduate School, 1900-1945, unpublished dissertation, Stanford University, Sept., 1950. The author notes that few of these features were present when the first Ph.D's. were given, Yale 1861. The research emphasis, the dominance of science, and the specialization are all introductions made between about 1890 and 1910, pp. 131-32, p. 250 ff.

[2]Stephen H. Spurr, Academic Degree Structures: Innovative Approaches, McGraw-Hill Book Co., N.Y., 1970.

[3]Berelson, Graduate Education, pp. 221-25.

domesticated?"[1]

In the consideration of research Berelson reached one of the few conclusions that does not fit the occurences of sixties. Data on preparation for research and preparation for teaching revealed a heavy emphasis on the research side whether the respondent was reporting what presently existed or what should be, and irrespective of whether the respondent was a student or faculty. In spite of this information Berelson suggested quite a different view of research activity in the university.

> "Although the university is still the home of research training (ital.), it may have already lived its short life as the dominant center for research itself. Before the graduate school, research went on in academics and societies devoted to particular subjects; since World War II, it is increasingly located in industrial and governmental research installations and, as a half-way measure on both sides, in the research institutes common on university campuses but not integrally a part of the instructional program. The fifty years from the 1890's to the 1940's may have constituted the 'university era' in scientific research taken as a whole. However, the university is still dominant as the home of 'basic research,' though perhaps not so much as is generally assumed. For example, of all the authors in leading journals in 22 disciplines and fields in recent years, only 65% were in academic life."[2]

The conclusions and recommendations, 19 of them, have had some importance as guidelines for individual institutions and for some federal or foundation programs. Notable among them is the changing of

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[1] John G. Darley, "The Graduate School as a Professional School" in T. R. McConnell, et. al., The Graduate School as a Professional School, N.S.S.E. Yearbook, 61st Year, University of Chicago Press, Chicago, Ill. 1962. Chapter IX, p. 191 ff. In the graduate school the looseness of structure has led to the ritual observance of the formal requirements; language, 'original' thesis, residence requirements, etc. but it has also encouraged avoidance of debate about the central issues such as the goals and purposes of graduate education.

[2] Ibid., footnote, p. 13.

general language requirements to a departmental requirement or to a set of alternative skill courses, the encouragement of the four year doctoral program by Ford Foundation, the strengthening of the graduate deanship and his attendant organization, and the extension of national graduate school organizations.

But the most significant influence of the Berelson inquiry, in my opinion, has come and will come in quite a different form. It lies in the use of data to fix conditions within graduate study and thereby allow more objective determination of policy. The gap between the assessments of graduate deans, faculty members, and recent recipients on some of the crucial points of graduate study in his study is striking. All those in a position to know came to know quite different things.

2. Voices of Wisdom and Experience

a. The Professional Meetings

There is no shortage of writings on graduate education in the 1960's. Topics tend to be the perennial favorites cites by Berelson in his original study and largely unaltered for a paper 1965; the character of the dissertation, the role of fellowships, the quality of students, preparation for college teaching, and the nature of research.[1] But they were not the same topics, as John Chase pointed out in a response to the paper.[2] The people discussing the issues came from many more areas of public life and many more institutions. There

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[1]Bernard R. Berelson, "Graduate Education in the Arts and Sciences" in Seymour E. Harris, K. M. Deitch & A. Levensohn, Challenge and Change in American Education, McCutcheon Publishing Corp., Berkeley, Calif., 1965, pp. 293-301.

[2]*Ibid.*, 301-309.

were many more of them and the information at their disposal was much more comprehensive. This distinction is reflected in the literature on graduate education. Part of the writing reflects time when graduate deans addressed their remarks only to their fellow deans in exchanges based largely on personal experience. The newer segment of writings has brought to bear on graduate education survey, interview, and multiple analysis techniques of the social sciences.

A good place to explore the wisdom and experience tradition is in the professional societies, the prestigious Association of Graduate Schools (A.G.S.) and newer Council of Graduate Schools (C.G.S.) which began its existence in 1961. The proceedings of both groups have three major values: 1) They give a "profile" of the immediately important issues and the form in which they are cast. 2) They fix the time at which issues "surface" e.g., minority students appear on the agenda in 1967-68, research became a permanent agenda item in 1963 for both organizations, interdisciplinary emphasis 1965. 3) Many of the reports and papers are transformed into articles or chapters in larger publications.

With respect to the topic under study, the effects of sponsored research on the educational process, the first extensive notice of the new phenomenon was taken in 1957. Prior to that time only fragments of the question appeared, e.g., teaching vs. research. John C. Weaver returned from a year of study in the field to report that the huge financial input from research ". . . has brought with it a whole new way of academic life. And although it is far too complex to permit the generalization that it is either 'good' or 'bad,' it has had a staggering impact upon us and is bringing tremendous change."[1] Weaver saw the benefits of new funding for the faculty, new equipment for research, and new opportunities for student support. He also displayed sensitivity to the educational process and the hazards of certain sponsored research practices to "a desirable environment in which to prepare a graduate student for a self-dependent career and the pursuit of basic scholarship."[2] Weaver's concern, real and visible though it was, brought little general response in the AGS until 1963 and 1964.

The first position was stated in the Report of the Committee on Policies in Graduate Study. ". . . if research within a research institute or unit does not involve graduate students in a central position, does not find expression in theses and dissertations of graduate students, it does not really belong in the university. It may still be useful for a university to house isolated research as a service function but it should not be regarded as a central obligation of a university."[3] This was a bold position but it could not prevail for, as Dean Magoun of U.C.L.A. noted ". . . new goals have been identified, resources of an unheralded magnitude have become available . . . novel pressures and accelerated rates of change have been introduced into the evolution of American higher education to a degree unprecedented in its history."[4]

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[1] John C. Weaver, "Federal Aid to Research and Graduate Education," Association of Graduate Schools, <u>Proceedings, Ninth Annual Meeting, 1957</u>, pp. 82-93.

[2] <u>Ibid.</u>, pp. 89-90.

[3] <u>Journal of Proceedings and Addresses of the A.G.S., 15th Annual Meeting</u>, 1963, pp. 40-51.

[4] <u>Ibid.</u>, p. 48.

The year for full attention to research and graduate education was 1964 when the AGS met in joint session with the Association of American Universities on the topic. The two central problems identified by the Committee on Research and Research Administration were 1) "a stronger integration of research and educational activities" held to be a responsibility of the graduate dean, and 2) "the need to emphasize the role of the whole university in its relation to grants and contracts."[1] After 1964 these broad questions of policy do not appear again. It might be said that problems of circumstance outran problems of principle. Problems of student support became more complex.[2] The tasks of renewing and managing research grants demanded immediate attention.[3] Then too, modest institutional grant programs appeared in the NSF and NIH programs to give the university some hope of broader based programs. The central issue of integrating research and graduate education was preempted and postponed by these events. The effort turned toward insuring and guiding the directions of federal support over the short-run

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[1]Report of the Committee on Research and Research Administration, Journal of Proceedings and Addresses of the A.G.S., 16th Annual Meeting, 1964, pp. 41-2. The sister organization treated the problem in the same years, see--Proceedings of the Third Annual Meeting, Council of Graduate Schools, 1963, pp. 48-50.

[2]Committee on Policies in Graduate Education, A.G.S. 16th Annual Meeting, "There exist many types of support for graduate students . . . In using these we find real conflicts between the need to support the graduate student, the need to give him opportunity for teaching experience, the need to protect his time for undistracted study, and the need to provide teaching for undergraduate classes," p. 22.

[3]Summary of Problems in Graduate Education," A.G.S., 17th Annual Meeting, 1965. "Thus, the issue of the relationship of the university to the Federal Government is perhaps, including all the ramifications, the single most time-consuming problem in graduate education." Dr. Hubert Heffner, Stanford University, p. 12.

future.[1] Attention also turned to the nature of the university's wider relationships with society. J. Perry Miller in his presidential report to AGS made clear that the issues Berelson saw in 1965 might always be present but there was a new set of concerns: 1) governance of the university, 2) responsibility to urban communities, 3) to minority groups, 4) clarification of the role of humanities, and 5) the plight of the liberal arts college.[2]

b. Essays and Commentary

Collected essays, symposia, and journal articles of the sixties confirm the general impression that one gathers from reports of the meetings; that the sheer magnitude and complexity of dealing with the Federal government in its multiplicity of programs and agencies prevented universities from complete analysis of their effects. Charles V. Kidd, a most astute observer, summarized the stress points as 1) the wartime contract-research system, 2) the dispersion of sources among a changing panel of agencies, 3) the concentration on sciences, 4) dissimilarities in values, language, and approach between academician and bureaucrat, and 5) the direct alliance between professor and patron.[3] These features remained unchanged to the present and, in an era of stringent budgeting, they lead to "increasing emphasis on specific missions of Federal agencies . . . narrower definitions of the importance of research (that) have reinforced the already strong tendency

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[1]Committee on Policies in Graduate Education, "The impact of Federal Funds on the Quality of Graduate Education and Research," A.G.S., 18th Annual Meeting, 1966, pp. 64-90. This report, an excellent summary, emphasized the fact that extra-mural questions had become the central problem.

[2]"Report from the President," Journal of Proceedings and Addresses, A.G.S., 1968, pp. 11-13.

[3]Charles V. Kidd, "The Federal Government and University Research" in Harris et. al., Challenge and Change, pp. 75-87.

to consider fellowship and traineeship programs of each agency in relation to its manpower needs.[1]

Along with the change in size and complexity of sponsorship patterns came changes in the graduate schools, too. Larger enrollments in more institutions with more programs brought an unaccustomed diversity to graduate education. The dean's essay, based upon long years of experience at one institution, was incapable of reaching the full scope of research influence, student support, or other dimensions of contemporary change. Representative of this passing tradition of collected wisdom is the collection published by the American Council on Education[2] or those few issues of the Graduate Journal which find some cause to look at graduate education.[3] The opening chapter pointed to the growth of scientific research as a matter of great importance.[4] Subsequent essays, far from assessing why, how, and to whom it was important, set about fitting the phenomenon to tradition.[5] Only the Cartter article, "The Decades Ahead," stands as an exception by using data to guide speculation on where change might lead.[6] Sometime in the mid-fifties graduate education escaped the bounds of simple tradition

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[1]Charles V. Kidd, "Federal Support for Graduate Education Reexamined," Educational Record, Fall 1970, pp. 339-44.

[2]Everett Walters, editor, Graduate Education Today, American Council on Education, Washington, D.C., 1965.

[3]The Graduate Journal, Vol. VII, No. 2.

[4]Walters, Graduate Education, pp. 22-4.

[5]Ibid., p. 59. "Today all the traditional and inherent difficulties of the Ph.D. have become magnified."

[6]Ibid., pp. 223-46. Slightly expanded version appeared under the title "Higher Education in the Last Third of the Century." Educational Record, Vol. 46, No. 2, Spring 1965, pp. 119-28.

when the understanding of it could be found in the past or in a single prototype institution.

Essays came to serve a new function as a medium for speculation. The search for a just relationship between research and education drew a share of such speculation. Heyns noted a central tension in the modern university arising from "the task of integrating the scholarly research life of the university with the instructional life . . ."[1] As an aid to this integration he suggested that "any professor interested should start with his research interest and reformulate it until he reaches a learning task with which the apprentice can help . . ."

The same tension between scholarly inquiry and instruction was considered by Peter H. Rossi.[2] Within the departmental setting the differences between scholarly production and teaching are accentuated because the emphasis shifts from one to the other. This generated role conflict for the academic and uncertainty for the student. The research center became an attractive organizational form because the primacy of research created a well-defined situation[3] for faculty and students. Neal Gross saw the tension between research and instruction as a product of a single value reward system. "In short, although

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[1] Roger W. Heyns, The Graduate Student: Teacher, research assistant, or scholar?" The Graduate Journal, Vol. VII, No. 2, Spring 1967, pp. 310-16.

[2] Peter H. Rossi, "Researchers, Scholars, and Policy Makers" Daedalus, Vol. 93, No. 4. American Academy of Arts and Sciences, Bostom, Mass. Fall 1964, pp. 1142-62. Gerald Milton Swatez, "Social Organization of a University Laboratory," unpublished dissertation, Univ. of Calif., Berkeley, 1966. In a study of Lawrence Radiation Laboratory he found the single purpose of the scientist protected further by the isolation of research functions from academic and administrative decisions.

[3] Leonard L. Baird, "A Study of the Role Relations of Graduate Students," Journal of Educational Psychology, Vol 60, No. 1, 1969, pp. 15-21. Found low scores on interrole conflict among research assistants.

multiple functions are expected of the academic man, the reward system gives research productivity and scholarly publication the highest evaluation in the assessment of a man's worth to his institution."[1] Jencks and Riesman maintained that the tension between research activity and other endeavors of the university was found in limitations imposed upon research itself.[2] One part of the restrictions came from the priorities imposed or expected by the sponsors. More important was the self-created restriction imposed by academics themselves. The circularity of relationships in which peer panels of professors awarded funds and evaluated results, knowing all the while that their proposals would be judged by a similar group is the prime example. Expert testimony from the same group also shaped the direction of policy for the sponsors. This convolution, say Jencks and Riesman, has not limited the refinement of techniques and methodologies but it has resulted in a narrow definition of areas judged "appropriate" to academic research. This road, once taken, leads inevitably into an inflexible disciplinary & departmental structure.

Freed from this condition academic research could move into the issues of public concern that are now avoided. Rightly conceived, academic investigation could escape the pretense of objectivity and put the student in closer touch with himself, an aim not served by the present structure. The villain in the scene for Jencks and Riesman, as it is for Heiss and others, is the department-discipline concept. Research is cut off from fulfillment by this organizational form and

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[1] Neal Gross, "Organizational Lag in American Universities." Harvard Educational Review, Vol. 33, No. 1, Winter 1963, pp. 58-73.

[2] Jencks and Riesman, Academic Revolution, pp. 515-30. See also pp. 245-46.

students are not so much harmed by current research practices as simply set apart from them. Wenglinsky marked the source of tension as a "relationship" problem[1] in the present graduate curriculum with its courses and requirements that emulate undergraduate practice. It is possible for only a few students to form a working relationship with an active researcher. The setting in which faculty and advanced students meet should be changed to match professional training by creating an extended period of apprenticeship to replace courses. Research in a collegial setting would be the principal feature. Sawyer pointed out with considerable directness that solutions to the research-education relationship lay in two distinct directions.[2] Public action by Congre ; and the agencies was the means by which institutional grants, just compensation for real costs, and geographic distribution of funds might be changed. As for the educational problems, "it is the responsibility of the university administration to see that neither graduate nor undergraduate education suffers because of the preoccupation of the faculty with research programs and the procurement of research contracts."

From the variety of accomodations suggested by these commentators two things are clear: Research is a vital part of university activity and few observors would remove it from the scene. The relationship between education and research is a matter of considerable speculation but not much information is available about nature of the interchange between the two activities.

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[1]Martin Wenglinsky "Reform in Graduate Education: A Proposal" Journal of Higher Education, Vol. XL, No. 7, Oct. 1969, pp. 534-42.

[2]Ralph A. Sawyer, "The Graduate Student and the University Research Program" in The Graduate Journal, Vol. VII, No. 2, Spring 1967, pp. 317-24.

D. DATA BASED STUDIES:

Several times we have noted a distinctive characteristic of the 1960's, a marked increase in the amount of information about the graduate scene gathered by broad gauge collection techniques. Three aspects of these studies have some relevance for the question at hand. In the studies of student support what emphasis is laid upon the educational effects of research employment or assistantships? Among the studies of graduate students what evidence of the relation between research and education emerge? Finally, what studies touch directly upon the results of this new finding?

The major pioneering study of student support in the arts and sciences was made through the National Opinion Research Center and reported by James A. Davis.[1] Using a systematic sample of 25 institutions, financial data was gathered from 2842 respondents. The intention was to assess the impact of manpower concerns, increased value of graduate study, and the effects of research and development. Research affiliated support displayed several distinctive features. The training experience of research employment was more often reported as valuable. Fewer R/A's complained about low pay at any level in the graduate process. A follow-up one year after the original inquiry revealed a lower drop-out rate among the duty stipend group especially the research affiliated group. Differences in ability between holders of fellowships, research assistants, and teaching assistants were negligible. A major condition visible throughout the Davis study is the fragile nature of graduate student support. One is conscious that

[1] James A. Davis, Stipends and Spouses: The Finances of American Arts and Science Graduate Students, University of Chicago Press, Chicago, Ill., 1962.

an alteration in university resources, in the business climate, or even in the disposition or health of any of the participants would collapse the financial framework.

There are many subsequent studies of student support which emphasize the sciences,[1] or even a particular field,[2] and specific kinds of support.[3] While the data offered by these studies is extensive it has not had much analysis beyond the national level. Charles E. Falk of the National Science Foundation fixed the reason:

> "The first results of this effort (collection of data on student support) are contained in this document. It is recognized that the graduate education system is exceedingly complex and that cause and effect relationships frequently are intricate. Thus, the interpretation of data . . . must wait until we know more about the numerous and complex factors that determine the operation of the educational system."[4]

Just beyond the support question lies the matter of attrition in graduate study and a definitive report was made under the direction of Allen Tucker in 1964.[5] The influence of research is visible at

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[1]Lindsey R. Harmon, Profile of Ph.D's in the Sciences, NAS-NRC, Career Patterns Report #1, Pub. 1293, Washington, D.C., 1965. National Science Foundation, Graduate Student Support and Manpower in Graduate Science Education, NSF 68-13, Washington, D.C., 1968. National Science Foundation, Support of Full-Time Graduate Students in the Sciences, NSF 69-34, Washington, D.C., 1969.

[2]American Institute of Physics, 1966-67 Graduate Student Survey, A.I.P. No. R207. NAS-NRC, Physics: Survey and Outlook, Washington, D.C., 1966, Pub. No. 1295, See Chapter 8. NAS-NRC, Chemistry: Opportunities and Needs, Washington, D.C., 1965, pub. No. 1292.

[3]Federal Interagency Committee on Education, Student Support Study Group, A Study of Pre-doctoral Student Support, Nov. 8, 1968. Washington, D.C. and Report on Federal Pre-doctoral Student Support, Part 1, Fellowships and Traineeships, April 1970, Washington, D.C.

[4]NSF, Graduate Student Support, NSF 68-13, p. iii.

[5]Allen Tucker, David Gottlieb, John Pease, Attrition of Graduate Students: at the Ph.D. level in the Traditional Arts and Sciences, Pub. No. 8, 1964. Office of Research Development and the Graduate School, Michigan State University, East Lansing, Mich. 1964.

several points in his analysis of responses from 4,747 participants from 24 universities. Those who included an evaluation of the research opportunities in their original decision to attend a graduate school had a lower drop out rate.[1] Respondents were also asked to rate the opportunities given by their department for teaching, research, both, and applied work in the discipline. The largest differences in ratings by drop-outs and Ph.D's appeared on research. The drop outs rated opportunities low thereby indicating that they never made the connection with this vital activity.[2] When attrition was related directly to the primary type of support, the research assistants had a low drop-out rate very close to the level of fellowship holders. This corroborates the Davis observation.[3] In the final interpretive section of the report two professorial stereotypes are presented, the researcher who eschews involvement with students, and the teacher who concentrates on students and puts research into second priority. The means of reform proposed is that of reforming the researcher to take more interest in students. An alternative not often mentioned is that of constructing devices for bringing students into closer contact with research which is, after all, the essence of a university's intellectual commitment.

Graduate students were not extensively studied until the 1960's partly because their numbers were comparatively few but also because their experience was regarded as too individualized for survey analysis. The work of Ann M. Heiss has done much to allay this second assumption.

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[1] *Ibid.*, pp. 140-43.

[2] *Ibid.*, pp. 156-62.

[3] *Ibid.*, pp. 216-18.

A study of Berkeley students, about 2200 of them, laid out some of the stark truths that Berelson hinted at.[1] Several aspects of the inquiry touched research, again through the research assistantships which were heavily concentrated in the natural sciences. Selection of a doctoral research topic was a source of stress to a number of respondents ranging from 24% in the professional schools down to 9% in the social sciences. About 35-40% felt they would like more direction on the choice of topic. Student criticisms of research did not condemn the activity but the rewards system that forced the faculty away from students.

The more comprehensive report on graduate education recently published turned up additional aspects of research influence.[2] Heiss agrees with other critics that graduate schools train for research rather than educate for inquiry. By the training process, natural curiosity is severely pruned in the name of improved methodology. Research input has strengthened differentiation in the university but, "the research assistantship is the primary vehicle through which students in the sciences and social sciences obtain research preparation." Only 33% held one. The satisfaction level among R/A's was generally high except in the humanities. Duties were regarded more favorably by R/A's than by teaching assistants. They also had more esprit de corps and better contact with the faculty. In the final recommendations is one that suggests a much clearer definition of the research assistantship

[1] Ann M. Heiss, "Berkeley Doctoral Students Appraise Their Academic Programs" The Educational Record, Winter 1967, pp. 30-44. The author was kind enough to provide a complete mimeographed edition of this valuable study and the associated tables.

[2] Ann M. Heiss, Challenges to Graduate Schools, Jossey-Bass Inc. Publ. San Francisco, California, 1970.

to fix its instructional features and its service requirements more clearly.[1]

Most studies have fixed upon research assistantships as the only visible contact point between research and the student. Worthen studied later productivity of those who held research assistantships.[2] He found, however, that assistantships without real involvement in research, "ersatz" assistantships, were not related to later research activity.

An attempt to fix another aspect of research, the training phase, was made by a study at The University of Minnesota.[3] The respondents in ten fields felt that they had acquired more skill than their work required in terms of knowledge of method, in terms of skill and practice, and in terms of actually doing research. Only in "supervision of research programs" was their preparation slightly below their needs. It would appear that graduate student contact with research is much broader than the research assistants' experience and formal class training.

In summary, studies of graduate students indicate that those who have had an association with research by means of an assistantship have a higher satisfaction, lower dropout rates, and, possibly more contact with faculty and students. Few attempts have been made to assess the contact with research activity beyond research assistantships.

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[1] Ibid., pp. 289-90.

[2] Blaine Richard Worthen, "The Impact of Research Assistantship Experience on the Subsequent Career Development of Educational Researchers," unpublished Ph.D. dissertation, Ohio State University, 1968.

[3] Robert T. Alciatore, Ruth E. Eckert, Minnesota Ph.D's. Evaluate Their Training, University of Minnesota, October, 1968.

The graduate school has been viewed as a socializing agency in several studies. Gottlieb, using the extensive sample data from the NORC survey of graduate students,[1] examined the idea that "the graduate faculty constitutes the most important reference group for student selection of occupational specialties."[2] He found that change toward a research emphasis to one's career interests occured in about half the cases. This change was related not to simple contact with faculty but rather to the "content of interaction" and the climate of the department. The distinctive nature of study in the arts and sciences is quite visible in this study. Baird departed from the notion that "the professor is the main agency of socialization both creating present demands on the student but also attempting to mold the student into his own conception of the ultimate role."[3] He found that faculty-student relations were not clearly linked to stress which was more a product of competition and the perceived difficulty of the work. He, too, noted that "ambiguity and conflict are 'built in' to graduate schools to a certain degree."[4] Both of these studies suggest that role formulation for the arts and science student at the graduate level has characteristics markedly different from those of most other professional schools.

Two studies that made the examination of research and education

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[1]David Gottlieb, "The Process of Socialization in the American Graduate School," unpublished Ph.D. dissertation, Univ. of Chicago, 1961.

[2]*Ibid.*, p. 37.

[3]Leonard Lyn Baird "Role Stress in Graduate Students," unpublished dissertation Ed. D., University of California, Los Angeles, 1966, p. 33.

[4]*Ibid.*, p. 263.

a central theme have a bearing on this inquiry. Consolazio, attracted by the generous amounts of data gathered about higher education, made some interesting statistical analyses of the relationship between fiscal inputs and outputs in the form of degrees.[1] Attention is focused upon degrees in science and technology at 1063 institutions subdivided into four classes by the kind of programs they offered. Among the major universities he found a direct and simple linear association between the amount of Federal funds and the number of doctors degrees in science and engineering. And, "From the regression line, one can estimate that each $1 million in Federal funds for academic science appears to be associated with the education of 7 doctorates in science and technology." The strength of the relationship and its regular character has contributed one of the assumptions adopted for this inquiry; that the form of any association between research affiliation and the variables would be linear. Consolazio has a number of other quite interesting findings and the study appears not to have had the attention it deserves. He found, for example, that increases in the proportion of graduate students in the total enrollment are associated with the amounts of educational and general income in an exponential fashion.

Another recent study aimed at assessing the major impact of research funds made some inquiry into student reactions. Dressel and Come gathered data from the public institutions in Michigan.[2] A general conclusion was that the greatest benefits to graduate education

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[1]William V. Consolazio, The Dynamics of Academic Science, NSF 67-6, National Science Foundation, Washington, D.C., Jan. 1967.

[2]Paul L. Dressel, Donald R. Come, Impact of Federal Support of Science on the Publicly Supported Universities and Four-Year Colleges in Michigan, NSF-C-506, March 1969.

from research inputs came in the form of new plant and facilities, then in the form of equipment, and, finally, through student support funds. Faculty opinion emphasized the value of research in attracting good professional staff and in attracting good students. Where research funds are present in large amounts, the faculty report an effect upon the curriculum and instructional means. There appears to be a critical level for such funding, below which no major effects occur. Student responses were more temperate in the endorsement of research. Graduate and undergraduate views were surprisingly similar in seeing research as beneficial to the professor, somewhat less beneficial to the instructional process. The significant difference in responses fell between those who had experience with research and others. The research group "tended consistently to indicate a favorable connection between research activity and good teaching."[1] All those who had more contact--graduate students, those at high research institutions, research assistants,--assigned a higher value to research inputs. Curiously, the research assistants reported the largest amount of work time per week but also reported professional benefits more frequently. Asked to rank the various types of assistance by the contribution it might make to professional experience, respondents chose the research assistantship over all others, even fellowships. It appears from these reactions of students that the imprint of research is made through involvement rather than through the instructional process.

Summary: In this review of reactions to the introduction of large scale research funding certain trends can be discerned. The Bush report prompted a policy of funding based on the idea that support for

[1] *Ibid.*, p. 118.

basic research was synonymous with support for education. Literature for a whole decade was devoted to reacting to and coping with the dilemma this policy posed rather than to an analysis of the effects. The Berelson study set a new direction based upon data rather than intuition for understanding change in graduate education. In the early and mid-sixties extensive studies of graduate education based on broad data collection were undertaken. These have given a number of indications of how research effects are manifested in the experience of students. Most inferences are drawn from research assistants only and do not reflect the full scope of student involvement. The principal influences come through active participation rather than through the medium of the classroom. Research association appears to be related to less drop-out, more favorable attitudes toward graduate study, more social interaction with faculty and with other students, better professional preparation. There appears to be sound justification for a study which considers involvement with research beyond the assistantship status alone and which attempts to assess the effect this involvement has had upon the actual experiences of graduate students.

CHAPTER III

AN EXPLORATORY APPROACH

A. THE UNANSWERED ISSUE

1.- In Classic Form

Thirty years of expansion in academic research and growth in graduate education have not diminished the force of one issue. In the literature of the period we saw how the central question in this issue was preempted by the immediate difficulties of managing sponsored research, compromised by an emphasis on student support, and put aside in the face of increasing affluence and success in the academic world.

The issue endures, however, in the form posed by Cardinal Newman over a century ago: "To discover and to teach are distinct functions."[1] Or, to cast the statement in a phrasing the Cardinal was fond of; research is one thing, education another. The crucial question for the university is: "What is the nature of the relationship between education and research?"

2.- Three Possible Answers

It has never been feasible for the university to postpone an answer to this question without generating discomfort among faculty,[2]

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[1] John Henry Cardinal Newman, The Idea of a University, Image Books, Doubleday and Company, Garden City, N.Y., 1959, (paperback) p. 10.

[2] Desmond, "Faculty and Student Frustrations," AAUP Bulletin, pp. 23-6. He attributes faculty discontent, even in the face of marked improvement in salary, workload, and professional conditions, to uncertainty surrounding this issue.

discontent among students, and confusion to the layman's eye in the purposes of higher learning.

Answers have been developed around three general positions. Institutions, sometimes whole systems, have created organizations to fulfill each of these viewpoints.

a. There is no relationship of any consequence between research and education. Not only are they distinct in function but they are separate as to purpose, means, and organizational needs. Newman maintained such a view in his classic. Robert Hutchins[1] has not retreated from it in a lifetime of thought and writing. The logical consequence to this view is a research institute divided from the university but still holding selected ties and exchanges. This is the model for Continental and Soviet research and Martin Trow reminds that it is not altogether impossible in the United States.[2]

b. While there is no intrinsic relationship the two can be brought into a fruitful symbiotic relationship by skillful design of the learning environment. The art of teaching lies in the ability of the professor and the capacity of the institution to turn one to the benefit of the other with a resultant gain to each. Such views lie at the heart of the master-apprentice, professor-assistant, model which is presumed to have existed as an ideal type in the German university cf

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[1]Robert M. Hutchins, The Learning Society, Praeger, N.Y., 1968, p. 112.

[2]Martin Trow, "Reflections on the Transition from Mass to Universal Higher Education" in Daedalus, Winter, 1970, pp. 1-46. Under the heading of "What next?" he notes that a deepening crisis in the American University might well produce "an acceleration of the movement of academic men, especially research scholars . . . out of the universities and into various public and private research centers which are (or seem to be) better protected against attacks from left or right," p. 38.

the nineteenth century.[1] The relationship--not the model--has never been developed on the scale of a whole university or a division although it does appear in departments.[2]

c. The two are closely related: Both are facets of a single purpose, the search for knowledge, and they differ only in that education represents the individual's own search and research represents the search on behalf of mankind. The relationship is so close in the university that educational benefits are a direct result of research and the process of exchange requires no special attention.[3] By simply doing what they are best able to do, research, a university faculty generates valuable educational outputs that are a major component of student learning at the advanced level.

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[1]Friedrich Paulsen, The German Universities: Their Character and Historical Development, MacMillan and Co., N.Y., 1895. ". . . the triple scale of Scolaris, Baccalarius, Magister is evidently identical with that of the apprentice, journeyman, and master work man which we find among medieval artisans. The apprentice learns, the journeyman learns and produces, or even teaches when the occasion offers: the master workman produces and teaches," p. 31. This reflects the origins.

[2]Joseph Ben-David, The Universities and the Growth of Science in Germany and the United States, Minerva, Autumn-Winter, 1968-69. After noting that the German practices of linking the "chair" and the institute" in the person of one senior professor--Ordinarius--for life resulted in the suspension of growth in new fields of knowledge and frustration to the ambitions of lower academics, this author emphasizes the significance of the American departmental structure as a critical point of distinction. ". . . the departmental structure eliminated the anomaly whereby a single professor represented a whole field, while all the specializations within the field were practised only by members of research institutes who were merely assistants to the professor," p. 8. This broadened the range of interpersonal contacts for American graduate students and increased the output of specialized scholars.

[3]Harvey Brooks, "The Future Growth of Academic Research," in Harold Orlans (edit.). Science Policy and the University, "At their best good teaching and good research are inseparable. Each should reinforce the other," p. 66. And in the same collection see Wolfgang Panofsky, "Big Science and Graduate Education;" the fact that advanced research and graduate education are inseparable in axiomatic to almost all writers on the subject and might even be taken as the definition of education leading to a Ph.D.," pp. 192-93.

3. The Researchable Question

The long tradition of American higher education rests unequivocably with the fact that the two phenomena are related and that both are appropriate to the university. However, it is the character of post-war support for research that has shaped the choice between (b) and (c) above as to how they are related. From the partial incorporation of the Bush proposals into national policy and the subsequent development of project support it is clear that the working relationship in the university is presumed to be (c); education is a direct function of research activity. Twenty or more years of operational policy and funding have confirmed this as a working proposition. Whether we agree or not, the proposition has the authority of existing practice behind it. An increase in research is assumed to bring, pari passu benefits to education.

The nature of this relationship has had little examination in spite of its relevance to graduate education. As Kidd observed: "The importance of the effect of federal research funds on the quality of graduate training is matched by the difficulty of securing a reliable assessment of the effects . . . no one really knows what has happened to the quality of graduate training in his field for the country as a whole,"[1] or even in a single institution, one might add. And Strickland listed this area as one of the "Continuing Concerns." "One issue that has not abated is the impact of research upon the academic program of colleges and universities. If the lively continuance of that issue is not surprising, the adversary context in which it is cast - 'research

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[1]Kidd, American Universities and Federal Research, pp. 135-36.

versus teaching' - is glibly misleading."[1] Our research question is: Assuming the relationship between research and the educational process is a direct one, what effects are apparent in the experience of graduate students who have had an affiliation with research activity? To what degree do students perceive research, particularly sponsored research in the university around them? What uses for research are students aware of in their own experiences? What other effects can be found in the student experience by a comparative analysis of some variables in that experience?

B. ASSUMPTIONS ABOUT EDUCATION AND RESEARCH

1.- The Process of Education

The qualities of the educational process become assumptions at this point and need to be stipulated directly.

a. Education is intended developmental change. To borrow the concise phrase of Robert Hutchins: "Education is taken to be the deliberate, organized attempt to help people become intelligent."[2]

b. It is aimed primarily at intellectual growth and refinement. But much more is also involved: the cultivation of skills, the alteration of fundamental attitudes, or some type of affective reorientation with the whole pattern of chance woven into a coherent role. The primary emphasis is upon the elaboration of abstract thought.

c. Education is achieved by abetting or enabling self-development. Its outcomes are individualized and internalized. Ross Mooney found the students ability to conceive of himself as an effective

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[1]Strickland, Sponsored Research in American Universities and Colleges, p. 183. American Council on Education, Wash., D.C., 1968, p. 183.

[2]Hutchins, The Learning Society, p. VII.

"instrument of inquiry" was an important element, sometimes a controlling element, in graduate study at the doctoral level.[1]

d. The emphasis is upon experience. The individual undergoes vicariously, virtually, or actually a set of life-happenings which have meaning in and of themselves. They are not simply preparation for reality. This, of course, is an adaptation of John Dewey's theory of experience and it is most appropriate to graduate education.[2]

e. Graduate education in the arts and sciences at the Ph.D. level is conceived as a delicate balance between the changing character of knowledge and the experiences each individual perceives as necessary for his own intellectual development. It is an open set of experiences without the formal structure usually imparted by time schedules, course requirements, and curricular patterns. While there are a few conventional requirements in the form of examinations and a dissertation of a research nature the main source of structure is the student's own efforts in organizing and synthesizing his experience into a developmental pattern.

f. This experience is carried out in a controlled environment. Part of this learning environment involves instruction in a structured curriculum but it is also characterized by a certain isolation, a structure of peer relationships, and a set of informal transactions with professors, and visiting scholars.

g. The campus learning environment in graduate education has taken on a new quality and a new scope during the past decade. To

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[1]Ross L. Mooney, "Evaluating Graduate Education," Harvard Educational Review, Vol. 25, No. 2, Spring 1955, pp. 85-94.

[2]John Dewey, Education and Experience, Collier Books, N.Y., 1963, (original 1938,) pp. 19-20 and Chapter 3, "Criteria of Experience."

begin with it is immersed in and surrounded by a setting that is richer in both knowledge and experience. Marshall McLuhan offered an expression of this:

> "In recent decades the establishment has become enveloped in a new information environment that causes a kind of reversal within. The new need is to direct the educational enterprise toward discovery rather than instruction. As the environment becomes richer in information than the classroom, the student's genuine role becomes directed toward involvement and discovery rather than focused on the acquisition of classified data."[1]

The campus learning environment now is one that places far less emphasis on teaching. Carl E. Schorske, the historian, drew a vivid simile in characterizing the changes for his own field. The vital nineteenth century historical assumption was that, in the humanities or history, "the architecture of the edifice is foreknown, although the building has not yet been fully constructed. The task of graduate education is to train people to bring new bricks and mortar to this building. Almost none of us do our scholarly work on such premises any longer."[2] The reason for this kind of change is set forth skillfully by Thomas S. Kuhn in his description of scientific change. Human knowledge is breaking out of one paradigm or set of premises and proofs but not yet fully into another. As a result all knowledge seems to be transitory and formal teaching can only deal with a small segment.[3]

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[1]Marshal McLuhan, "Environment as a Programmed Happening" Purves Memorial Lecture, 1967, in Walter J. Ong, S. J. Knowledge and the Future of Man. Holt Rinehart, Winston, N.Y., 1968, pp. 118-19.

[2]Panel discussion, "Research and Graduate Education in the Social Sciences," Journal of Proceedings and Addresses of the Association of Graduate Schools, 1968, pp. 49-50.

[3]Thomas S. Kuhn, The Structure of Scientific Revolutions, University of Chicago Press, Chicago, Ill., 1962. See Chapter IV, "Normal Science as Puzzle Solving," pp. 35-42.

The practical aspect of this change for graduate education is dealt with by Martin Wenglinsky who suggested that the "real time" between discovery and the availability of knowledge to the student must be reduced.[1] The obvious way to do this is involve the student in the very acts of creation, research. This posits a new role for the teacher as a manager and creator of learning environments, a new role for the doctoral adviser as coordinator of these resources.

C. AN APPROACH AND SOME THEORETICAL CONSIDERATIONS

1.- Graduate Study as Professional Socialization

a. Professional Socialization: Education at the doctoral level is acknowledged to be more than intellectual preparation. Becoming a chemist or an historian involves much more than the segmented role of a man who knows a great deal of chemistry or history. The graduate student is involved in a process of adult socialization toward a specialized role in his discipline and also toward a rather well defined professional status in society. This membership in a learned profession, carrying as it does a common set of norms and values along with a characteristic position in society, suggests an approach to our question. By directing attention at the process of socialization toward a professional status, two advantages are gained. (1) Individuals in various disciplines can be regarded in a similar light since they are, in part, being educated into a similar professional status. (2) The process can be examined. It is here that research affiliations would have the greatest educational impact.

b. Definition and Clarifications: Before attempting to

[1]Martin Wenglinsky, "Reform in Graduate Education: A Proposal," Journal of Higher Education, XL, No. 7, Oct. 1969, pp. 534-42.

hypothesize around this notion clarifications must be made on a number of points; the concept of a professional, the specific meaning of status, the attributes of adult socialization,[1] and the means by which it is achieved in graduate education.

(1) Professionalization: The academic community has long since established itself as a profession by the primary requirements of skills based upon advanced intellectual education, the autonomy of performance, the right to self-regulation and judgement of performance, a sense of commitment toward a more or less helpless client, and its ethical norms.[2] But scholarly professions have become more consolidated as a professional entity in the past two decades.[3] Ben-David has given great weight to the fact that research activity was incorporated into many phases of those professions that are tenanted by Ph.D.'s.[4] In

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[1]John A. Clausen, edit., Socialization and Society. Little Brown & Co., 1968. See Orville G. Brim, Jr. "Adult Socialization" for an excellent discussion of the nature of self-initiated socialization, a condition which creates a unique pattern of motivation and expectations placed by the individual upon himself, pp. 184-99.

[2]Wilbert E. Moore. "Occupational Socialization," in Handbook of Socialization Theory and Research, Russell Sage Fdn., Rand, McNally Co., Chicago, Ill., 1969, pp. 876-77.

[3]T. R. McConnell (et. al.) The Graduate School as a Professional School, N.S.S.E., 61st Yearbook, Part II, "Education for the Professions," University of Chicago Press, Chicago, Ill., 1962. See Chapter II, "The Nature of a Profession," by H. S. Becker and Chapter IX, "The Graduate School as a Professional School," John G. Darley.

[4]Joseph Ben-David, "The Universities and the Growth of Science in Germany and the United States," Minerva, Autumn-Winter, 1968-69, pp. 21-2. "The principal effect (of the professionalization of research in the Ph.D.) was to create a professional role which implied a certain ethos on the part of the scientist as well as his employer . . . The Ph.D. must keep abreast of scientific developments, do research and contribute to the advancement of science; while the employer . . . accepted an obligation to provide him with the facilities, the time, and the freedom for continuous further study and research which were appropriate to his status."

their recent analysis of the American academic system, Parsons and Platt also cite the effects of the new research technology in consolidating the academic professions around one more activity that has general recognition of society.[1]

A most striking feature of an increased coherence in the academic profession has come in the form of a stronger sense of community. Some years ago Goode offered an excellent analysis of a profession as a "community without physical locus."[2] Contemporary observers have noted the effects of the project system in fixing professional loyalty more firmly with the profession and less with the institution. Parsons and Platt have identified not only the primary community of academic membership but the broader memberships in the secondary communities, the scientific community, the community of intellect,[3] etc. An emphasis upon the broader profession rather than the discipline provides an approach to socialization which is common to all fields.

(2) Status: What of the idea that doctoral students are

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[1]Talcott Parsons and Gerald M. Platt, "Considerations on the American Academic System," Minerva, Vol. VI, pp. 497-523. "The course of training required for the Ph.D. has produced a 'profession' i.e., a large corps of persons who have undergone a systematic disciplined training. The essential element in this improvement through the course of study leading to the Ph.D. was its emphasis on research." The authors also emphasize the strong tendency of faculty to try to maintain unity and coherence between teaching and research.

[2]William J. Goode, "Community Within a Community: The Professors," American Sociological Review, Vol. 22, No. 2, April 1957, pp. 194-99. "It may . . . be called a community by virtue of these characteristics: (1) Its members are bound by a sense of identity, (2) once in it, few leave, so that it is a terminal or continuing status . . . (3) members share values, (4) role definitions vis-a-vis both members and non-members are agreed upon . . . (5) there is a common language, (6) the community has power over its members . . . (7) its limits are reasonably clear, though not physical . . . (8) it controls the selection of trainees."

[3]Parsons and Platt, "American Academic System," p. 506.

socialized toward a professional status? "A person . . . enters a social structure applicable to the given situation, and establishes his rights and obligations with reference to others holding positions within the same structure."[1] Such a view of status brings it within the scope of that amorphous but highly useful area known as role theory. The formation of role behavior may be viewed from three vantage points: There is the prescriptive and normative aspect in which expected behavior is derived from cultural patterns or from functions in a social structure. There is the interactive aspect in which the individual perceives the role expectations "sent" by others, and forms an interpreted received role.[2] Finally there is the personal aspect in which the individual translates the collected impression of the role into behavior which he evaluates as appropriate. Our attention is focused on the first of these aspects, specifically, on the process of relating to the professional status.

Of course the other two facets of role formation are also quite visible. A graduate student is becoming a philosopher, historian, or physicist and in that central activity the interactive processes are the crucial element. He is introduced to a role that fixes habits of mind, attitudes, and skills that are the creative tools of the field. But along with all other Ph.D.'s he is socialized toward a certain

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[1]Kingsley Davis, "Status and Related Concepts" cited in Bruce J. Biddle, Edwin J. Thomas (edit.) Role Theory: Concepts and Research, John Wiley and Sons, Inc., N.Y., 1966.

[2]See Daniel Katz, Robert L. Kahn, The Social Psychology of Organizations, John Wiley and Sons, Inc., N.Y., 1966, pp. 171-98 for a detailed analysis of the interactive role episode in an organizational setting. Also, Neal Gross, Ward Mason, A. W. McEachern, Explorations in Role Analysis, John Wiley and Sons, N.Y., 1958. Chapter Two, "The Definitional Problem" pp. 11-37 for a summary of various aspects of these three facets of role.

status, a professional position, which carries its own set of expectations. Brim comments that: "One acquires an understanding of the recognized statuses--the traditional positions--in his society, learning the names so that he is able to locate other individuals in the social structure, as well as identify himself. Not as much attention has been given to this aspect of the content of socialization . . ."[1]

It was Everett C. Hughes who placed the great emphasis upon obligations arising from occupational roles. "Status assigns individuals to various accepted social categories; each category has its own rights and duties. No individual becomes a moral person until he has a sense of his own station and the ways proper to it. Status, in its active and conscious aspect, is an elementary form of office. An office is a standardized group of duties and privileges devolving upon a person in certain defined situations.[2]

The precise nature of expectations arising from status in the learned professions has had limited consideration. Parsons and Platt have recorded the academic commitment to "cognitive rationality," which "prizes the disciplined and realistic apprehension of the world."[3] The academic world emphasizes this value not only for its own sake, a commitment to the esoteric worth of knowledge, but also for its instrumental worth as a means of developing the social order. Goode has emphasized the professional community with its sense of membership, self-selected

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[1]Orville G. Brim, Jr. & Stanton Wheeler, Socialization After Childhood, John Wiley and Sons, Inc., N.Y., 1966, pp. 4-5.

[2]Everett Cherrington Hughes, Men and Their Work, The Free Press, Glencoe, Illinois, 1958, pp. 56-7.

[3]Parsons and Platt, "The American Academic System," p. 504.

continuation, and boundaries.[1] The expectation of a high degree of personal autonomy portrayed among academics by a certain skepticism and analytical habits of mind that lead to the role of social criticism has been elaborated.[2] It is also reflected in habits of work and related activity. The high value of free inquiry is a professional attribute rather than a disciplinary one and carries the approval of tradition. There is also an expectation that those in the profession will have a degree of specialized skill in investigation and communication.[3]

As we noted above the attributes of the scholarly professional status have become more marked in recent years. They have also appeared in a wider setting. Trow has emphasized the function of the university in "the selection, formation, and certification of elite groups: the learned professions, higher civil service, the politician, the commercial and industrial leaderships."[4] Others have noted how the expectations and perquisites of academic status have been extended into industrial and governmental research laboratories by Ph.D.'s in

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1 Goode, "Community Within a Community."

2 Heiss, Challenges to Graduate Schools, p. 10.

3 Basil J. Sherlock, Richard T. Morris, "The Evolution of the Professional: A Paradigm," Sociological Inquiry, Vol. 37, No. 1. Winter 1967, pp. 27-46. From a study of the dental profession the authors have arrived at a typology of outcomes applicable to other professions: These include: Knowledge, technique, ethics, professional culture, argot, heritage, professional etiquette, market place information, and career plans.

4 Martin Trow, "Reflections on the Transition From Mass to Universal Higher Education," Daedalus, Winter, 1970, p. 2. Persons and Platt, op. cit., view education not only as a major factor in status formation but as a discrete criterion for social stratification. "The possession of a higher education is now a major criterion distinguishing the upper middle class from the lower middle class in the U.S." p. 502.

research.[1]

(3) Socialization:

(a) As Role Matching: Graduate education in the arts & sciences shares some but not all of the attributes commonly found in socialization toward a role in the professions. Entry is voluntary. Admission is selective. The change in status that results is largely permanent and irrevocable. A high degree of personal motivation is presumed. The process of professional preparation has been rather clearly established by investigations in other fields. Generally there is a fairly clear configuration of professional role attributes to represent a socialized condition. There are personified by either a model or set of role incumbents.[2] A corresponding group of role aspirants is visible at various preliminary stages.[3] Usually, studies have focused upon how closely the socialized individuals match the role model. They have also examined the stages, or "levels," by which socialization

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[1]Donald Pelz & Frank M. Andrews. Scientists in Organizations, John Wiley & Sons, Inc., N.Y., 1966. It is reflected in this study of productivity in various settings. Another aspect, the problem of finding suitable rewards for scientists in large heirarchecal organizations is treated in F. H. Goldner & R. R. Ritti, Professionalization as Career Immobility," American Journal of Sociology, Vol. 72, March 1967, pp. 489-502.

[2]Percy Tannenbaum, Jack McLeod, "On the Measurement of Socialization," Public Opinion Quarterly, Vol. 31, Spring 1967, pp. 1-37.

[3]Medicine, law, the military, and the clergy have been studied in this pattern. The two classics for medicine are: Howard Becker, Everett Hughes, Blance Greer, and Anselm Strauss, Boys in White: Student Culture in Medical School, Univ. of Chicago Press, Chicago 1961, and Robert K. Merton, George Reader, and Patricia Kendall, The Student Physician: Introductory Studies in the Sociology of Medical Education, Harvard Univ. Press, Cambridge, Mass., 1957. Typical of military emphasis is: Charles E. Bidwell, "The Young Professional in the Army: A Study of Occupational Identity," American Sociological Review, Vol. 26, June 1961, pp. 360-72.

takes place.[1] The part played by reference groups, role models, and peer interaction has also had attention.

On the surface it appears as if professional preparation in the arts and sciences might well duplicate these conditions. But it is precisely here, in the process of role formation, that graduate study in the arts and sciences shows differences. Rosen and Bates have considered the graduate school as an organization in which "the twin foci of the social structure are the necessarily complementary roles of socializing agent and neophyte."[2] The device used is a comparison of the "ideal" model and reality, the role match. Ideally the socializing agents, collectively, have all the knowledge and skills needed to train neophytes. They also have complete knowledge of the needs of the profession and the goals of socialization. The visible role enactment bears a correspondence to the ideal type. The authors conclude that in almost every respect there are sharp disjunctions between this ideal condition & reality. Professor's roles have become too complex to fit this form. Rapid changes in all fields and the changing character of professional participation have destroyed the image.

Ideally the neophyte is expected to be a passive receiver in relation to the socializing agent and active in his own self-development. The model envisions the transmission by the agent of consistent, clear, and complementary role prescriptions. Even a casual view reveals reality to be very different. There is an emphasis on creative, independent scholarship throughout the process and this alone denies the

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[1] Becker, Hughes, Greer, Strauss, Boys in White, pp. 435-43.

[2] Bernard C. Rosen, Alan P. Bates, "The Structure of Socialization in Graduate School," Sociological Inquiry, Vol. 37, No. 1, Winter 1967, pp. 71-84.

clarity the model requires. Ambiguity between adviser and advisee have been the subject of one study.[1]

Ideally socialization is sequential, graded into levels, and time ordered. The reality of graduate study does not conform to this kind of regularity, a situation that will be discussed in the paragraphs dealing with the time variable.[2]

Ideally the socialization model employs a system of rewards and punishments to shape the behavior of aspirants. The expectation is that such reinforcements will be clear, sufficiently varied to meet the circumstances, uniform in application, and reasonable. If grades are taken as the chief source of sanctions they suffer from major insufficiencies by these standards. Other sanctions, notably verbal approval and encouragement, are only weak reflections of the model.

Rosen and Bates have cited in more detail than this summary can give the variation between the conventional role match model and the actuality of study in the arts and sciences at the doctoral level. They fall short of suggesting what seems to be a logical conclusion: the conventional view of socialization for a profession does not provide an analogy close enough to permit its use in the study of graduate school socialization in the arts and sciences. The absence of a time ordered sequence, formal isolation, clear intermediate statuses and rites de passage: the small emphasis on identifying with visible models, on uniform sanctions, and on trial experiences in the quasi-professional

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[1] David Kagan, "Role Expectations of Doctoral Candidates and Their Faculty Sponsors," (Unpublished dissertation, Ed.D.) UCLA, 1966.

[2] Howard Becker and Anselm Strauss, "Careers, Personality and Adult Socialization," American Journal of Sociology, Vol. 62, November 1956, pp. 253-63.

setting; all these suggest rejection of the role matching model. By its traditions and practices graduate education toward the learned professions has not only avoided but abjured the introduction of graded stages.[1] Viewed as an educational organization, the graduate school does not have "an elaborated formal role pattern in which the division of labor results in a functional specificity of roles."[2] And so while the outcomes may be the same; common behaviors, internalized values, etc., the process by which the arts and sciences student gains a role seems different from most other professionals.

(b) Structural Differentiation: If socialization is not accomplished by graded steps in a sequence of role matching then what is the mechanism? A possibility emerges if we examine several of the pointed characteristics of graduate study, particularly at the advanced level. There is a heavy emphasis on movement through the transitional role as a graduate student. Indeed, one of the major hazards is role fixation as a perpetual student. There is an emphasis on responding to individual needs that differ in substance and in timing. There is an emphasis upon learning and constructing rather than upon instruction and replication. There is an emphasis upon utilizing the enriched environment not only in the form of facilities but in terms of a diversity of faculty and student views. In brief, within broad parameters and an extensive learning environment there is an openness to student decisions which allow the construction not only of a professional role

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[1]Davis, Stipends and Spouses, Peter H. Rossi notes the "absence of a steady progression of grades" as the distinguishing organizational feature in the pattern of graduate study. p. iii.

[2]Daniel Katz and Rob't. Kahn, The Social Psychology of Organizations, John Wiley & Sons, Inc., 1966, p. 47. "Defining Characteristics of Social Organizations."

but the pattern by which it is learned.

While this may appear to be an extreme reading it is not without conceptual precedent. One possible set of explanations is suggested by Talcott Parsons' analysis of the family as a socializing agent:

> ". . . the main outline of the process of personality development, so far as it is legitimate to regard it as a process of socialization, can be regarded as a process of structural differentiation . . . there first occurs the establishment of a very simple personality structure . . . Then there occurs the differentiation of this system through a series of stages, into a progressively more complex system. Throughout, this process occurs in direct relation to a series of systems of social interaction, also of a progressively increasing order of structural complexity."[1]

Applied to the graduate experience at the doctoral level the idea of differentiation appears to have considerable utility.[2] To begin with it allows us to replace the step by step pattern of socialization with a diffusion model in which the student is free to expand his abilities in any one of a number of directions. The educational structure in which he moves might afford more or less opportunity for differentiated experience depending upon the degree to which the structure itself is differentiated.

From this view of an open system of action marked by structural differentiation we can derive an indication of how effective an educational experience might be by the degree to which it reflects differentiation. In simplified terms: at the graduate level, the wider opportunity provided by the university for differentiated activity, the more effective socialization would be. Thus, the individual who has the

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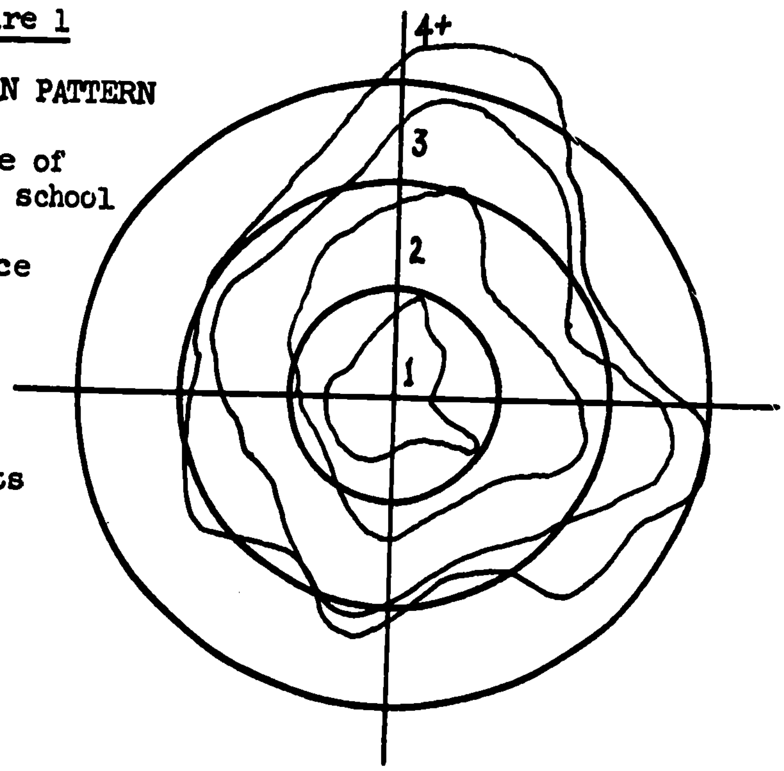
[1] Talcott Parsons & Robt. F. Bales, Family, Socialization, and Interaction Process, The Free Press, Glencoe, Ill., 1955, p. 27, and Chapter II passim.

[2] Heiss, Challenges to Graduate Education, pg. 214.

Figure 1

DIFFUSION PATTERN

Rather than the graded sequence of levels typical of professional school this diagram suggests another pattern for the arts and science graduate student. Circles represent the departmental environment. The irregular shapes represent the area of student competence as it grows in response to his own interests and needs year by year.



opportunity to examine ongoing research activity as well as published results, who meets professionals other than faculty in a variety of settings, who can work with peers under a variety of conditions is undergoing a more effective, as well as a more differentiated, socializing experience. Academic research activity could be expected to have a differentiating effect on the learning structure.[1] Students who are able to take advantage of this added dimension should show more differentiated experience and therefore more effective socialization.

The concomitant process is one of integration of this experience around a professional status. Out of wider experience should come a more precise understanding of the meaning of membership in the profession. A by-product should be a more visible sense of structure in the

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[1]Heiss, Challenges to Graduate Schools, p. 214. "The recent growth in the research function of the university has considerably strengthened the differentiation of the university, but not without serious cost to the institution." On the last point we reserve judgement.

experience one has undergone. This is put quite lucidly by Parsons and Bales:

> "We should like to suggest to the reader two main respects in which we think there is an essential uniformity in the process of differentiation in systems of action, whether they be social systems or personality systems . . . The first of these concerns the relation of differentiation to the concept commonly paired with it, that of integration (ital.) . . . differentiating processes always go hand in hand with integrating processes. We incline to interpret this as a consequence of the organization of action into systems. (ital.)"[1]

It must be made explicit that the focus is on a very narrow segment of Parson's theory: the process of differentiation--integration as it applies to one aspect of activity in the social system known as graduate education. While it is a convenient organizing principle for this exploratory approach, the failure to relate the occurences under study to the cultural system, on the one hand, and the personality system on the other does some violence to the unity of the theory itself.

(c) Summary: To examine the assumption that research activity has effects on the educational process, the conceptual framework of adult socialization is suggested. Such socialization is directed toward a role within the discipline but it is also aimed toward a role set derived from status as a professional. In the fields of higher learning this broader professional status has been marked by increased emphasis and coherence in recent years. Professional socialization in the arts and sciences through advanced graduate study is not identical with the sequential process of role matching that typifies other professions. An alternative view of socialization as structural differentiation is proposed. Such a process is similar to the effects of the

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[1]Parsons and Bales, Family Socialization, p. 28.

family in childhood socialization. The individual makes his choices and decisions according to his own evaluations of a series of situations within an extended action system. These notions are generalized by Parsons in his broader theory. The differentiated structure of the university provides an opportunity for more differentiated experience to the student. Academic research increases the differentiation of the university structure. Students affiliated with research therefore should show more differentiated experience. If research activity has no palpable effect on the socialization process then students involved with research will show no more differentiated experience than their uninvolved associates. Successful integration of experience around a structured view and around professional status is the parallel process that accompanies differentiation.

D. THE VARIABLES AND HYPOTHESES

1.- Selected Variables

There are two principal sources from which variables could be drawn to examine the effects of a research affiliation upon the socialization of graduate students. One is the literature on professional socialization. Changes in the self-concept of the socializee are often considered most useful because they reflect a degree of internalization or at least acceptance of norms and values. Closely related are those studies which assess how closely the neophyte has perceived and adopted the norms and behaviors of the profession.[1] The process of developing occupational identity has also had attention. Carper and Becker suggested mechanisms through which identity is developed to be: 1) An

[1] P. H. Tannenbaum, J. M. McLeod, "On the Measurement of Socialization" Public Opinion Quarterly, Spring, '67.

irretrievable investment of time 2) the cultivation of one's interests and the acquisition of skills, 3) the acquisition of an ideology or understanding of why practices are followed, 4) adoption and internalization of motives, 5) a sponsorship pattern relating the individual to the occupational group and to society.[1]

We have elected to go to a second source of variables found in the process of graduate education itself. In the commentaries of those experienced with graduate education and in the recent data-based studies these are recurring points of emphasis. Because of the unique nature of study in the arts and sciences a set of variables that reflect some of these emphases offers the greatest utility. (1) Time in its varied uses and perceptions is the most studied factor. Because it is not tightly scheduled in the arts and sciences the manner in which students perceive and structure time reflects something of socialization. (2) Social interaction, the amount, character, and importance of it is also a fundamental indicator of process. (3) Pre-professional experiences of certain kinds, notably publication, research design, and teaching, are shared by all fields of study. Part of experience is also oriented toward the larger professional community. Together, these elements of experience give another variable. (4) Finally, there is the matter of openness and restriction. If graduate education is, in fact, the kind of open experience tradition maintains it to be then limitations on choice or encouragements toward new experience have a special importance. Each of these variables and the operational indicators used to assess them will be described in the appropriate chapter.

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[1]Howard S. Becker, James Carper, "The Elements of Identification with an Occupation," American Sociological Review, Vol. 21: June 1956, pp. 341-48.

There is one more variable, involvement with research activity. The assessment of student relationships with research activity beyond the formalized research assistantship is a central task in this study. As the independent variable it is treated more fully in the next chapter.

2.- General Hypothesis

A high degree of involvement with sponsored research at the graduate level is related positively to more extensive professionalization: This condition obtains when "involvement with research" is described by means of recall "recognition" of research projects and by self-ascribed "association with research" activity which is related or unrelated to the dissertation. And when "socialization" is viewed as a process of differentiation of experience and, concurrently, as an integration of that experience into a structured view of choices or decisions. The variables selected to represent, in part, this process of socialization are: time, interaction, openness, and anticipatory professional experience. The general hypothesis is assumed to describe a positive linear relationship of the simplest type.

3.- Subsidiary Hypotheses

A high degree of involvement with research:

H-1: Acts as an organizing and structuring factor for the individual's perception and scheduling of time. It is expected that the high research group will show;

-shorter period as a full time student and less dispersion within the group.
-shorter elapsed time BA-Ph.D. and a narrower range of dispersion.
-less difference between expected and actual time spent in study for the degree.
-more factors acting to accelerate studies and more of these factors drawn from the less personal categories.
-wider use of external factors in scheduling time and more emphasis upon aids which are in the environment.

-estimates of optimum time for achieving a degree under different conditions of support to be shorter than the non-research related group and less scattered.
-fewer disruptions to study and less time lost to them.

H-2: Will be related to increased interaction with individuals, groups, and institutional agents within the academic community. High research group will evidence:

-greater frequency of contact with more individuals.
-interaction with individuals serving specific functions related to his own work.
-higher evaluation of group relationships in the academic community, fewer mentions of groups outside the university community.
-greater emphasis on relationships among students as colleagues.
-a view of the department and the institution as a supportive agency to be regarded favorably.

H-3: Is associated with more diverse pre-professional experiences and a greater sense of professional community when assessed in the following ways;

-more encounters with individuals in the profession other than those on the immediate faculty of the institution.
-greater variety in the ways in which these associations have been made.
-larger number of specific pre-professional experiences.
-emphasis upon further concentration in one's field as the next direction of movement in the profession.
-in rating institutions will tend to use organized professional evaluations rather than personal opinion.
-dissertation follow up is more likely.

H-4: Tends to be associated with more openness and fewer restraints upon student choices:

-on critical matters of choice he will tend to see a good balance of freedom and guidance.
-restrictive forces acting upon his dissertation work will be fewer and less forceful.
-more encouraging factors will be noted by the respondents.

CHAPTER IV

DESIGN AND PROCEDURE

A. DESIGN

1.- The Developed Assumptions

From a review of the literature and practices that characterized the era of greatest research growth and from recent writings about adult socialization a series of assumptions have been derived.

a. The approach to sponsored research and its educational consequences has been based for twenty five years on the notion that the two are closely related and interactive. No special planning is necessary to produce educational benefits from academic research.

b. Graduate education may be regarded as a form of adult socialization. The individual enters an identifiable environment which has distinct parameters but a loose internal structure. He holds the expectation of self-development toward acceptance into a profession, the scholarly community. Graduate education in the arts and sciences is characterized by an absence of the sequence of levels, prescriptive roles, time-ordered structure, and the designed apprenticeship characteristic of other professional training.

c. Research activity is a generalized behavior common to all fields at the graduate level and a distinctive element of the university. While it may take a variety of forms it is identifiable as a discrete entity.

d. These assumptions lead to the hypothesis that research enhances the socialization process, that is, the educational experience, by providing to the individual, a more differentiated experience and a more integrated or ordered view of that experience.

2.- Operational Considerations

a. The Setting in which such an elusive set of ideas can best be examined is one in which all the favorable conditions are at the maximum. The years of doctoral study center on research. Those who successfully achieve the Ph.D., the research degree, are those who have had the most complete involvement with research. A university with a large research program that is closely articulated with faculty interests and responsive to them provides the widest exposure. Finally, the respondents should be drawn from those who did most of their work in the peak years of research sponsorship, 1964-68. Their experience should be recent enough to permit recall without too much distortion from their own current activity.

These maximized conditions were present for the successful Ph.D.'s at the University of Michigan during the period 1966 through 1969, and it is from this group that the sample was selected.

In the dollar value of research volume the University has consistently ranked near or at the top of a list of institutions of higher learning in the United States. Institutional policy on research has laid heavy emphasis on faculty initiative with the Office of Research Administration carrying a supportive and developmental role. The paragraphs below provide an accurate reflection of this emphasis.[1]

"UNIVERSITY RESEARCH POLICIES

[1] Office of Research Administration, A Guide to Obtaining and Administering Sponsored Research, University of Michigan, Ann Arbor, Mich., Sept. 1, 1970.

General. Although the University has established various procedures for initiating and conducting research projects, the responsibility for managing these projects lies with the project directors. The University encourages individual faculty members, or groups of them, to seek outside support for research that will contribute to basic knowledge; the initiative for undertaking research, however, must originate with the faculty or research staff. The University insists that the research program be integrated with the academic function; project directors are encouraged to employ students on projects, to use research facilities whenever appropriate for classroom instruction and demonstration, and to work toward the rapid transfer of important research results to the curriculum. The University also encourages the general dissemination of research findings, except for projects that have security classifications or that affect the proprietary interests of a sponsor."

"UNIVERSITY ORGANIZATION FOR THE ADMINISTRATION OF RESEARCH

General administrative structure. Since the University regards the research projects of its faculty members as part of their academic responsibilities, the technical responsibility for research resides in the departments and colleges. A project director is responsible primarily to his chairman and dean for his research activities just as for the rest of his academic activities. However, in view of the enormous growth of research activities in the past decade, the University has made a number of special administrative arrangements to support the chairmen and deans and to provide an overall review for these activities."

In keeping with the view that research and education exert a natural rather than planned influence over one another, the University has no specific activity charged with increasing educational outcomes from research activity.[1]

3.- The Design

To investigate the hypothesis that affiliation with research.

[1]National Science Foundation, A Case Study of Support of Scientific and Engineering Proposals, NSF 63-22, Wash. D.C., 1963. This pair of self studies at New York Univ. and The University of Michigan found that graduate student participation was included in 53% of the proposals submitted by Michigan. If data are adjusted to remove dental and medical proposals where student participations are low, then the share of projects including student participation rose to 66%. This adds the evidence of fact to the intentions stated in the paragraphs above.

in and of itself, enhances socialization a rather simple design is proposed. Among the sample group of successful recent Ph.D.'s, those who were more involved with research are distinguished from those who were involved less or not at all. Their answers are compared on items chosen to reflect each of the major variables, time, interaction, pre-professional experience, and openness. If the assumption that underlies most sponsored research is accurate;--that an automatic exchange of benefits occurs from research to education--then we would expect to find those highly involved with research exhibiting significant effects with respect to the variables.

B. THE SAMPLE

1.- Recent Recipients and the Mailing List

During the period from December 1966 through December 1969, the University of Michigan conferred the Doctor of Philosophy upon 1889 individuals from about one hundred designated departments, programs, and specialties. From this group, sixteen departments in the arts and sciences were selected for study. Two engineering departments were added to give additional perspective. In each department the degree recipients were matched with addresses using the Alumni Records Office file. The original list totaled 747. Foreign addresses, except Canadian, were removed along with those for whom no address could be found. The final mailing list was 664. A comparison of the sample group with enrollment distribution for a recent period is presented in Table 4.1. The sample group differs in distribution from the general enrollment pattern of the graduate school. Natural sciences and the social sciences are over-represented in the selected sample. The humanities are somewhat under-represented and the engineers, as intended, are not large enough to allow major conclusions about that field. When we examine the sample group itself it is clear that the distribution of the respondents among the four divisions of knowledge is a faithful replica of the total sample distribution.

TABLE 4.1

SAMPLE: DISTRIBUTION OF RECENT ENROLLMENT, Ph.D.'s, AND RESPONDENTS AMONG STUDY FIELDS, BY DIVISIONS

	ENROLLMENT				SAMPLE Ph.D. RECIPIENTS			
	Fall 1969		Fall 1968		Listed 1966-69		Respondents	
	No.	%	No.	%	No.	%	No.	%
Nat. Sci.	947	21	1003	22	277	37	174	37
Soc. Sci.	1001	22	980	21	270	36	166	35
Humanities	1656	36	1578	34	133	18	91	19
Engineers	961	21	1054	23	67	9	39	9
TOTAL	4565	100%	4615	100%	747	100%	470	100%

The primary device for collection was a mailed questionnaire in a single stage sample. A pretest version was mailed to 45 individuals and interviews were conducted with five respondents to develop a revised and shortened questionnaire. Appendix B contains the final questionnaire and letters.

Mailed material included a letter, the survey document, and a postpaid return envelope all sent by first class post. At the point of mailing, those contingencies which are so much apart of every mailed inquiry began to appear. On the second day after mailing the first complete postal strike in U.S. history began and extended over ten days. This was followed by an air controllers slowdown that delayed

TABLE 4.2

SAMPLE: RESPONSE RATES: Recipients of Ph.D. in Selected Fields Dec. 1966-Dec. 1969

I	(A) N=Listed	(B) Mailed	(C) Returned	(D) N=Useable	% Return (C÷B)	% Useable Response (D÷B)
Mathematics	79	74	49	48		64.8%
Astronomy	17	17	15	15		88.2
Chemistry	76	71	48[a]	39[a]		54.9
Geology	22	21	18	18		85.7
Botany	17	17	12	12		70.5
Zoology	68	60	45	42		70.0
	279	260	187	174	71.9%	66.9%
II						
Psychology: Clinical	23	23	19	19		82.6
Psychology: Physical & Experimental	43	43	25	24		55.8
Psychology: Social	44	41	34	34		82.9
Anthropology	25	24	18	18		75.0
Sociology	26	19	17	16		84.2
Economics	54	43	29	26[b]		60.4
Geography	12	10	8	8		80.0
Political Science	40	31	22	21		67.7
	267	234	172	166	73.5%	70.9%
III						
English	89	89	65	62		69.6
History	49	46	33	29		63.0
	138	135	98	91	72.5%	67.4%
IV						
Aeronautical Engineering	32	27	20	19		70.3
Mechanical Engineering	40	32	20	20		62.5
	72	59	40	39	67.7%	66.1%
TOTAL	756	688	497	n=470	72.2%	68.3%

a. Ten of this group were in pretest, seven responses not useable.

b. Pretest group, useable responses.

mail in East coast areas. The last group to be mailed included incumbent faculty at the University of Michigan. The campus itself was disarranged by a series of issues that drew heavily on faculty time in the closing weeks of the term. Early faculty returns indicated that respondents could not distinguish closely between experience as a student and subsequent research experience as a faculty member. No mailing is entirely normal but this combination of events was at the extreme end of probability. Table 4.2 summarizes the response rates by department.

When the level of return reached 50% a follow-up was begun. A hand-typed letter and a second copy of the questionnaire was sent. Returned mail was rechecked and a second address used if it was known. Up to three addresses were used for a small group, perhaps two dozen, who had moved but could be traced. When returns reached 60%, at about the fifth week, a telephone contact was made. Responses of all kinds totaled 490, a return of 74.8% on the mailing and 65.6% return on the original list. Various devices were used to improve the response. In the follow-up letter an offer was made to correct addresses or relay information of value to the respondent to other offices within the University. All such actions, approximately 25, were reported to the participant by postcard.

Third follow-ups were made by telephone using the services of a young lady who had limited information about the project and considerable persuasive skill.

2.- The Character of the Sample

There are two critical questions to be met at this point: To what degree does the sample group resemble or differ from all the Ph.D. recipients for those years? Are there marked differences between non-respondents and respondents?

Fortunately, the NAS-NRC "Survey of Current Doctorates" has generated independent data that can be used for some of these comparisons. A questionnaire for this national survey is completed by each doctoral recipient just before the degree is conferred. Punched cards for the class are returned to each university. Information was available on Ph.D.'s for all the commencements in our sample except the latest two.

One characteristic that has some essential comparability is age. It is independent of the sample questionnaire and yet it is related in a general way to the stages of education. A comparison of the total Ph.D. group, 1966-1969, with the sample, non-sample, and non-respondents offers an indication of how representative the participants in this study are of the whole Ph.D. cohort. (Table 4.3). It is clear that the sample

TABLE 4.3

SAMPLE: YEAR OF BIRTH: BY TOTAL Ph.D. GROUP 1966-1969
NON-SAMPLE SAMPLE, NON-RESPONDENTS

	Total Ph.D. Group 1966-69		Non-Sample		Total Sample		Non-Respondent	
	Number	%	Number	%	Number	%	Number	%
1940-44	485	30.0	204	19.5	191	33.5	41	28.8
1935-39	625	38.7	399	38.2	226	39.6	59	41.5
1930-34	292	18.1	215	20.6	97	17.1	26	18.3
1925-29	155	9.6	107	10.2	38	6.7	11	7.7
1920-24	82	5.0	68	6.5	14	2.4	5	3.5
1915-19	27	1.6	25	2.4	2	0.3	0	
1910-14	12	0.7	11	1.0	1	0.1	0	
Other	5	0.3	4	0.4	1	0.1	0	
TOTAL	1613	*100%	1043	*100%	570	*100%	142	*100%
Median	1937.3		1936.0		1937.8		1937.4	

*Information from NAS-NRC "Survey of Earned Doctorates for University of Michigan." August & December 1969 were not available.

group with its distribution of 33.5% in the youngest group and 2.9% in the older group, i.e., born before 1925, is slightly biased toward the younger age. In the total cohort only 30% were born after 1940 and 7.6% born before 1925. Undoubtedly this bias is a consequence of omitting any representation for the field of education and of a smaller representation of the humanities field. There are, however, no major distortions in the sample on this characteristic.

Some indication of similarity between respondents and non-respondents can be gained from the "years of professional experience" as reported to National Research Council at the time of graduation. (Table 4.4). The principal distortion here is a significantly higher

TABLE 4.4

SAMPLE: YEARS OF PROFESSIONAL EXPERIENCE: By Response
(From NAS-NRC "Survey of Doctorates" Questionnaire for University of Michigan)

Years	Respondents	%	Non-Respondents	%	Not Sent
None	22	5.7	5	3.5	1
1	22	5.7	14	10.0	2
1-1.9	31	8.1	10	7.1	7
2-2.9	29	7.6	12	8.5	5
3-3.9	40	10.5	11	7.8	6
4-5.9	29	7.6	15	10.7	2
6-7.9	25	6.5	6	4.2	1
8-9.9	15	3.9	7	5.0	0
10-14.9	16	4.2	4	2.8	2
15	5	1.3	3	2.1	1
Rejects	156	41.0	50	35.7	23
TOTAL	380	*100%	140	100%	50
Median	3.4 yrs.		3.7 yrs.		

*Information from NRS-NAS "Survey of Earned Doctorates:" Does not include August & December 1969.

proportion of non-respondents, 10%, than respondents, 5.7%, in the "one year of experience" category. There is no ready explanation for this anomaly and the rest of the array is reasonably similar.

There is one additional possibility to be dealt with at this point; that the research group had an advantage because of association with research before or apart from their doctoral experience. In table 4.5 below, answers from the survey (question 3) reflect this previous activity. Significantly more of the research group report

TABLE 4.5

SAMPLE: PREVIOUS RESEARCH EXPERIENCE BY TYPE AND BY CATEGORY OF ASSOCIATION

(3) Did you have any research experience prior to entering doctoral study?

NO__________ YES__________ For how many years__________

What was the nature of the activity?

	n= TOTAL	No Research Association NR	Some Association All R
1. No Previous Experience	223	65%	42%
2. Student Experience, Unpaid,			
a) As an Undergraduate	72	7	18
b) As a Graduate	74	14	17
3. Paid Experience:			
a) University, College, Fdn.	42	5	10
b) Federal, Other	15	4	3
c) Industrial	31	3	7
d) Other	12	2	3
TOTAL	470	100%	100%

exposure to research. However, much of it was an undergraduate and the percent reporting it as a graduate student is quite similar. The actual numbers in these lesser categories are quite small. Differences are there but not enough to stand as a determinant element in this study.

Summary: When the sample is compared to the total enrollment of the graduate school, it over-represents the natural and social sciences, understates the proportion of humanities students, and merely touches the engineers. The sample bears good correspondence to the total of Ph.D. recipients with respect to age. Within the sample the non-respondents do not differ substantially from those whose answers are used with respect to the amount of experience they had at the time of completion of the degree. Among the respondents there was no commanding evidence that those who were "associated" with research during graduate study had extensive professional experience before starting their studies.

C. RESEARCH: THE INDEPENDENT VARIABLE

1.- Estimating Relationships with Research:

Research as used in these pages refers to investigative activity carried on by faculty members in their field or in related disciplines and involving a commitment of professional time. Sponsored research of the project type is certainly the most visible expression of these activities because so many of the parameters are formally defined and recorded. However, research is conceived as a general activity within the university similar to teaching, independent study, counseling and advising, or even administration. It is a concept, an abstraction, manifested by individual cases which differ widely from one another in specific attributes.

Customarily, the research assistantship has been the only dimension of student association with research activities that warranted attention. An attempt has been made in this study to find operational indicators broad enough to include a wider range of student involvement. At the same time these indicators must be sufficiently broad to permit personal professorial projects as well as sponsored and contract activity to be included by the respondents. The emphasis is upon that part of research activity which comes through to the student and there still may be indirect, diffuse, or subtle effects upon the student experience that are beyond his elementary awareness. One additional feature is desirable. Such indicators should be defined in a form which will allow them to comprehend the wide variations among the fields of study. To operationalize relationships with research two separate indicators are developed, "recognition" and "association." While the two show a good deal of statistical similarity and are aimed at assessing the same general characteristic, affiliation with research, they do have quite different conceptual bases. In the analysis and the reporting they are separately identified.

a. Recognition is a measure of student awareness of research activity. It takes advantage of the fact that research in its most clearly defined form is sponsored project research. Projects usually represent a whole class of investigative efforts carried on by a professor or group within the department and serve to cue students to other research they may be familiar with. Awareness of sponsored projects also provide an indication of how visible research in institutes or centers outside the department is to students.

For each department, a list of sponsored research projects for the years 1965-66 to 1968-69 was constructed from the records of the Office of Research Administration. This list included projects carried out in centers or institutes but directed by individuals holding faculty appointments in a department. Projects with small grant awards, less than $8,000, were not included. Each respondent also had the choice of adding any other research activities which were important to him but not listed. These could be either titled projects or the general research interests of individual professors. Thus, there was provision for identifying any research activity beyond sponsored projects if it was important to a student. See Appendix B, question 32 for the format used.

Presented with this list of projects specific to his field and to his period of study, the participant was asked to respond in several ways. Projects with which he was familiar, i.e., "recognized" were to be checked. In these paragraphs "recognition" describes the student perception of a project. The term, "identification" is used in relation to the project, not the student, to show how many times the particular project was selected.

The total number of checks was taken as the Level of recognition. From the distribution of responses in each department two kinds of scales were set up: (1) a trichotomy with those above the department median recognition level designated, HI group; those below the median, LO group, and those with NO recognitions. When the HI's and NO's for the departments are used together we have the simplest estimate of awareness of research, a dichotomy. (2) An interval scale in which the proportion or percentage of listed projects checked by the respondent was recorded, (Symbol REC.) This scale gives an indicator that is relatively free of the difference in the length of departmental lists. For purposes of analysis recognition can be expressed as a dichotomy, a trichotomy, and an interval scale.

b. Association rests on the individual's own subjective assessment of his affiliation with research. It involved the selection of a self-ascribed category within a partially ordered set displayed in Appendix B, Question 29. The set involved two dimensions: First, whether there was "knowledge of or association with" research. Second, whether the association was related or unrelated to the respondent's dissertation.

The unused cells represent one category that is impossible and one that is so rare as to be unworkable. These self-ascribed categories were treated as an ordered group that ranges from "no association" (NR) with research to concentration of experience in a "single project" (RP). Since each respondent made his judgement within the framework of his own field or department a certain measure of control for disciplinary differences was introduced.

Figure 2 CATEGORIES OF ASSOCIATION

		KNOWLEDGE OF AND ASSOCIATION WITH RESEARCH		
		NONE	SOME	SINGLE PROJ.
RELATION TO DISSERTATION	Related	(Impossible)	Some Knowledge Related to Diss. RR	Single Project Related RP
	Not Related	No Knowledge No Relation NR	Some Knowledge Not Related RNR	(rare)

c. Uses. From the same list of sponsored projects, amended by the respondent to include missing research activities, the subject was asked to select the projects most useful to him. By checking appropriate boxes he designated those uses served by each of these projects. The choices for the kind of use included five "components of research" common to doctoral dissertation work: Support to cover living expenses, direct costs to the research activity including supplies, travel, etc., techniques and methods, data and information, and theory and concepts. The main value of this indicator was as a description of how research was useful to the doctoral student. It was not used for analysis.

d. The Research Dimension: We have at our disposal two conceptual bases for indicating a relationship with research, recognition and association. Out of the answers to these, several levels of measurement are made available.

LEVELS OF MEASUREMENT FOR RELATIONSHIPS WITH RESEARCH

Recognition Dichotomy	Recognition Trichotomy	Association & Relation: 4 Categories Ordered	Proportion Recognized: Interval
HI-NO	HI-LO-NO	NR, RNR, RR, RP	REC

2.- The Independence of Research Estimates

Thus far we have treated affiliation with research measured by recognition and association as a discrete phenomenon. Before using these concepts as a basic analytical tool three questions must be answered: a) While the two methods we are using to examine the relationship with research, association and recognition arise from different bases, how closely do they correspond in assessing a similar attribute? b) Are the two indicators truly independent or simply a function of scholarly excellence, fellowships, or support patterns? c) Are the two methods simply a function of the department or division of study?

a. If our two mechanisms for measuring research are, in fact, getting at the same attribute then we would expect a high degree of association between them. When the distribution of responses in both categories is set into a bivariate table these data appear.

The degree of association in the full table, 4 X 3, when measured by the application of Kendall's tau-b is .40, a substantial and significant agreement. If the data are collapsed into a fourfold table of "no" recognition, "some" recognition, "no" association and "some" association a value for Kendall's Q of .81 is obtained. Put another way, if a respondent was "associated" with research at all, the probability that he

TABLE 4.6.1

RESEARCH: COMPARISON OF ASSOCIATION AND RECOGNITION

Association With Research	Recognition Level NO	LO	HI	
None NR	103	3	12	118
Some Assoc. Unrelated To Diss. RNR	12	35	85	132
Some Assoc. Related To Diss. RR	17	31	68	116
Single Project RP	8	31	58	97
	140	100	223	n = 463

will be in the "HI recognition" group is .61. Allowing for the differing bases for these methods of assessment, we can conclude that there is considerable agreement between them in assessing affiliation with research. In spite of this similarity the two are kept separate throughout the analysis.

b. The question of whether these research indicators are sufficiently independent of ability or certain kinds of support can be partially answered. By assuming that the better students get most of the fellowships our task is made a little simpler.

On the instrument question #2 required respondents to rank various categories of support in terms of importance for each year of full time study. If the same proportion of respondents ranked fellowships first irrespective of their association with, or recognition of, research, then we may infer that research involvement is not shaped by the existence of a fellowship. The distribution of first ranked choices for "HI," "LO," and "NO" recognition groups for each year of study and for the type of support; fellowships, loans and savings, earnings of spouse, teaching assistantships, research assistantships, outside employment is displayed in Appendix A, Table 4.7. The fellowships section only is abstracted below to show the share of respondents in each class who designated the fellowship as most important. Differences are significant only in the third year.

TABLE 4.7.1

SAMPLE: PERCENTAGE RANKING FELLOWSHIPS FIRST: BY LEVEL OF RECOGNITION AND BY YEARS

	1st Yr.	2nd Yr.	3rd Yr.	4th Yr.
No Recognition	33 %	27 %	29 %	36 %
Low Recognition	35	35	51	43
High Recognition	32	34	38	40

When categories of association were used as the control the similarity of all research groups in ranking fellowships first is even more regular.

TABLE 4.8

SAMPLE: PERCENTAGE RANKING FELLOWSHIPS FIRST: BY ASSOCIATION BY YEARS

	1st Yr.	2nd Yr.	3rd Yr.	4th Yr.
No Association: NR	31 %	31 %	32 %	32 %
Some Association: not related: RNR	35	36	39	40
Some Association related: RR	29	28	43	47
Single Project	33	30	33	33

Recognition and Association as we have measured them appear to be substantially free of fellowship influence.

The similarity between the research and non-research group with respect to support can be illustrated even further. The graduate student needs, above all else, support which carries no obligation upon his time. If we combine all the first rankings into broad categories distinguishing the types of support which give this freedom for two representative years the distribution below is developed.

TABLE 4.7.2
SAMPLE: DISTRIBUTION OF SUPPORT RANKED FIRST: FIRST YEAR

	Unobligated	Work Related	Employment	
NO Recognition	67 %	28 %	5 %	100%
LO Recognition	50	47	3	100
HI Recognition	59	38	3	100
	THIRD YEAR			
NO Recognition	56 %	37 %	6 %	100%
LO Recognition	58	37	5	100
HI Recognition	57	41	2	100

There are significant differences among the various recognition groups in terms of overall support patterns and they are visible in Appendix A, Table 4.7. Such differences are quite specific. The NO research group depended more heavily upon spouses' earnings and loans to gain unobligated time and also tended toward outside employment as a source of support.

c. There is, finally, the question of whether research recognition and association are not simply the product of membership in a certain department rather than a variable independent unto itself. To meet part of this objection the control for departmental differences has been introduced. That is, the "high recognition" group is composed of the "HI" group from each department. It represents the sum of the relative positions in each department.

In the case of our self-ascribed status each individual is judging himself in terms of his department so there is a certain insulation against his being influenced by other fields. The distribution of the various categories is displayed in Table 5.1, Appendix A. It is clear by inspection that department membership alone is not the single determinant of research association.

D. THE DEPENDENT VARIABLES AND THEIR EVALUATION

1.- Assessing the Variables

All of the major process variables; time, interaction, preprofessional experience, and openness, as well as research recognition and association were represented by a series of questionnaire items. These are listed below and the corresponding question on the instrument designated. Responses were punched into cards, four per participant, giving 255 "bits" of information per respondent. Preliminary frequency distributions were run, corrections made and the data entered on magnetic tape. The OSIRIS tape system of the Institute for Social Research, University of Michigan was used to create a dictionary of all items and others were added as the project advanced. The statistical programs of the Institute for Social Research were used for all but three runs when the console-controlled programs of the Statistical Laboratory were more convenient.

Open end questions were coded by an independent rater or by the project director with fifty of the instruments double rated for a reliability check. Several questions were set in rank order form but because of duplications and omissions the data were processed as simple ordinal ratings. Responses on items were given an unweighted ordinal score, 1-4 or 1-5. There was a directional quality to such scoring consistent with the hypothesis.

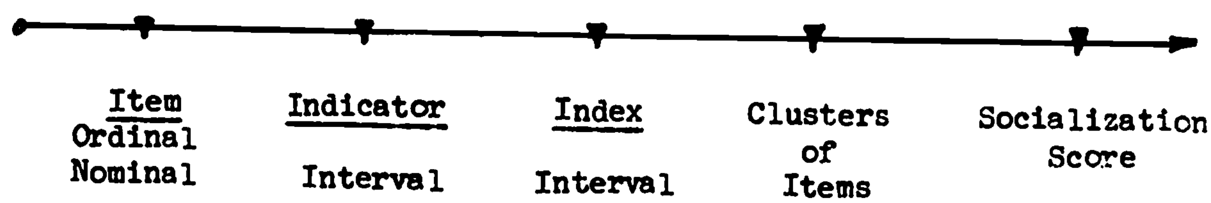
In a number of areas the scores for several items could be combined into a summary values which are referred to as <u>indicators</u> in subsequent paragraphs. Within each variable it was also possible to combine the indicator scores to give an index of that variable. While all such combinations reflected only a part of the variable they proved useful as an exploratory device.

VARIABLES AND ITEMS	SOURCE
a) <u>Time Variable</u>:	
1) Elapsed time: baccalaureate to Ph.D. in years	NRC DATA
2) Full time study in years.	Q 1-2
3) Optimum time to attain Ph.D.: Under three conditions of Support: in years.	Q 8
4) Difference between expected and actual time of completion.	Q 7
5) Accelerants to Doctoral study: In coded nominal categories.	Q 6
6) Disruptive Factors: Time lost to sixteen factors.	Q 10
7) Aids to scheduling: Seven aids ranked by usefulness.	Q 9
b) <u>Interaction</u>:	
1) Frequency of Interaction with ten classes of individuals.	Q 12
2) Functions served by those individuals: Sixteen response combinations.	Q 12
3) Group associations: Importance of eleven groups.	Q 16
4) University Agencies: Evaluation of twelve offices.	Q 17
5) Fellows students: Attitude toward twelve descriptive statements.	Q 18
c) <u>Pre-professional Experience</u>:	
1) Leading persons in Field: number of encounters.	Q 14-15
2) Standards for Judgement of own work: Ranking of six factors.	Q 13

	SOURCE
3) Ranking of Institutions in field: basis for judgement.	Q 19
4) Professional experience: Activity in thirteen types.	Q 24
5) Dissertation topics explored: number, kind of follow-up.	Q 22
6) Preferred next career direction.	Q 23
d) <u>Openness and Constraints</u>:	
1) Expectations vs. Actuality: on nine factors.	Q 20
2) Balance of Freedom and Direction: ten factors.	Q 21
3) Restrictive factors: Importance of eight factors.	Q 25
4) Encouraging factors: Importance of eight factors.	Q 26
e) <u>Academic Research</u>:	
1) Association with Research: 4 categories.	Q 29
2) Sources for components of research.	
3) Recognition of research.	Q 32
4) Uses of research.	Q 32
5) Attitude toward research effects on Students: five factors.	Q 28
6) Attitude toward research effects on Faculty: Agreement-disagreement on six factors.	Q 29
7) Attitude toward research effects on Institution: Agreement-disagreement on five factors.	Q 27

These combinations of items fall along a vector which with proper weighting and evaluation could reach single comprehensive value to represent the socialization process.

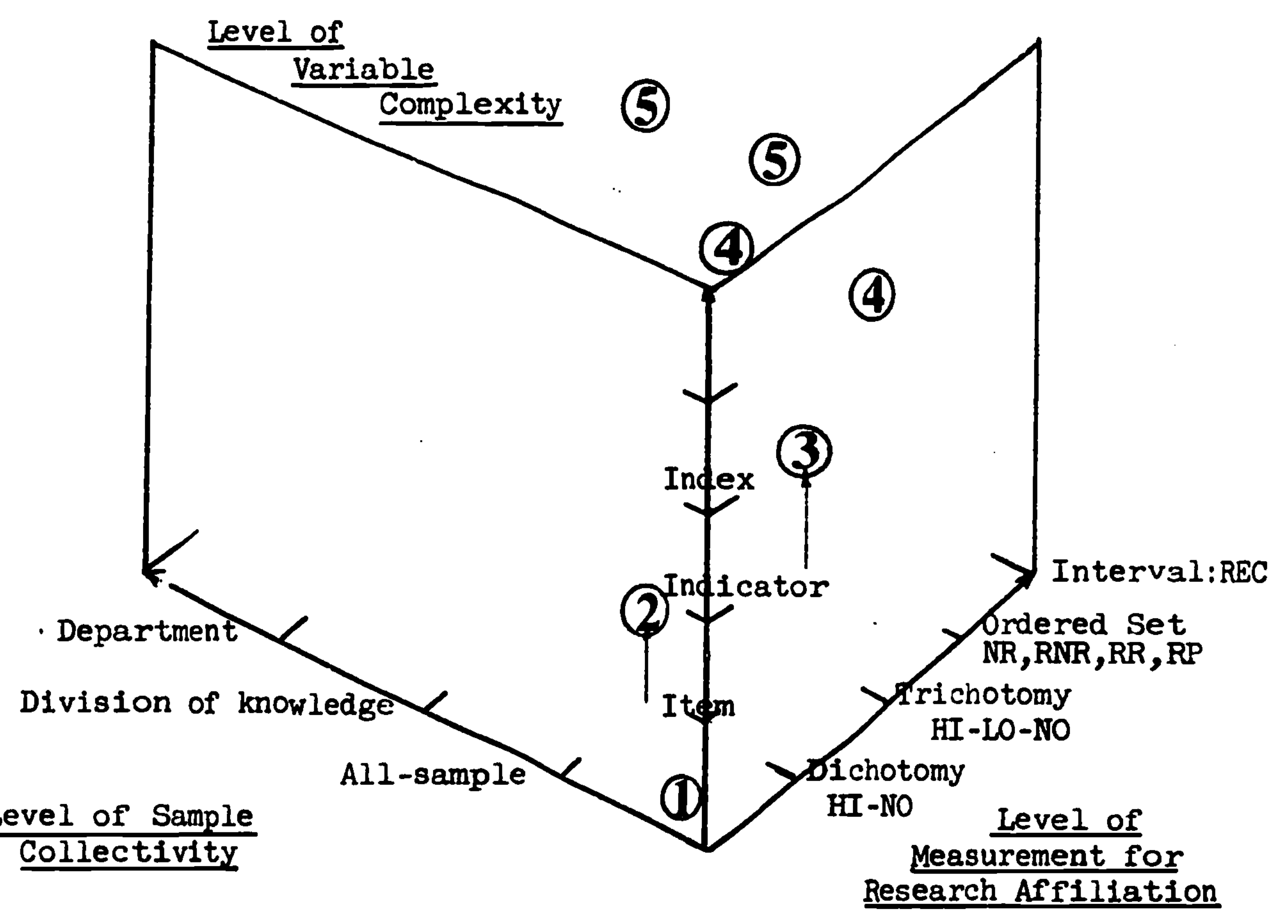
LEVEL OF VARIABLE COMPLEXITY



E. PATTERN OF ANALYSIS

In the foregoing paragraphs it has been noted that several different levels of measurement are available to reflect the relationship to research whether by recognition or by association. The responses to individual questions can be combined in different ways to give indicators and indexes. Finally, the sample itself can be subdivided by department or by broader divisions of knowledge. If these three aspects of the information are put together into a diagram or matrix the steps in analysis become clearer.

Figure 3
SCHEMATIC MATRIX OF ANALYSIS PATTERN



The steps in analysis were:

1. The starting point was the description of item-responses for the total sample without regard to research relationship. A simple tabulation of response on every item allowed separation of items with very low participation, about four of them as it turned out.

2. The question of determining where in this array of items differences between the research-related segments of the sample and the non-research group appeared at a significant level was the next logical step. Bivariate tables were set up for each item and tested for significance by X^2 computations using p .05 as the point of distinction. The independent variable, research, was represented by both the self-ascribed "association" and the "recognition" in the dichotomy mode. Of the 152 items drawn from the four dependent variables 69 showed a significant difference in one or more of the contingency tables.

3. To make full use of the information, the research groups were further subdivided by categories of association. This allowed consideration of the question as to what kind of research association made the greatest difference. The standard formats for these questions are shown below.

a) Does research related to the dissertation have a greater or less effect upon responses?

	Values of Item	n=
No Association: NR		118
Some Association, related: RR, RP		213

b) Does research affiliation of a general type, not related to the dissertation, show a different pattern?

	Values of Item	n=
No Association: NR		118
Some Association, Not related: RNR		132

c) What is the effect if all research activity is part of a single project rather than scattered?

	Values of Item	n=
Some Association: Related: RR		116
Relationship all on Single Project: RP		97

Given the appearance of a significant difference by X^2 tests the next task was an assessment of the strength of the difference. How strong and in what direction does the relationship appear?

Because the research variable in its categorical forms had a directional quality, "less" to "more" involvement with research, and because most of the items had an ordinal form with a direction related to the hypothesis it was possible to calculate the value of Kendall's tau-b as a measure of association between research and the variable.[1] The statistic allows for large numbers of ties, has limits of 1, -1, and conforms to the normal distribution when N is large. Because of the large number of ties in any given question and because of the simplicity of the table, values rarely exceeded Tau-b = .35 in this data. Significance levels are indicated where applicable.

In a few cases the strength of the relationship was estimated by the use of Goodman and Kruskal's gamma, a measure of association

[1]Sidney Siegel. Nonparametric Statistics for the Behavioral Sciences, McGraw Hill Book Co., N.Y., 1956, pp. 213-23.

suitable to nominal--ordinal comparisons.[1]

4. One measure of research recognition, the percent of projects recognized, and several responses on the instrument gave data at the interval level. Product moment correlations were calculated by Pearson's method using a computer program from the Institute for Social Research. Exploratory intercorrelations were also developed. In several cases the data reflected a high degree of regularity and a simple one-way analysis of variance was calculated to assess the strength and significance of associations.

5. We have already noted how some items could be combined with others to give "indicators" and further combined to give "indexes" of the variable. These were compared with the level of recognition in its interval form to give general correlations for the whole sample. Then the sample was subdivided into the four major divisions of knowledge, natural sciences, social sciences, humanities, and the small engineering group. Controlling for division, the correlations were run again to ascertain how much of the association revealed in the total sample was a product of involvement with an area of study. As an exploratory step, more interesting than important, responses were controlled by department for a small group of items related to the time variable and the results are displayed in Appendix A, Table 6.11.

The indexes and indicators are treated in detail in Chapter X.

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[1]Leo A. Goodman and Wm. H. Kruskal, "Measures of Association for Cross Classifications," American Statistical Journal, Vol. 49, No. 268, Dec. 1954, pp. 732-64.

CHAPTER V

RESULTS: RESEARCH

A. A DESCRIPTION OF RELATIONSHIPS WITH RESEARCH

For the exploration of research effects a framework has been proposed that involves the separation of those affiliated with research from those who had no such connections. This distinction is made in two ways, by recognition of sponsored projects, and by self-ascribed association with research activity. It has been demonstrated that the two methods have a reasonable degree of correspondence, that research affiliation is independent of fellowship holding, and that it is not merely an idiosyncracy of the sample.

Given these conditions what kind of distributions for association and recognition appear in the total sample, among the major divisions of knowledge, and between the departments? How much recognition is there of these sponsored activities by advanced students? To what uses are the projects put by students in their own work? In relation to other resources a student may count upon what is the comparative emphasis on research projects and the research activity at institutes or centers?

1.- Association

In the total sample group, 75% of the respondents reported some association with research. The distribution by division is displayed below and a more detailed summary by department is provided in the Appendix A, Table 5.1.

TABLE 5.1.1

RESEARCH: ASSOCIATION WITH RESEARCH

	NO ASSOCIATION NR	SOME ASSOCIATION: NOT RELATED TO DISS. RNR	SOME ASSOCIATION: RELATED RR	SINGLE PROJ. RR	
I. NATURAL SCIENCE	18%	33%	31%	14%	100%
II. SOCIAL SCIENCE	16%	24%	24%	32%	100
III. HUMANITIES	59%	23%	14%	02%	100
IV. ENGINEERING	10%	33%	17%	38%	100
ALL: n= 463*	25%	28%	24%	20%	100

*Note: non-responses are not shown here.

Considered as a whole the distribution of the sample group is surprisingly even with about a fourth falling into each category. Even the divisions show similarity with the humanities standing as the marked exception. Several points are noteworthy. (a) An association with research is not absolutely indispensable even in the natural sciences. (b) Those whose research was "related" to the dissertation are about equal to the group whose research contact was "unrelated." This would seem to indicate that there is no great pressure to work only with the research endeavors that bear upon one's dissertation. While there may be pressure toward project-related work it is not visible in the total sample group. (c) Concentration on single project research has generally been noted as the hall mark of engineering but we see in these data an unexpected prevalence in the social sciences. (d) The skewed nature of the humanities responses raise some interesting questions. The wording of the question was such that subjects were encouraged to add any other research, sponsored or unsponsored, personal or institutional, to the list if it had meaning or usefulness for them. Other evidence, notably reports of ongoing faculty research, shows that the humanities faculty is rather deeply engaged in research efforts on identifiable subjects. The question arises as to why students seem to be unaware of it or, put in another way, why it is so separated from the perceptible learning environment. Three obvious interpretations suggest themselves: Students, with a view colored by publicity, consider as "real" research only the investigative efforts that are legitimatized by funding, by a publication or by an award. Or, faculty in the humanities, feeling overshadowed by the growth of sponsored research are slow to disseminate their interests. Or finally, the nature of research in the humanities is of such a character that professors are reluctant to disclose the investigative phases because of their tentative or random character. For whatever reason, there is substantially less perception among the humanities people in the sample.

The question arises as to whether the students who reported "no association" came to that condition by choice. Table 5.2 below displays the answers provided by respondents. About half the group,

TABLE 5.2

RESEARCH: NO RESEARCH GROUP: REASON FOR NON-AFFILIATION: BY DIVISION

	I Nat. Sci.	II Soc. Sci.	III Hum.	IV Engr.	Total
Research not available for student participation	10	6	35	1	52
Research was available but I:					
-Did not obtain affiliation even though I did desire it	2	3	2	0	7
-Rejected it in favor of more teaching experience	0	5	0	0	5
-Rejected it in favor of more intensive academic exp.	13	4	4	2	23
-Rejected it in favor of employment outside the University	2	4	2	1	9
TOTAL	27	22	53	4	106
No Answer	5	6	1	0	12
					118

11% of all the respondents found that no research was available for student participation, a rather small proportion and, of course, heavily weighted to the humanities. The remarkable figure in the group is the small number who desired research experience but did not get it.

While there are gross similarities in the distribution of association for the total sample and even for the major divisions of knowledge, the detailed distribution by departments in the Appendix A, Table 5.1 shows a different picture. There is wide variation. The numbers are too small for purposes of our analysis. The hypothesis under which this inquiry operates is a broad one but, clearly, a most interesting question for further study is why similar departments produce such a wide variety of response on this question.

2. Recognition

Among the 470 respondents a total of 328 checked one or more projects as familiar, almost 70%. Even among the 142 who found no recognizable project and could add none of their own to the list there were some, 24 to be exact, who reported some kind of association with research in the previous category. Undoubtedly there are many kinds of contact with research not captured by either of these means. What is recorded is the visibility of the formalized research activity and other projects that were of special importance to respondents. The information in the summary table below and in Appendix A, Table 5.3 was developed by taking the number of recognitions for each student and dividing by the total projects listed for his department to give a proportion recognized. These individual recognition levels were combined to give department means and the mean proportion recognized for the division.

TABLE 5.3.1

STUDENT RECOGNITION LEVELS

	Number of Respondents	Number of Projects	Mean Proportion Recognized	Number of Zero Recognitions
Natural Sciences	174	285	19.0%	41
Social Sciences	166	217	25.4	39
Humanities	91	9	23.8	58
Engineering	39	93	20.3	4
	470	604	22.3	142

Again there is a certain stability across division lines in the recognition levels of individual students. It appears that an average student is aware of about one fifth of the recorded project research going on around him. In no department did every project go unrecognized. Even in fields where sponsored projects are something of a rarity such as History and English the share of sample respondents who acknowledged one or more projects was slightly more than a third. Any projects the subject may have added are included in these data.

It might be argued that the percent of projects recognized, what is called here <u>recognition level</u>, is simply a function of the number of projects listed; the more projects on the list, the more recognitions. To test this the departments were ranked by the number of projects on the list and then ranked by recognition level. The two rankings were compared by Spearman's rank order correlation to give a rho = -.195, not significant. Recognition level therefore can be accepted as an approximation of the respondent's awareness of sponsored research activity.

These conditions are displayed in Appendix A, Table 5.3 listing individual departments. A glance at these rankings on mean proportion of recognitions finds Astronomy at the top with 47.6% followed by Geology 40.6%, Botany 34.0%, Experimental and Physiological Psychology at 32.6% and Social Psychology at 31.1%. That these recognition levels are in part a product of departmental policy is demonstrated by the low level in Mathematics, 5.0%. This department makes extensive use of project funds to aid graduate students through assistantships at the dissertation stage. It is a policy of support only, in most cases. The recipients do not work with projects and do not have regular contact with the research activities. This gives a clue to the idea that intra-departmental exchange of information about ongoing research and a conscious program of introducing students to research may produce some direct changes in awareness.

3.- Uses

To capture information about the uses to which research was put by the sample group it was necessary to establish a set of categories that fell between the single generalized label of "support" and the infinite number of uses individuals might cite in an open end response.

It was assumed that certain common "components of research" are present for every doctoral student although the particular combination might vary widely: Support for living, direct costs involving supplies, travel, equipment, etc., data and information the raw material, techniques and methods for systematic treatment, and theory and concepts for an organizing framework. These notions were derived from the pretest and from interviews where the question was posed in an open form. Respondents were asked to check appropriate boxes if a project was useful to them. Each of these checks was counted as a "use," a rather synthetic but useful mechanism. There was provision for adding other projects not on the list and for indicating the "uses" they might have had too. Again, we emphasize that this reflects only what the respondent was aware of and there is a strong likelihood that the whole impact is much larger in categories like direct costs or data.

TABLE 5.4.1

STUDENT LEVELS OF USE

		Number of Respondents	Number of Projects Listed	Mean Proportion of Uses	No. of Zero Users
I.	Natural Sciences	174	285	6.5%	75
II.	Social Sciences	166	217	11.3	58
III.	Humanities	91	9	11.3	78
IV.	Engineering	39	93	7.6	10
		470	604	9.8%	221

About half of all respondents, 249 (53%), found one or more of the projects useful in one or several ways. To the prepared list of sponsored projects, 57 respondents added projects that had special utility for them. In all, 67 separate identifiable research activities were appended. The summary table above and the more complete table by department in Appendix A, Table 5.4 displays the distribution of these "uses." Because of the small number of projects the proportion of uses in the humanities is not of any great significance. In the analysis no statistical calculations based upon the level of use were made. The importance of the information lies in what it shows of the purposes served by both listed and added projects.

In the table below a summary of the distribution of responses to show the number of projects used is given. A, B, C, D, are not particular projects but only the first project mentioned, the second, etc.. E, F, G represent the first added project, the second added project, etc. At least 106 respondents found one project on the presented lists useful as a source of support: 119 found a first one useful in the construction of the theoretical base for their own work.

TABLE 5.5

RESEARCH: USES OF PROJECTS (number of responses)

	Listed Projects				Sub Total	Added Projects			Total Mentions
	A	B	C	D		E	F	G	
Support	106	41	8	11	(166)	44	12	1	223
Direct Costs	101	34	11	11	(157)	42	8	2	209
Data & Info.	109	51	22	13	(195)	57	14	4	270
Techniques	116	63	33	15	(227)	48	12	2	289
Theory & Concepts	119	62	37	16	(234)	46	17	4	301

When a single project was added, column E, we can see that it was most often, 57, a source of data or information although more than one use was usually checked. It is clear that respondents tended to think of projects as providing a variety of benefits rather than a single dominant contribution. It would be careless to attempt a more specific analysis of these data because of the way in which the response option was set up, a point to be covered later. Nevertheless it appears that projects are a frequent source of theoretical notions and technique both of which are critical to the formulation of a research problem.

Much of the thinking about the benefits of research for the educational process is based on the notion that research is diffused by the normal process of academic exchange of ideas throughout the department. The elements it generates become a kind of "free good" open to the scrutiny of responsible scholars, including the nascent scholars. In this light it was worthwhile to ask how the respondents became associated with the useful projects. Our subjects were asked to designate for each project the avenue by which they became associated with those activities that were checked as useful. Choices were somewhat restricted and the pattern in the table below developed from the answers.

TABLE 5.6.1

RESEARCH: ORIGIN OF ASSOCIATIONS (number of responses)

	Listed Proj.				Added			Total
	A	B	C	D	E	F	G	Mentions
Assigned to Project	5	1	2	0	0	0	0	8
Developed from Casual Contacts	42	27	15	6	17	3	1	111
Invited to Join	56	19	6	5	38	6	1	131
Followed up on Class Reference	13	5	1	0	3	2	1	25
Attracted by Reputation of Investigator	31	10	4	1	4	3	0	53
Joined to Supplement Income	11	6	1	1	8	2	0	29
Other	21	15	8	0	10	2	0	56

Clearly the initiative, the control, of useful association with research projects lies within the project itself, with the investigator primarily but also with others who come into casual contact with the student population. A departmental requirement for research association would have, and does have, little effect. The attraction of earnings is not significant. The two categories which reflect the initiative of the student are low by comparison. Taken together this indicates that the idea of open access, however comfortable or traditional it may be, does not fit the facts. This finding also adds one more task, dissemination, to the already long list of responsibilities facing the project director. His actions determine the degree to which the educational utility of the project will be diffused and, of course, his actions are abetted or curtailed by department policies which emphasize the importance of, and allow time for, the presentation of research activity at various stages in its development.

4.- Research in Relation to other University Facilities as a Source for the Components of Research:

Thus far in our examination of the uses of research we have concentrated attention on the usefulness of individual projects and other identifiable research activities for meeting the "components of research" each doctoral student needs for his own work. The results of this approach tell us something of whether a project was recognized and used. Such results, however, fall in very narrow limits and do not relate research to other parts of the educational environment. How useful, for example, is project research in providing support when considered alongside fellowships, personal earnings or other forms of support? In a procedure that was a reversal of the one described above respondents were presented with each of the five "components of research" suitably defined, and asked to describe the main sources of aid with that component and the "auspices" by which they were made available. These were open-ended responses which could be coded for each component in terms of the form the assistance took and the source through which it came. This kind of two factor division was made for support and direct costs. A single source identification was sufficient for the other components; technique and method, data and information, theory and concepts.

a. Support: Research activities in the form of either project research or through the programs of investigation at the centers, were cited as a primary source of support by 13% of the respondents. Its relative position among the various sources did not change when the second reference of each respondent was considered. Together, the department and the student's own resources account for about half of the support and government grants cover another quarter.

The coding was done in such a way as to separate aid contingent on research that did not obligate the holder; from government

TABLE 5.7.1

RESEARCH: SOURCE AND FORM OF SUPPORT (number of responses)

FORM

SOURCE	Personal Funds & Earnings	Teaching Fwp.	Research Assistantship	Fellowship, Grant, Own Project	Distribution of First Mentioned Total	%	Distribution of Second Mentioned
Self & Family	64	-	-	-	64	14	20%
Chm. or Dept.	1	114	12	29	156	34	37
Research Ctr. or Proj.	4	-	53	4	61	13	12
Other Univ. Source	2	-	1	26	29	6	8
Gov't.	5	1	8	95	109	23	13
Foundation or Business	-	-	-	16	16	3	5
Employer & Other	20	-	1	11	32	7	6
TOTAL	96	115	75	181	467		
%	20	25	16	39		100%	100%

fellowships, traineeships, and grants. The fact that 39% of these successful students depended upon Federal fellowships and grants serves to emphasize the value of the NDEA, NSF, and NIH programs of student support as separate from research sponsorship or institutional grants. A slightly more detailed breakdown is displayed in Appendix A, Table 5.7.

b. Direct Costs: A similar table below presents information about the sources of aid for the direct costs of dissertation research. By meeting the primary needs of about 20% of the respondents the research centers and the projects contributed more heavily in this category of research than in any other of the five components. The department still ranks as the first source with 28% of the respondents citing it as a primary aid. The government category displays a number of fellowships

TABLE 5.8.1

RESEARCH: SOURCE & FORM OF SUPPORT FOR DIRECT COSTS

SOURCE	FORM: Personal Funds	Teaching Fwp.	Research Asst.	Services, Facilities	Fellowship, Grant Own Project	Distribution of First Mention Total No.	Distribution of First Mention Total %	Distribution of Second Mention %
Self & Family	51	-	-	-	-	51	13	14
Chmn. or Department	-	7	2	71	31	111	28	23
Research Ctr. or Project	1	-	35	24	20	80	20	19
Other Univ. Source	-	-	1	16	47	64	16	21
Government	1	-	7	6	54	68	17	11
Foundation or Business	-	-	-	4	12	16	4	7
Employer or Other	1	1	-	1	9	12	2	5
TOTAL	54	8	45	122	173	402	100%	
%	13	2	11	30	44			100%

that carry supply allowances and the traineeship programs that make provision for identifiable student expenditures. Looking across the forms of support we can readily see that much of the assistance took the form of special services, equipment, and supplies, 30%. Small grants from department resources or those of other university sources including the Graduate School research grants program accounted for another 26%. The share of respondents dependent upon their own resources continued at about the same percentage as that found in general support, 13%. The second mentions followed the same pattern with a somewhat larger share citing all-university sources. On the whole, however, this particular component of research is supported from more diverse sources than any of the others.

c. Data and Information

For the remaining components of research a single phase table is sufficient. About 18% of the respondents noted research activities as a primary source for data and information. The principal aid in this category came from the classic academic sources with a university-wide character, the libraries, museums, special collections, and laboratories 34%. Among the second mentioned sources there is a significant increase in the use of extra-university facilities from 7% to 19%. There is also an increase in the departmental sources among the second mentions. (Appendix A, Table 5.9.) The difficulty in assessing the relative importance of the research contribution to these components lies in the lack of any comparative base. We do not know what the condition might have been twenty years ago or what it is at a non-research institution. One has an impression, however, that research management has yielded good but not spectacular returns of an educational nature on project type research.

TABLE 5.9.1

RESEARCH

SOURCE OF DATA & INFORMATION	First Mention	Second Mention
Own Collection	19%	8%
Within Department	14	22
University Facility	34	22
Research Center or Project	18	17
Extra-University Facility	7	19
Government	6	5
Employer & Other	2	7
	100%	100%
n =	378	162

d. Techniques and Methods

This is another of the areas where one might expect to find research activity a major contributor. It is reflected, however, in the responses of only 9% of the sample and in the second mentions it remained at the same level. It is the direct assistance of the doctoral chairman and committee, 22%, and the formal emphasis of the department in its courses and seminars, 27% that emerged as most significant. For one part of the respondents, 18%, the development or refinement of technique was apparently the central contribution of the investigator himself. (Appendix A, Table 5.10)

TABLE 5.10.1

TECHNIQUE & METHOD

SOURCE	First Mention	Second Mention
Self Developed	18%	10%
Chm. or Committee Members	22	23
Dept: Courses and Seminars	27	22
Conventions & Literature In Field	13	14
Other University Facility	8	11
Research Center or Project	9	10
Employer & Other	3	10
	100%	100%
n =	373	203

e. Theory and Concepts

This is the most elusive of our "components of research" and drew the smallest response with only 363 of the 470 offering a specific comment. Research activity is mentioned by very few, about 4%. Three quarters of the responses center on the chairman, the department, and the conventions of the discipline. Again we find about one fifth, 19%, of the respondents identified their own formulations as the major source. Except for the drop in self-developed theory and a rise in the share who noted colleagues or the employer as a source, the second mention retains the principal relationship. (Appendix A, Table 5.11)

TABLE 5.11.1

THEORY & CONCEPTS

SOURCE	First Mention	Second Mention
Self Formulated	19%	9%
Chmn. of Doctoral Committee	24	28
Department, Faculty, Courses	26	27
Conventions or Literature Infield	24	20
Research Center or Project	4	5
Others	6	11
	100%	100%
	n = 363	n = 209

There is a contradiction in the two forms of data around which we have developed our description of the uses to which research can be put. When a project was listed, a large number of respondents checked theory and concepts as one of the contributions. With the question reversed it now appears that research is a very infrequent source of theory. Part of the answer lies in a mechanical flaw in the design of the instrument. Having listed a project as useful it was quite easy, too easy as it turned out, to simply check the boxes without attention to the labels. For this reason we have avoided drawing inferences that might easily go beyond the accuracy of the collection device.

5.- A Summary of Descriptive Characteristics

There is rather wide awareness of research activity among successful doctoral students. Judged by either method of acknowledgement, self-ascribed association or externally prompted recognition, approximately three quarters of the respondents reported familiarity with investigative activity. Of those answering the questionnaire about half reported finding university research useful to their own work. If the very low acknowledgement level of the humanities group (91 subjects) is removed, the share finding research useful rises to two thirds among the other 379 respondents. If the sample is an accurate reflection it appears that scholarly research in the humanities is not readily turned to instructional purposes in forms perceived by students.

Citations of the uses to which individual projects were put tended to place the non-financial contributions; theory, information, and technique on an equal basis or slightly higher than financial aid in the form of support or direct costs. Projects that were added to the prepared list differed in one respect; they were more often a source of information. Access to research projects is not open but controlled. It depended for our sample respondents upon the invitation of those conducting the project rather than upon initiative the student may exercise.

When research as a general activity is considered in relation to other university facilities a somewhat varied pattern of utility emerges. About one sixth of the group found research a primary source for their dissertation-related needs but this ranged from 19% who mentioned direct costs to a mere 4% citing theory. In the panoply of academic resources research activity holds a significant but not commanding position. Put succinctly three quarters are familiar with research, two thirds to a half use it, and for about one sixth it is a primary aid.

Awareness levels are the result of several factors, the nature of the field of knowledge itself, university policy, departmental procedures and practices, faculty management of projects, and individual alertness of students. Some inferences, limited but clear, about the relationship of these factors can be made from the data. Field of knowledge alone is not the determining element in awareness although the humanities are clearly different from all other areas. Departmental policy can shape extreme conditions by heightening or reducing the exposure of the students to research or, more accurately, the visibility of the ongoing research to the advanced students. And, if it is departmental policy that encourages awareness, then it is the project directors who act as gatekeepers to admit students to the use of these projects. There is a great deal of study still to be done on all facets of the question. As an example, Appendix A, Table 5.12 displays the number of times projects drew identifications. This suggests that some departments get high awareness and the reasons for this can be gathered by a relatively simple inquiry. Likewise, certain projects drew large numbers of identifications while others drew none. What brings them into a learning environment is worth investigating.

CHAPTER VI

RESULTS: TIME

A. TIME AS A DISCRETE FACTOR

1.- As An Index

The amount of time spent in graduate study has come to be regarded as a fundamental kind of indicator and has drawn considerable study in the last fifteen years, particularly from 1958 to 1965. Expressions of this index carry little self-evident meaning, however, for each is a composite of the nature of the discipline, the policies of the department, or doctoral chairman, and the personal qualities of the student. The Ph.D. degree is not defined in terms of time nor is it specified by the time-related media of courses and credits. Still, one finds a strong tendency to treat the interval of time involved in graduate study as if it had intrinsic meaning, usually to support a point of view. If, for example, graduate eduation is seen as a completely open environment through which the student moves primarily by his own decisions and actions then the amount of time is clearly a function of his will, energy, and skill. On the other hand, if the onus lies with the institution and its departments to produce a workable program of study then the passage of time is a measure, in part, of program effectiveness.

Typical of the first outlook is the study of Rosenhaupt, whose description of the graduate school portrays it sharply;

"A graduate school is primarily a family of scholars who select their own company, setting their own climate of interests, and supporting each other in their quest for more knowledge. To enable them to do research the scholars need libraries and laboratories. For financial support and intellectual stimulus they surround themselves with apprentices. Those apprentices who give a good account of themselves are rewarded with a title - doctor of philosophy - but this rewarding of apprentices is only a secondary interest of any graduate school."[1]

A somewhat different view of the institution's position has appeared in the comments of critics and even more often in the responses of students. Witness the recommendation of the authors of a study by the Southern Regional Education Board:

"There must be developed within respective departments and in the graduate school, distinct and consistent patterns of expectation with respect to understandings, skills, and competencies which a candidate is expected to exhibit; with respect to the general curricular structure defining the heart of each discipline; with respect to the content areas to be covered in examinations; with respect to the timing of examinations within the context of other specific and general requirements."[2]

And the comments of a respondent in this study:

"...no limiting suggestions were ever given, only suggestions for more work. This is clearly not proper ! "

But the point is that, without a time standard, it is no "better" to complete the work of a Ph.D. in 5 years, than 4, or in 3. One cannot tell what a "good" time span might be based on educational criteria. Time, intrinsically, has no absolute meaning because it is not one of the parameters by which the degree is defined. J. Perry Miller called attention to this fact rather pointedly at the Council of Graduate Schools

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[1]Hans Rosenhaupt, Graduate Students: Experience at Columbia. 1940-1956 Columbia University Press, N.Y., 1958, p. 72.

[2]Kenneth M. Wilson, Of Time and the Doctorate, SREB Research monograph #9, Southern Regional Education Board, Atlanta, Ga., 1965, pp. 158-159.

. . . meeting in 1962. Commenting on "A Model Time Schedule for Completing the Ph.D." he cited such a model as a "Nonsense problem". "I am less concerned with the ideal than I am with the proposition that we can and should do better."[1] Time is useful as an index only when the attributes it reflects are identified, and when some comparative basis can be established. In the data that follow, the research groups are compared with the groups which had no contact with research.

2.- Time As An Educational Resource

a) Education, in one sense, can be defined as efficient learning.

All formal programs of training and instruction find their justification for existence in the efficiency of the experience they provide. This effectiveness may be judged in terms of quality or enrichment or it may be assessed in terms of an improvement in the quantity of skills, knowledge, and even wisdom of the learner. Throughout lower schooling and in most professional education, time is a planned resource, scheduled in terms of the material covered as with the syllabus and curriculum or charted in terms of the student's progress from one level to another. Only in graduate education in the arts and sciences does one find an absence of specific consideration for the scheduling of time. It is the singular feature of graduate study. Critics who decry the lact of "structure" mean that reference points are missing or unclear. The classical assumption of scholarly preparation is simply that the participant has "all the world and time" at his disposal.[2]

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[1] Council of Graduate Schools in the U.S. Proceedings of the Second Annual Meeting 1962, pp. 38-50.

[2] Rosenhaupt, Graduate Students, p. 81.

b) Sources of Efficiency

Some judgement of the efficiency of an educational process cannot be avoided, however, and a reasonable completion rate is expected. To meet this criterion of effectiveness, higher education has used one of two approaches: (a) Select those students who have that combination of personal and intellectual attributes which match the predictors of success. (b) Construct that combination of programmatic and supportive features which will keep the largest share of participants active to the point of completion. Those familiar with research on undergraduate education will immediately recognize these features as principal stages in the search for sound admission policies, a problem of the fifties and sixties. The final outcome was an examination of the interaction of both approaches and, ultimately, a rejection of both the search for ideal students and completely flexible environments in favor of a transactional view.[1]

Graduate education has only begun to move away from approach (a) and will undoubtedly face increasing pressure to modify its programs to meet the pressing social needs of minority groups, of professionals in need of retraining, and of those who require broader training in policy formation. For the moment, and for our sample group, the operational principle was one of selective admissions determined by tradition and the current state of the field of study. We can assume the participants were originally chosen as the best candidates available to each department.

c) Graduate Education and Structure

Graduate education at the Ph.D. level has traditionally maintained

[1]Morris I. Stein, Personality Measures in Admissions, College Entrance Examination Board, N.Y. 1963. This monograph offers an excellent summary of these investigations.

its unstructured and open character as a prime virtue. The experience is conceived as a delicate balance between the changing character of knowledge and the personal needs each individual perceives for himself. Presumably the student moves through an enriched open environment selecting what he requires for his own intellectual development, guided but not driven by an association with mature scholars. The transit is not marked off into units of time and such rites de passage as there are, qualifying exams, etc. are loosely structured.[1]

The harsh realities that mar this academic idyll have been picked up by critics. (a) First of all, few environments can be maintained in so open a condition as this scheme requires. They slip into diverse and over-exacting requirements on the one hand or loose standards on the other. Jencks and Riesman were "troubled by the rigidity of the departmental and disciplinary categories into which the graduate schools are characteristically organized."[2] Most critics of graduate education join them in seeing this pattern as the chief enemy of openness in the life of the mind. Heiss concurs in this criticism offering even more extensive objections to the departmental unit as a setting for learning.[3] So the rigidity is not in requirements levied on the student but rather in the setting within which he must work. (b) Second, if choices of the new graduate student are left wholly unguided then the untutored decisions are likely to be filled with wasteful errors and retrials.

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[1]A full statement of the character of the Ph.D. was prepared by a committee chaired by Dean Sanford Elberg and published, after discussion and modification, in the Journal of Proceedings and Addresses of the Association of Graduate Schools, 1963, pp. 17-25.

[2]Jencks and Riesman, Academic Revolution, p. 515

[3]Heiss Challenges to Graduate Schools, pp. 275-277, also p. 22.

Berelson emphasized this point before the Council of Graduate Schools at its first meeting in 1961 calling for more regularized, orderly procedures provided they could be made within the basic conceptions of graduate study.[1] At the AGS meeting a few years later this problem was laid to the faculty. This "area of difficulty lies within the curriculum and is largely the faculty's responsibility. I refer to the apparent amorphousness, the lack of coherence or even definiteness of many graduate programs." Further: "in Utopia . . . the student would be allowed to roam at will, find his own problems and their solutions, set his own time limits. In our imperfect post lapsarian world this system does not work, as we have come to discover.[2] (c) Still another argument for more structure to graduate programs springs from the relationship of the university with society at large. There are public expectations of what the university is about. If these expectations are to be at least partly satisfied, a structure that is comprehensible not only to the participant but also to those interested parties outside the academy must be created. Galbraith made plain how the long range needs of industry shape the emphasis of technological fields.[3] In his study of graduate study in the field of English, D.C. Allen noted this with respect to teaching. "The first duty of our doctoral graduates is, of course, to teach; this duty is the one that society understands and the

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[1]Proceedings of the First Annual Meeting, Council of Graduate Schools, 1961, p. 79.

[2]Journal of Proceedings and Addresses of the Association of Graduate Schools, 1964. Report of the "Committee on Expediting the Ph.D.", pp. 63-65.

[3]Kenneth Galbraith, The New Industrial State, Houghton-Mifflin Co. Boston, Mass. 1967, pp. 288-290 and Chapter XXV.

reason society supports the profession."[1] Dean Roy F. Nichols emphasized the separate nature of research training in contrast to research operations to meet specific social needs.[2]

It is significant that the first detailed studies of the time consumed by graduate study were made in response to societal pressures, the manpower concerns of the early 1950's. (d) Finally, there is the criticism that, after an educational career filled with definite schedules and prescribed requirements, the student of proven ability is dropped rather abruptly into a situation almost unstructured as to time. A new set of intellectual challenges is compounded by the demand that the individual structure and schedule his time and effort to meet a concealed agenda. This is so serious, say the critics, that success in graduate school represents, in fact, something quite different from intellectual capacity and dropouts occur for reasons which are more incidental than crucial.

d) The Educational Mandate

The educational mandate in all this is clear: Preserve the valuable freedoms - the Lehrfreiheit and the Lernfreiheit - but alleviate the ills by bringing the minimum amount of order and structure that is required. Structure can come in two principal ways: (a) One form of structure may be thought of as static and consists of milestones, bench marks, levels, in short, a set of reference points. Generally these are normative or ritualistic. Apologists insist there is already considerable structure in graduate education. Dean Moody Prior observed:

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[1] Proceedings; Eighth Annual Meeting, Council of Graduate Schools, 1968. "Can the Ph.D Be Streamlined," pp. 53-56.

[2] Journal of Proceedings and Addresses of the Association of Graduate Schools, 1964, pp. 79-80.

> "The program for the Ph.D. has centered its attention on producing the learned scholar, with emphasis on depth of knowledge and on the cultivation of those tools and habits of mind to go beyond what he has learned and to exercise independence in the understanding of his chosen branch of knowledge and advancing it . . . Thus defined, the Ph.D. program possesses a clear logic and propriety."[1]

Out of her extensive studies Ann Heiss observed, "The extent to which the Ph.D. is standardized is reflected in its requirements."[2] Another recent proposal would have the graduate years marked off into levels by certification into what appear to be natural divisions, masters level, candidates level, and full doctorate. There would be formal admission at each level. Thus, the major blocks of time would be structured but within each there would be ample flexibility for the particular needs of a discipline or an institution.[3] (b) There is another way of infusing the graduate experience with a sense of structure. We have described study toward the Ph.D. as a developmental process, socialization toward a profession. By maintaining an environment which continuously offers cues, feedback on performance, leads to the next steps, and analogs of activity with sufficient force and clarity to permit realistic self-assessment, a form of dynamic structuring is introduced. This is the way in which the adviser's role toward the candidate was envisioned in the traditional master-apprentice model of graduate study. Such complete dependence upon interpersonal exchange has proven to be costly in time, and withal, somewhat precarious. But impersonal agents in the learning environment can provide a similar set of functions. Situations themselves can provide reference points and cues. An implied element in the expansion

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[1]In Walters Graduate Education, pp. 34-35.

[2]Heiss, Challenges, p. 109.

[3]Stephen H. Spurr, Academic Degree Structures: Innovative Approaches, McGraw Hill Book Co., N.Y., 1970.

of campus research was this notion that enrichment of the learning environment through research would compensate for the reduction in professorial time given to direct guidance. In managing research activity the professor-project director would provide structuring aids in the learning environment to his students.

e) To Summarize and Hypothesize:

The amount of time spent in graduate study has no intrinsic or ideal value. It is useful as a comparative or reflective index when appropriately defined. Time is treated as a fundamental educational resource everywhere in education except in the graduate school. Critics have cited this lack of structure as a serious shortcoming. Structure can be introduced in two ways, however, by either static markers or by dynamic inputs to a process. It is hypothesized that research affiliation affords the individual more opportunities for the dynamic structuring of time by providing leads, cues, and feedback from an enriched learning environment. The outcomes would be a shorter time as a full time student, closer correspendence between expected and actual time of completion, a more coherent view of optimum conditions, and the wider use of more resources in scheduling his efforts.

B. THE ASSESSMENT OF TIME

1.- There have been few occasions where the development of accurate information produced more direct, almost dramatic, results than one finds from the studies of time spent in graduate education. For fifty years there had been a sincere concern for the lengthy doctoral preparation.[1] The pressure of external demands upon the academic world just after World War II produced an outcry of "mea culpa" and a general acceptance that the Ph.D. preparation took too long and should be shortened. Fortunately, several excellent studies and many lesser inquiries have defined the concepts of time more clearly and brought them together with significant amounts of data.[2] As a result it is possible to state rather clearly what the problem of time in the Ph.D. process is. Why the problem persists is not so easily summarized.

The time a student actually spends at his work, usually referred to as "full time equivalence," is accepted as reasonable by most observers, four full-time academic years. But it is in the blocs of time before enrollment, the unenrolled summers and terms during the time he is a student, and, finally, the period of research and independent writing apart from the university but before his degree, that the problem lies. In short it is the interstices of graduate study that cause delay and increase "elapsed time". The reasons for the condition at first appear to be wholly a function of insufficient support

[1] Journal of Proceedings and Addresses of the Association of Graduate Schools 1964, p. 61. ". . . the deans of AGS have delibrated the problem of how to expedite graduate programs some three dozen times since 1900. A cynical observer might suggest they have grown fond of the problem . . ."

[2] (a) Berelson, Graduate Education, pp. 156-62. (b) National Academy of Sciences-National Research Council, Doctorate Production in United States Universities, 1920-1962, Publication #1142, Washington, D.C., 1963. (c) Kenneth M. Wilson, Of Time and the Doctorate, SREB Research Monograph #9, Southern Regional Education Board, Atlanta, Ga., 1965. (d) Lindsey Harmon A Profile of Ph.D.'s in the Sciences, Career Patterns Report #1, Pub. 1293, NAS-NRC, Wash., D.C., 1965.

and Berelson made this his personal conclusion.[2] But other studies of attrition and delay have pointed to many influences that have specific impacts at certain points in the graduate experience. While the complexities of attrition are beyond the scope of this paper it is clear that personal problems, boredom, disillusionment and family stress are added to obstacles in the program such as language requirements or multiple qualifying examinations in accounting for delays. The location of the problem has been made clear, however, and its condition is accurately charted.

Data on a national scale, particularly in the sciences, is both complete and timely, a condition due primarily to the efforts of the National Foundation, the National Academy of Sciences, and the National Research Council. These agencies gather yearly data to keep the basic studies up to date.[2]

Each of the concepts of time measurement; elapsed time, enrolled time, and time from first registration has its uses. If education is conceived as a continuous process then elapsed time is most suitable. If real costs to the institution are at issue then time registered is the useful definition. On the other hand, if costs to the student are the point of examination then years from first registration is the approximate measure.

2.- The mean time elapsed, B.A. to Ph.D., offers some convenience for our calculations and can be used as an indicator of effects on the

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[1]Bernard Berelson, "Graduate Education in the Arts and Sciences" in Seymour Harris, Challenge and Change in American Education, McCutcheon Publishing Corporation, Berkeley, Cal., 1965, pp. 300-301.

[2]National Academy of Sciences, Doctorate Recipients From United States Universities, 1958-1966, Publication #1489, NAS, Washington, D.C., 1967 & yearly SUMMARY REPORT by the National Research Council.

total group of participants without distortion. These data and the medians for elapsed time of the sample are gathered from the National Academy of Science - National Research Council forms, "Survey of Earned Doctorates," prepared by each student just before his degree was conferred. In about 20 cases the information was obtained from university records.

3.- The time spent as a student, however defined, is subject to distinct limitations. If enrolled time is used then the summers and terms devoted to off-campus research and writing are neglected. Our emphasis in this study is on the student perception of time so we have used "years as a full time student" as the medium. While the use of full years probably generates a rounding error it avoids the severe shortcomings of counting only registered terms. It records the number of years as a "de facto" student fully engaged in his work. The mean full time years is the unit most often used in the data that follow.

4.- Subjects were asked to indicate the difference between expected time and actual time. This item was suggested by a conclusion of Eli Ginsberg from his study of career patterns. Man shapes a career "by constructing a system of expectations and projecting himself into the future."[1] The difference between expectation and actual is an indication of reality assessment.

5.- Since the sample group represents the successful segment of a larger population there is some value in their identifying factors that accelerated their studies. Answers were made in the form of open ended statements which were then coded into three major categories; personal factors including family influences, factors that involved the doctoral

[1]Eli Ginsberg and John L. Herma, TALENT AND PERFORMANCE, Columbia University Press, N.Y., 1964, pp. 203-204.

chairman or faculty, and financial elements. Each of the three was divided into a positive or negative mode out of deference to one of educations' oldest dilemnas, reward or punishment. To these were added three minor factors; administrative change, previous experience, and affiliation with project research. It was expected that those affiliated with research would record more accelerants, chiefly of the non-personal type.

6.- The length of time considered optimum for the completion of Ph.D. work under several conditions of support was requested. Whether under 1) all fellowship 2) half-fellowship, half teaching assistantship 3) half-fellowship, half-research assistantship. It was expected that the research group would indicate shorter times with less dispersion among their choices.

7.- Because of the loose structuring of graduate study the reference relationships are significant. Participants were asked to identify aids to scheduling from a list of presented activities, persons, and agencies.

Of these aids, one goup represented personal influences and the others, external influences. Subjects were asked to rank, in terms of usefulness to them, those items that applied to their own experience.

8.- Deterents, threats, and delays to graduate study have been widely studied. Since the emphasis here is on actual experience the question was set in terms of time lost to disruptive factors. The choice of factors listed was made from those commonly noted by other studies along with a few that had special timeliness e.g., the draft. Some have been noted as causes of actual attrition as well as delay, and it is useful to know whether these hazards also confronted the successful student[1]. The hypothesis suggests that research related student would encounter fewer disruptions and less time loss.[2]

C. RESULTS: DESCRIPTIVE AND ANALYTICAL

A common format is used in the paragraphs that follow. First, the distribution of responses is summarized. It is compared with other studies whenever this perspective is useful. Second, the hypothesized expectations are noted. Finally, the results of comparison of each of the phases of research affiliation, association and recognition; with the item under study are reported.

This analysis follows the regular test pattern noted in Chapter IV, however, all of the results tabulated are not displayed in this report. Each item is reported in terms of the frequency distribution of the sample responses. When the effect of the research variable has been uncovered in the detailed analysis by contingency tables then a tabular summary is usually included in the text. If differences at a significant level appear in both relationships, association and recognition, only one, the stronger, is reported in detail.

1.- Elapsed time: A comparison of the response of the study sample with national data has general interest. In all divisions except engineering there is substantial similarity between our respondents and the most comprehensive national study made by NRC.

The distortion in the small engineering sample is due to the in-

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[1]Berelson, Graduate Education, pp. 167-172. Sources of attrition. Wilson, Of Time, pp. 70-71, Causes of interruption after master's degree. Heiss, Challenges, pp. 176-177, Reasons that students were tempted to drop out.

[2]Davis, Stipends and Spouses, In the follow-up on the study made a year later the research oriented group displayed lower drop-out rates. p.111

clusion of four career military officers who had substantial careers behind them at the time of graduate enrollment.

TABLE 6.1

ELAPSED TIME: BACCALAUREATE TO Ph.D.: MEDIAN YEARS

		Sample N	Median Years	N.R.C. 1968 Summary[1] Median years
I.	Natural Sciences	174	6.58	6.5
II.	Social Sciences	166	7.11	8.1
III.	Humanities	91	9.56	9.1
IV	Engineering	39	8.75	7.1
			7.25	7.56

The hypothesis suggests that elapsed time should be shorter for those more closely related to research. Further, that there would be more agreement, less dispersion among those with a research affiliation.

When the sample group was separated into categories that describe association with research that is exactly what emerged.

TABLE 6.2.1

ELAPSED TIME: BACCALAUREATE TO Ph.D.: MEAN YEARS

		Mean Years	Standard Deviation
No Association with Research	NR	9.00	4.94
Some Association: Not Related to Diss.	RNR	8.04	4.71
Some Association: Related to Dissertation	RR	7.94	4.47
Single Project: Related	RP	7.34	3.00
		8.11	4.43

This set of relationships was considerably more regular than most of the data generated on this variable and lent itself to a one way analysis of variance. The results showed a value of $F = 2.658$ with $df_1 = 3$, $df_2 = 459$, significant at the .05 level. With both mean years and standard deviations

[1] National Research Council, Doctoral Recipients from U.S. Universities: Summary 1968, Washington, D.C., April 1969, Table II.

showing the expected pattern, this data give good support to the hypothesis. Students who report an association with research tend to have a shorter time and less variation in the time between completion of undergraduate work and the completion of the Ph.D. The next question is whether the reduction comes in the years before enrollment or during the years of full time study.

Elapsed time is reported as an interval scale and this allowed a more refined analysis than is possible with most of the other data. Recognition, when reported as proportion of projects recognized by an individual, also gave an interval scale and the two were correlated. In the gross comparison of the whole sample no significant findings appeared.

Other studies have consistently demonstrated wide differences among fields of study on all the time indices. In view of this, a control for the major division of knowledge was introduced by subdividing the sample into natural sciences, social sciences, humanities, and engineering. Product moment correlations between percent recognized and elapsed time were run in each division. Only in the social sciences did significant results appear. A Pearson's r value of -.168, significant at the .025 level was calculated indicating that association with research as indicated by higher rates of recognition is slightly related to a shorter period of elapsed time in the social sciences. (Appendix A, Table 6.11).

At this point curiosity suggested a slight disgression from the main emphasis of the study, student connection with research and its effect on their experiences. Attention was shifted to the departments. The number of sponsored projects for a department was correlated with the mean elapsed time for students in the department. This comparison gave a Pearson's r value of -.214, p.= .05, (Appendix A, Table 6.3). A larger number of projects for a department is moderately related to a shorter period of elapsed time.

Summarizing these results we find a regular relationship between the categories of association and the amount of elapsed time. The no association category showed the longest time span and the greatest dispersion. Project related association produced the shortest elapsed time and least dispersion. A higher recognition level was correlated with less elapsed time only in the social sciences. Actually a shorter elapsed time is more closely related to the simple amount of research of the project type in the department rather than to student relationship with it.

2.- Years as a Full Time Student

The distribution of responses on this item, presented for the sample below and shown by department in Appendix A, Table 6.2, showed a mean of 4.53 years and a median at 5.10 years, slightly below the median of 5.3 years reported for comparable fields in the N.R.C. Summary of 1968.

TABLE 6.4

TIME: YEARS AS A FULL TIME STUDENT

	2 Years or Less	3	4	5	6	7 Years or more
Number	27	57	137	119	117	10
Percent (Cumulative)	5.9%	18.1%	47.2%	72.9%	97.8%	100%

Few of this successful sample group could be defined as "part time", less than 6%, even if such a definition were expanded to include all those with two years or less of full time study. Clearly, a doctoral candidate must be prepared to commit a substantial number of years, 4 or more, to full time study.

The hypothesis holds that an affiliation with research will result in a shorter period of full time study, on the average, and that the research affiliated group will display a narrower dispersion. Involvement with research, it is believed, aids organizing and scheduling thereby reducing delays and inefficiencies.

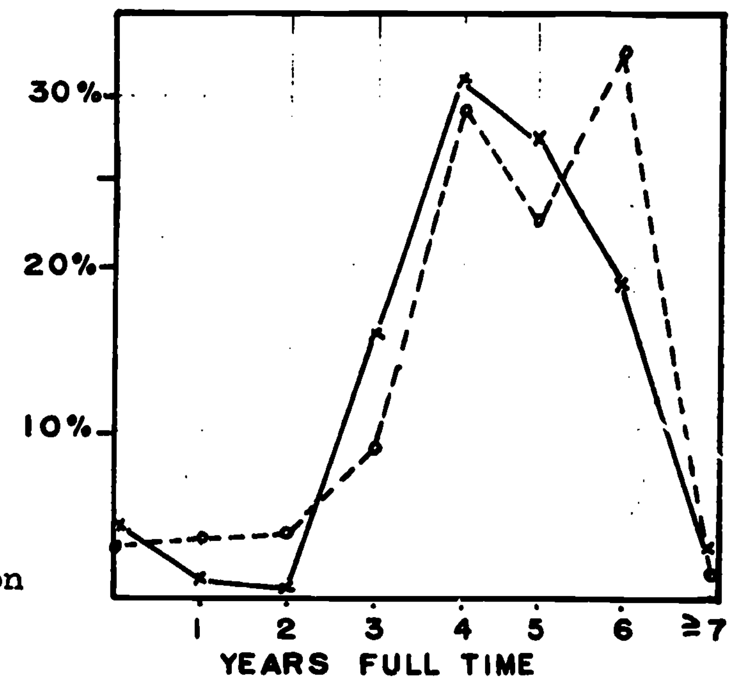
The four basic conditions of association with research were compared on the distribution of full time years and tested for differences by X^2. No significant distinctions appeared in the sample group.

When recognition of projects was used as the evidence of research involvement and compared to the number of full time years some small distinctions appeared. Dichotominzed in HIGH recognition and NO recognition the data yielded a distinction by X^2 at the .02 level, but the value of Kendall's tau-b, .07, showed that the relation of the differences to research was insignificant. The pattern of distribution is summarized by the graph below. The mean years of full time study for HIGH recognition was 4.45 (S.D. 1.328) and for NO recognition 4.61 years (S.D. = 1.511).

Figure 4

YEARS AS A FULL TIME STUDENT

(X^2 = 17.78, df=8, p=.025)



——— No recognition
- - - High recognition

no more than a year beyond expectations. However, more than a third, 37.0%, were overdue on their own standards by 1-3 years. Even beyond the 3 year difference there is a substantial group of 11.5%. One cannot help but speculate on the consequences to personality, judgement of professional worth, family plans, and life styles of an educational program in which only 30% have had their expectations met on time and almost half find them clearly defined.

The immediate question for this study is whether an association with research brought expected time closer to actual time. We are not here concerned with whether this was achieved by making expectations more realistic or by shortening the actual time, merely with the size of the difference. It is hypothesized that involvement with research will be related to less difference in time, i.e. better realization of expectations. When the sample was distributed by the kind of association with research and tested against this item no significant differences appeared.

TABLE 6.5.2

TIME: DIFFERENCE BETWEEN EXPECTED AND ACTUAL: By Recognition Levels

(7) When you began graduate study you held some expectation of how long it would take. How much difference was there between your original expectation and the actual time required for the completion of the degree?

	Total Sample		Recognition Level	
	Number	Percent	NO	HI
1. Shorter by six months or more	26	5.7	5.8	7.0
2. About the same	119	25.1	18.8	27.9
3. Longer by six months to a year	95	20.7	21.7	21.0
4. Longer by a year to three years	171	37.0	35.5	36.7
5. Longer by three to five years	32	6.5	8.7	3.8
6. Longer by more than five years	23	5.0	9.4	2.6
	n=459	100%	n=138	n=229

(X^2 = 12.93, df =5, p =.05)

Because the relationship between the number of years of full time study and research is such an important one, the analysis was carried to the limits of the data. Recognition of research in its interval form, proportion of projects recognized, was correlated with the number of years of full time study. No significant result appeared at the all-sample level. The analysis was carried further by controlling for the major fields of knowledge and department but no significant supporting results appeared and the details of these facts are reported in Chapter X and Table 6.11 in Appendix A.

It can be concluded that, for this sample, affiliation with research did not consistently or significantly show a relationship with a shorter span of full time study.

3.- Expected Duration Versus Actual Time

In view of the small amount of information available to the prospective doctoral student about the amount of time his studies may take, it is of some value to examine how closely his expectations were met by the actual events. The distribution of the total sample is displayed below.

TABLE 6.5.1

TIME: DIFFERENCE BETWEEN EXPECTED AND ACTUAL TIME

(distribution of sample)	Number	Percent
1. Shorter by six months or more	26	5.7%
2. About the same	119	25.1
3. Longer by six months to a year	95	20.7
4. Longer by a year to three years	171	37.0
5. Longer by three to five years	32	6.5
6. Longer by more than five years	23	5.0
	n=459	100%

For about half of our recent recipients the completion date was

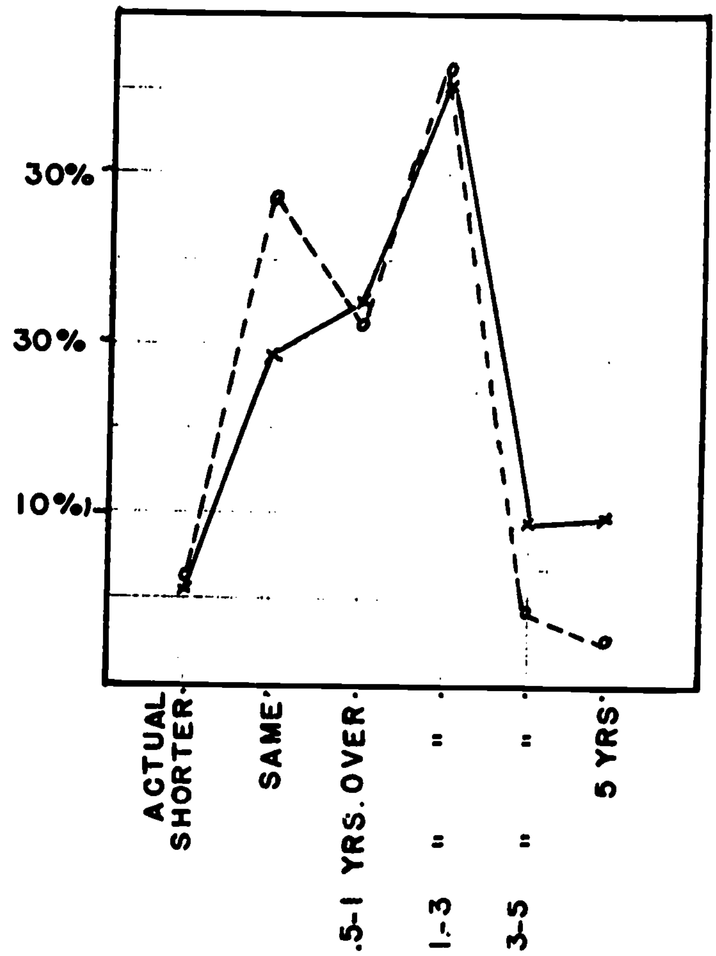
With the extreme categories of recognition, HIGH and NO, compared there was a difference significant at the .05 level by X^2. The HIGH recognition group came closer to meeting their expectations on the average and the strength of the relationship between research and item was estimated at .125 by Kendall's tau-b. There was, however, a peculiarity in the distribution. As the graph indicates a larger share of the HIGH group met their expectations. If they did not meet their expectations then they followed the pattern of the NO group except that the "drag-out" was not so pronounced.

Figure 5

DIFFERENCE BETWEEN EXPECTED AND ACTUAL TIME

($X^2 = 12.93$, df=5, $p = .05$)

—— NO recognition
- - - HIGH recognition



When recognition was considered as an interval value and correlated with expectations, an ordinal scale, with a control for division of knowledge two distinctive significances appeared. The social science group generated a Pearson's r value of -0.310 significant at the .0005 level and in the hypothesized direction. Other divisions showed insignificant correlations when treated individually. When the total sample was considered the product moment correlation between recognition and difference of expected from actual time was r = -0.114 with p. = .025, (Appendix A, Table 6.11).

4.- Accelerants

As doctoral recipients, our sample group was in a position to know something of the forces behind their own rare success. The accelerating influences they cited were coded into the following categories:

TABLE 6.6.1

ACCELERANTS

	Number	Percent	
Personal: Positive	27	13.2	22.0
Personal: Negative	18	8.8	
Chairman or Faculty: Positive	60	29.3	32.7
Chairman or Faculty: Negative	7	3.4	
Financial Resources: Positive	49	23.9	29.3
Financial Resources: Negative	11	5.4	
Administrative Changes	11	5.4	
Experience or Employment	12	5.9	
Project Affiliation or Assistantship	10	4.9	
	n=205	100%	

Of the total sample group, 43.6% reported some kind of accelerating influences. Negative kinds of reinforcement, that is pressures, fears, threats, etc. in the form of deadlines, limited time or money, and the like, played a small role and were cited by only one in six respondents, slightly less often in the research related group. Notwithstanding minor variations in the data it must be concluded that the hypothesis is not supported by the response on this item and more detailed analysis is not indicated.

5.- Optimum Time to Complete the Doctorate:

Our respondents were also in a unique position to assess how rapidly one might be able to complete the doctoral program under various conditions of support. A summary of mean estimates is found in Table 6.9, page 172.

a. With full fellowship support:

The optimum number of years estimated by the sample group for doctoral work was 3.61, (S.D. = 0.751) quite close to the period of time noted by Berelson as "full time equivalent," 3.5 years.[1]

This estimate also falls close to the data gathered by Dressel and Come in a more recent study, 3.72 years, provided by graduate students at all Michigan institutions.[2] It still does not correspond with the estimate of 3 years that often appears in faculty comments. "Our announced curricula imply that a properly prepared and judiciously selected AB should be able to acquire the degree, if he is fully supported, in three years."[3] And so it is clear that, even a decade after Berelson, the basic discrepancy between what faculty and administrators saw as the optimum time and what recent recipients perceived is still present: a difference of a little more than half a year separates them.

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[1]Berelson, Graduate Education, pp. 158-160.

[2]Dressel and Come, Impact of Federal Support of Science. Table 4-9.35, p. 134-X.

[3]D.C. Allen, "Can the Ph.D. be Streamlined, " Council of Graduate Schools, Proceedings of the Eighth Annual Meeting, 1968, pp. 53-57. See also Leonard Beach, "A Model Time Schedule for Completing the Ph.D." Council of Graduate Schools, Proceedings of the Second Annual Meeting 1962, pp. 38-40.

Our hypothesis suggests that those students who are involved with research will present an estimate that is shorter in time and less dispersed than that estimate made by respondents who have had less contact with research consequently less basis for structuring their answers.

When the sample responses were subdivided by association with research, no significant difference appeared. When subdivided by recognition in its dichotomized form, HIGH and NO recognition, no differences at a significant level appeared.

However, when recognition was treated as an interval variable, controlled for the division of knowledge, and compared to optimum time estimates by means of product moment correlations then a distinction was found, Appendix A., Table 6.11. Social sciences, natural sciences, and engineering together showed a slight correlation in the predicted direction, r = -.108 significant at the .025 level. Social sciences alone gave stronger evidence of association in the hypothesized direction, r = -.199 significant at the .01 level.

These small corroborating evidences do give some support to the hypothesis and no significant contradictions appeared.

b. Half Fellowhip, half teaching assistantship support:

Under this pattern of support our respondents estimated the doctoral program would require 4.64 years (S.D. 0.941), just about a year longer than with full fellowship aid. The Dressel and Come data on students at major Michigan institutions revealed an estimate of 4.69 for similar conditions.

The hypothesis maintained that those involved with research would estimate less time than the uninvolved and that dispersion would be smaller.

The comparison of our standard categories of association on this item showed no significant difference in the length of time estimates. With the most extreme conditions of research recognition, however, a distinction significant by X^2 test at the .01 level appeared between HIGH recognition and NO recognition.

TABLE 6.7

TIME: OPTIMUM NUMBER OF YEARS WITH TEACHING ASSISTANTSHIP: By Recognition Level (percent)

	≤2	3	4	5	6	≥7	
HIGH recognition	2	5	48	34	10	1	100%
NO recognition	2	3	33	37	19	6	100%

(X^2=19.04, p=.01)

When recognition as an interval scale was correlated with this item and controlled for division the social science group showed a Pearson's r = -.212, p = .01. When natural sciences, engineering and social sciences were combined a confirming value of r = -.114, p = .025 was calculated. (Appendix A, Table 6.11).

With respect to the shorter time estimates, the hypothesis can be regarded as weakly supported.

c. Half Fellowship, half research assistantship support:

Our respondents estimated that the optimum time for the completion of the degree under these conditions of support would be 4.38 years, (S.D. 0.925). This is 0.8 of a year more than under full fellowship support and somewhat less, 0.3 of a year, than expected with a teaching fellowship. The data gathered by Dressel and Come follow the same order of magnitude but the research assistantship is not regarded as quite so beneficial, 4.57 years being the mean in their sample.

Again the hypothesis anticipated that those involved with research would estimate a shorter span of time for the completion of graduate study under conditions of support involving a research assistantship.

Each of the four groups representing an association with research was compared with the non-research group but no differences of any significance appeared.

When recognition in its dichotomized form, HI and NO recognition, was used for comparison a distinction did appear. The relationship between more recognition of research and less time was estimated at tau-b = .178 by Kendall's tau.

TABLE 6.8

TIME: OPTIMUM NUMBER OF YEARS WITH RESEARCH ASSISTANTSHIP: By Recognition Level (percent)

	≤2	3	4	5	6	≥7	
HIGH recognition	3	12	54	25	6	0	100%
NO recognition	1	7	36	37	14	5	100%

(X^2=24.79, p=.001)

To pursue this one step further recognition in its interval form was correlated with the number of years estimated as optimum with a research assistantship. The full results are found in Appendix A, Table 6.11. The values of Pearson's "r" were: Natural sciences +.119, Social sciences gave -.221, Humanities -.186, and Engineering -.321. The plus value for the natural sciences contradicts the hypothesis and the question is dealt with in more detail in Chapter X. The importance of the implication cannot be postponed, however, for the natural sciences are precisely the area where research assistantships are most common. Those who know this support best are less inclined to see the research assistantship as a significant benefit in terms of time.

We have not yet treated the matter of dispersion among the research and non-research group. This is best done by combining the data into the Table below:

TABLE 6.9

TIME: OPTIMUM NUMBER OF YEARS ESTIMATED FOR THREE SUPPORT SITUATIONS: BY ASSOCIATION WITH RESEARCH

Knowing what you do now what would you consider the optimum number of years for the completion of the doctorate from first graduate registration under each of these conditions of support?

	All Fellowship		Half Teaching: Half Fellowship		Half Research Asst: Half Fellowship	
	Mean Years	S.D.	Mean Years	S.D.	Mean Years	S.D.
1. No Association with Research NR	3.70	.811	4.79	.962	4.56	.876
2. Some Association: Not Related RNR	3.40	.792	4.62	.945	4.37	.967
3. Some Association: Related RR	3.51	.683	4.48	.882	4.26	.867
4. Single Project: Related RP	3.66	.687	4.68	.960	4.34	.968
TOTAL SAMPLE	3.61	.751	4.64	.941	4.38	.925

Under the condition of fellowship support, the hypothesis is supported with the research groups showing less dispersion. With the teaching assistantship there is less consistency and the project related group show as much dispersion as the non-research group. Finally under the conditions of a research assistantship the group most familiar with that type of support displayed considerable dispersion. This would seem to indicate that, as we noted above, those with the greatest knowledge of its effects are not convinced of a universal benefit in such tenure.

6.- Aids to Scheduling:

Presented with seven possible sources of assistance in structuring their time during graduate study, the respondents were asked to rank those most useful to them.

TABLE 6.10

TIME: AIDS TO SCHEDULING: TOTAL SAMPLE (number of responses)

	RANKED 1	2	3	Total Mentions
1. Department requirements	136	98	57	311
2. Deadlines of doctoral adviser	46	42	32	148
3. The "expected" sequence in dept.	63	83	80	250
4. Published Graduate School requirements	26	40	50	137
5. Comparisons with other students	48	92	72	255
6. Self-initiated deadlines	199	81	62	361
7. External requirements	37	43	41	146

The importance placed upon self-initiated deadlines is not particularly surprising for an experience as personal as doctoral study. The remaining distribution is more instructive. There was heavy dependence upon departmental guidance in determining what the expected timing should be. The department role has both a formal aspect and an informal aspect because other students convey a sense of what is to be expected. Items 1, 3, and 5 are all functions of the departmental interaction scheme. One surprising fact is the small emphasis on the doctoral adviser. Although his functions are many and crucial, a responsibility for keeping the advisee on schedule is not seen as one of them.

It was hypothesized that those respondents who were involved with research would find more aids to scheduling by reason of their wider exposure to institutional activity. It was also anticipated that the distribution of the research related group would emphasize informal guides to scheduling.

On the first point, the number of aids used, there was very little difference among the sub-groups irrespectiv~ of how they were arranged. The actual method of estimating this factor was to calculate the non-response level on each item for each category. The hypothesis was not supported.

On the matter of which aids were useful to which groups, an interesting distinction appeared but it is difficult to display. See Table 6. 12. As we anticipated, there was no difference on self-initiated requirements. All groups ranked this first. But on the item "Comparison of your timing with other students" the research related groups consistently gave this a second rank yielding a distinction significant at the .05 level when tested by X^2. The non-research groups tended to mention "Published graduate school requirements" most often as the second ranked aid. When the third rank choices are examined the distinctions are less clear and not significantly different than chance could produce. "Published requirements" are still most mentioned by the non-research group but they are joined by more of the research related groups in this choice.

TABLE 6. 12

TIME: AIDS TO SCHEDULING: MOST FREQUENTLY RANKED 1, 2, AND 3 BY CHARACTER OF AFFILIATION WITH RESEARCH

In contrast to all other schooling the time of a graduate student is not tightly scheduled or structured by formal means. He must construct his own timetable to know where he stands. Rank these factors in terms of their usefulness to you in scheduling your work. Use "1" for most useful and omit those which did not apply.

1. Department requirements which were specific and graduated.
2. Deadlines set by doctoral adviser for the completion of tasks.
3. The "expected" informal sequence communicated by other students.
4. Published Graduate School requirements providing general guidance.
5. Comparison of your timing with other students.
6. Self initiated requirements and deadlines.
7. External requirements: job waiting, limited leave, limited funds.

TABLE
CONTINUED

Statement =	1	2	3	4	5	6	7
Association							
No Association				2&3		1st	
Some Association Not Related				3rd	2nd	1st	
Some Association Related			3rd		2nd	1st	
Single Project: Related			2nd	3rd		1st	

The total picture is one in which those with no research affiliation are heavily dependent upon published general statements that are rather remote from their field of study. On the other hand the research groups tend to utilize informal relationships with other students in the department as an aid to structuring time.

7.- Disruptions and Delay:

In recent years, particularly since 1957, considerable attention has been directed at the factors associated with the termination of graduate study before the degree has been attained. A related aspect of these conditions is found in the costly delays to those who eventually do finish. A recent study offers a complete analysis of open end responses made to an Office of Education questionnaire. Answers from about a thousand graduate students at 38 major institutions were coded into four principal causes of delay and disruption.[1] Several of the sub-categories were useful

[1]Paul Edward Darlington, "An Analysis of the Obstacles Perceived by Graduate Students as Delaying Their Programs Toward the Doctorate", unpublished dissertation, Ph.D., University of Michigan, 1970.

in constructing the descriptive statements used in this study.

Most of the statements on the instrument are adaptations of the conventional factors. The question one would like to answer, and cannot, is whether the successful students face the same problems as the drop-outs but somehow manage to cope with them. We must be content with a summary of those most often mentioned and those most costly in time lost.

First of all, the sample group, a high success group, did not encounter widespread disruption and no item in the array of 16 drew as much as a 50% response. Only five reached the 20% response level. Nor could the time loss be characterized as substantial.

Most often mentioned was the teaching fellowship and its impact was rather variable. Just about the same proportion elected each of the time-loss values. This betrays the rather diverse character of the experience and the difficulty of making generalizations about it without detailed study. Quite a few marginal comments by the respondents mentioned the training value of the teaching experience but, in its present form, it is clearly regarded as a delay rather than an integral part of the doctoral program.

Second in frequency was the combination of personal items ranging from poor work habits to boredom. The self-condemnation implicit in this choice appears to be part of the Ph.D. syndrome. Caplow and McGee commented on the persistence of this characteristic in the mature scholar. "The ordeal is sufficient to eliminate the vast majority of graduate students before they reach the doctorate. For those who survive, the habit of insecurity and a certain mild-paranoid resignation are standard

TABLE 6. 13

TIME: DISRUPTIVE FACTORS: TOTAL SAMPLE DISTRIBUTION

Listed below are some of the disruptive factors cited by graduate students. Evaluate those which you encountered in terms of time lost through that factor.

(Number of responses)	LESS THAN A TERM	ONE TERM TO 6 MONTHS	6 MONTHS TO 1 YEAR	LOSS OF ONE YEAR	TOTAL MENTIONS
Illness or family obligations.	67	26	19	26	137
Military service or the Draft.	34	3	2	12	51
Insufficient finances for minimum level of living.	33	14	13	39	98
Expiration of grant or fellowship.	34	12	11	13	70
Inavailability or inadequacy of research material, equipment, or facilities.	54	32	18	14	118
Changes in membership of doctoral committee.	52	17	6	5	80
Inaccessibility of doctoral chairman.	46	14	19	13	92
Time demands imposed by a teaching fellowship.	48	53	60	56	216
Time demands imposed by a research assistantship.	47	18	13	6	83
Interruption to attain in-state fee and resident status.	33	13	3	0	49
Changes in Departmental requirements	38	3	5	3	49
Change of field from Bachelor's or Master's.	33	19	18	17	87
Difficulty in isolating an acceptable research topic.	38	54	50	28	170
Personal pressures such as poor work habits, overexacting standards, procrastination, boredom.	58	59	47	41	203
Indecision about career goals	43	20	7	10	79
Academic problems, insufficient preparation.	36	37	21	10	102
Distribution of all checks on all items:	44.3%	25.1%	18.9%	16.7%	100%

psychological equipment."[1] It is apparently one of the dueling scars of the doctoral years and does not appear as frequently among the drop-outs cited in other studies.

In her study of doctoral students in 1964 Ann Heiss found the isolation of a suitable research topic a source of difficulty.[2] This is confirmed by our successful group. It tended to be a costly factor in terms of time and involved more than six months for almost half of those who encountered it, a total of 78 individuals, about one sixth of the sample.

There were several items that drew an insignificant response, barely ten percent. The most surprising was military service with only 41 individuals recording its effects. Of these only 12 lost more than a year to this much publicized hazard. Other very minor hazards were the expiration of grant or fellowship 70 respondents, departmental or program changes, 49 individuals, and the problem of establishing residence in the state to allow in-state fee privileges, 49 individuals.

It was hypothesized that those who were involved in research activity would have significantly fewer disruptions and encounter less serious time loss.

Few of our subdivisions of research yielded enough distinction between the research and non-research group to support the hypothesis. There were a few individual items on which significant difference appeared but these are interesting rather then determinant. A comparison

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[1]Theodore Caplow and Reece J. McGee, The Academic Market Place, Basic Book, N.Y., 1958, p. 223.

[2]Ann M. Heiss, "Berkeley Doctoral Students Appraise their Academic Programs" mimeographed paper, Center for the Study of High Education Berkeley, California, April 1964, pp. 29-30.

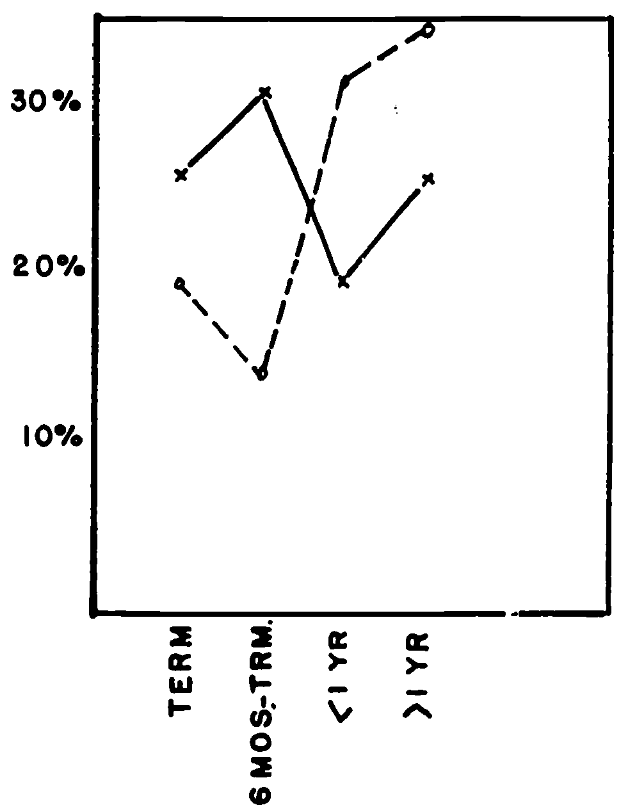
of the HIGH recognition group with the NO recognition group, our most extreme division, on the disruptive item of "Insufficient finances" gave a X^2 value significant at the .01 level with more time lost related to lower research recognition with a strength of tau-b = .377 using Kendall's statistic . About the same proportion (22%) of respondents in each group cited the item but for the non-research group the time loss was much higher, almost 62% of the non-research group reported a loss of more than a year.

The distinction between these two groups was also significant on the item treating delays from the teaching fellowship experience. About 45% of the HIGH recognition group citied the item against 54% of the NO recognition group. But the patterns were very different, a difference significant by X^2 at the .05 level. The graph shows more clearly than a table the higher time loss to this item among the non-research group.

Figure 6

TIME LOST TO TEACHING FELLOWSHIP

(X^2 = 9.76, df = 3, p. = .05)



——— HIGH recognition
- - - NO recognition

It can be concluded that an affiliation with research had no general effect in reducing the number of students who encountered disruptions. In the few cases where a distinction appears the research affiliated group felt less effect in lost time then the non-research group.

D. SUMMARY AND CONCLUSIONS

If research affiliation and time were related in the hypothesized manner then time spans would be shorter and dispersion less for the high research groups. Expectations would be closer to actuality, disruptions fewer, and, with respect to aids in scheduling and accelerants, more resources would be used.

a. The amount of elapsed time between baccalaureate and Ph.D. was shorter and less dispersed for those more involved with research. When association with research for the total sample was compared, the association was regular and significant. When recognition was used to distinquish the type of research affiliation the results for the total sample were insignificant. With controls for the division of knowledge introduced, however, the social sciences supported the hypothesis at a significant level, $r = -.168$, $p = .025$ and while others divisions showed no support. No contradictions developed.

In a digression from the question of student affiliation with research a test was made to see whether the simple number of projects in a department was related to a shorter period of elapsed time. A Pearson's $r = -.214$, significant, was generated. This implies that the mere existence of more research in a department is more related to a shorter elapsed time than is any student relationship with the research. The reason is quite plain. Research funds allow departments to bring good students back into graduate study more quickly.

b. The number of years of full time study is unrelated to the character of research affiliation in the framework of this study and in terms of the total sample. At the extremes of research recognition, HIGH and NO recognition, there is some support for the hypothesized condition but nowhere else. When the responding group was divided by areas of knowledge a clear contradiction appeared in the natural sciences.

c. Since the shortening effect of research for the total sample is visible in elapsed time but not in full time years it appears that both the existence of more sponsored research and student affiliation with it act to shorten the time between the baccalaureate and registration for doctoral work.

d. The difference between expected and actual time of completion was shorter for the HIGH recognition group in all divisions except the natural sciences. The social science group confirmed the hypothesis with a product moment correlation of -.309, p = .0005 while the mathematics department, because of its way of using research resources, contradicted the hypothesis.

e. Accelerating influences were reported with about the same frequency, -44% of the respondents, -in all the sub groups of the sample except one. The project-related research group cited accelerants less frequently 25%. This item gave no other evidence of a relationship with research.

f. Estimates of optimum time under various conditions of support were expected to show the influence of research on an individual's sense of time structure. Shorter estimates of time and less dispersion was anticipated among the research group. Throughout, the dispersion was lower for the research-related group. The expected patterns reached the significant levels of p = .05 with the teaching fellowship and research assistantship. An exception appeared with the project-related group which displayed wide dispersion in estimating the effects of a research assistantship.

g. The identification of aids that might be used to schedule one's time displayed an interesting distinction between the research and non-research group. All agreed that the individual's own time table ranked first. On the second choice, however, the research-related group gave most of its selections to "comparison with other students". The non-research group mentioned most often the published graduate school information. This difference even continued into the third choice level where many of the research-related combinations cited "expected sequence" rather than formal requirements.

h. When disruptive factors were considered no major distinctions appeared between the research and non-research group. The time lost to financial problems and to the teaching fellowship was greater for the non-research group but its appearance was no more frequent.

The research affiliations of students do have effects on the way in which students order and structure their time. Such affiliation appears to give a more definite idea of how much time is involved in some of the activities of graduate study. It also helps bring expectations closer to reality. This outlook seems to be fostered by informal interactive mechanisms - peer reference and expectation - rather than by prescriptive means. There is little evidence of direct influence of research in shortening the time of study, reducing disruptions, or increasing the number of visible accelerating influences.

The most interesting variation arose between the natural sciences and the social sciences with the former showing little response and even contradiction to the hypotheses and the latter exhibiting confirmation. It suggests that research, particularly in project form, may be approached in two, perhaps more, different ways. It may be regarded as support primarily and accompanied by little attempt to bring its other benefits to the attention of the student. Or it may be incorporated in activities of a department or division in a variety of ways and identified to students in their day to day work. The recurring evidences of correlation between recognition of research and the hypothesized conditions in the social sciences and its absence in the natural sciences where research projects have been most numerous manifests a distinction that deserves more study.

CHAPTER VII

RESULTS: INTERACTION

A. THE NATURE AND SIGNIFICANCE OF INTERACTION

1.- Interaction as a Fundamental Process

The concept of social interaction, i.e., individual acts or behaviors occuring within a setting of persons, objects, or symbols which together constitute an exchange situation, is regarded as a basic process by all the social or "behavorial" sciences. The main features of the concept are well established: a) A primary notion is that in every encounter there is an exchange, a reciprocity, of effects among the participants. The Parsonian view makes out the existence of interaction to be fundamental: "The assumption is that the mechanisms of socialization operate only so far as the learning process is an integral part of the process of interaction in complementary roles."[1] Interaction also reveals the nature of structure.[2] b) There are valences or weightings in the exchange that vary among the participants and give unique meaning to the episode. Parsons, for example, denotes these as "systems of orientations." c) There is an element of encounter or exposure in the process but it may take a wide variety of

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[1]Parsons, The Social System, p. 209.

[2]Parsons, The Social System, p. 25. "Since a social system of processes of interaction between actors, it is the structure of relations between the actors as involved in the interactive process which is essentially the structure of the social system. The system is a network of such relationships."

forms, symbolic, real, vicarious, even imagined. Perception of the encounter, what W. I. Thomas referred to as the "definition of the situation" is selective rather than complete and takes in "significant others."[1] d) The objects with which one interacts may be persons, physical items particularly those with symbolic richness, social entities such as the family, a corporation, etc., or even one's own "alter ego."

Studies of interaction have resulted in an extensive elaboration of the concept. We have selected two of the most obvious indicators for this analysis, the amount of interaction, and the functions it served as perceived by a single participant.

2.- The Amount of Interaction

Like the amount of time involved in graduate study, the amount of interaction between the individual and others has little meaning, in and of itself, except as a descriptive device. However, we take it as an indicator of many meaningful processes and as an index of social functions. Childhood socialization, sociometric theory, social aspects of personality formation, and small group theory all give bases for inferring the significance of encounters between persons, between the individual and the group and, as well, between the individual and a symbolic system. Since it is a general assumption that no interaction is an occurrence wholly devoid of meaning then the amount of social interaction is a first point of analysis. Maccoby emphasized the simple significance of the amount of interaction for studies of socialization based on her laboratory studies with children.[2]

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[1]Merton, Kendall, Reader, The Student Physician, see Appendix A. "Socialization: A Terminological Note," p. 287.

[2]Eleanor E. Maccoby, "The Choice of Variables in the Study of Socialization," Sociometry, Vol. 28, No. 4, pp. 357-71. Other variables

3.- Functions of Interaction

Normally the problem of identifying the functions served by interaction in its various forms is the central task of the investigator. In the case of a voluntary socialization experience where the primary actor intends and expects certain outcomes, it is of some importance to have his perceptions of functions. Ideally one would like to have a full description of the functions and some evaluation of their importance. The emphasis here is much more limited. In the case of interaction with individuals the respondents have been asked to identify combinations of four simple functions related to graduate study; general guidance, critical analysis, technical advice, moral support. In the case of interaction with other students, or rather among students, the respondents were asked to evaluate a set of equivocal statements describing those relationships.

4.- Facets of Interaction

Three facets of interaction were taken as indicators for this exploratory study:

a. Individuals: There is a full literature in social psychology to describe the varied functions which relationships between individuals may serve. The notion of the instructor, mentor, or guide in educational settings has been expanded to include his functions as a model, as a reference person, and as a reflective agent. A particular set of individuals who are close to the graduate experience--the chairman, other students, non-faculty staff--was presented to the respondents

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suggested for inclusion in socialization studies are "reward-punishment" in its various forms, the "identity of socializing agents," "warmth" or other characteristics of affective tone, and "permissiveness vs. restrictedness."

for evaluation in terms of frequency of contact and functions. (Appendix B, question 12.)

b. Groups: Associations with social groups represent a class of relationships that are equal with individual interaction in importance. Again we are using a very simple indicator, the respondent's evaluation of importance, as an expression or reflection of much more than the answer denotes. Individual-to-group relationships have a great many functions in adult socialization. Groups act as filtering and interpreting agents between the formal structure of an educational system and the participants.[1] They give meaning to and assign priorities among conflicting instructions. They may act as reference sets providing not only a model but also the permissible range of deviation. The group is often the medium by which approval and sanction is made effective.[2] It is also the means of providing the necessary isolation and insulation to hold the experiences of socialization apart from unrelated activities. Relationships among graduate students in a number of forms have been touched upon by the Heiss studies and merit considerably more study.[3] Our attention is directed at the constellation of groups which are important and at the differences the research-related groups may display.

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[1] Becker, et. al., Boys in White, p. 435

[2] See Robert A. LeVine, "American College Experience as a Socialization Process," in Theodore M. Newcomb and Everett K. Wilson, College Peer Groups, Aldine Publishing Company, Chicago, Ill., 1966, pp. 107-32.

[3] Ann M. Heiss, Berkeley Doctoral Students Appraise Their Academic Programs, mimeo. Center for the Study of Higher Education, University of California, Berkeley, Cal., 1964, p. 36. "The supportive-stimulus role of other graduate students," and Challenges to Graduate Schools, p. 156 cites the acceptance of peers as models and their significance in professional development. P. 174 lists an appraisal of peer outlook on a number of issues.

c. Institutional agencies: The relationships with the offices and functionaries of the larger institution have a special quality. Friedenberg and Roth have illustrated how the unsuccessful graduate student finds the institutional mechanisims[1] a source of frustration and even hostility. (Appendix B, question 17.)

These elementary assessments of the amount of interaction, its functions and importance, the attention to individuals, groups, and institutional agents represent only the very edges of an extensive social phenomenon. Nevertheless, if an affiliation with research has a strong effect on the educational experience which itself depends so heavily upon interaction processes, then indications of the influence should be apparent in these fundamental indicators.

B. HYPOTHESIZED EXPECTATIONS

The expectation is that research involvement measured by either recognition or association will be positively related to all aspects of interaction. By presenting the individual with a more highly differentiated learning environment, research increases both the amount of interaction and the number of functions it serves. Specifically, for the research-involved group:

1. The amount of interaction with individuals, as indicated by both the number of significant others and by the frequency of contact, will be greater.

2. This interaction will be perceived as serving more functions for the work of the respondent.

3. Group relationships will be evaluated as more important when

[1]Edgar Z. Friedenberg and Julius A. Roth, Self Perception in the University, Supplementary Educational Monographs, Number 80, University of Chicago Press, Chicago, Ill., Jan. 1954, pp. 71-3.

they fall within the university, less important when outside.

4. Group relationships with fellow students and among students will be regarded as contributing to the educational experience.

5. Interaction with institutional agencies will be perceived as more favorable.

C. RESULTS: DESCRIPTIVE AND ANALYTICAL

a. Frequency: There are few surprises in the overall distribution of responses reporting contact with a selected group of individuals, Table 7.1. Contacts mentioned most often by the respondents were with: the chairman of the doctoral committee (99% of sample cited), the doctoral committee members (80%), and with fellow students in the same field (77%). About half the respondents cited contact with the course director while a teaching fellow (55%) and with other faculty in the department (52%). Relatively few of the survey group reported contact with a supervisor on research work (29%), with faculty in other departments (26%), and with non-faculty staff members (21%).

The frequency of meetings with the selected individuals is of primary interest. Other students, naturally enough, were the source of interaction most frequently. But then we note that two classes of individuals who were mentioned by relatively few students were the object of intensive interaction. The supervisor on research, although significant for only 29% of the respondents, met with those students frequently. A similar intensity characterized relationships with students outside the department. Only 28% of the respondents mentioned them but they were seen "often" or "very often." These may well be the product of situations of everyday living but they did serve a function. Non-faculty associations show the same high frequency for a small number of respondents.

TABLE 7.1

INTERACTION: FREQUENCY OF CONTACT WITH INDIVIDUALS

(12) Even in the highly individualized experiences of doctoral study, associations with others have significance. Some of these relationships are touched by these questions of how much contact you have had with individuals in certain categories and which of four functions this contact may have served. Mark those which apply.

	Very Often		Often		Infrequently		Rarely		100%	N=470	% of Sample Respondents
	n	%	n	%	n	%	n	%			
Doctoral Chairman	135	29	169	36	134	29	27	6		465	99%
Supervisor, Employer	57	42	50	37	19	14	10	7		136	29
Course Director	23	9	124	48	52	20	59	23		258	55
Member of Committee	13	3	72	19	164	43	129	34		378	80
Faculty in Dept.	34	14	72	30	93	38	44	18		243	52
Faculty Other Dept.	5	4	14	11	41	33	63	51		123	26
Non-Faculty Staff	29	29	26	26	24	24	22	21		101	21
Student in Field	235	65	93	26	23	6	9	3		360	77
Student Other Field	46	35	52	39	14	11	20	15		132	28
Professional Assoc.	17	16	15	14	25	23	52	47		109	23

b. Functions: To describe the functions served by these relationships with individuals our respondents had a choice from 16 permutations of four basic functions: "general guidance," "critical analysis of work," "technical advice" and "encouragement and moral support." The distribution is displayed in Table 7.2 and it gives an interesting index of the variation in role function.

Both the doctoral chairman and the supervisor on research are most often cited as having all four functions and this is undoubtedly due to the fact that they were the same person for a share of the respondents who were on a single project. The course director and faculty within the department are commonly cited as sources of general guidance and encouragement. The faculty outside the department and non-faculty staff tend to provide technical advice and encouragement. Other students in the department are cited as serving all four functions by about one sixth of the respondents but the major function is morale building. Encouragement certainly plays a major part in doctoral success and it is clearly a major function of contacts with other students, in and out of the department, with professional associates off campus, and with faculty who are outside the department.

c. The Influence of Research Affiliation:

1) On frequency: The frequency of contact with the chairman was significantly greater for the research related group irrespective of whether the members are identified by the levels of <u>recognition</u> or by self-ascribed <u>association</u>. Each comparison of a research affiliated sub-group with a non-research group yielded differences significant by X^2 at the .001 level or rarer. This consistent reporting of more frequent interaction with the chairman is one of the strongest indications in the study. Two representative distributions are shown

TABLE 7.2

INTERACTION: FUNCTIONS SERVED BY CONTACTS WITH INDIVIDUALS: DISTRIBUTION OF RESPONSES

	Doctoral Chairman	Supervisor On Research	Course Director T/F	Doctoral Committee Member	Faculty Member: Dept.	Other Faculty	Non-Fac. Staff	Student In Field	Other Student	Off-Campus Professional
1. General Guidance	8%	16%	43%	11%	17%	14	7	3	3	6
2. Critical Analysis	7	6	5	13	6	8	3	4	5	7
3. Technical Advice	2	7	13	15	10	29	50	5	6	9
4. Encouragement	3	4	6	5	14	18	19	23	49	33
1 & 2	5	5	2	4	3	3	0	2	0	3
1 & 3	1	3	4	3	1	2	3	2	1	3
1 & 4	5	5	9	3	15	6	1	7	7	12
2 & 3	3	7	3	14	3	7	2	4	3	6
2 & 4	2	2	4	3	4	3	2	10	4	1
3 & 4	1	3	1	3	4	3	3	9	7	3
1, 2, & 3	6	6	1	4	2	2	0	1	1	2
1, 3, & 4	3	1	5	0	3	2	2	3	3	1
1, 2, & 4	8	2	2	3	1	0	0	3	2	1
2, 3, & 4	4	3	1	6	3	2	3	9	5	3
1, 2, 3 & 4	42	23	3	13	12	5	3	17	5	9
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Number of N=470 Respondents	465	136	258	378	243	123	101	360	132	109

below, Tables 7.3 and 7.4.

TABLE 7.3

INTERACTION: FREQUENCY OF CONTACT WITH CHAIRMAN

a) By Level of Recognition

	Very Often	Often	Infrequently	Rarely	100%	n=
HI Recognition	33%	37	26	4		229
NO Recognition	17	32	41	10		141
		(X^2= 17.64, p=.001)				

b) By Association

	Very Often	Often	Infrequently	Rarely	100%	n=
NR: No Association	16	34	39	11		115
RNR: Some Association Not Related	33	37	26	4		343
		(X^2= 23.35, p.=.005)				

These patterns clearly support the hypothesis as did all other combinations of association and the strength of the relationship between more research affiliation and interaction is tau-b = .208 by Kendall's method.

There was considerable contact with members of the doctoral committee and, here too, research affiliation made a difference but not in all categories. Those who had no association with research and that segment of the research group whose research experience was not related to their dissertation showed a different pattern of association. The difference in the hypothesized direction, although not strong tau-b = .108, is visible in the distribution below.

TABLE 7.4

INTERACTION WITH DOCTORAL COMMITTEE:
BY ASSOCIATION WITH RESEARCH

	Very Often	Often	Infrequently	Rarely	%	N
NR: No Association	2%	10	50	38	100	93
RNR: Some Association: Not Related	4	25	35	36	100	109
		(X^2= 10.10, p=.025)				

This kind of distinction in the frequency of interaction between research and non-research appeared in two other areas where the response rates were slightly lower. Interaction with the <u>course director</u> had importance for 258 respondents. Among the research group whose association with research was unrelated to the dissertation a sizeable share, 65%, reported contact with the course director that had meaning for their work. Only 54% of the non-research group reported such meaningful interaction. Those with no research experience reported meeting him "very often" or "often" in 40% of the cases while for the research group about 65% reported in those categories of interaction. The distribution gave a difference significant in our X^2 test pattern at the .05 level.

In one other class of interaction the research group reported much more contact. A relationship with <u>non-faculty</u> was reported by only 6% of the non-research compared to 26% of the research group. Interactive relationships with other students, with non-faculty staff members and with students or faculty outside the department all showed no significant differences in the frequency of contact.

As a final test of the hypothesis that more affiliation with research was positively related to higher interaction frequency, the proportion of projects recognized, an interval level variable, was correlated with a summary score, an interaction frequency index. Using Pearson's product moment correlation, the comparison gave a correlation of .27 significant beyond p = .005 as a measure of the association of research <u>recognition</u> and frequency.

2.- On function: The functions served by associations with individuals showed a significant difference on one item, an important one. Both research and non-research groups mentioned the contact with other students as a principal interactive relationship. But the research related students found the relationship much richer. The group that had "no association" with research cited "encouragement" and "general guidance" most often while over a third of the research associated group found other students contributing "technical advice" and "critical review" in addition to the previous two functions.

TABLE 7.5

INTERACTION: FUNCTIONS: OTHER STUDENTS: BY ASSOCIATION

	NR No Association	R Some Association
1. General Guidance	4%	2%
2. Critical Analysis	5	4
3. Technical Advice	1	6
4. Encouragement	37	19
1 & 2	0	2
1 & 3	1	2
1 & 4	11	6
2 & 3	1	5
2 & 4	9	10
3 & 4	7	9
1, 2 & 3	0	9
1, 3 & 4	3	3
1, 2 & 4	5	2
2, 3 & 4	1	11
1, 2, 3 & 4	13	18
	100%	100%
	(X^2=28.11, p=.05)	
n =	75	266

2.- Interaction with Groups

a. Frequency: Among the groups whose importance is evaluated on question 16 those mentioned most frequently by the respondents are the peer group or classmates, the work team, the discussion group, and social groups within the department. See Table 7.6 below. There are several distinctive features to these groups: They hold a loose and quite variable relationship to the central activities of graduate study, that is to say they are "temporary" groups. There is an absence of any formal basis for continuance. They do not lay explicit demands upon the participants. Although the work team may appear to be an exception to these conditions it is a temporary group not formally rooted in the social structure.

The number of citations given to those groups that appear to demand a consistent commitment of time or require attention to matters not directly related to graduate study is markedly lower. Such groups are mentioned by less than half of the respondents. Action groups and student committees, however close to the destiny of the university or department their interests may lie, are mentioned by half the respondents but only 16 persons rated them as "important." It would appear that any idea of a strong formal structure representing graduate students as advisers to the administration on policy formation is foredoomed to ineffectiveness by non-participation.

Extra-university groups played a supportive role of some importance for about half the sample group. About 53 individuals found a church or religious group association important to them and slightly more, 68 persons, mentioned the extended family as "important" or "very important." Political activity was a factor of significance for only about 20 individuals; about the same number mentioned neighborhood groups.

The several conditions visible in this small amount of data appear to fit well with the ideas developed around reference groups. The central function of graduate study, the development of high competence in a field of study, demands a concentration of effort. Group relationships are relatively unstructured in the graduate arts

TABLE 7.6
INTERACTION: IMPORTANCE OF SELECTED
GROUP ASSOCIATIONS
(percent)

(16) A number of typical group associations are listed below. During your years as a graduate student which memberships had a beneficial value for you and how important was the association? Mark those which apply.

	UNIMPORTANT	OF SOME IMPORTANCE	IMPORTANT	VERY IMPORTANT	100%	n=
Student peer group: those who began study at same time, shared some classes and seminars.	4%	21	29	46		459
Work teams: research group, teaching fellows, fellow employees.	12	32	31	25		388
Discussion groups: informal seminars, "brown bag" groups, coffee hour groups, evening discussion groups.	16	39	29	16		408
Action groups: task oriented groups, reform groups, ad hoc committees, evaluation and suggestion groups.	76	17	5	1		245
Formal committees or boards: appointed or elected student or student-faculty groups.	77	17	5	1		249
Social groups in the department: friendship groups, intramural teams and athletic groups, theatre groups.	37	36	21	6		318
Extra-university groups:						
Neighborhood groups.	78	11	5	6		212
Political associations.	72	19	6	3		214
Church or other religious groups.	63	14	13	10		234
Family, other than spouse and children.	51	21	18	10		245
Professional associations.	42	32	18	7		283

and sciences as compared with law or medicine but the same effects come about as the product of individual choice.[1] Students apparently construct a set of group relationships which are supportive but which do not force a divergence of time and interests to tangential activities. The fact that choice for the Ph.D. student achieves the same profile of group relationships that the design of the program accomplishes for the medical student and the dental student appears to indicate that isolation, or sequestration, is indeed a fundamental process in socialization. The fact that it is achieved by voluntary means and by limiting qualitative factors in relationships is distinctive to the arts and science group.

b. Influences of Research Affiliation: Some interesting variations emerge when the sample is broken into sub-groups on the basis of research contact. The research related groups selected the work team, the family, and professional groups more often than their no-research counterparts.

In terms of the number of respondents involved and the importance assigned, the work team differences are most significant. Any kind of research association yielded a significantly higher rating of the experience but the strongest distinction came where research was related to the dissertation.

The strength of the association between research affiliation and importance of the work team is indicated by Kendall's tau-b as .207.

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[1] Basil J. Sherlock, Richard T. Morris, "The Evolution of a Professional: A Paradigm," Sociological Inquiry, Vol. 37, No. 1, Wtr. 1967. From a study of dental students as they move through professional school. These investigations have fixed "sequestration" as one of the fundamental institutional processes. In dental school, and also in medicine and engineering this is partially achieved by presenting the student with a fully scheduled day, 9:00 A.M. to 5:00 P.M. Arts and Science Students, by contrast, have large blocs of open time. pp. 27-37.

TABLE 7.7

INTERACTION: GROUP: IMPORTANCE OF WORK TEAM

	Unimportant	Of Some Importance	Important	Very Important	%	n=	% Of Sample
NR: NO Association with research.	22%	33	28	17	100	87	74%
RR: SOME Association: Related to dissertation	8	29	32	31	100	192	88
		(X^2=14.90, p.=.01)					

These data suggest that the group involvements centered on the teaching assistantship, a characteristic form of work association for the non-research group, hold much less value for the doctoral student than the work team whose activity is research.

There is a further refinement of this observation to be found in the responses on discussion groups. Any research association yields stronger evaluation of discussion but the biggest distinction is formed with the research group whose experience was not related (RNR) to their dissertation.

TABLE 7.8

INTERACTION: IMPORTANCE OF DISCUSSION GROUP

	Unimportant	Of Some Importance	Important	Very Important	%	n=	% Of Sample
NR: NO Association	24%	39	28	8	100	100	85%
RNR: SOME Association Not related to dissertation	11	38	28	22		118	89%
		(X^2=11.70, p.=.01)					

The strength of the association by Kendall's tau is tau-b = .188. In these data on work groups and discussion groups there is a suggestion of how the research affiliation may operate to increase interactive relationships, whether group or individual. Contact with research provides a substance, a medium of exchange, on which interchanges of all sorts can focus. More will be said of this in the chapter summary.

Further differences between the No Association group and the research affiliated subdivisions of the sample appear in the evaluation of action groups. Only about half of the respondents in any of the categories acknowledged this type of group relationship so the cell frequencies are too small for statistical reporting but the differences are clear throughout. For 50 out of 345 persons in the research associated categories the action group was an "important" experience. Only 7 of the 118 non-research group felt so strongly. Within the research related categories it was those who had general contact with research not related to their dissertation that gave the strongest emphasis.

To gather an overall impression of the relationship between research affiliation and the importance assigned to group relationships the Recognition level was used. By summarizing all evaluations of importance a "Group interaction index" was created. This interval value was correlated with the "Level of recognition" in percent to give a Pearson's $r = .27$ as a measure of the association between more research and more group interaction. By using Recognition as a measure it was possible to identify a general relationship between research and a higher evaluation of group relationships. Association fixed which group relationships were most significant.

3.- Interaction with the Institution

a. Frequency: We have already noted the important observation of Friedenberg and Roth that successful students tend to hold a more favorable attitude toward the institution. That study goes a good deal further in noting that the successful student views the institution as an instrumentality which he can use to advance his own ends. By contrast the unsuccessful student perceives himself as caught up in and victimized by the impersonal institution. We have adopted only the first notion and hypothesized that the research-affiliated student, because of his differentiated exposure to the university and its resources, will reflect a more favorable view of its agents.

For the sample at large the most frequently mentioned points of contact were the department, the graduate school, library, accounting payroll and registration, Table 7.9 below. The school or college offices, financial aids and technical services were next in frequency of contact. Strong approval is exhibited for the department, the true "alma mater" of every graduate student, and this is to be expected. Striking, however, is the strong favorable view of the libraries with 73% reporting approval. For those who used them, about 40% of the respondents, the institutes and centers, the departmental laboratories, and the technical services of the university won strong approval with over 3/5 reporting favorable reactions. Those offices which had substantial unfavorable reactions included the accounting-business group with one out of three reporting unfavorable reaction, and the registration and records group with one out of four reporting unfavorable. Less extreme are the unfavorable responses to the graduate school and financial aids, one out of six recording unfavorably, and to the school offices, computer, and office of research administration with a slightly higher rate of disapproval.

b. The Influence of Research Affiliation: The research

TABLE 7.9

INTERACTION: CONTACT WITH INSTITUTIONAL AGENCIES
(percent)

(17) In a large university many activities become specialized and institutionalized presumably to give more effective service to clients. What was your reaction to encounters with these divisions? Mark those which apply.

	ALWAYS UNFAVORABLE -2	USUALLY UNFAVORABLE -1	NEITHER FAVORABLE NOR UNFAVORABLE 0	USUALLY FAVORABLE +1	ALWAYS FAVORABLE +2	100% n=	Mean score
Department office.	1%	6	14	54	25	459	.96
Specialized Institutes or Centers.	0	6	29	54	11	201	.70
Computing Center.	2	16	31	43	8	228	.39
Specialized laboratories in departments.	0	7	28	52	13	183	.64
School or college offices.	1	18	38	37	6	272	.29
Graduate School offices.	2	14	27	45	12	428	.51
Main Libraries.	0	8	19	57	16	420	.81
Financial Aids office.	4	12	38	33	13	216	.39
Accounting, payroll, business offices.	7	25	33	28	7	340	.03
Office of Research Administration.	5	12	38	34	12	152	.36
Registration and Records.	4	20	35	33	8	336	.21
Technical services: shops, printing, etc.	1	8	20	52	20	269	.82

associated group reported more contact with the computer services, with institutes and centers, with departmental laboratories and with technical services, and this is certainly to be expected. But they also report more contact with registration and records, with the school or college offices and with the business offices.

TABLE 7.11

INTERACTION: INSTITUTION; INSTITUTES & CENTERS

	Always Unfavorable	Usually Unfavorable	Neither	Usually Favorable	Favorable	%	n=
NR: NO Research Association	0%	17	36	47	0	100	36
RR: SOME Research Association: Related to Dissertation	0	5	23	57	15	100	107

(X^2= 12.54 p.= .025, tau-b = .267)

It would be reasonable to assume that those non-research individuals who did have some contact with all these agencies might show the same pattern of approval or disapproval as their research-related counterparts. They do not. The big difference appeared between those whose research experience was related to their dissertation and the non-research group. It appeared in relationships with the department and with the research centers in the patterns displayed below. Similar distinctions at levels greater than p = .05 by X^2 tests appeared with the departmental laboratories and the office of research administration.

There is one interesting contradiction to the hypothesized conditions. In the case of contact with the school or college offices the research affiliated group evaluated the experience more unfavorably than did those who had no connection with research, a difference significant by X^2 at the .05 level but to a very weak degree.

TABLE 7.10

INTERACTION: INSTITUTION, DEPARTMENTAL OFFICES

	Always Unfavorable	Usually Unfavorable	Neither	Usually Favorable	Always Favorable	%	n=
NR: NO Research Association	1%	9	18	57	15	100	117
RR: SOME Research Association: Related to Dissertation	0	5	13	52	30	100	211

(X^2 = 11.29 p.= .025, tau-b = .159)

By using Recognition measurement it was possible to develop a comprehensive view of the relationship between research affiliation and the evaluation of contact with institutional agencies. The responses were treated as a score with "always favorable" = 5. The summarized values gave an interval scale which was correlated by Pearson's method with research recognition level. The resulting value, r = .23, reflects a positive evaluation related to more research affiliation.

Summary of interaction with institutional agencies: Research Recognition is associated with a more favorable evaluation of university agencies. When the research activity is measured by Association we find the most favorable evaluations among those whose research activity is related to their own dissertation work.

4.- Aspects of Student Interaction

a. Distribution of Responses: This section of the survey instrument differed from most of the others by asking for an evaluation of statements rather than as assessment of experience. (Appendix B, question 18.) The aim was to uncover some of the reasons why student associations are considered important with the idea that research related students might show a different pattern. Respondents were presented with twelve equivocal statements, six emphasizing a favorable and unlimited role for student interaction, and six describing limited or negative roles. Specifically, the statements touched students' roles in setting academic standards, transmitting information, exchanging ideas and critical evaluation, and sustaining morale.

In the responses of the sample some statements drew clear support, some were rejected, others reflected uncertainty. The view that good students have an important role in setting standards was strongly endorsed. The functions of intellectual exchange and critical analysis drew substantial agreement. Clearly rejected were those statements which downgraded the importance of student interaction or which suggested that the influence might be very limited. Uncertainty characterized the idea that student interaction functioned as an information network to provide knowledge of departmental policy, of new work in the field of study, and valuable orientation data. This distribution is displayed in Table 7.12.

b. The Influence of Research Affiliation: Research affiliation produced a strong difference in distribution on several of these items. There is much more agreement among the research-associated groups with the idea that intellectual exchange and critical analysis are important functions of student interchange. There is more emphatic disagreement with the idea that students have little to contribute or that graduate study is primarily a solitary experience. The notion that student influence is confined to the first year is more firmly rejected and the view that mutual encouragement is the primary value of student exchange is less acceptable. The research group, associated throughout, represents the strongest views of the general features in the sample.

The distinctive element in this set of conditions lies in the fact that the largest differences appear between the group whose research

TABLE 7.12

INTERACTION: FUNCTIONS OF ASSOCIATIONS WITH STUDENT COLLEAGUES (percent)

(18) It is widely believed that students gain a great deal from associations with their graduate student colleagues. Please indicate your views on each of these statements related to that idea. Mark all.

	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE	100%	n=
Other students, particularly the good ones, function as "pacesetters" to determine standards of academic performance.	1%	9	11	49	30		460
One is more likely to hear of new work in the field from fellow students than from class, seminars, or faculty.	8	42	27	18	5		459
Reliable information about most departmental matters come first through student channels.	6	24	32	30	8		461
There is considerable intellectual exchange on a rather advanced level among students.	3	10	15	50	22		461
The reactions of other students provide some of the best critical analysis of one's work.	3	19	23	39	16		461
The real orientation to graduate work comes from other students.	7	23	23	34	13		456
The main contribution students make to each other is in the form of encouragement and emotional support.	4	21	27	39	9		460
Information from other students is important only in the first year of graduate study.	37	50	11	2	0		460
The influence students have upon one another is overrated by faculty and observers.	16	35	39	9	1		444
Few students have anything of major value to contribute to the education of their fellows.	44	43	8	4	1		460
Graduate study is primarily a "solo" experience and other students have only a small and relatively insignificant part in it.	32	42	10	13	3		460
Competition among graduate students for recognition of all types is a major factor in most departments.	6	24	32	32	6		452

association was not related to the dissertation and the no-association group.

TABLE 7.13

INTERACTION: ASSOCIATIONS WITH COLLEAGUES

(a) "There is considerable intellectual exchange on a rather advanced level among students."

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree	%	n=
NR: NO Research Association	5%	14	18	48	15	100	118
RNR: SOME Research Association not Related to dissertation.	1	4	13	50	32	100	131
		(X^2= 20.3 p = .005, tau-b = .25)					

(b) "The reactions of other students provide some of the best critical analysis of one's work."

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree	%	n=
NR: NO Research Association	3%	35	26	23	13	100	118
RNR: SOME Research Association not Related to dissertation.	2	8	17	51	21	100	131
		(X^2= 39.4 p = .005, tau-b = .32)					

(c) "The main contribution students make to each other is in the form of encouragement and emotional support."

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree	%	n=
NR: NO Research Association	3%	14	21	53	9	100	118
RNR: SOME Research Association not Related to dissertation.	6	25	25	38	6	100	130
		(X^2= 10.3 p = .05, tau-b = -.18)					

It is clear that the research-related group view the relationships among students as a substantial part of the graduate learning experience. These relationships are not merely peripheral or supportive nor are they seen as a temporary phenomenon. Contacts among students have sound cognitive functions and form an essential element in graduate study which is itself regarded as a social rather than solitary experience.[1] Davis found that research assistants reported more memberships in groups and this new data specifies some of the reasons for such associations.

D. SUMMARY: INTERACTION

The amount of interaction with individuals, with institutional agencies, and, with groups is greater for that segment of the sample reporting affiliation with research whether measured by Association or Recognition. Differences in the number of functions and the type of functions actually experienced are not significant. When opinion about the importance of student relationships was examined in detail, however, there was a difference. Research-related groups placed a higher importance on critical analysis and intellectual exchange. The hypothesis is confirmed at a modest but consistent level of association.

In looking at these general conditions in more detail we find:

With individuals, the research Associated group showed more students involved more frequently with three classes of individuals, the doctoral chairman, members of the doctoral committee, and the course director. Contact with an employer and with non-faculty staff members is also typical of the research group.

On the matter of functions served by individuals a single distinction appeared. "Other students" provided only supportive guidance to the no association group while the research group emphasized a wider group of functions.

[1]Davis, Stipends and Spouses, p. 112.

Group interaction was evaluated at a similar level of importance by all members of the sample except in three cases. The research associated respondents evaluated the work team, the discussion group and the action group more highly.

In the case of institutional agencies the research associated groups reflected more varied contact. This was true not only for obvious agencies like the computing center but also for the department, school and college offices, and the business office. The quality of these contacts was evaluated as more favorable throughout, even with the department.

Opinions on the importance and the functions of relationships among students brought out the distinctive character of the research related group in two ways. The research group viewed student associations as serving substantive functions. They rejected more strongly statements downgrading the student role.

When we carried the analysis one step further and examine which kind of research,Association showed up strongest on each item some interesting suggestions emerged. In the case of relationships with individuals, with groups, and on opinions about the importance of student relationships, it was the research group which had experience not-related to their dissertation work that showed the strongest distinctions. With institutions and their agencies the distinctions were strongest with the group whose research was related to their dissertation.

Taken as a whole it is clear that any association at all with research is beneficial to the amount of interaction and the importance it holds. It is contact with research itself that has the effects. Research affiliations apparently provide a basis for exchange and interaction. They generate some element, cognitive or informational, that functions as a medium of exchange, providing a focal point for interaction. Support for this idea comes from a gratuitous comment entered by a respondent on the survey instrument. "The frequency of interaction should not necessarily be taken to mean that faculty were generally unavailable. Rather it reflects my own deficit in not having much to offer in an interactive situation, particularly in my early years as a graduate student." It may be a factor in the weakness of the teaching fellow relationship which, however useful it might be later, seems to have little effect in increasing exchange between the student and the course director or the student and his work team associates. Like many other non-fiscal aspects of academic research this question of its "exchange value" is awaiting complete investigation.

CHAPTER VIII

RESULTS: PRE-PROFESSIONAL EXPERIENCE

A. THE NATURE OF THE VARIABLE

1. Aspects of Professional Preparation: A characteristic of every kind of professional preparation is an exposure of the aspirant to a series of trial situations. These are learning situations rather than tests of competence and he is expected to behave "as if" he were fully socialized into the profession. Sometimes these trial circumstances are wholly contrived as in the case of the moot court, war games, or role playing. More often the learner is brought into a selected and controlled segment of a real situation as in the case of the medical student taking down patients' histories or the law student researching a brief. Professions that are characterized by private practice and public license are scrupulous in circumscribing the conditions surrounding these prototype experiences. Professions that are practiced in an institutional framework are far more casual about the situations themselves but pay considerable attention to the credentialling process and the ritualistic evidences of it. In teaching and with the clergy, for example, little attention is paid to the prototype situation, the teaching assistant or the supply preacher, but the ritual symbols; the order of names on a research paper, the title whether teaching fellow, instructor, or lecturer, faculty perquisites, or the right to perform sacred offices for the clergy are carefully guarded. The amount and variety of situations holding a component of professional behavior is

an important fact about training. In the scheme we have been using for analysis more experiences indicate wider differentiation and this, in turn, reflects a more effective process of socialization.

It has been assumed that these anticipatory experiences inculcate deep attitudes and values that are transferred to other professional situations.[1] This is, in fact, the basis for the concept of "anticipatory socialization." Individuals who aspire to membership in a group are viewed as taking on the values of that group in advance of membership.[2] This condition gives a certain precarious quality to continued acceptance by the group in which the person is an incumbent. This notion may have considerable power in the case of upward social mobility but it is less useful when applied to adult socialization of the voluntary kind. In a learning situation, such as graduate school, the intention and the supporting structure are designed to move the person out of the temporary group. Indeed, one of the hazards of graduate study is that of becoming fixated in the student role. Elder mentioned "love of Cambridge" as a retardant for his subjects at Harvard-Radcliffe.[3] Whether the values are adopted in anticipation of membership and, indeed, whether they are fully internalized after the experience can be determined only by very risky inference or very skillful measurement.

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[1]Parsons, The Social System, "The socializing effect will be conceived as the integration of ego into a role complementary to that of alter (s) in such a way that the common values are internalized in ego's personality . . ." p. 211.

[2]Robert K. Merton, Social Theory and Social Structure, The Free Press, N.Y., 1968 edition, pp. 319-23.

[3]J. Peterson Elder, A Criticism of the Graduate School of Arts and Sciences at Harvard University and Radcliffe College, Harvard University, Cambridge, Mass., 1958.

Howard S. Becker has advanced an important alternative approach. It is not necessary to know how completely values or attitudes are incorporated into the core of personality in order to make useful analyses. It is sufficient to concentrate on the situation and the visible or reportable aspects of a person's adjustment to it.

"Situational adjustment: One of the most common mechanisms in the development of the person in adulthood is the process of situational adjustment. This is a very gross conception which requires analytic elaboration it has not yet received. But the major outlines are clear. The person moves in and out of a variety of social situations, learns the requirements of continuing in each situation and of success in it. If he has a strong desire to continue, the ability to assess accurately what is required, and can deliver the required performance, the individual turns himself into the kind of person the situation demands. Broadly considered, this is much the same as Brim's notion of learning adult roles. One learns to be a doctor or a policeman, learns the definitions of the statutes involved and the appropriate behavior with respect to them . . . The notion of situational adjustment is more flexible than that of adult role learning . . . We construct the process of learning an adult role by analyzing sequences of smaller and more numberous situational adjustments . . . sequences and combinations of small units of adjustment produce larger units of role learning."[1]

This idea, that a response to the situation or series of situations has an importance in and of itself, is consistent with the emphasis of this study on the actual experience of successful Ph.D. Undoubtedly this approach limits the theoretical inferences that can be made but it has an advantage for educational planning. The construction and control of situations is the main instrumentality available to education.[2]

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[1] Howard S. Becker, "Personal Change in Adult Life" Sociometry Vol. 27, No. 1, March 1964, pp. 40-53.

[2] Becker, Geer, Hughes, & Strauss, Boys in White, "The implication of this (that situational experiences fixed beliefs & values) for those who desire to change people's behavior is that changes can be brought about by altering the circumstances and situations people have to contend with." Coda, p. 442.

2. Selected Indicators of Pre-Professional Experience.

a) Prefigured Activity: From the principal sectors of academic activity common to all fields a list of specific experiences was presented. Areas included were publication, research, teaching, and interpersonal relations in forms that are consistent with student experience. Respondents checked those activities that were part of their own experience. (Appendix B, question 24.)

b) Contact with the Professional Community: One of the outcomes of large scale support for research, particularly in the form of projects, has been an increased importance for the professional organizations. In the learned professions there appears to be increased coherence around these organizations and more communication within them. On the assumption that the advanced student would be introduced to this phase of professional life two items were constructed to reflect it. Respondents were asked to indicate the number of individuals prominent in the field they had met, other than faculty at their university. An indication of the setting in which the meeting took place was also included. (Appendix B, questions 14 & 15).

A second indication of contact with the profession at large was gathered in connection with the ranking of the top three institutions. Respondents were asked not only to rank the top three but also give the basis or source of information for such an ordering. It was this latter information that was used to assess, or rather infer, the individual's knowledge of the profession. Answers were coded into eight ordered classes ranging from the citation of an existing study to pure opinion. (Appendix B, question 19).

c) Career Development: Another assumption about professional preparation is that it increases commitment to the profession and forces the rejection of other options.[1] The integration of interests around a particular sub-field is expected. As a simplified indication of how well-focused professional interests might be the respondents were asked to indicate the next direction they would prefer to move. Choices ranged from pursuit of a specialty to a change of field. (Appendix B, question 23).

d) Standards for Judgement of Performance: One characteristic of a profession is the right, "license" is Everett C. Hughes' term, of the membership to establish criteria and to judge the performance of those who claim to be professionals. At some point in graduate study the socializee should begin to move away from reliance on formal judgements by authority figures toward collegial judgements. Respondents were asked to rank six statements describing various sources of comparative standards which might be used in evaluation of their work. (Appendix B, question 13).

e) Dissertation Topics: On the assumption that a research association should result in a minimum of vacillation in the selection of a research topic, respondents were asked how many topics they actually explored. They were also asked to indicate what follow-up might have been made on these topics after completion of their doctoral work. (Appendix B, question 22).

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[1]James W. Carper, Howard S. Becker, "Adjustments to Conflicting Expectations in the Development of Identification with an Occupation," Social Forces, Vol. 36, No. 1, October 1957, pp. 51-6.

B. THE RESULTS: DESCRIPTIVE AND ANALYTICAL

1.-Prefigured Experiences As A Student

In constructing this list a rather high threshold was set. Omitted were many tasks of the teaching and research which a great many students count as regular but low-level professional activity, reading and grading papers, collecting data, etc. The commonest experience was conducting a seminar or discussion meeting reported by 50% of the sample group. In that set of experiences having to do with publication about one third of the sample reported one or more activities. A smaller segment, from 15-20%, had some contact with the type of activity that characterizes the autonomous professional, consulting, supervising, and making recommendations. Lost because of a misprint on the instrument was an item touching professional ethics.

It was hypothesized that those affiliated with research would have more of these experiences than the non-research group.

This distribution of responses, that is those who checked the experience as applicable, is displayed below in Table 8.1. The responses are also subdivided to show the percent in each subgroup that had such experience. Research association categories are used and the standard set of comparisons was made. The difference between the no-association and all categories associated with research is indicated on the table. Research association made a significant difference in experience with the design of a research project or the preparation of a proposal where it might be expected. But the research groups also had more frequent experience in the activities related to publication and teaching at an advanced level.

There is no clear advantage of one type of association with research over the others except in the case of senior authorship, super-

TABLE 8: 1

PRE-PROFESSIONAL: SUMMARY OF EXPERIENCES: BY ASSOCIATION WITH RESEARCH

(24) With which of these activities did you have experience as a student? Mark all those which apply.

Shows percentage in class with experience.	n=	NR %	RNR %	RR %	RP %
			Association with Research ---R---		
Published article (s) as senior author.	152	25	36	26	41
Published article (s) as junior author.	121	14	29	24	35[a]
Submitted articles based on doctoral research.	143	22	25	35	38[c]
Prepared or edited reports on other research.	138	14	30	34	41[a]
Read paper at a professional meeting.	138	14	36	30	35[a]
Designed a research project other than dissertation	184	16	45	41	57[a]
Prepared a formal research proposal	96	9	25	21	26[a]
Conducted seminars or discussion meetings.	236	46	51	47	57
Taught regular class: advanced level.	92	11	27	25	13[a]
Supervised technical personnel on project.	87	8	15	15	39[a]
Participated in a consulting situation.	97	13	24	21	26[b]
Participated in a committee, team or group charged with making formal recommendations.	71	9	17	18	13
* misprinted category omitted.					
n =	470	118	132	116	97

Comparison of non-research (NR) with all research groups (R) by X^2 test gave

(a) $p = .01$ (b) $p = .02$ (c) $p = .05$

vision, and designing a project, all categories where the group who were active on a single project held a significant advantage.

Measurement of recognition in its interval form helps to give an indication of the relationship research holds to the variety of experiences. When the number of experiences was correlated with the level of recognition a Pearson's $r = .24$ was generated.

2.- Contact With the Professional Community

A full assessment of this relationship would require the enumeration of memberships, amount of attendance and participation in professional societies, habits of reading in professional literature, and an evaluation of the importance attached to activity in the professional society. On the test instrument memberships and attendance at meetings were included as an item but showed little discriminatory power.

a) Meetings with Prominent Men in the Field: The data in Table 8.2 show clearly the bimodal character of contacts, --"encounters" was the term used. About a third of the sample group had little or no acquaintance with off-campus representatives of the profession. Somewhat more than a third, 37%, had considerable contact. While it is difficult to arrive at a sound comparative judgement one has the intuitive feeling that this is a rather small amount of contact. One would expect higher responses, given the fact that the sample represents the most successful aspirants to the profession, that they were studying at a major university which has a constant flow of colloquia and symposia, as well as full participation in professional societies, and that the professional group has increased its importance in all respects over the last decade. The description of the type of contact that characterized the meetings, although rather unspecific, makes clear the role of professional meetings and, more important, the role of the department in the introduction of neophytes to the formal community.

When the data are subdivided by research association the hypothesized condition is confirmed. The strength of the association between research and the number of contacts is reflected by a correlation of tau-b= .21 using Kendall's test. Among the research groups those whose research was related to their dissertation met slightly more professionals.

The nature of the meetings was also considered in relation to research affiliation. Joint projects, departmental events, and professional meetings came out significantly high for the research associated groups.

TABLE 8.2

PRE-PROFESSIONAL: MEETINGS WITH PROMINENT MEN IN FIELD BY RECOGNITION LEVEL & ASSOCIATION

(14) Of the prominent men in your field, outside of the University of Michigan faculty, how many did you encounter during your student year?

	Total Sample	By Level Of Recognition-%		By Association = %			
					R		
	n=	HI	NO	NR	RNR	RR	RP
None	50	8%	18	20	7	11	5
1-3	107	19	33	32	22	24	15
4-6	91	19	16	18	20	19	22
7-9	41	8	9	9	9	9	10
10-12	49	13	7	6	11	10	17
12	123	33	17	15	32	28	32
	461	100%[a]	100%[a]	100%[b]	100%	100%	100%[b]

a: $X^2 = 26.6$, $p = .001$.
b: NR X all R classes $X^2 = 27.11$, $p = .001$

(15) Which of the following kinds of activities or occasions characterized these encounters?

	n=
Worked on a joint project.	52
Corresponded or consulted personally.	156
Met in a department seminar or coffee hour.	256
Met outside department but on campus.	86
Heard paper read at professional meeting.	290
Conversed on a social basis.	176
Other.	46

b) Ranking of Institutions:

Assessing the relative importance of institutions in one's field of study is an important component of professional knowledge or perhaps speculation would the the more accurate word. From the first suggestions of institutional evaluation by Abraham Flexner, through the classic study by Hayward Kenniston of the University of Pennsylvania, there is a lineage that leads to the institutionalized rating that has finally been reached in the last five years. Studies within the disciplines have been made, too, and there is the AAUP Salary Study each summer but the commanding influence lies with the reports of the American Council on Education.[1]

The sample group indicated what basis they used for judging institutions and the results appear in table 8.3. It is somewhat surprising that only about a fourth of the total sample showed any reliance on published studies. There is a heavy emphasis upon rather casual opinion based on personal acquaintance with faculty and students as well as upon tradition. These personal judgements are the basis for 40% of the evaluations. More objective evaluations of publications, research output, and programs or facilities were cited by about one sixth of the respondents. It is clear that a full sense of status relationships among institutions has not yet emerged for these recent Ph.D's.

When the responses were subdivided by research affiliation no significant differences appeared. This absence of a relationship was true for both the categories of research association and for the levels

[1]Allan M. Cartter, An Assessment of Quality in Graduate Education, American Council on Education, Washington D.C., 1966. Kenneth D. Roose, Charles S. Anderson. A Rating of Graduate Programs, American Council on Education, Washington D.C., 1970.

of research recognition.

TABLE 8.3

PRE-PROFESSIONAL: BASIS FOR RANKING UNIVERSITIES

(19) In your academic field which universities are generally ranked at the top?

1. ______________________________

2. ______________________________

3. ______________________________

What source or information would you use to confirm such a set of ratings?

	n=	%
1. Published Report of Professional Association	53	11
2. Existing General Study: A.C.E., A.A.U.P.	56	12
3. Proposed Study or Unidentified Published Study	47	10
4. Personal Evaluation of Acquaintances & Faculty From Various Institutions	74	16
5. Personal Evaluation of Students & Graduates	29	6
6. Personal Evaluation of Publications	76	16
7. Personal Evaluation of Research Output	6	1
8. Tradition, Opinion, "General Knowledge."	83	19
No Response	29	9
	453	100%

3. Career Development: Next Direction.

On the assumption that the career plans of the more socialized respondent would be centered on subspecialties in his discipline an ordered group of statements was presented to the respondents. Almost two thirds indicated that they would stay within the field choosing either to specialize or to explore new trends. Only a small share, 7%, reflected an interest in moving into another area. Table 8.4 sets forth the distribution.

TABLE 8.4

PRE-PROFESSIONAL: CAREER DIRECTION, TOTAL SAMPLE

(23) At this point in your career and with full recognition of the oversimplication in these categories please indicate the direction you would prefer to move next. Select one.

	ALL SAMPLE n=	%
Refine and intensify my special interests in the field.	173	38
Explore certain new trends in my major field.	121	27
Broaden my background by study in certain peripheral areas.	88	20
Acquire some general understanding of other major fields of knowledge and culture.	38	8
Change fields and begin building an added special competence.	32	7
	452	100%

It was hypothesized that those involved with research would show a greater convergence in the subfield specialty than those who had no connection with research. This condition did not appear whether recognition or association in its various combinations was used for comparison.

4. Standards for Evaluating One's Performance.

In assessing the quality of one's performance the respondents in the sample placed heavy emphasis upon the doctoral chairman and close friends among the students. The comments of individual professors also ranked high. The usual standards of undergraduate life, the "curve" for all students, and formal grades rated low. Departmental "tradition" had little significance. There are serious design flaws in this question. The concept of movement from formal judgement to peer judgement may have some validity but it must be tested by a set of choices that are more refined than these.

TABLE 8.5

PRE-PROFESSIONAL: BASIS FOR ASSESSING QUALITY OF OWN PERFORMANCE

(13) To get an accurate estimate of the quality of your own performance, how useful was each of these comparative standards? Rank by using "1" for most useful and skip those which did not apply.

	NUMBER RANKING ITEM				*
	1st	2nd	3rd	4th	n=
Activity of close friends who were students in department	144	87	72	29	328
Level of performance of all students in the department.	45	65	69	33	207
An "understood" level of achievement set by departmental tradition.	42	65	52	27	183
Comments of individual professors about specific tasks that were performed.	97	94	62	32	280
Guiding comments and criticisms from doctoral chairman.	152	101	51	35	335
Grades and published standards of the University.	59	66	66	43	231

*Higher Rankings 5, 6, 7 Omitted.
Total Shows all Responses.

5. Dissertation Topics Explored.

This is one area in which one would expect the association with research to yield very direct results. Already familiar with research practice, we would anticipate a high degree of efficiency in selecting a topic among those whose experience was research-related. Reasonable, too, is the expectation that the topic would be one that might set the direction of further efforts. As it turned out the data on this item are interesting only in the descriptive sense. No significant differences appear among any of the sub groups. The gross data contains few surprises except perhaps the very low rate of follow-up. Only a third considered themselves as still active on research topics that were used or examined in connection with the dissertation.

TABLE 8.6

PRE-PROFESSIONAL: DISSERTATION TOPICS EXPLORED OTHER THAN FINAL

(22) Before you settled on a final dissertation topic how many other ideas or projects did you explore? Number________

	NO Other	1	2	3	4 or more	
Number	108	150	125	52	35	470
Percent	23%	32%	27%	11%	7%	100%

Are you now following up on any of these?______ If so, in what way?

No Follow Up	336
Published article	12
Working on an article	11
Basis of a research proposal	4
Continuing research	63
Have students studying it	5
Used in teaching	3
Continued reading & study	16
More than one of above	4
	454

C. SUMMARY: PRE-PROFESSIONAL EXPERIENCE.

Experiences of the doctoral years that might be related to professional efforts later displayed an interesting variety in the sample group. There was considerable activity related to publication with about one third reporting authorship or editorial work. Curiously, this was apparently unrelated to the development of publications from the dissertation for only 23 persons mentioned worked on a publication from that source. In fact, the dissertation seems to stand as a discrete experience for less than a third reported any follow up at all. Experience involving other research planning or design was mentioned by about 30% of the respondents. Those kinds of group activity related to professional practice, consulting and supervision, were least frequently cited.

Turning to those experiences which represent articulation with the professional community we find evidence of the unplanned nature of this transition in the academic world. There is no integrated pre-professional experience of the type found in medicine, law, or the military. Extensive contact with professionals other than faculty at the home institution, i.e. more than ten meetings with individuals, was characteristic of only a third of the sample. But the most surprising aspect of this variable came from the basis the respondents would use for ranking institutions in their field. Considering the fact that many of these individuals may have recently examined the employment market and reached a conclusion, it is surprising to find so few of them aware of the studies made in recent years to rank institutions. Less than a quarter of the respondents identified such a reference point for their judgement.

The hypothesis found only a limited amount of confirmation among the items used to examine this variable. Association with research was related to more kinds of experience and brought out a strong distinction in publications activity, supervising and consulting and even in teaching an advanced class. The research related groups individually and together showed more contact with professional persons beyond the campus. This came about through joint projects, attendance at professional meetings, and active participation in departmental affairs.

Research association gave no advantage in knowledge of studies that ranked institutions. Nor, surprisingly, did the research related groups have fewer exploratory efforts in the establishment of a dissertation topic. Standards used to judge the quality of one's performance showed the same emphasis upon comments from the chairman and the activity of friends irrespective of affiliations with research. Preferences for the next step in career development were substantially similar but slightly more of the non-research group would like to move to other areas of study. The research project group would like to broaden experience into peripheral areas but not move out of the field.

This is probably the most complex of the variables in the group. The few items which have been used to estimate its dimensions are clearly insufficient. They do reveal, however, the inadequate nature of transition into the professional academic community. Quite probably the tightening employment market for Ph.D.'s in the arts and science will lead to much attention to this phase of professional preparation.

CHAPTER IX

OPENNESS AND CONSTRAINTS

A. THE NATURE OF THE VARIABLE

1.- Openness

The term "openness" has appeared in a variety of contexts over the last two decades. General system theory has given both a special meaning and a special utility to the term.[1] In the psychology of personality the notion has been used as descriptive of the non-authoritarian attitudes. At least one philosopher has applied the idea to a whole society and held that "openness" is the distinctive quality of the best contemporary cultures.[2] The term appears to have two principal meanings. Most often, as in general system theory and personality theory, it denotes receptivity, acceptance of new input, or the permeability of boundaries. The second orientation to the term emphasizes the existence or development of a wider range of options. Used in this sense, the term describes a diverging chain of choices or decisions exercised with a minimum amount of constraint.

It is the latter meaning which applies to the socialization process in graduate education. It is no more than a logical extension of the assumption with which we began. A graduate student in the arts

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[1] Walter Buckley, Modern Systems Research for the Behavioral Scientist, Aldine, Chicago, Ill., p. XVIII and passim.

[2] Karl Popper, The Open Society and Its Enemies, London, 1947

and sciences is constructing the image of a professional role at the same time he is being socialized into it. In the loosely structured environment of graduate school the more differentiated his experiences can be, the richer this role formulation will be. It follows that the fewer constraints and the greater number of encouragements he perceives, the more open his choices and decisions can be. Such openness may appear in the tangible forms of funds, facilities, or equipment or in the shape of data, information, or techniques, or through increased social interaction of the supportive and developmental kind.

2.- Operational Indications

Evaluations of openness and constraint must necessarily come from the direct participants in the socialization process. Among all the persons who have an interest in the process and its outcomes, they alone have a holistic view of occurrences. Unintended and seemingly unrelated strictures are present in every educational setting as the studies of undergraduate environments have amply demonstrated and they can be uncovered only through the eyes of the incumbents.

The contrast between expectations and actual outcomes is a useful indication of openness. (See Appendix B, question 20.) The idea of a balance between direction on the one hand and guidance on the other is not a conventional type of question. It has the virtue of indicating satisfaction in the neutral choice and the general source of dissatisfaction in the extreme choices. (See Appendix B, question 21.)

In evaluating restricting influences the point of concentration is the selection of the dissertation research topic, the precise point at which scholarly tradition emphasizes freedom of inquiry. The list of possible restrictions is made up of shortages, limitations arising from policy decisions, and previous commitments that might have curtailed freedom. In a sense, the encouragements are the reverse side of these components. This type of question can uncover only the gross dimensions of this variable which, more than the others in the study, is dependent on the interplay of factors that take a highly individualized pattern. (See Appendix B, questions 25 & 26.)

The hypothesis anticipates a higher degree of openness among the research related group. Specifically, more neutral, i.e., satisfied responses on the balance of expectation and actuality, direction and guidance; fewer restrictions and more identifiable encouraging influences.

B. RESULTS :DESCRIPTIVE AND ANALYTICAL

1.- Expectations and Outcomes

Most investigators of the graduate scene have found a rather high degree of general satisfaction among graduates irrespective of how unfavorable the specific criticisms might be. The data in table 9.1 below display this same general satisfaction but they also reveal more precise information. Contact with the faculty proved more rewarding than expected for a large share of the responding sample. The research phases, particularly the chance to initiate research, turned out more favorably than anticipated for a significant share. Since these two elements, contact with mature scholars and creative research, lie at the heart of graduate socialization such an emphasis by the respondents is a reaffirmation of the system. Even the much-maligned teaching experience was better than expected for 43% of the sample and, at the extreme, one added comment from a respondent in the social sciences read--". . . for me, graduate school was . . . in every way a harmful and unpleasant experience for me, except for my contact with

TABLE 9.1

OPENNESS: EXPECTATIONS AND OUTCOMES ON SELECTED GRADUATE EXPERIENCES
(percent)

(20) How did the actual outcomes compare with your expectations on these facets of the graduate experience? Mark all.

MUCH MORE INTERESTING AND REWARDING
SOMEWHAT MORE INTERESTING AND REWARDING
JUST ABOUT WHAT WAS EXPECTED
LESS REWARDING AND INTERESTING
MUCH LESS REWARDING AND INTERESTING

	-2	-1	0	+1	+ 2	100%	n=	Mean score
Course work: lectures and discussions.	7%	23	49	16	5		457	-.08
Course work: seminars and laboratories.	9	26	39	19	7		451	-.12
Personal contact with faculty.	6	16	27	31	20		453	+.43
Informal department events: 'brown bags,' coffee hours.	10	19	43	20	8		435	-.02
Formal departmental events: seminars for guests, faculty presentations.	9	24	42	20	5		449	-.14
Opportunities to participate in and observe ongoing research.	10	18	34	25	13		423	+.13
Chance to initiate research projects or original studies.	7	9	38	26	20		431	+.42
Opportunities for creative classroom teaching experience.	8	12	37	29	14		407	+.28
Opportunities to plan a course to be taught.	13	14	41	19	13		381	+.04

my undergraduate students."

It was the traditional features, the structured aspects, that fared poorly. Seminars and laboratories were badly regarded by more than a third of the group. Similar dissatisfaction appears with respect to other departmental events whether formal or informal. When the research groups are compared with their non-research associates a few significant distinctions appear. Obviously, research initiation and participation are much more favorably reported by those "associated" with research but that is redundant information. The one other significant distinction centered on informal departmental events. All the research associated groups but particularly the "research, not related to dissertation" found the department activities more rewarding and interesting.

TABLE 9. 1. 1

Informal Departmental Events:

	Much less	Less	About as Expected	More	Much More	
NO Association: NR	18 %	22	39	16	5	100%
Some Association, not related: RNR	6 %	14	43	24	13	100%
	$X^2 = 13.35$, p=.01, n=233					

When recognition in its interval form was correlated with outcomes scores a Pearson's r= .200, significant, was generated.

2.- Balance of Freedom

On this question, reflecting as it does a balance between coercion and guidance, the responding sample displayed a high acceptance of conditions as they are. The share of neutral reactions shown on Table 9.2 is quite high for all categories. The mean scores, in all cases but two, incline toward "too little guidance." Only in the selection of courses and in activity as a teaching fellow is there a reflection of over-direction. Quite clearly, there is no sense of coercion or a lack of freedom in these data.

There is some further evidence on where guidance is most needed. Other studies have reported the dissertation topic as a source of

TABLE 9.2

OPENNESS: BALANCE BETWEEN FREEDOM AND GUIDANCE
ON SELECTED DECISIONS
(percent)

(21) Many activities in graduate study are a product of fine judgements about the amount of freedom that is most beneficial to the student. Without some guidance, time and effort are wasted while too much direction inhibits the development of natural talent. Working from this premise how would you rate the balance of freedom you met in making decisions in these areas? Mark those which apply.

	TOO LITTLE GUIDANCE	LITTLE GUIDANCE	BALANCED JUST ABOUT RIGHT	MUCH DIRECTION	TOO MUCH DIRECTION			Mean score
	-2	-1	0	+1	+2	100%	n=	
Choice of courses.	5%	12	63	12	8		462	+.05
Selection of cognate area.	7	23	63	5	2		441	-.26
Selection of specialized field or area of concentration.	5	19	72	3	1		447	-.23
Activity as a teaching fellow.	6	17	60	10	7		356	-.04
Duties as a research assistant.	3	14	75	7	1		277	-.12
Designation of doctoral chairman.	3	18	74	3	2		435	-.16
Selection of doctoral committee members.	2	14	71	9	4		452	.00
Choice of dissertation topic.	8	16	67	7	2		455	-.19
Decision on Research design and methods.	11	21	60	6	2		401	-.31
Decision on first career employment.	14	28	53	5	0		403	-.49

anxiety and delay. The responses by this sample group of recent Ph.D.'s help fix the problem more precisely. It is the question of research design and the method of pursuing the topic that is most troublesome. Almost a third of the sample, 32%, felt the need for more guidance at that point in their work. This condition held true whether an individual was involved with research activity or not. On the choice of a dissertation topic there is a quite different pattern of response. The research associated group was more comfortable with the status quo than their non-research counterparts, one third of whom needed more guidance.

TABLE 9. 2. 1

BALANCE: CHOICE OF DISSERTATION TOPIC

	Guidance Too Little	Little	About Right	Direction Much	Too Much	
No Association: NR	16 %	17	58	6	3	100%
Some Assoc.: R	5	16	70	7	2	
	X^2=15.35, p.=.01.					

Another significant response came on the matter of first employment. This, of course, is the point at which training, role preparation, meets the professional world. A significant share of the sample group, 42%, felt that there was insufficient guidance. It made no difference whether the respondent was associated with research or not. Most of the respondents are now settled into an academic career, about 80%. The fact that this response is so high would seem to indicate that a certain disillusionment with the transition into the active professional world lingers even after the immediate problem has been solved.

When recognition level was correlated with scores on this item no significant results were generated.

3.- Restrictions on Selection and Development of the Dissertation Topic:

TABLE 9.3

OPENNESS: IMPORTANCE OF RESTRICTIVE FACTORS ON DISSERTATION TOPIC
(percent)

(25) How significant was each of these factors in restricting the selection and development of a dissertation topic? Mark all that apply.

	UNIMPORTANT	OF SOME IMPORTANCE	IMPORTANT	VERY IMPORTANT	100%	n=
Equipment and facilities were limited.	58%	19	14	9		281
Funds to support the full scope of the project were lacking	60	20	10	10		282
Information and data were inaccessible.	72	14	8	6		272
Techniques for full analysis were unavailable.	67	18	10	5		256
Interests fell outside the areas of department or faculty competence.	55	23	13	9		294
Interests lay outside the conventional boundaries of the discipline.	72	13	9	6		258
Conditions of fellowship or traineeship required work in a relatively narrow subfield.	90	6	1	3		223
Association with and commitment to a sponsored research project limited natural interests.	74	11	7	8		246

Among the eight restrictive factors encompassed by the statements, one drew a response from more than 60% of the respondents, six were identified by 50-60% and only one by fewer than half. The fact that "interests fell outside areas of department or faculty competence" not only drew the largest response but also held the greatest importance is especially significant. About 132 respondents assigned some importance to this restriction and it made no difference whether they were affiliated with research or not.

A number of interpretations suggest themselves but none can be fixed without further exploration. These may, in fact, be due to a narrowness in faculty interests or to departmental interests brought about by an emphasis on specialized competence. A more likely explanation, given the size of the university and the efforts that go into balancing departmental talent, lies in the changing nature of knowledge. In most fields of study changes are occuring at rates and in directions that do not fit departmental patterns or the traditional structures of the discipline. Succinctly put, the environment of investigation, like the environment of learning, is rapidly overreaching the department and the discipline. A further indication in this direction, a more extreme expression of it, is manifested in the fact that 73 individuals felt their interests lay beyond the discipline and this constituted a restriction. A research involvement does have significance on this item, however, with significantly fewer in the research associated group identifying the item.

The other identified general area of restrictions is a usual one, shortages of funds, facilities, and information. About a fourth of the total sample group attached importance to shortages of funds and equipment. The problem was equally reported by research affiliated and non-research groups so it may be interpreted as a condition of relative deprivation. There are always unfinished aspects to dissertation research.

The problem of getting information or data is quite different. For the non-research group it tended to be significantly more important, while the research related groups consistently evaluated it as less significant. The strength of the relationship between more association with research and inaccessibility is estimated at -.270 by Kendall's tau-b.

TABLE 9. 3. 1

Restrictions: Inaccessibility of Data

	Unimportant	Some Importance	Important	Very Important	
No Assoc.: NR	52 %	26	14	8	100%
Some Assoc.: R	78	11	6	5	100%
	X^2=16.29, p=.001				

4.- Encouragements in the Selection and Development of the Dissertation Topic:

More respondents identified encouraging factors than restrictive items but this is about what one would expect from Ph.D. recipients who have transcended or overcome such difficulties. An overwhelming emphasis rests on encouragement from the chairman or another faculty member and no other item comes close.

An opportunity to work with recognized authorities was identified by 72% of the respondents. While affiliation with research produced no general effect on the distribution of answers the project-related group valued this item less highly than other groups. Another item that had a wide effect was the attraction of a new area within the discipline. Research affiliation made no difference on the pattern of

TABLE 9.4

OPENNESS: IMPORTANCE OF ENCOURAGING FACTORS ON DISSERTATION TOPIC (percent)

(26) How important was each of these factors in encouraging the selection and development of a dissertation topic? Mark all that apply.

	VERY IMPORTANT	IMPORTANT	OF SOME IMPORTANCE	UNIMPORTANT	100%	n=
Ready availability of equipment and supplies.	28%	22	26	24		312
Availability of funds to adequately support your study.	24	19	28	30		336
Accessibility of data, special collections, or observational opportunities.	23	18	25	34		333
Opportunities to consult and work with recognized authorities in the field.	31	20	30	19		340
Existence of an ongoing research project you could join.	55	11	17	17		276
Attraction of a new or vital area in the discipline.	29	20	26	25		297
Opportunity for interdisciplinary study.	54	17	17	12		257
Active encouragement from doctoral chairman or other faculty member.	8	17	37	38		434

responses.

The opportunity for funding had significant influence, receiving great weight among the research group whose experience with research was related to the dissertation. The strength of the relationship between research association related to the dissertation and funding as an encouragement was .240 by Kendall's tau-b.

TABLE 9. 4. 1

Encouragements: Availability of Funds

	Unimportant	Some Importance	Important	Very Important	
No Assoc.: NR	37 %	19	29	15	100%
Some Assoc.: RR, RP Related	16	17	29	38	100%
	X^2=16.97, p.=.001				

Availability of data or collection opportunities was also a significant attraction for all groups of respondents but the research group gave slightly more importance to it. We get some indication of the importance of this item by comparing its rating as a restrictive element with its significance as an encouraging item. As a restrictive item it is reported by the non-research group: as an encouraging item it is listed by the research group. The fact that neither funding nor facilities show up in this kind of cross reference suggests the conclusion that the problem of data collection may be among the most crucial aspects of the dissertation.

Finally, there is no suggestion that the mere existence of a project is sufficient to draw dissertation interest.

C. SUMMARY

The information developed around this very limited treatment of openness and constraint confirms other reports that the successful doctoral student in the arts and sciences has a favorable impression of his total experience. In most areas and certainly in the crucial ones his expectations were exceeded. He encountered no major coercive forces, met relatively few restrictive elements, and was able to respond to an important range of encouraging factors. The ability of graduates to discriminate so precisely among the sources of difficulty while still holding a favorable overall evaluation should act as a major encouragement to the use of inquiries to recent alumni as a guide to policy. While there were distinctions between those who had an affiliation with research and those who did not, they are not clear enough to permit the conclusion that research group enjoyed a more open experience.

The heart of the doctoral experience is revealed as quite sound. Contact with faculty members was better than expected. Opportunities to initiate research studies were better. Doctoral students felt able to respond to the attractions of working in new areas of the field with recognized authorities.

The problem areas are quite specific. (1) The structured parts of the program, particularly laboratory experiences and seminars, show definite weakness. It may be that the traditional purposes of these activities are better served by involvement with active research projects than by contrived situations that are unrelated to larger, more immediate issues. (2) There are indications that the narrowness of the departmental structure, however good its membership may be, is not sufficient to meet the interests of large numbers of students who are attracted more by the new areas of the field and the more comprehensive intellectual issues of the times. It appears from the limited data here that students are not so much interested in jumping out of the bounds of the discipline as in bringing a wider scope of knowledge into the field. (3) There are some distinct indications of the dissertation problem in the responses. A significant share of the sample feel a need for more guidance at the research design stage. For those who have no association with research the matter of selecting a topic could also be improved by more guidance. The non-research group also reflect more difficulty in the collection phase of their doctoral work. Thus, an affiliation with research helps narrow the topic, provides a means for gathering necessary data, and offers peripheral support in terms of funds and facilities. (4) The transition from doctoral training to professional employment is not perceived as completely satisfactory confirming a conclusion of the previous chapter. About 35% of the respondents, 168/470, felt that more guidance at that critical point in one's career was desirable.

CHAPTER X

SUMMARY AND CONCLUSIONS

A. THE GENERAL CONCLUSION

1. The Setting Restated: By now it is fully apparent that a framework of assumptions and premises, practices and procedures, has been constructed around graduate education. The device approximates graduate study in the arts and sciences "as it is."

On the research side, academic investigation has been acknowledged as free inquiry directed toward understanding and characterized by free and open exchange of findings. The roots of policy for large scale federal sponsorship have been found in the Bush assumption with its notion that research and education are automatically inter-related. Research is conceded to be universally appropriate to the learned community however much its forms may differ from field to field.

On the education side, a unique quality of graduate education in the arts and sciences lies in the openness of that experience. The individual moves to meet his own needs for intellectual growth using the resources of a learning environment in ways that are distinctive to him. Neither pace, nor events, nor requirements are tightly structured, a condition found nowhere else in traditional education. The participant is preparing for a role in a field of learning and for a status in the learned professions. This socialization process is made more effective by a differentiation of the environment which, in turn, permits a more effective integration of experience. Sponsored research contributes to the differentiation by adding new resources, equipment and facilities, data and information sources.

2. The Hypothesis Restated:

Within the framework--the "as is" model of graduate study--an appropriate hypothesis has been set. An association with research should make a difference. Those involved with research activity are expected to show more varied kinds of experience and more extensive use of resources. At the same time they should display a more integrated view of the structuring and scheduling processed in their own programs. To identify the amount and kind of affiliation an individual has had with research, either his self-ascribed kind of association or the degree to which he recognizes ongoing sponsored research can be used.

3. A General Conclusion:

Within the framework of assumptions and in terms of the hypothesis about 152 separate items were examined around four major dependent variables; time, interaction, pre-professional experience, and openness. Connections with research were measured by self-ascribed association or by student awareness of project research, recognition. Significant differences appeared between the non-research group and one or more of the research-connected groups on 69 items. About 5 of these ran contrary to hypothesized conditions. Correlations of combined scores on interaction, openness, and pre-professional experience also demonstrated moderate support for the hypothesis. Research does appear to exist as a separately identifiable activity in student experience. Recognition of projects, i.e. student awareness of research in the learning environment, and self-described associations do provide a means of assessing relationships with research that is more sensitive than mere identification as a research assistant.

Putting these observations together we can conclude that the conclusion is modestly supported. Those with research relationships do reflect a somewhat more differentiated experience and a more integrated view of that experience. Those without research contact show a more dispersed pattern of experience and more varied evaluations of that experience.

B. SPECIFIC CONCLUSIONS BASED ON THE ITEMS:

Far more important than a general conclusion is a detailed specification of those items on which research related groups differed significantly from those who had no research contact. Also worth specifying are the items on which differences might have been expected but did not appear.

1. An affiliation with research as evidenced by either high recognition of projects or self-described association is related to the following responses:

a. shorter elapsed time between the baccalaureate and receipt of the Ph.D. due to earlier entry into graduate study.

b. more accurate sense of time structure as evidenced by (1) less difference between expected and actual time of study, (2) estimates of optimum time that were shorter and less dispersed.

c. more reliance upon other students as an aid to scheduling time.

d. more frequent contact with the doctoral chairman, with faculty in the department, with non-faculty and with students outside the department.

e. interaction with both the chairman and with other students served more functions.

f. the following groups were judged as most important; the work team, discussion groups, action groups, and professional associates by the research group.

g. the reasons for the importance of student associations were found in intellectual exchange, and critical analysis. They were important throughout graduate study.

h. contact with agencies of the institution tended to be more favorable in the case of the department as well as with laboratories and centers. Contrary to expectations it was not more favorable in the contacts with school and college offices.

i. more experience with publication as a junior author, in editing work, in reading pages, in teaching at an advanced level, and of course, with research design and supervision of technical personnel.

j. contact with men prominent in the field but outside this university was more frequent tending to come about through the department and professional meetings.

k. expectations of satisfaction were exceeded in the research opportunities provided by the graduate experience. The informal department events were also better than expected.

l. choosing a dissertation topic and completing it was made easier by appropriate guidance, by encouragement through the availability of data or funds, and the opportunity to work with experts in the field.

In summary: the research affiliated student composite profile shows a person who was able to get into graduate study without too much delay. He achieved a realistic sense of time requirements and relationships by putting together the experience of other students and the informal expectations in the department. Contact with his chairman, the committee and a variety of other individuals gave specific information and guidance rather often. Other students offered critical exchange and intellectual stimulus rather than simple encouragement. Student associations held a continuing importance for him especially discussion groups and work-associated teams. A wide range of pre-professional experiences were open to him by way of publication experience, research activity and even teaching in advanced seminars and classes.

2. Characteristics Unrelated to Research: On a number of items there were no differences in the sample response even though one might reasonably expect them to appear and even though the hypothesis anticipated them. Affiliation with research was not related to:

a. fewer years as a full time student.

b. more accelerating factors or a different pattern of such factors.

c. significantly fewer disruptions and delays.

d. the amount of interaction with faculty or groups outside the department.

e. more effective introduction into professional employment or articulation with the professional community.

f. significantly fewer false starts on the dissertation topic or more follow up on that work.

g. a reduction in tensions arising from problems of research design for dissertation.

h. radically different support patterns in terms of the proportion of time-obligated vs. unobligated support. Within each of these major classes there are differences in contributions from spouses, savings, and loans rather than in fellowships.

The non-research student was likely to have encountered delays before enrollment in graduate study and tended to be less certain about the amount of time it takes. He was less likely to meet his expected time schedule and was dependent upon published statements of the University and upon formal grades for his evaluation of timing and progress. The chairman was especially important to him but he saw him less often than the research--involved individuals. Interaction with other students held a significant but decreasing importance for him. Associations with other students were important for the encouragement and companionship rather than for any critical exchange about his work. Graduate experience was regarded as an individualized rather than a social experience. The non-research student shared the problem of research design with his research related counterpart but he also had problems isolating a topic, getting data together, and finding support.

3. Other Suggestions From the Patterns of Response: Scattered through the replies of the 470 successful Ph.D.'s to more than 200 items are a number of related observations that do not have much to do with the research distinction but do say something of importance about the doctoral experience. While such a small sample cannot be definitive these responses to help specify some attributes which other studies have described in a more general form.

a. The role of the doctoral chairman is a central one, perhaps the central one and fact supports the truism. Our respondents portray some of the ways in which the role is crucial to the doctoral student. The most surprising finding was that he is not expected to play a major part in scheduling the use of time. It is the department upon which the student depends for a sense of timing. On the other hand he is the most important source of information and judgement on the quality and worth of one's work after course requirements are met. Probably few advisers and fewer faculty realize the singular importance of their personal comments for a student's work. In the undertaking of the final dissertation research active encouragement from the adviser is a major item. The notion of the inaccessible chairman is not confirmed by this sample. In fact, the contact with faculty in general was above expectations for half the group. The freedom to chose one's own doctoral chairman was acknowledged by more than 90% of the respondents thereby setting aside another bit of mythology.

b. The stress related to the dissertation can be described a little more accurately on the basis of this sample. The research design for the project is apparently troublesome for just about everyone, research affiliated or not. Students feel that more guidance is needed in about 1/4 of the cases and almost no one feels he had too much direction. Fixing the topic itself required more than two tries for a substantial share, 40%, of the respondents but the research related group had some advantage. They also had an advantage with sources of funds and sources of data. Clearly the doctoral student who, on his own, is facing problems of selection, design, collection, and funding will require much more personal guidance and advice than his counterpart who can get some assistance with one or more of these items through a research project or an institutionalized agency such as a museum, government office, or special collection.

c. The importance of graduate student peer associations is often cited but seldom specified. The sample data indicate that peer groups in various forms are the essential social world of the doctoral student. But it also makes clear that formal structures in that setting are evaluated poorly. A department can provide the settings in which interaction can occur but it can do little to structure the interaction itself on any kind of a permanent basis. The study of graduate peer groups may well prove as interesting and as valuable to policy formation as the extensive literature on undergraduate social environment has been.

d. Support patterns for graduate students have been thoroughly studied and our data suggest only one emendation. The critical feature of support programs may not be the total value of all kinds of support but rather that share of support which carries no obligation. In the sample group there was a high degree of variation in the combinations of specific types of support used. When types were collapsed to time-obligated and unobligated categories a surprising similarity for our sample of successful Ph.D.'s emerged.

C. OTHER FINDINGS:

Indicators and Indexes at the Division Level: We have noted that some of the items lend themselves to combination into representative scores which can be treated as interval data. This device also allows us to control for divisions of knowledge and look at the differences and similarities. All indicators and indexes were correlated with the level of recognition, i.e., the proportion of projects recognized, and then intercorrelated with each other to explore relationships.

1. Time: For the most part, the outcomes in the remaining tables supplement the conclusion already developed from the items but one set, the data on time, has some significant variations. In the table below each of the time indicators was correlated with research recognition by product moment method to give the indicated "r" values. The hypothesized expectation was that, throughout, there would be a negative relationship. The individual who knew more about research would be able to use that differentiated experience to provide structure and schedule to the open time frame of graduate education in ways that would shorten it. This is, of course, one side of an ambiguity. It is equally plausible to maintain that the mere fact that an individual is

around for a longer time will give him more acquaintance with research, therefore more recognition will be related to positive values. Thus, any plus values reflect a sharp contradiction of the hypothesis.

TABLE 6.11.1

CORRELATION OF TIME & INDICATORS AND LEVEL OF RESEARCH: BY DIVISION OF KNOWLEDGE (product moment correlations, r =)

	I Nat. Sci.	II Soc. Sci.	III Hum.	IV Engr.
Years of Full Time Study	.127	-.066	-.079	-.061
Elapsed Time: B.A. - Ph.D.	.056	-.168	.096	-.051
Difference: Expected Vs Actual	.038	-.309	-.008	-.008
Optimum Time: All Fellowship	-.059	-.200	.002	-.176
Optimum Time: 1/2 Teaching Fwp.	-.038	-.212	-.089	-.278
Optimum Time: 1/2 Research Asst.	.119	-.221	-.186	-.321
N =	174	166	91	39

Significance of p $\geq$ .05 Underlined.

The expectation is pretty well met by the social sciences, Division II, except for full time years. The engineering group, IV, is pointed in the right direction and the humanities data reflect the kind of neutral response we might expect. It is the natural science group that presents the puzzling contradiction. The years of full time study with a positive value of r = .127 constitute a strong denial of the hypothesis. The estimate of optimum time under a research assistantship also runs contrary to expectations suggesting that the more an individual knows of sponsored projects the less he values an assistantship.

As a matter of curiosity we introduced controls for department and, even though the frequencies are too small for reliability, the data are displayed in Appendix A, table 6.11. Clearly astronomy, geology, and botany are the source of most of the aberration with chemistry contributing on the matter of the research assistantship. A distinction so marked as this suggests that inputs from research have quite different effects in the social sciences than they do in the natural sciences. The roots probably lie in the nature and conditions in the disciplines rather than in research. Full answers will require considerable study but a beginning explanation can be made. The rising scale of research funding for the social sciences came during the years of development for new methodologies and techniques.[1] New subjects for study and a new scale of inquiry were added to a new public value for the results of social science research. The emphasis of the most active graduate schools shifted toward more training in technique and the ideal mechanism was involvement with current research. Funding of research centers and institutes became the most effective means of carrying this out. Thus, in the social sciences, the principal activities were forced by the direction of change into closer contact with research.

In the natural sciences, on the other hand, no such broad scale transformation was in progress. Research funding simply enabled departments to do more of what they were already engaged in. The requirement was not for new ways to train students but rather for support for students while they were being trained in the established and accepted ways. If this distinction is proven valid by further study it means that sound policies of research sponsorship will have to be fitted much more carefully to the nature of the field if educational outcomes are expected. The single patterned research policy with its proposal, pro-

[1]J. Perry Miller, "New Trends in Graduate Study in the Social Sciences," in Walters, Graduate Education, pp. 171-183.

ject, principal investigator, indirect and direct costs, and short duration will have to be supplanted by new forms of research relationships which respect the nature of the discipline and the state of the art in that field.

2. Other variables: Interaction, Pre-professional experiences, openness. None of the other variables displayed such a marked contrast between the natural and social sciences. Some of the strongest relationships in the study appear around interaction indicators. Except for the humanities which show almost no relationship between research and any given item, the hypothesized condition of more interaction as a correlate of more research recognition holds up well.

TABLE 10.1

CORRELATIONS OF INTERACTION INDICATORS & INDEX
WITH LEVEL OF RESEARCH RECOGNITION:

	TOTAL SAMPLE	I	II	III	IV	I	II	III	IV
1. Frequency of Contact	.267	.167	.365	-.112	.232				
2. Group Associations: Importance	.272	.257	.267	-.062	.359	.278	.404	-.0003	.421
3. Institutional Contact: Favorable	.228	.186	.229	.085	.266				
4. Student Associations: Importance	.169	.183	.168	.056	.200				

Significance = .05 Underlined.

The four interaction indicators show a stronger and more consistent relationship with knowledge of research than any of the other variables. The relationship is strengthened further when the four indicators are combined into a single index value for each division and then correlated with research recognition.

As a part of the exploration each of the indicators and the indexes was cross-correlated with similar values for other variables. Aside from the obvious relationships there was little in the way of new information. The interaction group and specifically the "Frequency of interaction" score did show significance with "pre-professional experiences, "r = .227. More experience, in turn, was positively associated with "more rewarding outcomes" giving a value of r = .316. The active and antecedent element in this combination is involvement with research, then experience itself appears. A higher degree of social interaction and more rewarding outcomes follow in terms of time. While there is no rigorous scheme of proof to support the idea, it appears that interaction levels might be considered as a means of evaluating the vitality of an on-going program. If individuals have a variety of contacts, a high sense of importance to the groups with which they are involved, and a favorable view of the institutional agencies with whom they are in contact then a graduate program is probably moving toward satisfactory outcomes.

The indicators and indexes developed around pre-professional experience and openness did not yield a high degree of consistency. Tables 10.3 and 10.4 in Appendix A display the information and, along with it, the intercorrelations of the indexes.

D. OBSERVATIONS AND POSSIBILITIES:

From the continual sifting and recasting of the bits of data in a study like this one generates not only conclusions that reflect the information literally but a collection of intuitive conclusions that transcend it. They come through not only as judgements but as recommendations and suggestions for future study.

1. The development of research activity as an educational

resource in graduate education deserves serious attention. Appropriate linkage between the vitality of research for which the American graduate school has become renowned and the professional development of all doctoral students should become a matter of experimentation and exploration in most fields. The information collected in this study shows that even without visible and conscious planning, research affiliation does have a modest level of good effects. But there are large areas of ineffectiveness, strong suggestions of new needs, and a general impression of a resource not fully used. Relatively few students have enough contact with ongoing research to render it useful. Avenues of association are too narrow and belie the essential openness of both graduate education and scientific exchange. In the humanities, association with personal scholarly research in the developmental stages is minimal while the natural sciences seem preoccupied with the support aspect and tied to the formal pattern of the research assistant.

Admittedly, the question is a delicate one and any activity would have to be undertaken in a way that would not interfere with but supplement the efforts of the investigators. One cannot know precisely what should be undertaken in each field but the first step is to raise a consciousness of the fact that many aspects of a project or scholarly inquiry have a very high value to the learner <u>even while they are in the formative stages</u>. The design, the preliminary data, the techniques, the problems of management, all these represent elements from which advanced students can gain insights and skills. The central task is one of opening avenues by which students at the appropriate level of study can be introduced to what is in process in the department and its associated facilities. It would help if research policy for the institution recognized the value of specific identification and reporting of the educational efforts associated with a project. The instrumentalities by which increased dissemination and involvement might come about depend heavily upon the nature of the field and the ingenuity of the faculty. Almost certainly the responsibility for the creative application of research activity would have to be lodged at the department or college level rather than with the project directors who are already over burdened. An appropriate first step on this who matter would be an examination of those projects with which students are heavily involved. Ultimately it is possible to see a set of informal associations with research replacing some of the laboratory and seminar experiences which are held in low regard by doctoral students. The key, of course, is development from within the disciplines themselves encouraged by information from analytical and experimental studies. Educational expertise has a role to play, one which is often misunderstood and almost always denigrated by the formal disciplines, but it lies in the design of policies that will encourage (rather than devices that will produce) new modes of association between research and learning.

2. Graduate education should be conceived and planned as a total learning environment: The university community, viewed as a learning system, is a delicate balance of critical items. Faculty competence, student ability, and the shape of the curriculum have acknowledged importance but the accessibility of resources, conditions of organization and social interaction, and the nature of student support patterns gain increasing notice as crucial factors.

Traditionally the responsibility for these varied elements has been carefully segmented. Student support, for example, has been treated as a kind of recognition award with a tenuous relationship to individual needs on the one hand and to the cost of living on the other. In point of fact, however, the amount and kind of support a student has access to may determine not only whether he finishes but whether he ever had a chance from the start. The organization of the department, whether the chairmanship rotates or is permanent, for example, has quite material effects upon the study patterns of graduate students although the question has been treated as a matter of faculty concern only. The curriculum has been viewed as the chief medium by which the faculty shapes learning along with the tutorial associations to modify its ill effects. The faculty member has thought of himself as being completely in command of his field, or at least one corner of it, and has put forth enormous personal efforts in many cases to stay there.

There is considerable evidence to suggest that the character of learning has over-reached many of these notions.

The formal curriculum is outmoded as a concept to describe education and formal classes have taken on a reduced function in the process of learning. The increased development of all-university facilities like the computing centers, specialized study centers, museums, research stations, and satellite units like urban extensions have ended the exclusive role of the department as the central agent of educational policy. In a sense, too, the broadened character of learning and the quickened pace of knowledge growth have over reached the individual faculty member. Students are led outward from established interests and techniques by contact with wide-ranging facilities and by multi-disciplinary problems. Faculty are asked to deal with a condition where knowledge is developing even while it is being learned.

Scarce resources, the appearance of disadvantaged students on the graduate scene, and the rising cost of existence are temporary realities that are forcing new approaches to graduate support. There is also a growing feeling that an institution has some degree of moral commitment to provide, not an assurance of success, but a reasonable opportunity for those students who commit themselves to a lengthy professional preparation.

For the graduate school to take account of, and responsibility, for, the total learning system will require major alterations, first in outlook and then in practice. Fortunately, graduate education already holds many of the components for a new approach to the learning environment; the idea of an open structure of student support patterns; long-term commitment of resources, limiting enrollment at the doctoral level to the level of support. Organizational changes will be required to link the departments into university-wide facilities, to take full notice of the learning process, and to expand patterns of student interaction.

And what of the faculty role? Here we meet the true essence of the change. A faculty member will be called upon to think of himself in quite different terms. Rather than instructing groups and tutoring individuals he will have a responsibility for managing a sector of the total learning environment. His concern will be directed at creating circumstances, settings, and resources for self-instruction. Instead of carefully guiding five or six students he will be influencing larger numbers but in ways too varied for full personal understanding. This is not to say that the personal component will be lost. It will no longer be the major determinant. Such a change in outlook would help reduce the feeling of antagonism between teaching and research for it would move toward making research more truly an instrument of learning. While this scale of change may seem fanciful in its details, it suggests no more than conditions demand, that the university construct an environment to match the dimensions of learning.

3. The transition of the graduate student into membership in the professional community and into a professional role merits more attention by the university. Compared with other professions there is a striking abruptness to the movement of a new Ph.D. into a condition of professional employment. There is almost nothing in the doctoral training pattern to provide an understanding of the ethical considerations in the profession, to introduce managerial skills on an elementary level, and to provide an understanding of the institutional setting in which he might work. In our sample the respondents saw this disjuncture in terms of first employment but it goes beyond knowledge of market conditions and practices and really involves the final step in professional socialization.

Finally, one leaves an examination of graduate study with some very elementary impressions. First, there is an appreciation for the remarkable strength of American graduate education. In the past two decades graduate schools have been able to mobilize individual talent and gather physical resources in a manner which would have been counted miraculous a short generation ago. Second, there is the question, not new but insistent, as to whether today's leadership can reformulate goals, adjust practices, and overhaul organizational structures rapidly enough to keep this educational and intellectual resource in complete touch with the society which so urgently needs its benefits.

TABLE: 2.3

FEDERAL OBLIGATIONS FOR RESEARCH AND DEVELOPMENT:
By Character of Work, 1956-1970

(Millions of dollars)

Fiscal Year	Total		Research: Basic		Research: Applied		Development		R & D Plant	
1956	3,267	100%	206	6.3%	646	19.7%	2,136	65.3%	279	8.5%
1957	4,389		262	5.9	662	15.0	3,007	68.5	457	10.4
1958	4,906		335	6.8	744	15.1	3,491	71.1	336	6.8
1959	7,123		517	7.2	886	12.4	5,291	74.2	429	6.0
1960	8,080		610	7.5	1,331	16.4	5,611	69.4	528	6.5
1961	9,607		825	8.5	1,796	18.6	6,438	67.0	549	5.7
1962	11,069		1,106	9.9	2,166	19.5	7,017	63.3	779	7.0
1963	13,663		1,389	10.1	2,652	19.4	8,454	61.8	1,168	8.5
1964	15,324		1,567	10.2	2,898	18.9	9,761	63.6	1,099	7.1
1965	15,746		1,690	10.7	3,164	20.0	9.760	61.9	1,132	7.1
1966	16,179		1,844	11.3	3,427	21.1	10,050	62.1	858	5.3
1967	17,149		2,015	11.7	3,258	18.9	11,256	65.6	620	3.6
1968	16,525		2,104	12.7	3,261	19.7	10,557	63.8	604	3.6
1969 (est.)	16,664		2,146	12.8	3,301	19.8	10,400	62.4	817	4.9
1970 (est.)	17,193		2,399	13.9	3,713	21.5	10,376	60.3	705	4.1

SOURCE: NSF 69-31 Federal Funds for Research, Development and Other Scientific Activities Vol. XVIII. U.S. Government Printing Office, Washington, D.C., 1970.

TABLE 2.4

FEDERAL OBLIGATIONS FOR RESEARCH AND DEVELOPMENT
By Performer: Fiscal Years 1958-70
(millions of dollars)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	-------est. 1968	1969	1970-------
Federal Intramural	1,374 30.1%	1,640 24.5%	1,726 22.9%	1,874 20.7%	2,098 20.4%	2,279 18.2%	2,838 20.0%	3,093 21.2%	3,222 21.0%	3,396 20.5%	3,493 21.9%	3,647 23.0%	3,819 23.2%
Industrial	2,607 57.0%	4,246 63.4%	4,834 64.0%	5,890 65.0%	6,565 63.8%	8,291 66.4%	9,136 64.2%	9,058 62.0%	9,384 61.3%	10,262 62.1%	9,460 59.4%	9,174 57.7%	9,476 57.5%
Universities & Colleges	288 6.3%	367 5.5%	459 6.1%	585 6.5%	755 7.3%	900 7.2%	1,077 7.6%	1,194 8.2%	1,350 8.8%	1,455 9.4%	1,490 9.4%	1,521 9.6%	1,635 9.9%
FFRDC-Univ.[a]	209 4.6%	271 4.0%	323 4.3%	410 4.5%	510 5.0%	546 4.4%	587 4.1%	609 4.2%	643 4.2%	666 4.0%	714 4.5%	741 4.7%	767 4.6%
Non-Profit Institutions	77 1.7%	106 1.6%	136 1.8%	223 2.5%	289 2.8%	396 3.2%	486 3.4%	550 3.8%	591 3.8%	624 3.8%	619 3.9%	606 3.8%	640 3.9%
Others	15 0.3%	64 0.9%	74 0.9%	77 0.8%	73 0.7%	84 0.7%	101 0.7%	111 0.8%	130 0.8%	127 0.8%	145 0.9%	159 1.0%	155 0.9%
Total	4,570 100%	6,694 100%	7,552 100%	9,059 100%	10,290 100%	12,495 100%	14,225 100%	14,614 100%	15,320 100%	16,529 100%	15,921 100%	15,847 100%	16,488 100%

[a]Federally Funded Research and Development Centers at Universities

SOURCE: NSF 69-31 Federal Funds for Research, Development, and Other Scientific Activities, Vol. XVIII U.S. Government Printing Office, Washington, D.C., 1970.

TABLE 2.5

FEDERAL OBLIGATIONS FOR BASIC RESEARCH
By Performer: Fiscal Years 1958-70

(Millions of dollars)

	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Federal Intramural	125	173	160	206	251	299	363	424	449	478	515	547	601
	37.3%	33.4%	26.2%	25.0%	22.7%	21.5%	23.2%	25.1%	27.1%	23.7%	24.5%	25.5%	25.0%
Industrial	25	72	93	149	236	322	336	299	325	366	390	391	513
	7.4%	13.9%	15.2%	18.1%	21.3%	23.1%	21.4%	17.7%	17.6%	18.2%	18.5%	18.2%	21.4%
Universities & Colleges	127	186	244	293	381	479	564	637	728	784	800	807	861
	37.9%	35.9%	40.0%	35.5%	34.4%	34.4%	36.0%	37.7%	39.5%	38.9%	38.0%	37.6%	35.9%
FFRDC. Univ.	34	51	63	111	153	170	177	196	213	249	262	267	289
	10.1%	9.8%	10.3%	13.5%	13.8%	12.2%	11.3%	11.6%	11.6%	12.4%	12.4%	12.4%	12.0%
Non-Profit Institutions	20	28	37	46	59	86	90	96	98	108	108	102	104
	5.9%	5.4%	6.0%	5.6%	5.3%	6.1%	5.7%	5.7%	5.3%	5.4%	5.1%	4.8%	4.3%
Others	3	8	11	19	26	33	35	38	33	30	29	33	32
	0.8%	1.5%	1.8%	2.3%	2.4%	2.3%	2.2%	2.2%	1.8%	1.5%	1.4%	1.5%	1.3%
Total	335	517	610	825	1,106	1,389	1,567	1,690	1,844	2,015	2,104	2,146	2,399
	100%												

SOURCE: T-C-99 Federal Funds for Research, Development and Other Scientific Activities, NSF 69-31, Vol.XVIII, U.S. Government Printing Office, Washington, D.C., 1970.

TABLE 2.6

FEDERAL OBLIGATIONS FOR BASIC RESEARCH: BY SELECTED AGENCIES: REPRESENTATIVE YEARS (millions of dollars)

	1953 Amount	%	1958 Amount	%	1961 Amount	%	1964 Amount	%	1968 (Est.) Amount	%
Dept. of Defense	65	42.5	111	33.1	173	20.9	241	15.4	288	12.4
Dept. of H. E. W.	15	9.8	50	14.9	137	16.6	274	17.5	412	17.7
Atomic Energy Commission	35	22.9	72	21.5	167	20.2	238	15.2	322	13.8
National Aeronautics & Space Administration	16	10.4	26	7.7	190	23.0	524	33.4	805	34.5
National Science Foundation	2	1.3	33	9.8	77	9.3	155	9.9	256	10.9
All Others	20	13.1	43	12.8	80	9.7	134	8.5	249	10.7
TOTAL	153	100%	335	100%	825	100%	1567	100%	2331	100%

TABLE 2.7

TRANSFERS OF FUNDS USED FOR PERFORMANCE OF RESEARCH AND DEVELOPMENT, BASIC RESEARCH, 1970 (ESTIMATED)

(1) All Research and Development

(Millions of dollars)

Sources of funds	Performers: Government: Federal	Performers: Government: State and local[b]	Performers: Industry[c]	Performers: Universities and colleges[d]	Performers: Associated FFRDC's[e]	Performers: Other nonprofit institutions[c]	Total	Percent distribution, sources
Government:								
Federal	3,650	53	8,500	1,525	725	600	15,053	55.0
State and local[b]	. . .	77	12[f]	380	. . . .	34[f]	503	1.8
Industry	. . .	2	10,738	60	. . . .	85	10,885	39.7
Universities and colleges.	. . .	1	. . . .	570	. . . .	. . .	571	2.1
Other nonprofit institutions	. . .	2	. . . .	140	. . . .	231[g]	373	1.4
Total	3,650	135	19,250	2,675	725	950	27,385	
				3,400				
Percent distribution, performers	13.3	.5	70.3	9.8	2.6	3.5		100.0
				12.4				

(2) Basic Research (Table 2.7 cont'd.)

(Millions of dollars)

Sources of funds	Performers: Government: Federal	Performers: Government: State and local[b]	Performers: Industry[c]	Performers: Universities and colleges[d]	Performers: Associated FFRDC's[e]	Performers: Other nonprofit institutions[c]	Total	Percent distribution, sources
Government:								
Federal	555	10	225	1,220	300	145	2,455	61.9
State and local[b]	. . .	20	4[f]	280	. . . .	21[f]	325	8.2
Industry	. . .	1	521	40	. . . .	20	582	14.7
Universities and colleges.	. . .	1	. . . .	420	. . . .	. . . .	421	10.6
Other nonprofit institutions.	. . .	1	. . . .	90	. . . .	94[g]	185	4.6
Total	555	33	750	2,050	300	280	3,968	
				2,350 (universities and FFRDC's combined)				
Percent distribution, performers.	14.0	.8	18.9	51.7	7.6	7.0		100.0
				59.3 (universities and FFRDC's combined)				

[a]All data are based on reports by performers. [b]These R&D funds based on NSF estimates using survey data for earlier years (State ... 1964 and 1965; local data 1966 and 1967). [c]Expenditures for FFRDC's administered by both industry and by nonprofit institutions are included in the totals of their respective sectors. [d]Includes agricultural experiment stations. [e]Federally Funded Research and Development Centers.

SOURCE: NSF 69-30. National Patterns of R&D Resources, U.S. Government Printing Office, Washington, D.C., 1969.

TABLE 2.8

HIGHER EDUCATION: HISTORICAL SUMMARY OF U.S. INSTITUTIONS: EXPENDITURES AND INCOME OF CURRENT FUND: 1947-1964

(Income thousands of dollars)

CURRENT FUND INCOME	1947-48	%	1951-52	%	1955-56	%	1959-60	%	1963-64	%
1- Educational & General										
Student Tuition	305,632	32.9	448,395	23.1	725,926	20.4	1,161,753	20.0	1,899,455	19.8
Veteran's Tuition	365,136		147,513		15,637		3,483			
Other Federal:										
Land Grant	43,173		49,376		72,616		88,297		119,756	
Research	95,270	7.9	221,105	11.8	355,576	13.1	828,734	17.8	1,797,095	22.6
Other Purposes	24,468		35,418		50,056		120,384		253,898	
State & Local Gov't.	405,421	19.8	692,601	26.8	998,499	27.5	1,540,986	26.5	2,374,020	24.7
Endowment Earnings	86,708	4.2	112,927	4.3	145,040	3.9	206,666	3.5	266,213	2.3
Private Gifts & Grants	91,568	4.4	149,925	5.8	245,539	6.7	383,186	6.5	551,507	5.7
Sales, Services & Other Educational Activities	129,438	6.3	178,141	6.9	272,870	7.5	379,058	6.5	568,088	5.9
	1,546,814		2,035,401		2,881,759		4,712,548		7,830,033	
2- Auxiliary Enterprises	466,667	22.9	511,248	19.8	693,975	19.1	1,005,963	17.3	1,610,426	16.7
3- Student Aid Income	. . .		21,058	0.8	53,039	1.4	94,248	1.6	150,871	1.5
4- Other	24,289	1.1	11,657	0.4						
Total Current Fund Income	2,037,770		2,579,364		3,628,773		5,812,759		9,591,330	

EXPENDITURES (in thousands of dollars) (Table : 2.8 cont'd.)

CURRENT FUND EXPENDITURES	1947-48	%	1951-52	%	1955-56	%	1959-60	%	1963-64	%
1- Educational & General Funds										
General Administration and General Expense	172,883	9.1	235,426	9.4	358,380	10.1	587,336	10.4	964,213	10.4
Instruction & Departmental Research	661,437	34.9	827,737	33.2	1,148,510	32.5	1,802,870	32.0	2,820,632	30.5
Extension and Public Services	72,458	3.8	99,287	3.9	141,074	4.0	208,378	3.7	298,185	3.2
Libraries	44,558	2.3	60,948	2.4	86,133	2.4	135,913	2.4	237,851	2.5
Plant Operations and Maintenance	202,908	10.7	241,564	9.7	326,260	9.2	473,682	8.4	689,327	7.4
Organized Research	160,823	8.4	320,362	12.8	506,097	14.3	1,024,399	18.2	1,982,892	21.4
Related Activity	85,527	4.5	148,321	5.9	222,345	6.3	294,344	5.2	459,458	4.9
Sales and Service Expenditures	. . .		. . .		. . .		9,134	0.1	13,832	0.1
Total: Educ. & Gen'l.	1,400,574		1,933,645		2,788,799		4,536,057		7,466,389	
2- Auxiliary Enterprises	440,531	23.2	479,333	19.2	639,721	18.1	917,943	16.3	1,455,227	15.7
3- Student Aid	. . .		39,795	1.6	96,224	2.7	173,963	0.3	303,371	3.2
4- Other Current	53,359	2.9	33,456	1.3	. . .		. . .		. . .	
Total Current Fund Expend's.	1,894,464	100%	2,486,229	100%	3,524,744	100%	5,627,962	100%	9,224,488	100%

SOURCE: Higher Education Finances, June 1968, U.S. GPO., Washington, D.C., p. 3. OE-52009

TABLE: 2.9

HIGHER EDUCATION: CURRENT FUND INCOME SOURCES FOR SAMPLE GROUP OF INSTITUTIONS, 1951-64

PUBLIC UNIVERSITIES

Year	Total (millions)	Student Fees	Federal Research	State	Other (2)
1951-1952	746	9.7%	N.A.	50.3%	N.A.
1953-1954	878	10.6	12.3%	51.4	25.7%
1955-1956	1,158	11.7	12.6	50.3	25.4
1957-1958	1,507	11.7	15.0	50.5	22.8
1959-1960	1,862	11.3	18.8	48.1	21.8
1961-1962	2,389	11.2	21.9	45.9	21.0
1963-1964	3,080	12.0	23.4	44.0	20.6

PRIVATE UNIVERSITIES (1)

Year	Total (millions)	Student Fees	Federal Research	State	Other (2)
1951-1952	478	30.3%	N.A.	7.0%	N.A.
1953-1954	520	34.2	20.9%	3.7	41.2%
1955-1956	625	35.1	20.9	3.6	40.4
1957-1958	789	35.1	23.3	2.9	38.7
1959-1960	1,030	32.9	29.6	2.9	34.6
1961-1962	1,336	32.1	32.5	3.0	32.4
1963-1964	1,669	29.7	35.2	2.7	32.4

(1) Includes 88 publicly and 58 privately controlled institutions.
(2) Includes endowment earnings and gifts and grants from individuals, philanthropic organizations, business corporations, and other private sources, etc.

SOURCE: Toward a public policy for graduate education in the sciences. National Science Board, 1969. U.S. Government Printing Office, Washington, D.C.

TABLE 2.10
CURRENT FUND INCOME: UNIVERSITY OF MICHIGAN:
SELECTED YEARS 1960-70

	1959-60	1961-62	1963-64	1965-66	1967-68	1969-70
1- Student Fees	9,466,303 9.1%	10,896,664 9.2%	13,599,235 9.6%	17,385,455 9.6%	25,501,952 11.3%	29,562,357 11.7%
2- State Appropriation	35,768,775 34.2	37,972,647 31.9	40,994,255 29.0	55,555,266 30.7	63,860,998 28.4	68,577,606 27.2
3- Federal Grants & Contracts	19,727,626 18.9	28,492,609 23.9	42,320,501 30.0	52,214,279 28.8	61,852,506 27.5	60,754,154 24.1
4- Gifts & Other Grants	12,281,546 11.7	8,274,790 7.0	7,390,628 5.2	12,328,611 6.8	14,024,609 6.2	16,875,044 6.7
5- Investment Income	2,441,630 2.3	2,949,782 2.5	3,059,472 2.2	3,607,303 2.0	5,005,963 2.2	6,081,187 2.4
6- Dep't. & Related Activity	not separately recorded	2,870,790 2.4	3,217,206 2.3	4,621,223 2.6	6,736,561 3.0	7,585,365 3.0
7- From Restricted Revenues. (not included in total)	(2,596,122)	4,459,436)	(4,592,347)	(4,718,942)	(710,914)	380,519 0.1
Auxiliary Activity	24,892,539 23.8	27,567,726 23.2	30,701,212 21.7	35,394,860 19.5	48,147,673 21.4	62,446,940 24.8
Total Revenue Less Transfers	104,578,419 100%	119,025,008 100%	141,282,509 100%	181,106,997 100%	225,130,262 100%	252,263,172 100%
Total Revenue Including Transfers	101,147,077	114,402,201	136,690,162	175,879,809	224,419,348	252,263,171

(Table: 2.10 cont'd.)

CURRENT FUND EXPENDITURES: UNIVERSITY OF MICHIGAN:
SELECTED YEARS 1960-1970

	1959-60	1961-62	1963-64	1965-66	1967-68	1969-70
EDUCATIONAL AND GENERAL						
1- General Administration and General Expense	5,450,582 5.3%	6,644,089 5.8%	7,118,790 5.2%	8,713,099 5.0%	9,744,100 4.4%	12,429,846 4.8%
2- Instructional and Departmental Research	33,369,146 33.0	35,053,565 30.6	40,821,646 29.9	50,634,046 28.8	62,228,523 28.4	72,926,504 28.7
3- Exten. & Public Services	2,535,405 2.5	3,084,128 2.7	3,888,778 2.8	5,092,214 2.9	5,134,382 2.3	5,315,770 2.0
4- Libraries	2,047,638 2.0	2,152,544 1.9	2,878,387 2.1	4,528,331 2.6	5,462,286 2.5	5,988,826 2.3
5- Plant M & O	7,889,757 7.8	10,717,964 9.4	10,932,865 8.0	13,699,469 7.8	19,645,099 9.0	22,183,734 8.7
6- Organized Research	20,887,068 20.6	26,659,806 23.3	37,095,117 27.1	45,622,743 25.9	53,372,355 24.3	52,421,010 20.7
7- Related Activity	217,170 0.2	204,416 0.2	. . . .	. . . .	. . . .	2,708,209 1.1
Auxiliary Ent. & Student Aid	28,567,444 28.2	29,885,689 26.1	33,902,743 24.8	47,580,907 27.1	63,827,216 29.1	80,363,309 31.6
Total Expense	100,964,210 100%	114,402,201 100%	136,638,326 100%	175,879,809 100%	219,413,961 100%	254,337,208 100%

SOURCE: Annual Financial Report, University of Michigan.

TABLE: 4.6

RESEARCH: COMPARISON, RECOGNITION LEVEL AND ASSOCIATION WITH RESEARCH: SAMPLE GROUP

ASSOCIATION WITH RESEARCH	RECOGNITION OF PROJECTS: No Recognition No.	%	Low Recognition No.	%	High Recognition No.	%		
1- No Significant Knowledge of or Association with Research	103 87.3%	73.6%	3 2.5%	3.0%	12 10.2%	5.4%	118	100%
2- Some Knowledge & Assoc. but Unrelated to Dissertation	12 9.1%	8.6%	35 26.5%	35.0%	85 64.4%	38.1%	132	100%
3- Some Knowledge & Assoc. Related to Dissertation	17 14.7%	12.1%	31 26.7%	31.0%	68 58.6%	30.5%	116	100%
4- Relationship with a Single Project	8 8.2%	5.7%	31 32.0%	31.0%	58 59.8%	26.0%	97	100%
TOTAL	140	100%	100	100%	223	100%	463	

TABLE 4.7

SAMPLE: TYPE OF SUPPORT RANKED FIRST:
BY YEAR, BY RECOGNITION LEVEL

(percentage)

	1st Year			2nd Year			3rd Year			4th Year		
	NO	LO	HI	NO	LO	HI	NO	LO	HI	NO	LO	HI
No obligation of time												
Fellowship	33%	35%	32	27	35	34	29	51	38	36	43	40
Loans & Savings	12	4	10	8	6	4	6	3	3	3	2	2
Spouse's Earnings	22	11	17	25	8	14	22	4	16	16	5	16
Time Commitment												
Teaching Fwp.	23	27	25	33	29	32	30	26	26	24	30	24
Research Asst.	5	20	13	4	17	13	7	12	15	8	16	16
Outside Employment	5	3	3	3	5	3	6	4	2	13	4	2
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
N :	134	98	220	132	97	218	126	91	216	116	81	183

(X^2=19.77 , 12 df. p=.10) (X^2=24.79, 12df. p.=.02) (X^2=27.98,12df.p=.01) (X^2=26.56,12df.p=.01)

TABLE: 5.1

RESEARCH:ASSOCIATION WITH RESEARCH: BY DEPT.

	No Assoc. NR		Some Assoc. Unrelated RNR		Some Assoc. Related RR		Single Project RP		TOTAL: Respondents		No Response	
Math	19	.39	10	.20	14	.29	4	.08		48	1	100%
Astron.	0		6	.40	7	.46	2	.13		15		
Chem.	5	.12	10	.25	15	.38	8	.20		39	1	
Geol.	2	.11	6	.33	2	.11	8	.44		18		
Bot.	0		4	.33	6	.50	2	.16	54 {	12		
Zoo.	6	.14	22	.52	11	.26	2	.04		42		
	32	.18	58	.33	55	.31	26	.14		174	3	
Psych.	7	.36	3	.15	5	.26	4	.21	77 {	19		
Psych.	1	.04	6	.25	10	.41	7	.29		24		
Psych.	2	.05	14	.41	4	.11	14	.41		34		
Anthro	4	.22	4	.22	2	.11	6	.33		18		
Soc.	2	.12	2	.12	5	.31	6	.37		16	2	
Econ.	4	.15	1	.03	8	.30	13	.50		26	1	
Geog.	1	.12	3	.37	4	.50	0			8		
Pol. Sci.	7	.33	7	.33	3	.14	4	.19		21		
	28	.16	40	.24	41	.24	54	.32		166		
Hist.	14	48	8	.27	4	.13	2	.06		29	1	
Engl.	40	.64	13	.20	9	.14	0			62		
	54	.59	21	.23	13	.14	2	.02		91		
Aero	3	.15	5	.26	1	.15	10	.52		19		
Mech.	1	.05	8	.40	6	.30	5	.25		20		
	4	.10	13	.33	7	.17	15	.38		39		
	118	.25	132	.28	116	.24	97	.20		470	7(.01)	100%

TABLE 5.3

RESEARCH: RECOGNITION OF RESEARCH: By Department and Division
Number of projects listed, Mean number
and Mean proportion recognized

Div. & Department	Number of Projects			Number of Projects Recognized Per Respondent				Number of Zero Recognitions
	n	Listed	Rank	Mean No.	Rank	Mean Prop. %	Rank	
I								
Mathematics	48	43	5	2.5	15	5.0	18	24
Astronomy	15	29	12	13.8	2	47.6	1	1
Chemistry	39	71	2	8.8	6	14.4	16	7
Geology	18	23	13	9.3	9	40.6	2	2
Botany	12	38	7	12.9	4	34.0	3	0
Zoology	42	81	1	16.4	1	20.7	11	7
	174	285		9.7		19.0%		41
II								
Psychology-Clinical	19	12	15	2.3	14	19.3	12	6
Psychology-Phys & Ex.	24	42	6	13.7	3	32.6	4	1
Psychology-Social	34	36	8	11.2	5	31.1	5	6
Anthropology	18	22	14	4.0	13	18.2	14	8
Sociology	16	32	10	9.6	8	30.3	13	3
Economics	26	34	9	7.4	11	21.9	9	5
Geography	8	8	16	1.8	16	23.4	7	3
Political Science	21	31	11	6.5	12	21.2	8	7
	166	217		8.0		25.4%		39
III								
English	62	3	18	0.8	18	28.5	6	39
History	29	6	17	0.8	17	13.8	17	19
	91	9		0.8		23.8%		58
IV								
Aero. Engineering	19	45	4	8.2	10	18.2	15	3
Mech. Engineering	20	48	3	10.1	7	21.0	10	1
	39	93		9.4		20.3%		4
TOTAL	470	604	..	7.4	..	22.7%	..	142

TABLE 5.4

RESEARCH: LEVEL OF USE: By Department and Division
Number of projects listed, Mean number
and Mean proportion of Uses

Div. & Department	n	Number of Projects Listed	Number of Projects Rank	Number of Projects Used Per Respondent Mean No.	(Rank)	Mean Prop. %
I						
Mathematics	48	43	5			
Astronomy	15	29	12	0.71	16	1.6
Chemistry	39	71	2	4.87	3	16.8
Geology	18	23	13	3.97	7	5.6
Botany	12	38	7	3.67	8	15.9
Zoology	42	81	1	5.0	2	13.2
Total	174	285		2.67	12	3.3
II						
Psychology-Clinical	19	12	15			
Psychology-Phys. & Ex.	24	42	6	1.63	15	13.6
Psychology-Social	34	36	8	7.58	1	18.0
Anthropology	18	22	14	4.03	7	11.1
Sociology	16	32	10	3.28	9	14.9
Economics	26	34	9	4.06	6	12.7
Geography	8	8	16	4.46	4	13.1
Political Science	21	31	11	1.12	14	14.1
Total	166	217		2.00	13	6.5
III						
English	62	3	18			
History	29	6	17	0.34	18	11.2
Total	91	9		0.69	17	11.5
IV						
Aero. Engineering	19	45	4			
Mech. Engineering	20	48	3	4.26	5	9.5
Total	39	93		2.85	10	5.9
TOTAL	470	604	. .	2.81	. .	97.8

TABLE 5.6
RESEARCH: ORIGINS OF ASSOCIATION WITH RESEARCH
PROJECTS: SAMPLE GROUP (number and percent)

	LISTED PROJECTS				ADDED PROJECTS			TOTAL MENTIONS (%)	
	A	B	C	D	E	F	G		
Assigned to Project as Part of Department Requirements	5	1	2	0	0	0	0	8	1.9%
Developed From Casual Contacts with Persons on the Project	42	27	15	6	17	3	1	111	26.9%
Invited to Join by Director or Investigators	56	19	6	5	38	6	1	131	31.7%
Followed up on Classroom or Seminar References	13	5	1	0	3	2	1	25	6.0%
Attracted by the Reputation of Investigator: Sought Connection with Project	31	10	4	1	4	3	0	53	12.8%
Joined Primarily to Supplement Income	11	6	1	1	8	2	0	29	7.0%
Other	21	15	8	0	10	2	0	56	13.6%
									100%

TABLE 5.7
RESEARCH: SOURCE AND FORM OF SUPPORT FOR LIVING EXPENSES:
1st MENTION: TOTAL SAMPLE (number of responses)

FORM OF SUPPORT

SOURCE	Personal Funds: Full Time Earnings, Savings	Teaching Fellowship	Research Assistantship	Partial Grant	Fellowship	Own Project	TOTAL	%
Self and Family	64	-	-	-	-	-	64	13.7
Chairman or Department	1	114	12	0	28	1	156	33.4
Research Center	2	0	15	0	3	0	20	4.3
Research Project	2	0	38	0	1	0	41	8.8
Other U/M Source	2	0	1	2	24	0	29	6.2
Employer	19	0	1	1	8	0	29	6.2
Government	5	1	8	1	88	6	109	23.3
Foundation or Business	0	-	-	0	16	0	16	3.4
Other	1	0	0	0	1	1	3	0.6
TOTAL	95	115	76	4	169	8	467	
%	20.3	24.6	16.3	0.9	36.2	1.7		100%

TABLE 5.8
RESEARCH: SOURCE AND FORM OF SUPPORT FOR DIRECT COSTS
FIRST MENTION: TOTAL SAMPLE

FORM OF SUPPORT

	Personal Funds	Teaching Fellowship	Research Assistantship	Services, Use of Facilities	Fellowship	Grant	Own Project	TOTAL	%
Self and Family	51							51	12.7
Chairman or Department		7	2	71	8	23		111	27.6
Research Center	1		6	12	2	1		22	5.5
Research Project			29	12	2	14	1	58	14.4
Other U/M Source			1	16	11	36		64	15.9
Employer	1	1		1	2	4		9	2.2
Government	1		7	6	31	17	6	68	16.9
Foundation or Business				4	6	6		16	4.0
Other					1	2		3	0.7
TOTAL	54	8	45	122	63	103	7	402	
%	13.3	2.0	11.3	30.3	15.7	25.6	1.7		100%

TABLE: 5.9

RESEARCH: SOURCE OF DATA AND INFORMATION: TOTAL SAMPLE

	First Mention		Second Mention	
	No.	%	No.	%
Own Collection	72	19.0	12	8.0
Within Dept.: Chmn., Lab., Facility or Station	53	14.0	36	22.2
University Facility: Libraries, Museums, Clinics	129	34.1	35	21.6
Research Center or Institute	37	9.8	17	10.5
Research [illegible]	32	8.5	11	6.8
Extra-University Facility Museum, Private Collection, etc.	25	6.6	31	19.1
Employer	4	1.1	4	2.5
Government: Nat'l. or State	22	5.8	8	4.9
Other	4	1.1	7	4.3
N=	378		162	
		100%		100%

TABLE: 5.10

RESEARCH: SOURCE OF TECHNIQUE AND METHOD: TOTAL SAMPLE

	First Mention		Second Mention	
	No.	%	No.	%
Self Developed	67	18.0	20	9.9
Chairman of Doctoral Committee or Other Members	81	21.7	47	23.2
Department Courses, Seminars, Laboratories	101	27.1	44	21.7
Conventions of the Discipline Literature in Field	48	12.9	29	14.3
Other University Facility: Library, Computer Center, Museums	30	8.0	22	10.8
Research Center or Institution	19	5.1	11	5.4
Research Project	15	4.0	9	4.4
Employer	10	2.7	16	7.9
Other:	2	0.5	5	2.5
N=	373		203	
		100%		100%

TABLE: 5.11

RESEARCH: SOURCE OF THEORY AND CONCEPTS: TOTAL SAMPLE

	First Mention		Second Mention	
	No.	%	No.	%
Self Formulated	69	19.0	20	9.6
Chairman of Doctoral Committee	89	24.5	58	27.8
Dep't.- Faculty, Courses, Seminars	93	25.6	57	27.3
Conventions of the Discipline or Literature in Field	87	24.0	42	20.1
Research Center or Institute	5	1.4	5	2.4
Research Project	9	2.5	5	2.4
Employer, Colleagues	8	2.2	16	7.7
Other	3	0.8	6	2.9
N=	363		209	
		100%		100%

TABLE 5.12

RESEARCH: PROJECTS IDENTIFIED BY DEPARTMENT & DIVISION, Number listed, and identified, Number of individual identifications

Div. & Department	Number of Projects A Listed	B Identified	C % Ident.	Number of Identifications D Total	E=D A Per Proj.
I					
Mathematics	43	36	83.7	99	2.30
Astronomy	29	29	100	189	6.52
Chemistry	71	66	92.9	393	5.54
Geology	23	23	100	165	7.17
Botany	38	37	97.3	163	4.29
Zoology	81	79	97.5	656	8.10
Total	285	269		1,516	5.84
II					
Psychology-Clinical	12	12	100	44	3.66
Psychology-Phys. & Exp.	42	39	92.8	237	5.64
Psychology-Social	36	36	100	329	9.14
Anthropology	22	19	86.3	61	2.77
Sociology	32	30	93.7	144	4.50
Economics	34	34	100	206	6.06
Geography	8	7	87.5	15	1.88
Political Science	31	31	100	132	4.26
Total	217	208		1,049	4.83
III					
English	3	3	100	51	1.70
History	6	6	100	19	3.16
Total	9	9		70	.77
IV					
Aero. Engineering	45	35	77.7	146	3.24
Mech. Engineering	48	38	79.1	199	4.14
Total	93	73		345	3.71
TOTAL	604	559	92.5	2,980	4.93

TABLE 6.2

TIME: ELAPSED TIME, BACCALAUREATE TO Ph.D. AND YEARS AS A FULL TIME STUDENT,
(Mean Years By Dept. and Division)

		ELAPSED TIME		FULL TIME YEARS	
	N	Mean	S.D.	Mean	S.D.
I					
Mathematics	48	7.08	4.34	4.50	1.459
Astronomy	15	7.20	4.00	4.267	1.981
Chemistry	39	6.15	4.02	4.41	1.409
Geology	18	8.22	3.32	4.278	1.487
Botany	12	8.83	3.19	5.583	0.996
Zoology	42	7.38	3.40	4.829	1.340
	174	7.19	(3.87)	4.590	1.455
II					
Psychology: Clinical	19	7.63	2.75	5.316	0.885
Psychology: Physical & Experimental	24	5.62	2.28	4.583	1.100
Psychology: Social	34	8.06	5.46	4.971	1.114
Anthropology	18	8.55	3.54	4.556	1.338
Sociology	16	8.00	6.29	4.375	0.957
Economics	26	7.19	3.68	4.038	1.038
Geography	8	12.00	6.00	3.50	1.069
Political Science	21	7.95	3.31	4.00	1.095
	166	7.75	(4.36)	4.512	1.169
III					
History	29	10.41	4.46	4.897	1.319
English	62	9.82	4.55	4.295	1.551
		10.01	(4.50)	4.469	1.4[illegible]
IV					
Aeronautical Engineering	19	9.84	5.19	4.737	1.593
Mechanical Engineering	20	8.75	5.46	4.053	1.[illegible]
	39	9.20	(5.20)	4.395	1.3[illegible]
TOTAL	470	8.11	(4.43)	4.527	(1.360)

TABLE: 6.3

TIME: ELAPSED TIME BA TO Ph.D, & SPONSORED PROJECTS
MEAN YEARS AND NUMBER OF PROJECTS LISTED BY DEPARTMENTS AND DIVISIONS
FROM NRC-NAS DATA FOR RESPONDENTS

	Mean Years	Number of Projects
I		
Math	7.08	43
Astron.	7.20	29
Chemistry	6.05	71
Geology	8.22	23
Botany	8.83	38
Zoology	7.43	81
II		
Psych.-Clin.	7.63	12
Psych.-Phys. & Ex.	5.62	42
Psych.-Soc.	8.06	36
Anthropology	8.50	22
Sociol.	8.00	32
Econ.	7.00	34
Political Science	7.90	31
III		
English	9.82	3
History	10.48	6
IV		
Aero. Engr.	9.84	45
Mech. Engineering	8.75	48

TABLE 6.6

TIME: ACCELERANTS: By Association & Recognition Levels

(6) If there were any special influences that acted to accelerate your doctoral studies in a beneficial fashion please describe them:

	Total No.	Total %		Association NR None	Association RNR Some Unrel	Association RR Some Rel.	Association RP Single Proj.	Recognition None NO	Recognition High HI
Personal: Positive	27	13.2	22.0	33.3	24.6	15.2	11.4	30.3	20.5
Personal: Negative	18	8.8							
Chairman or Faculty: Positive	60	29.3	32.7	37.1	27.9	30.5	36.4	34.0	32.2
Negative	7	3.4							
Financial Resources: Positive	49	23.9	29.3	22.2	32.8	26.0	36.4	23.2	34.0
Negative	11	5.4							
Admin. or Acad. Changes	11	5.4		3.7	4.9	8.7	4.5	5.4	5.4
Experience or Employment	12	5.9		1.9	4.9	13.0	4.5	3.6	4.5
Project Affiliation or Research Assistantship	10	4.9		1.9	4.9	6.5	6.8	3.6	3.5
	n= 205	100%		100%	100%	100%	100%	100%	100%
				n= 54	61	46	24	56	112
Percent reporting accelerants	43.6			45.8	46.2	39.6	24.7	39.7	48.9

TABLE 6.11

TIME: CORRELATION OF RESEARCH RECOGNITION WITH VARIOUS TIME ITEMS: BY DEPARTMENT

(Pearson's r values: p≥.05 Underlined)

I	Mean Proportion of Projects Recognized	Years of Full Time Study	Elapsed Time	Difference: Expected Actual	Estimates of Optimum Time Under Three Conditions of Support: Fellowship	Teaching Fellowship	Research Assistant
Mathematics	.05	.07	.04	.29	.11	.04	.05
Astronomy	.48	.48	.42	.42	-.10	-.04	.04
Chemistry	.15	-.05	-.24	-.23	-.01	.01	.26
Geology	.41	.36	.10	-.24	-.20	-.11	.23
Botany	.34	-.37	-.01	.34	.18	-.43	-.21
Zoology	.21	-.02	-.17	-.08	-.10	-.10	-.14
Nat. Sci.	.20	.127	.056	.038	-.059	-.038	.119
II							
Psych.-Clinical	.19	-.29	.22	-.25	-.08	.14	-.19
Psych.-Physio.	.33	-.08	-.19	-.16	-.52	-.48	-.49
Psych.-Social	.31	.03	.00	-.35	.02	-.05	.00
Anthropology	.18	-.50	-.44	-.59	-.45	-.37	-.20
Sociology	.30	-.11	-.16	.23	.07	-.03	-.27
Economics	.22	.20	-.51	-.50	-.03	--	--
Geography	.23	.03	-.85	-.85	.05	.24	.18
Political Sci.	.21	-.13	.35	-.06	-.38	-.35	-.24
Soc. Sci.	.25	-.066	-.168	-.309	-.200	-.212	-.221
III							
History	.14	-.03	.11	.02	-.41	-.42	-.38
English	.28	-.05	.11	.03	.17	.09	-.04
Humanities	.24	-.079	.096	.008	.002	-.089	-.186
IV							
Aero. Engineering	.18	.02	-.08	-.01	-.26	-.32	-.51
Mech. Engineering	.21	-.12	-.01	.04	-.08	-.25	-.20
		-.061	-.051	.008	-.176	-.279	-.321

TABLE: 10.2

CORRELATIONS OF OPENNESS & RESTRICTIONS INDICATORS & INDEX
WITH LEVEL OF RESEARCH RECOGNITION: BY DIVISION
(Pearson's r=: p.≐.05 Underlined)

	ALL SAMPLE	INDICATOR: DIVISIONS				INDEX: DIVISIONS			
		I	II	III	IV	I	II	III	IV
Expectations & Outcomes: More Rewarding.	<u>.200</u>	.087	<u>.371</u>	-.032	-.033				
Balance of Freedom:	.07	.037	.072	.026	.185				
Restrictive Factors: Fewer & Less Important	-.01	.010	.041	-.155	-.100	<u>.265</u>	<u>.337</u>	-.121	.031
Encouraging Factors: More & More Important	.213	.180	.257	-.013	.175				

TABLE: 10.3

CORRELATIONS OF PRE-PROFESSIONAL INDICATORS & INDEX
WITH LEVEL OF RESEARCH RECOGNITION: BY DIVISION
(Pearson's $r \geq .05$ Underlined)

	ALL SAMPLE	INDICATOR: DIVISIONS I	II	III	IV	INDEX: DIVISIONS I	II	III	IV
Variety of Experience	.242	.169	.319	.161	.124				
Professional Contacts	--	--	--	--	--	.262	.236	.108	.175
Next Career Directions	--	--	--	--	--				

TABLE: 10.4

INTER CORRELATIONS OF INTERACTION, PRE-PROFESSIONAL, AND OPENNESS INDEXES
(Pearson's r=)

	Nat. Sci.	Soc. Sci.	Hum.	Engineering
	I	II	III	IV
Interaction Index X Pre-Professional Index	.522	.232	.460	.110
Interaction Index X Openness Index	.409	.183	.237	.362
Openness Index X Pre-Professional Index	.396	.203	.155	.281

APPENDIX B

THE UNIVERSITY OF MICHIGAN
HORACE H. RACKHAM
SCHOOL OF GRADUATE STUDIES
ANN ARBOR, MICHIGAN 48104

March 1970

Dear Doctor Ford:

A relatively short time has passed since you achieved the most advanced formal degree offered by institutions of higher learning in the United States. For a graduate school it is important to know how the successful student used the resources the University holds and how he met the opportunities and problems of graduate study.

We enlist your help with this inquiry which has as its focus the later years of study, the doctoral years. The points of inquiry include; associations with groups, with persons, and with research activity along with the functions these associations served.

Questionnaires, we know, are rarely greeted with unrestrained joy. They are, nonetheless, one means of sensing the highly individualized responses that characterize graduate education. An attempt has been made to phrase these questions in terms that apply to a variety of fields. Where they seem slightly inappropriate to your field answer on the basis of your interpretation. Answers will be treated with confidence even though there is little that might be considered sensitive. The numbers identify field of study and year and will allow us to retain relationships among responses during processing.

Your answers are important on two counts. You have been selected because you finished your work recently and successfully. The group is not large and the range of individual response is very wide. To maintain the accuracy of the conclusions we are depending upon your answers. The questionnaire can be answered in several sittings and need not be completed all at once. It should take about 40 mimutes total according to the pretest experience and we ask you to return it as soon as you can.

Sincerely,

William Toombs

William Toombs
Assistant to the Dean

THE UNIVERSITY OF MICHIGAN
HORACE H. RACKHAM
SCHOOL OF GRADUATE STUDIES
ANN ARBOR, MICHIGAN 48104

April 1970

Dr. Anonymous Noman
6534 Scaramouche Drive
Outer Banks, N.C. 38976

Dear Dr. Noman,

Several weeks ago a duplicate of the enclosed material was sent to you at another address. Since then a mail strike, a trucking strike, and slowdown of airmail handling have added more uncertainty to the usual hazards of collecting information by mail !

You were one of a limited number of recent Ph. D. recipients from the University of Michigan included in the study. The aims are: To assess the experience of recent graduates rather than the opinions of those who are still in process or unlikely to finish. To explore the origins and uses of some non-financial resources as well as financial. To examine the perception and use by graduates of the research efforts within the University.

This study is a beginning effort in every sense but your help is needed with this first step. I can appeal only to your sense of professional courtesy in asking you to send back, as soon as you can, the completed document in the addressed postpaid envelope. In the event that the first copy went astray a second is enclosed.

If there are any bits of personal business at the University that I can attend to on your behalf -correct an address or record,etc.- just enclose a note with your response.

Sincerely,

William Toombs
Assistant to the Dean

THE UNIVERSITY OF MICHIGAN
HORACE H. RACKHAM
SCHOOL OF GRADUATE STUDIES
ANN ARBOR, MICHIGAN 48104

April 1970

Dr. Oriana Virtue
1793 Runnig Spring Rd.
Cinncinnati, Ohio

Dear Dr. Virtue,

The postal strike added a potential for disaster to the usual hazards of collecting information by mail ! The questionnaire sent to you on the eve of that walkout and just before the air mail slowdown went to a quite limited number of recent recipients of the Ph. D. from the University of Michigan.

The aims of the study are: To assess the experience of recent graduates rather than the opinions of those who are still in process or unlikely to finish. To explore the origins and uses of some non-financial resources as well as financial. To examine the perception and use by graduates of the research efforts within the University.

There is no completely convenient way of gathering this kind of personalized information from busy professional people. The mailed questionnaire has, at least, the advantage that the respondent may answer on his own terms and at times convenient to him.

This study is a beginning effort in every sense but your help is needed with this first step. I can appeal only to your sense of professional courtesy in asking you to send back, as soon as you can, the completed document in the addressed postpaid envelope. In the event that the first copy went astray a second is enclosed.

If there are any bits of personal business at the University that I can attend to on your behalf -correct an address or record,etc.- just enclose a note with your response.

Sincerely,

William Toombs

THE UNIVERSITY OF MICHIGAN
HORACE H. RACKHAM
SCHOOL OF GRADUATE STUDIES
ANN ARBOR, MICHIGAN 48104

April 1970

Dr. Eldorado Gully
Appt 3, Sandstone House
Mesa, Ariz.

Dear Dr. Gully,

Several weeks ago a questionnaire was mailed to you and I ask you to take a second look at it now. Only a small number of recent Ph. D. recipients in two engineering fields were included and, while the response so far has been good, it is necessary that we have as representative a set of responses as possible. Answers from those in the sample have displayed a remarkable amount of individuality in the experiences of the doctoral years. This makes it even more desirable to have your responses.

The aims of the study are: To assess the experience of recent graduates rather than the opinions of those who are still in process or unlikely to finish. To explore the origins and uses of some non-financial resources as well as financial. To examine the perception and use by graduates of the research efforts within the University.

This study is a beginning effort in every sense but your help is needed with this first step. I can appeal only to your sense of professional courtesy in asking you to send back, as soon as you can, the completed document in the addressed postpaid envelope. In the event that the first copy went astray a second is enclosed.

If there are any bits of personal business at the University that I can attend to on your behalf -correct an address or record,etc.- just enclose a note with your response.

Sincerely,

William Toombs
Assistant to the Dean

THE UNIVERSITY OF MICHIGAN
HORACE H. RACKHAM
SCHOOL OF GRADUATE STUDIES
ANN ARBOR, MICHIGAN 48104

GRADUATE STUDY AT THE DOCTORAL LEVEL

PART I: A PROFILE OF ACTIVITY AND SUPPORT

(1) If ALL of your doctoral work was taken as a part time student, that is at a rate of less than six credits a term or while you were fully employed, please check this box and turn to "3". ☐

(2) Each year of full-time study from a baccalaureate to a doctoral degree is represented by a column below. To indicate the kinds of support you used and their relative importance please rank by inserting a number, 1, 2, 3, 4, with "1" being most important, opposite the particular resource. Use no more than four numbers per column, less if appropriate.

	YEARS, TWO OR MORE TERMS, OF FULL-TIME DOCTORAL STUDY					
	1st	2nd	3rd	4th	5th	6th
AWARDS OR AID WHICH INVOLVED NO OBLIGATION OF THE STUDENT'S TIME:						
(a) Full fellowships, traineeships or full grants e.g. stipend, tuition.						
(b) Partial or supplementary grants, and awards. Less than $1,000 each.						
(c) Major loans from any source.						
(d) Savings or other personal sources e.g. deferred pay, employer contribution.						
(e) Earnings of spouse; family gifts.						
SOURCES WHICH REQUIRE SERVICE OR AN OBLIGATION OF TIME:						
(f) Teaching fellow appointment.						
(g) Teaching related assistantship; grader, reader, admin.						
(h) Research assistantship app't.						
(i) Research related employment, part time in the University.						
(j) Employment in the University on work not related to teaching or research.						
(k) Employment outside the University.						

(3) Did you have any research experience prior to entering doctoral study?

NO ______ YES ______ For how many years? ____________

What was the nature of the activity? ______________________________

____

(4) Briefly describe your present professional activity? ____________________

____

(5) For some individuals the graduate years are a time of great change in career orientations, for others the experience confirms previous plans. Reflecting on your own circumstances, rank the three most important career interests when you started with the three that were most important when you finished your doctoral work.

STARTING		COMPLETION
___	Writing, editing.	___
___	Teaching, lecturing.	___
___	Administration or management.	___
___	Research: theoretical and basic.	___
___	Research: applied or developmental.	___
___	Production: supervision or direction.	___
___	Other: ____________________	___

(6) If there were any special influences that acted to accelerate your doctoral studies in a beneficial fashion please describe them:

____

____

PART II: THE GRADUATE EXPERIENCE

These questions deal largely with personal evaluations of your experiences during the years of doctoral study. Feel free to make marginal notes to clarify a point.

(7) When you began graduate study you held some expectation of how long it would take. How much difference was there between your original expectation and the actual time required for the completion of the degree?

Actual time was shorter by six months or more.	___
Actual and expected time were about the same.	___
Actual time was longer by six months to one year.	___
Actual time was longer by one to three years.	___
Actual time was longer by three to five years.	___
Actual time was longer by more than five years.	___

(8) Knowing what you do now what would you consider the optimum number of years for the completion of the doctorate from first graduate registration under each of these conditions of support ?

All fellowship:_______ Half fellowship, half teaching assistantship:__________

Half Fellowship, half research assistantship:________

(10) Listed below are some of the disruptive factors cited by graduate students. Evaluate those which you encountered in terms of time lost through that factor.

	LESS THAN A TERM	ONE TERM TO 6 MONTHS	6 MONTHS TO 1 YEAR	LOSS OF ONE YEAR +
Illness or family obligations.	___	___	___	___
Military service or the Draft.	___	___	___	___
Insufficient finances for minimum level of living.	___	___	___	___
Expiration of grant or fellowship.	___	___	___	___
Inavailability or inadequacy of research material, equipment, or facilities.	___	___	___	___
Changes in membership of doctoral committee.	___	___	___	___
Inaccessibility of doctoral chairman.	___	___	___	___
Time demands imposed by a teaching fellowship.	___	___	___	___
Time demands imposed by a research assistantship.	___	___	___	___
Interruption to attain in-state fee and resident status.	___	___	___	___
Changes in departmental requirements.	___	___	___	___
Change of field from Bachelor's or Master's.	___	___	___	___
Difficulty in isolating an acceptable research topic.	___	___	___	___
Personal pressures such as poor work habits, overexacting standards, procrastination, boredom.	___	___	___	___
Indecision about career goals.	___	___	___	___
Academic problems, insufficient preparation.	___	___	___	___

(9) In contrast to all other schooling the time of a graduate student is not tightly scheduled or structured by formal means. He must construct his own timetable to know where he stands. Rank these factors in terms of their usefulness to you in scheduling your work. Use "1" for most useful and omit those which did not apply.

- -Department requirements which were specific and graduated. ______
- -Deadlines set by doctoral adviser for the completion of tasks. ______
- -The "expected" informal sequence communicated by other students. ______
- -Published Graduate School requirements providing general guidance. ______
- -Comparison of your timing with other students. ______
- -Self initiated requirements and deadlines. ______
- -External requirements: job waiting, limited leave, limited funds. ______

(12) Even in the highly individualized experience of doctoral study, associations with others have significance. Some of these relationships are touched by these questions of how much contact you have had with individuals in certain categories and which of four functions this contact may have served. Mark those which apply.

FREQUENCY: VERY OFTEN=Almost daily; OFTEN=Weekly; INFREQUENTLY=Monthly; RARELY=Once a term

VERY OFTEN	OFTEN	INFREQUENTLY	RARELY	ASSOCIATION	General Guidance	Critical analysis of work	Technical advice	Encouragement & moral support.
___	___	___	___	Doctoral chairman.				
___	___	___	___	Supervisor, employer on research.				
___	___	___	___	Course director while a teaching fellow.				
___	___	___	___	Member of doctoral committee.				
___	___	___	___	Particular faculty member in department.				
___	___	___	___	Faculty member in another department.				
___	___	___	___	Non-faculty staff member: research assoc., technician.				
___	___	___	___	Student in same field.				
___	___	___	___	Student associate in other field.				
___	___	___	___	Off-campus professional associates.				

(13) To get an accurate estimate of the quality of your own performance, how useful was each of these comparative standards? Rank by using "1" for most useful and skip those which did not apply.

Activity of close friends who were students in department. ____
Level of performance of all students in the department. ____
An "understood" level of achievement set by departmental tradition. ____
Comments of individual professors about specific tasks that were performed. ____
Guiding comments and criticisms from doctoral chairman. ____
Grades and published standards of the University. ____

(14) Of the prominent men in your field, outside of the University of Michigan faculty, how many did you encounter during your student years?

None___ 1 to 3___ 4 to 6___ 7 to 9___ 10 to 12___ More than 12___

(15) Which of the following kinds of activities or occasions characterized these encounters?

Worked on a joint project. ____
Corresponded or consulted personally. ____
Met in a department seminar or coffee hour. ____
Met outside department but on campus. ____
Heard paper read at professional meeting. ____
Conversed on a social basis. ____

(16) A number of typical group associations are listed below. During your years as a graduate student which memberships had a beneficial value for you and how important was the association? Mark those which apply.

	UNIMPORTANT	OF SOME IMPORTANCE	IMPORTANT	VERY IMPORTANT
Student peer group: those who began study at same time, shared some classes and seminars.	___	___	___	___
Work teams: research group, teaching fellows, fellow employees.	___	___	___	___
Discussion groups: informal seminars, "brown bag" groups, coffee hour groups, evening discussion groups.	___	___	___	___
Action groups: task oriented groups, reform groups, ad hoc committees, evaluation and suggestion groups.	___	___	___	___
Formal committees or boards: appointed or elected student or student-faculty groups.	___	___	___	___
Social groups in the department: friendship groups, intramural teams and athletic groups, theatre groups.	___	___	___	___
Extra-university groups:				
·Neighborhood groups	___	___	___	___
·Political associations	___	___	___	___
·Church or other religious groups	___	___	___	___
·Family, other than spouse and children	___	___	___	___
·Professional associations.	___	___	___	___

(17) In a large university many activities become specialized and institutionalized presumably to give more effective service to clients. What was your reaction to encounters with these divisions? Mark those which apply.

	ALWAYS UNFAVORABLE	USUALLY UNFAVORABLE	NEITHER FAVORABLE NOR UNFAVORABLE	USUALLY FAVORABLE	ALWAYS FAVORABLE
Department office.	___	___	___	___	___
Specialized Institutes or Centers.	___	___	___	___	___
Computing Center.	___	___	___	___	___
Specialized laboratories in departments.	___	___	___	___	___
School or college offices.	___	___	___	___	___
Graduate School offices.	___	___	___	___	___
Main Libraries.	___	___	___	___	___
Financial Aids office.	___	___	___	___	___
Accounting, payroll, business offices.	___	___	___	___	___
Office of Research Administration.	___	___	___	___	___
Registration and Records.	___	___	___	___	___
Technical services: shops, printing, etc.	___	___	___	___	___

(18) It is widely believed that students gain a great deal from associations with their graduate student colleagues. Please indicate your views on each of these statements related to that idea. Mark all.

	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
Other students, particularly the good ones, function as "pacesetters" to determine standards of academic performance.					
One is more likely to hear of new work in the field from fellow students than from class, seminars, or faculty.					
Reliable information about most departmental matters come first through student channels.					
There is considerable intellectual exchange on a rather advanced level among students.					
The reactions of other students provide some of the best critical analysis of one's work.					
The real orientation to graduate work comes from other students.					
The main contribution students make to each other is in the form of encouragement and emotional support.					
Information from other students is important only in the first year of graduate study.					
The influence students have upon one another is overrated by faculty and observers.					
Few students have anything of major value to contribute to the education of their fellows.					
Graduate study is primarily a "solo" experience and other students have only a small and relatively insignificant part in it.					
Competition among graduate students for recognition of all types is a major factor in most departments.					

(19) In your academic field which universities are generally ranked at the top?

1.______________________________

2.______________________________

3.______________________________

What source or information would you use to confirm such a set of ratings?

____

____

(20) How did the actual outcomes compare with your expectations on these facets of the graduate experience? Mark all.

	MUCH LESS REWARDING AND INTERESTING	LESS REWARDING AND INTERESTING	JUST ABOUT WHAT WAS EXPECTED	SOMEWHAT MORE INTERESTING AND REWARDING	MUCH MORE INTERESTING AND REWARDING
Course work: lectures and discussions.	___	___	___	___	___
Course work: seminars and laboratories.	___	___	___	___	___
Personal contact with faculty.	___	___	___	___	___
Informal departmental events: 'brown bags', coffee hours.	___	___	___	___	___
Formal departmental events: seminars for guests, faculty presentations.	___	___	___	___	___
Opportunities to participate in and observe ongoing research.	___	___	___	___	___
Chance to initiate research projects or original studies.	___	___	___	___	___
Opportunities for creative classroom teaching experience.	___	___	___	___	___
Opportunities to plan a course to be taught.	___	___	___	___	___

(21) Many activities in graduate study are a product of fine judgements about the amount of freedom that is most beneficial to the student. Without some guidance, time and effort are wasted while too much direction inhibits the development of natural talent. Working from this premise how would you rate the balance of freedom you met in making decisions in these areas? Mark those which apply.

	TOO LITTLE GUIDANCE	LITTLE GUIDANCE	BALANCED JUST ABOUT RIGHT	MUCH DIRECTION	TOO MUCH DIRECTION
Choice of courses.	___	___	___	___	___
Selection of cognate area.	___	___	___	___	___
Selection of specialized field or area of concentration.	___	___	___	___	___
Activity as a teaching fellow.	___	___	___	___	___
Duties as a research assistant.	___	___	___	___	___
Designation of doctoral chairman.	___	___	___	___	___
Selection of doctoral committee members.	___	___	___	___	___
Choice of dissertation topic.	___	___	___	___	___
Decision on Research design and methods.	___	___	___	___	___
Decision on first career employment.	___	___	___	___	___

(22) Before you settled on a final dissertation topic how many other ideas or projects did you explore? Number ______

Are you now following up on any of these? ______ If so, in what way? ________________

____

(23) At this point in your career and with full recognition of the oversimplication in these categories please indicate the direction you would prefer to move next. Select one.

Refine and intensify my special interests in the field.	___
Explore certain new trends in my major field.	___
Broaden my background by study in certain peripheral areas.	___
Acquire some general understanding of other major fields of knowledge and culture.	___
Change fields and begin building an added special competence.	___

(24) With which of these activities did you have experience as a student? Mark all those which apply.

Published article(s) as senior author.	___
Published article(s) as junior author.	___
Submitted one or more articles based on doctoral research.	___
Prepared or edited reports on other research.	___
Read paper at a professional meeting.	___
Designed a research project other than dissertation.	___
Prepared a formal research proposal other than dissertation.	___
Conducted seminars or discussion meetings.	___
Taught a regular class at advanced level; senior or graduate.	___
Supervised technical personnel on a project.	___
Participated in a consulting situation.	___
Examined a problem of professional ethics or raw responsibility.	___
Participated in a committee, team, or group charged with making formal recommendations.	___

(25) How significant was each of these factors in restricting the selection and development of a dissertation topic? Mark all that apply.

	UNIMPORTANT	OF SOME IMPORTANCE	IMPORTANT	VERY IMPORTANT
Equipment and facilities were limited.	___	___	___	___
Funds to support the full scope of the project were lacking.	___	___	___	___
Information and data were inaccessible.	___	___	___	___
Techniques for full analysis were unavailable.	___	___	___	___
Interests fell outside the areas of department or faculty competence.	___	___	___	___
Interests lay outside the conventional boundaries of the discipline.	___	___	___	___
Conditions of fellowship or traineeship required work in a relatively narrow subfield.	___	___	___	___
Association with and commitment to a sponsored research project limited natural interests.	___	___	___	___

(26) How important was each of these factors in encouraging the selection and development of a dissertation topic? Mark all that apply.

	UNIMPORTANT	OF SOME IMPORTANCE	IMPORTANT	VERY IMPORTANT
Ready availability of equipment and supplies.	___	___	___	___
Availability of funds to adequately support your study.	___	___	___	___
Accessibility of data, special collections, or observational opportunities.	___	___	___	___
Opportunities to consult and work with recognized authorities in the field.	___	___	___	___
Existence of an ongoing research project you could join.	___	___	___	___
Attraction of a new or vital area in the discipline.	___	___	___	___
Opportunity for interdisciplinary study.	___	___	___	___
Active encouragement from doctoral chairman or other faculty member.	___	___	___	___

PART III: RESEARCH AND GRADUATE STUDY

(27) There are many views of the influence that sponsored research projects in large numbers have had upon the contemporary university. On the basis of your experience and observations please evaluate in terms of agreement or disagreement these statements about the effects on the institution at large. Mark all.

	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
Sponsored research places the university in closer touch with the major problems and issues of contemporary society.	___	___	___	___	___
In almost all fields there are serious restrictions on information that close significant areas of research.	___	___	___	___	___
The intellectual environment of the university is stimulated by the exposure to reality given by project research.	___	___	___	___	___
Research of the project type increases the amount of supplies and equipment available but has little effect upon the cognitive or knowledge environment.	___	___	___	___	___
Teaching and research of the project type are fundamentally at odds and the university must content itself with commitment to one or the other.	___	___	___	___	___

(28) There is also a diversity of views on the effects sponsored research projects have on faculty and students On the basis of your observations please evaluate in terms of agreement or disagreement each of these statements. Mark all

	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
The educational importance of sponsored research derives from the financial support it provides to students	___	___	___	___	___
Close association with ongoing research is vital to a student's professional training	___	___	___	___	___
The heavy emphasis on sponsored research leads to the exploitation of graduate students as employees	___	___	___	___	___
The teaching competence of faculty members is visibly increased by involvement with research because they are kept in close touch with advanced thought in the field	___	___	___	___	___
Faculty members tend to be more sensitive to research sponsors and projects than to student needs.	___	___	___	___	___
The major value of research projects for graduate education lies in the opportunities they give for dissertation work.	___	___	___	___	___
Whatever the benefits may be it is clear that research involvement reduces contact between professors and students.	___	___	___	___	___
Too much association with sponsored research produces premature specialization in the graduate student	___	___	___	___	___
Project research increases student-faculty exchange by focusing their interests on a common point.	___	___	___	___	___
Students know very little about sponsored research projects that are underway in their department or program.	___	___	___	___	___
Research training and teaching competence go hand in hand for the contemporary scholar; there is no dispute between them.	___	___	___	___	___

#

The sets of questions that follow seek to establish your association with general research activities and the sources of assistance in your dissertation research. For this study the term "general research activities" is intended to include the full range of identifiable investigative efforts of others. It extends from the unfunded personal scholarly research of an individual professor through the sponsored faculty research projects and foundation sponsored research to the contract research at specialized institutes.

(29) Which one of the following statements best describes your association with general research activities during the later years of doctoral study ?

A.- No significant knowledge of or affiliation with research activity other than other than my own dissertation work. Answer the next 2 questions only. ☐

B.- Some knowledge of and some association with research activities but they were unrelated to my dissertation research. Skip # 31. ☐

C.- Some knowledge of and some association with research activities and they were related to my dissertation research. Skip #31. ☐

D.- Dissertation research was closely related and essentially part of one major research project which is identified in #32 below. ☐

To give a common base for comparing the wide variation in the research of doctoral students you are asked to accept this simplified model: A dissertation has as its foundation an original idea or set of ideas conceived by the scholar. In support and development of his basic notions he requires other components of research which are categorized for this study as:

SUPPORT for the living expenses of the scholar and his family.

DIRECT COSTS of the investigation including supplies, equipment, facilities, space and specialized services.

DATA, INFORMATION, opportunities for collection, for observation and for gathering similar raw materials for a study.

TECHNIQUES, METHODS, skills, designs, etc. which function as tools in the processes of collection, analysis, and interpretation.

THEORY AND CONCEPTS or notions which aid in the formulation and elaboration of the basic ideas.

(30) For you, what were the main sources for each of these components of research and through what auspices were they made available ? e.g. computer time by department. In the case of non-financial items we are particularly interested in how data, equipment, techniques, or ideas developed or associated in connection with one activity were shared, adapted, or reworked to serve other research purposes.

-SUPPORT: ____________________

-DIRECT COSTS: ____________________

-DATA, INFORMATION: ____________________

-TECHNIQUES, METHODS: ____________________

-THEORY AND CONCEPTS: ____________________

(31) You selected "A" in question 29: Answer this query and stop.
What was the situation with respect to research activity in the department or program in which you studied ?

Research was not available for student participation. ____

Research was available BUT I :-

- Did not obtain an affiliation with a project even though I did desire the association. ____
- Rejected a research affiliation in favor of more extensive teaching experience. ____
- Rejected a research affiliation in favor of a more intensive academic experience and a shorter total time. ____
- Rejected a research affiliation in favor of employment outside the University ____

(32) RECOGNITION AND USE OF RESEARCH: First scan the attached list of sponsored faculty research projects recorded by the Office of Research Administration for professors in your field of study for the years 1966 through 1968.

(a) If a project is merely familiar, mark the 'Recognition' circle as you read through.

(b) If a project was directly useful to your research work, write the identifying number on lines 'A'-'D' below. Then mark the columns to indicate its usefulness.

	THEORY AND CONCEPTS	TECHNIQUES, METHODS	DATA, INFORMATION	DIRECT COSTS	SUPPORT
A.________					
B.________					
C.________					
D.________					

(c) If a research activity that was of importance to your work is missing from the list or if it was not of the project type add it on lines 'E' - 'J'. Identify the director, brief title, sponsor (if any) and the location of the activity. Then check the columns. Personal research, some foundation research, and special outside research is likely to be missing.

(director) (title) (sponsor) (location)					
E.________					
F.________					
G.________					
H.________					
I.________					
J.________					

(35) How did you become associated with those projects or activities that proved most significant to your work ?

	A	B	_	_	_
-Assigned to the project as part of departmental requirements					
-Developed from casual contacts with persons associated with it					
-Invited to join by the director or investigators.					
-Followed up on classroom or seminar references.					
-Attracted by the reputation of the investigator and sought the connection with the project.					
-Joined primarily to supplement income.					
-Other ________					

THANK YOU VERY MUCH FOR YOUR ASSISTANCE !

GEOLOGY & MINEROLOGY

Recognize only

R	Prof.	Project Title	Sponsor
O	4769	Briggs, L.J.-Crustal Deformation in Saugre DeCristo Rouge	NSF
O	8075	Briggs, L.J.-Geology of the Hogback Basin, Wyoming	NSF
O	2512	Briggs, L.J.-Paleontology of Silurian Pinnacle Reefs	NSF
O	5976	Denning, R.M.-Crystal Cleavage	NSF
O	7617	Denning, R.M.-Study of Selected Properties of Neutron Irradiated Type I & Type II Diamonds	MMPP
O	8264	Farrand, W.R.-Lake Superior Coring III	NSF
O	8154	Goddard, E.W.-Radioisotope Dating of Rocks	NSF
O	6889	Heinrich, E.W.-Petrogenetic Studies of Carbonatites	NSF
O	5785	Kelly, W.C.-Thermometry of Ores	NSF
O	6070	Peacor, D.R.-Crystal Structures and Crystal Chemistry of Pyroxenes and Pyroxenoids	NSF
O	7325	Peacor, D.R.-Polytpic Phase Relations	AEC
O	8839	Peacor, D.R.-High Temperature Single Crystal Investigations	NSF
O	6054	Hibbard, C.W.-Plio-Pleistocene Faunas of the Snake River Region of Wyoming and Idaho	NSF
O	6619	Macurda, D.B.-Taxonomy of Blastoids	NSF
O	8587	Macurda, D.B.-Phylogenic Derivation of Perimian Blastoids	NSF
O	8345	Hibbard, C.W.-Late Cenozoic Faunas of Great Plains Region, Nebraska & Kansas	NSF
O	8078	Kesling, R.V.-Paleocology of the Miocene Choptank Formation	NSF
O	6055	Cloke, P.L.-Sulfide Solubilities	NSF
O	7916	Hough, J.L.-Geological Studies in Northern Lake Michigan	NSF
O	7055	Pollack, H.N.-Terrestrial Heat Flow	NSF
O	6567	Eschman, D.F. -Glacial Deposits	NSF
O	2437	Pomeroy, P.W.-Analysis of Long-Period Seismic Data	USAF
O	2637	Pomeroy, P.W.-Correlation of Long Period Seismic and Atmospheric Waves	USAF

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