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THE NOBLE EXPERIMENT:
SOCIAL SCIENTISTS IN ENGINEERING

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"The noble experiment has failed."

"It hasn't worked out the way the department head wanted. But there is more social science in the department because of him."

The above quotes are from faculty members in a university civil engineering department after a discussion of the negative tenure decisions for two social scientists who had been hired by the department head. This paper examines the forces which aided and hindered the attempt of the department head and a small group of social scientists to legitimate the membership and activities of social scientists in this engineering department. By focusing on this change effort as seen by the department head and social scientists, this study illustrates in microcosm several key issues about the development of academic disciplines. The paper proposes that the academic department is the arena where intellectual forces from several disciplines meet with the organizational forces peculiar to the university and combine to locally define (and re-define) the academic discipline. This case illustrates a particular category of the development of the academic disciplines--the addition of new members representing heretofore unincluded disciplines into a professional/academic department.
I. THE DEVELOPMENT OF ACADEMIC DISCIPLINES.

A. Organizational and intellectual factors.

The study of the development of academic disciplines has shown that both organizational factors, in the character of the universities, and intellectual factors, in the character of the intellectual climate of society, influence academic change. The importance of organizational and intellectual factors has been shown in two different types of disciplinary development—the creation of new fields and the evolution of subspecialties within disciplines. Ben David and Collins (1966) argue that a new role must be created in the overall intellectual community and in the university organization to allow a new field to "catch on" and become viable. Hagstrom argues that scientists attempting to establish a new subspecialty within a scientific discipline need: 1) leadership from key members with acknowledged superior abilities in order to win prestige; 2) dispersion of members across universities to have an impact in more departments; and 3) adherence to norms of individuality to prevent dilution of the subspecialty by the main discipline. Hagstrom describes how these organizational conditions influence the intellectual processes of problem-definition and methodology within the field, combining to achieve an acknowledged status for the subspecialty within the discipline.

The study presented in this paper addresses a third category of disciplinary development—the addition of previously unincluded specialties to an academic discipline. In this case, the main departmental discipline is civil engineering, and the new specialties originate within the academic disciplines of economics, anthropology, law and management.*

*The definition of law and management as social sciences is peculiar to this department, as will be discussed in a later section.
B. Civil engineering as an academic profession.

This section will present a schema of the professions which will place this study in the sociology of professions, and help the reader to better understand the characteristics of the people and the organization on which this paper will focus.

First it is important to understand that these faculty members are professional academics, not practicing engineers (or economists or lawyers).

Parsons and Platt (1973) distinguish between the academic profession, which is concerned with the "pure" cognitive resources in society, and the applied professions, which are concerned with the utilization of these cognitive resources in solving problems of clients in society. Although this division often cannot be made so neatly, it is clear that the primary role of these faculty members is not oriented to clients and production, but to scholars and publication. Although most do some consulting to stay in touch with professional practitioners, they are academic professionals.

Light (1974) presents a description of the structure of the academic professions which further defines these individuals. He first defines faculty as those people with academic appointments at institutions of higher education. He then lists the following characteristics of a profession:

1. It has exclusive powers to recruit and train new members as it sees fit.

2. It has exclusive powers to judge who is qualified.

3. It is responsible for regulating the quality of professional work.

4. It has high social prestige.

5. It is grounded in an esoteric and complex body of knowledge.
He defines a scholarly profession as "an occupation with the attributes of a profession whose core activity is the advancement of knowledge."

Finally, he defines an academic profession:

that subset of a scholarly profession with academic appointments at institutions of higher education. As a body, it exercises the first two powers of a profession and to a large degree regulates the quality of professional work. (Light, 1974, p. 11)

The concepts defining teachers and scholars and the academic profession is illustrated in this Venn diagram. (Light, 1974, p.11)

Figure 1: A Venn Diagram showing the relation between Faculty, a Scholarly Profession and their intersect, an Academic Profession.

Since all of these faculty teach in a university and publish research, they are academic professionals.

As Light points out, (1974, p. 12) there is not one academic profession, but one academic profession for each discipline, since
In the world of scholarship, the activities which accompany the five characteristics of a profession center on each discipline. (Light, 1974, p. 12)

That is, publication is aimed at a different audience for each discipline: judgment of quality is made by only certain people and according to criteria and process which they define. The legitimate area of expertise claimed by the profession is judged by its members, and so on.

In relating the academic professions to the rest of the professions, Light states that they are the "gatekeepers" for people through recruiting, training and qualifying new members.

I would add that they play a gatekeeping function for content, by adding new knowledge to the base required for professional certification, and by creating new professions when new knowledge demands such specialized attention. (Light, p. 12)

Civil Engineering qualifies as one of Parsons' and Platt's "applied professions". (Parsons and Platt, 1973, p. 94) Each type of engineering (civil, mechanical, etc.) can be seen as a separate profession in practice, represented by an "academic branch" (Light, 1974, p. 12.) which performs the gatekeeping functions. The members of the academic branch are academic professionals if they perform both the teaching and scholarly functions.

The functions of the members of the academic branch include not only teaching and research, but also the training of professionals. Ben-David (1972) describes the rapid rise of the "scientific (graduate-level) professional schools", which include all the above functions in a highly successful synergy. The university in this case is an ideal example of this type of school.

Ben-David (1972) also characterizes the kind of research which is done in these schools as "applied or problem-oriented science", which he calls "quasi-disciplinary research." (p.97) The term "adequately distinguishes
(these disciplines) from those fields that originated from attempts to solve problems defined by the internal traditions of a given science." (p. 97)

The department's relation to the "pure" science disciplines and the practicing professions was one of mutual influence. The department's members both made contributions and accepted new developments in both research and professional training. Because it is a department training professionals, the department found new areas where practical training could be changed by adding new areas of concern—in this case, socio-economic and political considerations. In its research, the department found the social science disciplines of economics, political science and anthropology and the profession of law added a new dimension to their current research designs. Overall, then, the addition of social science to the department's programs occurred on a number of fronts and in a number of ways. In the course of this study, it became clear that social science content was being added to the civil engineering department in two interacting modes, which I call the "domestic" and the "imported."

C. Integration of new content—domestic and imported modes.

In the domestic mode of integrating new content, some of the current faculty members in civil engineering (usually with engineering or science backgrounds) moved into doing social science work. For example, the transportation systems division faculty members were using a systems approach to analyze multi-modal transportation networks. They expanded their systems models to include not only physical and technological variables, but also social science variables such as income level of neighborhoods, environmental quality, political constraints and community values. They eventually developed systems models and planning techniques
which substantially incorporated the social variables usually studied by social scientists.

In the imported mode of adding social science, new members with social science backgrounds (credentials and experience) were added to the faculty. Instead of having a systems engineer add economic variables to his model, an economist was hired to work with the systems faculty to jointly develop programs which included content from physical and social sciences.

Historically, the domestic mode developed first in this department. However, the department head was impatient with the slow development of the social sciences in this mode. He therefore hired several social scientists and attempted to get their membership and work accepted as legitimate parts of the department.

This paper focuses specifically on the imported mode of adding new content. The data come mostly from the interviews with the department head and the social scientists and essentially represent their perceptions of the experience of attempting to become tenured, legitimate members of the department.

D. Key issues: loyalty to department or discipline? what is valid work? As in most American universities, the department is the prime locale of the reward system and identification for the faculty members (Straus, 1973; Litchfield, 1959; Caplow & McGee, 1965; Light, 1974). Promotion in rank, assignment to preferred tasks, and, above all, tenure, usually come within the tenure-track paths set out within a department. In professional/academic departments, a number of disciplines are relevant reference points for scholarly faculty research work. However, the activities which are most rewarded by the professionally oriented department are
not always those most rewarded by the scholarly-oriented disciplines. The question of loyalty to one's department or one's discipline is a key issue in this case for the social scientists.

A second key issue is the question of what is seen as valid work. Each department defines the professional/academic field in its own way by its members and the activities they choose to emphasize or ignore. The department—and indeed every level from project group to university—creates a map of the intellectual and professional terrain which the members then apply in placing the activities of other members. This definition of the field is based not only on the realm of knowledge claimed by the disciplines and professions at the societal level, but also on the narrow range of interests and particular specialties of the individuals involved. Although the question of what is seen as valid work may draw on sources outside the department, it ultimately reduces to a local evaluation. Organizational and intellectual factors both play a role, therefore, in each of these key issues.

II. RESEARCH DESIGN.

A. Institutional case studies of disciplinary development.

Because both organizational and intellectual factors influence the development of disciplines, it is important to study individual cases of change within single departments and universities. For example, understanding the dynamics of the creation of a new professorship in a new specialty in a disciplinary department can add to our understanding of the forces at work in the establishment of that specialty as a recognized subset of the discipline throughout the nation. Diner (1975) and Carey (1975), analyzing the development of the Department of Sociology at the
University of Chicago in the 1930's, demonstrate the influence of both broad intellectual features of the times and specific organizational conditions at that university. Ben-David & Collins (1966) argue that the creation of a new discipline requires both fertile intellectual ideas and supportive organizational positions to foster the growth of the ideas and the careers of the researchers. Their study shows that the supportive conditions must exist in several sites before the field as a whole can gain legitimacy in the overall sphere of intellectual activity.

This study focuses on the dynamics of change at a single institution to show how broad intellectual issues interact in a specific organizational setting. In any given academic department, the norms of the disciplines and the norms of the particular university meet and must be dealt with there in a local setting. The department acts on behalf of both the discipline and the university in making decisions on hiring, promotion and tenure. If change is to occur across the discipline as a whole, it must occur in a number of such localized settings. This case study of the addition of new social scientists to a civil engineering department illustrates in microcosm many issues in the development of civil engineering as a whole.

B. Methodology.

The data for this paper come mainly from interviews with the current and past department heads and with six of the social scientists who are on the departmental faculty.*

Additional information was obtained from respondents' resumes, Reports of the President and Chancellor which included reports by the department head and the dean, and the school bulletin listing the faculty.

*A list of the pseudonyms given to the "dramatis personae," along with their positions and fields, is attached as an Appendix.
and the subjects offered. This archival data was used in focusing the interviews, as well as in writing this analysis.

I interviewed both department heads in Summer 1975, as Professor Hyde was succeeding Professor Leeds who was going on sabbatical. I spoke with Hyde again in Spring 1976. I also used information from earlier conversations with Hyde, and from interviews with Leeds by another researcher who studied long-term change patterns in the department (Ehrmann, 1975).

The social scientists were all hired in the last eight years during Professor Leeds's term as department head. Five of them have graduate degrees in some field other than engineering--law, economics, anthropology and management. The sixth person has graduate degrees from an engineering-management program. His current work involves applying organization theory and economics to the analysis of the construction industry. His work is thus mostly social science. Two of the others have Bachelor's degrees in Civil Engineering, with one also holding a Ph.D. from the department in this study.

Of the six people I talked with, three are assistant professors with less than three years of service in this department. Two are associate professors with seven years of service whose tenure decisions were recently reached. The other person was appointed three years ago as a full professor with tenure to a joint appointment with the economics department after ten years in an economics department in another university. I selected representatives from each of the divisions in the department as it is currently organized--one from transportation, three from water resources, and two from constructed facilities. The six people I selected were the only ones I would classify on the basis of credentials as social scientists hired by the department.
I interviewed the social scientists in Spring 1976, using an interview guide as an informal checklist to guide the conversation. The interviews were very interactive, but generally covered the following range of topics: formal organization; teaching; research; other departmental or university activities; consulting; career issues, past and future, focusing on the current position; and field of study and professional identity. As the interviews progressed, an important issue emerged— the criteria used in evaluating their work—which was addressed in the later interviews.

C. Presentation via propositions.

The bulk of the data in this paper will be presented through a series of propositions. The term "proposition" is used to indicate that these summary statements are not so supported that they could properly be called "conclusions," nor are they so formulated that they could be called "hypotheses." They are tentative summaries, based on the data collected from informants who represent a subset of the viewpoints available to present a comprehensive view of this case. Throughout the discussion and analysis, suggestions will be made of alternative interpretations and additional data which would support or modify the propositions here. The propositions represent a coherent and comprehensive presentation of a complex analysis of an enormous amount of qualitative data. Most of the propositions are first-order propositions since they were derived from the data presented here, and have not been extensively tested using additional data. Where possible, data and theory have been used to elaborate the proposition to show both its plausibility and its limitations. The final section summarizes the main themes discussed throughout the case about the development of academic disciplines in institutional contexts. That section builds a relatively tight recapitulation of the central
conceptual argument without the qualifications present in the discussions of each of the individual propositions.

III. THE INSTITUTIONAL CONTEXT.

A. Introduction.

One important set of factors which affected the social scientists in their bid to become legitimate members of the department was anchored in the institutional context of this particular university and school of engineering at this time in history. This section describes that set of factors, beginning with the broad societal context of America in the 1960's and early 1970's, and progressing organizationally inward from the governmental, university, and school levels to the departmental levels of analysis.

This type of contextual anchoring is crucial in presenting a comprehensive and thorough analysis of the type of change described in this study. As later discussion will show, certain key elements of the institutional context prevented some of the efforts of the social scientists and the department head from being effective.

In studies which also focused on the institutional context of a developing discipline, Diner (1975) and Carey (1975) suggest that key organizational members and resources were extremely important factors in the development of the Department of Sociology at the University of Chicago. Organizational wealth and the willingness of leaders to use their resources in the pursuit of certain fertile intellectual ideas of the time combined to launch a powerful disciplinary development. Thus organizational factors can both help and hinder disciplinary changes.
In describing the historical and organizational context of the department, this section will describe some of the forces which brought about the arrival of the social scientists initially, and the constraints, opportunities and resources which existed during the time period covered by the case events.

B. The university.

The university is a private, technology-based major university (See Caplow & McGee, 1965, p. 23). It is medium-sized, with about 1000 faculty in 21 departments, and about 8000 students, most of them in graduate research and professional programs. There are five schools: engineering, science, architecture and planning, management, and humanities and social science. Engineering and science are by far the largest, together enrolling three-quarters of the students. Although technology has traditionally been the strength of the university, several departments in the social sciences and management schools are ranked among the best in the nation. In many ways the school exemplifies Kerr's description of the "federal grant university" (Kerr, 1963, ch. 2). In addition to dozens of departmental laboratories and centers, there are several interdepartmental and special laboratories whose research staff make up an "unfaculty" of another thousand or more researchers. Two-thirds of the revenue of the school came from sponsored research in 1970, with over 80% of these funds coming from federal sponsors. Of the total operating expenses in 1970, less than half was accounted to instruction and unsponsored departmental research.

In the late 1960's the university was hit by the decline in support for basic research and the general economic slump that affected all of higher education. Although the university as a whole held its own in research volume, the loss of key defense and space contracts, as well as
institutional support grants and federal fellowships, placed a severe strain on the university's general funds from endowment. Cutbacks were ordered in all support areas, and the number of faculty members was trimmed by some 10% between 1968 and 1972.

It is important to remember that the years from 1967 to 1972, the period just as this case is beginning, were times of great upheaval in American society and in universities, especially with protests over the Vietnam war, defense spending, and environmental concern. This university's campus was the scene of protests against defense research and alleged CIA-sponsored activities, as well as the prime target for the anti-technology sentiment of the times. Many members of the university community felt a severe threat to their closest values, often coming from other members of the community.

C. The engineering school and departments.

The School of Engineering has been a national leader in the number of doctorates awarded in engineering since the early 1930's (American Society for Engineering Education, 1968). It has also been ranked highly in quality in several surveys of deans and faculty members (Cartter, 1966, for example). The school awarded about 150 doctorates annually during the 1960's, plus 600 Masters' and Engineer's degrees and 400 Bachelors' degrees (Report of the President and Chancellor, 1974). As discussed in the previous section, the school serves a dual function of training scholars and professional practitioners.

The school is comprised of seven departments, each oriented to a branch of professional practice: civil, mechanical, metallurgical, electrical, chemical, ocean, and aeronautical engineering. The departments are each oriented strongly to their external disciplinary and professional fields,
and have a keen sense of their (generally high) standing on the national scene.

While the school dean has only a minor direct role in the incidents explored in this paper, his powers and posture toward the change effort are extremely important. In this school, the dean has the power of appointing department heads, although he uses a variety of advisory groups and strategies to gain information for the decision (Sorenson, 1975). His primary advisory body for policy and operating decisions is the school council, which is composed of the dean, the department heads, and the directors of the major centers and laboratories in the school.

The number and location of tenure slots, as well as the decisions on tenure candidates brought forward by the departments, are decided by the dean through discussions in the school council. In a new tenure review process begun in 1972, all junior faculty on the tenure track in all departments are reviewed by the council, not only those candidates brought forward by the departments, as had been done previously. This system functioned as an early warning system for junior faculty when the number of promotions and tenured positions was reduced in the early 1970's.

The dean's office has authority over the departmental budgets--both in setting accounting procedures and policies, and in determining the level of general funds allotted to each department. This became a major constraint on the department in this case, when a new program-based budgeting system was introduced in 1970 and general funds for the department were frozen at their 1969 level and subsequently reduced.

The dean's position on the integration of social scientists into engineering was basically consonant with that of Professor Leeds, the head of the civil engineering department. For example, in 1971 in his first report to the president, the dean wrote of the scope of engineering expanding from the "hardware phase" to include:
a "software phase" which relates to systems and to concept analyses, the need and impact analyses, and the identification of action and policy alternatives...the scope of engineering must include a concern to make meaningful solutions socially and politically feasible...It is clear that other fields such as economics, management science, and political science, must enter into the total process." (Report of the President and Chancellor, 1971)

As an example of the initial stages of the development of this "software phase," the dean cited Civil Engineering's "strong water resources development program which integrates a wide range of engineering disciplines with inputs from the 'soft sciences' to develop programs to help meet the crucial need for water" (ibid.).

These statements give us some indication of the dean's position in 1971, early in this case. They are representative of other "policy" statements made by the dean, and are indicative of his position on the social and policy aspects of engineering which were being discussed throughout the school.

In 1972, the school created a Center for Policy Alternatives to study the effects of technology and suggest alternatives in social and economic policies. The Center's Committee on Engineering Education studied social and economic trends and presented a set of alternative responses for the engineering education system (Committee on Engineering Education, 1975). This nationally focused study formed the basis for a self-study by the engineering school of its own goals, policies, and procedures, which continued through 1975.

Thus, there is some evidence that parts of the school shared civil engineering's concern for social aspects of engineering.

C. The civil engineering department.

Throughout the period of this case study, the department averaged 50 full-time faculty members in the professorial ranks, plus 25 non-professorial academic staff. About 100 undergraduate and 200 graduate students were enrolled in its degree programs.
In the 1950's the department faculty were mostly in applied mechanics in soils, structures, hydrology, etc. Professor Leeds characterized it as a "low technology" department with low student enrollment, competing with the more glamorous "high technology" departments in the school. At the low point of enrollment, the dean and the department heads considered terminating the department or merging its programs with another department.

In 1962, Professor Trevor was appointed department head with a mandate from the dean to revitalize the department, using the computer as his vehicle. He moved the transportation division away from its technology base and into a systems approach to analyzing transportation networks, their needs, siting, and operation. He used a subject allowing student "hands on" experience with the computer to successfully attract students. Many of the traditional department members either ignored the computer or used it as a tool to automate the tedious calculations in their current work. Trevor, however, saw it as revolutionizing the scope of the problems which could be addressed and the range of variables which could be included.

The transportation division was the first to bring in systems analysis to develop broader models including the social, economic and political variables that had previously been omitted from their technical designs.

In the water division, Professor Leeds and a small group took advantage of a temporary relocation of their offices next to the systems group to begin similar models for water systems. They staged a "mini mutiny" by refusing to return to the Division Hydrodynamics Lab offices until they had formed a self-sustaining critical mass of work and researchers. Some hydrodynamics faculty and most of the soils, structures and materials groups preferred to stay with the technical, engineering science approach which they felt was their strength.
Trevor created a Civil Engineering Systems Laboratory which housed a central computer facility for the department and systems-oriented faculty and staff representing each of the divisions. This group concentrated on the development of systems methodology across the divisions. The systems approach received great attention in engineering education, research and practice in the 1960's. However, it was not adopted by all the divisions and faculty of the department. Trevor introduced it in transportation, which has maintained the lead. Some of the engineering faculty in transportation began including social science variables, which seems to be the beginning of a domestic mode of integration. The imported mode began in transportation also.

In 1966, the first social scientist was hired by Trevor as a systems analyst in transportation. He had a graduate degree in agricultural economics. He was replaced in 1971 by another transportation systems analyst who had graduate degrees in economics. Meanwhile, an economist (Professor Waters) was hired into the water division by Trevor, but largely due to Leeds' influence. Leeds was the prime mover for systems development in the water division. A few members of the faculty in the construction-related divisions used the computer, but most of the faculty members in these divisions were not interested in introducing the "soft variables" in a systems approach to construction.

In 1970, Leeds succeeded Trevor as department head when Trevor became director of an interdepartmental lab. It is not clear how his appointment was seen throughout the department; but Leeds' view of the future clearly matched that of the Dean.
E. Effects of changes on the department.

Proposition 1: Changes in the department's institutional context created a push for social science skills, but tightened constraints on resources.

In the late 1960's, several important changes in the department's context--the nation and the university--took place. The national concern for the unanticipated effects of technology on the economic, social, and biological environments impacted the department in two ways. First, students demanded "relevance" in their education and programs addressing environmental problems. This change provided a market demand for environmental programs which the department could choose to develop.

Second, the sources, interests, and requirements of federal research sponsorship shifted. This shift hit the department indirectly through cutbacks in federal funds to the university from its traditional government sponsors in defense, atomic energy, and space. This and other factors produced a tight budget at the university level, which meant that university funds to departments were held constant and then reduced in the early 1970's. This made it more difficult to argue for new programs which required commitment of general funds.

In 1970, the engineering school introduced a new information gathering and accounting system using zero-based, program budgeting. The additional reporting in a new format added to the administrative burden of the department head and the individual professor.

The squeeze on funds was also coupled with a reduction in the number of faculty members between 1969 and 1972. The number of tenure slots opening each year was reduced, along with the chances of a junior faculty member achieving tenure at the school.

The shift in national priorities also required the department to deal with new federal sponsors--the Department of Transportation, Environmental
Protection Agency, and the National Science Foundation, for example. These sponsors were interested in research to help solve national problems in transportation and the environment. This gave the civil engineering department an edge over the high-technology departments since it had programs in these areas. But it also meant increased competition from other universities for funds in these areas.

Environmental concern also led to requirements for statements analyzing the environmental impact of construction projects (in transportation or energy facilities, for example) on the economic, social, and biological environments. This provided the department with the opportunity to develop methods of doing these analyses and incorporating these variables into the design of technological systems.

However, it also meant that those faculty members who were only interested in the technical and physical variables in their studies and designs were required to include some statement of environmental impact in order to have their requests for funds approved. As one of my respondents put it:

The engineers were emotionally and psychologically helpless in the face of the environmental and political concerns that were required of them. They were reaching out for help because their beautiful technical designs were being turned down because all their technical beauty wasn't enough for outside requirements.

In summary, the department members faced a period of tighter money and more administrative requirements on budget matters; fewer tenure slots and lower chances of receiving one; and requirements to pay attention to new variables. This last requirement was seen as an opportunity by some members to expand their work and by others as a burden which placed them in need of some help.
Obviously this short summary does not present sufficient evidence to judge the full effect of the contextual changes or the amount of resources available. The summary does point out two crucial areas of questioning where further data would be useful.

First, the "need" created in the department may have been felt very differently by different people. The data suggests that some people saw the changes in values as an opportunity to move into new areas, as a challenge to their desire to keep up with the forefront of the profession. Another group, according to my respondents, felt a need for someone to help them to meet the requirements, without interfering with the technical work in engineering.

The anthropologist in the group provides further evidence for the existence of these two types of responses:

Despite the fact that civil engineers (here) on the one hand, recognize the necessity for inclusion of social factors in engineering analyses; on the other hand, some of them prefer that I, as anthropologist-in-residence, should 'take care of all that,' thereby freeing them from the obligation to transcend study of physical systems.

Clearly a wider group of departmental faculty must be reached in order to decide if there was such a fundamental disagreement within the department about the role of the social sciences. Such differences may represent conflicting values which affect many other aspects of the integration effort.

More data are also needed about the levels of resources available to the department. The evidence so far is inadequate and contradictory. For example in funding, the department's share of university funds was tightly constrained, but I do not know the amount of outside funding and its ease of availability. Although the Dean advocated the addition of social science, other important supporting groups did not value this addition. The addition
of social science to engineering was debated throughout this time period by the entire engineering school. One might look for evidence of groups in the engineering school which paralleled the two groups within the department in their opinion of social science in engineering as burden or as opportunity.

F. The constraints of finding time and money.

In addition to money, status, and community support, the department's resources include the faculty members' time. For the individual faculty member, time is the most constrained resource.

Martin Trow sees "systematic distraction--the disruption of a man's work and thought by frequent demands on his attention from others" as "a major source of faculty stress." He attributes it to the overload of activities carried by each faculty member--research, teaching, consulting, professional organizations, administration, and organizational reassessment (Trow, 1970, page 90; see also Schein, 1970).

Professor O'Brien provides a fresh look at the phenomenon:

"Everyone is so very busy. I've had to start making a list of all the things I have and want to do, and making a cut-off at some point. This is the first time I have been so busy that I have to cut off and leave a number of things undone. I have to set priorities and list things."

According to my respondents, obtaining research contracts takes the largest block of time. In the engineering school, each professor is required to bring in a certain dollar amount of sponsored research to support graduate students and secretaries and to pay part of his own salary. In the civil engineering department, the minimum level is $50,000 annually by each member, from which nearly half of his salary is paid. Many of the professors feel this requirement seriously detracts from their "quality of life" and adds an additional burden to their already high "role overload" (Schein, 1970) and "level of distraction" (Trow, 1970). Andrews, the anthropologist
in the group, describes it as "frantic and frenetic grantsmanship." Many feel that the constraints on university funds worsened the situation.

Later we will see how, in the experience of my respondents, the tight time constraints and research dollar quota affect the quality of research and the opportunities for communication. The phenomena of overload, distraction, grantsmanship, and lack of time are important parts of the institutional context which affect every professor and limit organizational options.

IV. AUTOCRATIC LEADERSHIP AND ORGANIZATIONAL RESISTANCE.

The department head, Professor Leeds, had a forceful leadership style which he characterized as "autocratic." The following proposition is based on evidence from both department heads, and some of my respondents:

Proposition 2) The department head's forceful leadership style increased the resistance of some faculty members to the integration of social science.

To elaborate, some evidence on Leeds' style, his actions in the integration effort, and the reactions of some of the faculty will be discussed.

Leeds saw the department in a national leadership role:

I don't think we should be compelled by competition. We ought to act independently in light of what we think the profession should become. The eyes of the world are upon us.

We are producing leaders, not wholly responsive to the current demands of the profession, but looking to the future as leaders.

I do not have evidence which shows Leeds' vision of the future as he saw it in 1970, or that he had a clear vision of what the end state would be, or of how he planned to get there. I do have his recollections (and my respondents') of how he began the effort and his later formulations of the outcome of the integration effort.
First from Leeds himself:

There is a gradual change in faculty; some get older and retire, and new appointments can be used to replace them. If you want something happening overnight, you need real aggressive leadership.

I brought Laws and Pauls in, over the objections of some people. But I used my power as department head to say, 'No, this is it, they're coming.' I didn't have to win an intellectual argument.

Professor Laws remembered the beginning this way:

He knew from past experience the difficulties of inter-departmental groups here, so he decided to seize the opportunity himself. He had the power, the authority as department head, and decided to use it to get a group together in his own department.

From a relatively new professor, who was not here in the beginning:

It was Leeds' idea five or six years ago. It seemed to be quite autocratic, that he brought in social science by fiat. But he may have tried for or gotten a broad consensus, or maybe not. I really don't know.

Another respondent compared Leeds to the previous department head:

Professor Trevor had revolutionized the department with computers. Leeds saw social science as the way to make his revolution in the department.

This suggests that Leeds did have a forceful style of leadership. The evidence of the response of the department's faculty to his actions and style comes from the two department heads, Leeds and Hyde. First Leeds:

I began to push for expansion in water resources in the environmental program, then construction next; it hasn't arisen spontaneously out of that group; I've been trying to force it.

Elements in construction have resisted this; they are still very much technology-oriented.

Leeds pinpointed some of the traditionalists in the construction-related division as the prime source of resistance. Hyde commented on the reaction of some resistant faculty to the new social scientists but did not name them:
The department head brought these people (social scientists) in because he wanted something to happen in these areas—it was not originated from grass roots faculty interests. There was some resistance to the people and the areas for just this reason, no matter what actually happened later.

Clearly more data must be collected from the engineering faculty to hear their view of the experience of integration. Their "resistance" may be related to a preference for faculty initiation of "importing" new disciplines, or to a preference for development in the domestic mode before the imported mode of integration. Or it may be an expression of their desire for more participation in all departmental decision-making, not just around such change efforts as adding new disciplines. Or perhaps some preferred no change at all.

V. PRE-JUDGMENT BY OTHER SOCIAL SCIENTISTS: TURF DEFENSE

This proposition deals with a major obstacle to integration perceived by the social scientists in engineering.

Proposition 3) The social scientists in departments of social science in the university saw the introduction of social scientists into engineering as encroachment, and they defended their turf.

A chronology of the relationship between civil engineering and the social science departments will help explain the development of this proposition. According to Professor Waters, the first economist hired into civil engineering:

(The departments of) economics and political science did not help with economic and political science problems that the engineers had, when they were asked for help.

They were approached for a long time, for years, before I was hired. But they didn't want to help.

Waters offered two reasons for the social science faculty's refusal:

The reward system is set up entirely within the department for tenure and promotion. There is less payoff for doing out-of-department work, say helping the engineers. Therefore the people in the department of economics could not see much worth in trying to help the engineers.
There are stories of the engineers having a $400,000 project and just as it was nearly ended, they would run over to economics and say, 'Could you help us here, we need some economic or political statement here'—and the economists felt it was professionally degrading to them.

The first reason was echoed by Leeds' description of the economics department:

We can't use the economics department. They are a professional department, not a service department.

The economics department position was elaborated by Professor Egan, who now holds a joint appointment in both economics and civil engineering:

The feeling was that a competent economist would decline to service the engineers if he were interested in tenure...If one were to do service to the engineers, he would be unlikely to do work sufficient to fit the professional standards of the economics department.

This view that a "competent economist would not service the engineers" came up when Waters was hired. As he explains:

The economics department head at one point put up a notice that said that there was a threat to the economics department. This was right after I arrived. It essentially said that any economist who wasn't in the economics department wasn't as good, since if he was good enough, he would be in the economics department.

They must be worse, couldn't be as good. If they were the best, they'd be in the economics department.

This was discussed in a faculty meeting there.

Thus Waters confronted early the two key issues for the social scientists:

1) What is valid work? and 2) Who judges work and deserves loyalty—my department or my discipline? Waters was hired to teach applied economics:

Civil used to require an economics department course. But the department (civil) grew dissatisfied with it for two reasons. One was quality control—there were a lot of graduate students from economics teaching it. And the other reason was that they weren't interested in the same types of problems that engineers were. So now my course is required in civil. It was designed specifically to deal with the different kind of problems that engineers are interested in.
I suspect I represent a threat to the economics department...I teach students that they would otherwise teach in their own courses.

I think there is a legitimate concern by economics. They are afraid there will be an economist in civil engineering and an economist in chemical and an economist in ocean, and so on.

Waters suggests that his teaching economics in an engineering department threatened the economics department. However, since the economics department seems to have been reluctant to do service work, it is unlikely that they were concerned only about the loss of a few students from their courses. The loss of 100 students itself is important, since each department received some credit and resources from the university based on the total number of students enrolled in its courses. However, this loss is probably not as threatening as the loss of the power to train and to judge quality. A look back to the previously-listed characteristics of a profession suggests that the economics department felt a threat to its "exclusive powers to recruit and train new members as it sees fit" and its "exclusive powers to judge who is qualified" (Light, 1974, page 11).

This is illustrated by two incidents involving Waters and the economics department--their purported blocking of his tenure, and blocking of humanities credit for his subject. Waters explained what he saw as the source of the economics department's ability to block his tenure:

When I was brought in, Leeds referred to me as an economist.

Here there is an institutional pattern that if you have a degree in a field, and there is a department in that field here, then they have some say in your tenure and promotion decisions.

So since I was brought in as an economist, the economics department has this influence.

On reason why economics would use its influence to block his tenure has already been suggested--since he serviced the engineers, his competence must
be suspect. Another reason will be explained in more detail in the discussion in the next section--since he was an applied economist his work was not valued by the theoretically-oriented economics department.* Only data from the economics department members can verify if any of these were reasons to reject him, or if the department did block him. Waters claims that they did work against his tenure:

Soon after I arrived, Leeds told me that (the economics department head) would block my tenure.

Repeatedly, Leeds would send a letter and my publications to the economics department saying, 'What do you think of him.' And repeatedly they'd write back saying, 'He's all very well and good; he's doing good work and all... but we wouldn't want him.'

The denial of humanities credit to Waters' economics course was the origin of the proposition about "turf defense." In this university, undergraduates must earn a certain amount of credit in humanities courses taken from a list of courses which have been certified as appropriate for "humanities credit." It is advantageous to the engineering student if his required economics course is eligible for this credit, since the course helps satisfy two requirements at once and frees time for elective subjects. Waters describes the situation:

We had a problem with my subject in that I couldn't get humanities credit for it until just this last year. The humanities school was the sole judge of what subjects got humanities credit up until they changed the rules just last year.

Periodically I would put my course in for humanities credit, so it would be better for our students; and again and again the economics department head would reject it.

The head of the credit committee was from economics, so he and the department head could block it every time.

I assume it was a "turf defense" on their part; on the part of economics.

*Another reason to block his tenure must be considered--that the economics department's judgment that his quality was not sufficiently high was valid.
Thus far the proposition rests on Waters' description of his own case.

Professor Laws, the lawyer, added his view:

Waters hasn't gotten tenure due to the disapproval of the economics department.

Pauls, the political scientist, saw the writing on the wall with the decision on Waters, and decided to leave. He had similar problems with political science. It was a "turf" issue. Political science did not want political scientists in all the engineering departments.

The department heads in economics, political science, even management, have all been very hurtful to this whole program.

Civil is basically building a public sector management problem, and management didn't like that either. There has been chronic opposition to this program from that part of campus (economics, political science, and management).

Thus Laws corroborates Waters' view and adds examples of two other departments who might have felt encroached upon, and defended their turf.

The data so far have fleshed out several elements of the proposition which must be tested against data from the other social scientists in these departments. The proposition based on the available data is consistent with Light's work (1974) on the importance of the right of each academic profession to train and qualify its members. Struggles over this right to define the content and quality of work appear to be frequent at this university and others (Litchfield, 1959).

The data presented here suggest three issues on which to solicit the views of the social science department members: 1) the appropriateness of an economist (or political scientist) holding a position in the engineering school; 2) the value of the applied economics work; and 3) the competence of the individual hired in that position to do that work. Some additional data on the second issue will be discussed in the next section. But the disconfirmation or elaboration of this proposition requires direct answers from the other social scientists.
VI. (MIS) JUDGMENT BY THE DISCIPLINE.

A. Pre-judgment by the discipline.

The previous section showed how Waters, with an economics degree, confronted the central issues around the judgment of quality of his work. According to Waters and Laws, the economics department moved to protect their exclusive right to train by not granting his economics course the preferred status of a "humanities subject" and by moving to deny him tenure. If they did indeed block his tenure, they may have also been exercising their right to judge the quality of scholarly work. This section will discuss the differences in criteria for judging the quality of scholarship, with particular emphasis on the criteria used by the economics department and by Waters.

Two points from the previous discussion are especially relevant here. First, each discipline has its own standards and criteria of quality. The meaning attached to Waters' service of the engineers differs dramatically between the engineering and the economics departments. The engineering faculty valued his service while the economics department faculty used that service as the indicator that he was not an economist of their caliber. This pre-judgment by the economics discipline will be explained further as their criteria are discussed. Second, this judgment by the discipline is actually a judgment by the discipline only as it is locally defined by this university's economics department.

B. Differences in criteria between disciplines.

Light (1974) proposes that each academic profession--each discipline--has its own criteria and process for judging quality. The criteria and processes in law and engineering are contrasted here by Laws:
I've worked on radiation, power plant siting, carcinogens, land-use policy, noise levels, automobile pollution.

In all of these, the issues and the decision-making procedures are the same, the policy and management issues. The facts differ, and the actors differ.

But they all boil down, at least to a lawyer, to the same set of issues.

Q. Why did you say, "at least to a lawyer"?

A. One of the criticisms that...some of the engineers have made is that I have no critical mass of work, no body of work in one area.

Lawyers have a pattern to go through a variety of areas, dealing with the same sort of issues in various areas.

Law Schools require professors to rotate their teaching areas. In administrative law, which is my field, for example, a professor would be required to teach a variety of subjects--in public domain, in transportation, in regulation, in labor, in other industries.

There are a variety of subsets of issues pertaining to different areas.

Engineers look for lots of work in one area. Lawyers look for the same issues in a variety of areas.

There is no such thing as an environmental lawyer or a land-use lawyer.

A good lawyer addresses the same issues in a variety of areas, not just one.

The economist with the joint appointment commented on a similar dichotomy--economists stressing methodology, and engineers centering on problems.

Professor Egan:

I'd say economics is less problem-oriented, and more paradigm-centered.

Economists are sensitive to the tools they use. They are concerned with a method of analysis.

Economists are trained to approach problems in a particular way.

As an economist, I'd say methodology is very important.
We do our own thing, and it's elegant analysis.

People here are not interested in the nuts and bolts economics that the engineers are.

People are interested in creative analysis, in setting up a problem in a new way.

But people here would not reapply an existing model to some problem where it hadn't been done before. That kind of nuts and bolts application people here just aren't interested in.

Engineers do tend to be more centered in the problem than in the methodology.

Economists are a homogeneous group--there is a paradigm that's pretty well accepted.

Professor Waters concurs, and talks about the difference between his work in engineering and that work in the economics department in terms of the paradigm difference:

The other economists are very theoretical, interested in elegance and theoretical analysis.

I am very applied. Water Resources is in a stage of consolidation and applications. We are applying the early 1960's work (in the field).

Look at it this way. If a theoretical physicist, someone from the physics department, were to come to civil engineering to see what kind of physics was being done here, he would think it was sandbox level.

Well, that's what the theoretical economists would think of the economics that we do here. A theoretical physicist would have very little interest in the physics of building bridges. I like to do the social science equivalent of building a bridge.

C. The case of Waters: the danger of perceived inappropriate criteria.

Proposition 4) The economist in engineering believed he was judged according to inappropriate criteria.

Differences in the criteria of quality work are inherent in the differences between disciplines. Occasionally a person will be judged according to criteria which he perceives as inappropriate. Professor Waters' case is an example where the appropriateness of the evaluative
criteria is questionable. The previous proposition outlined how he saw the economics department using its influence to block his efforts at integration. He was quoted there as saying that this degree in economics made him subject to evaluation by the economics department at this university. He prefers to call his work "water resource planning" and his professional identity that of "water resource planner." But since he allowed himself to be called an economist by Professor Leeds he became subject to the economics department criteria. His work does not fit within the paradigm of economic analysis used by this department, but actually challenges it:

I feel constrained by "economist," because I feel that economists have missed the boat.

The purely economic paradigm that had existed before gave answers. But I felt that they were not what the political decision-maker was after. They had to be expanded to include other factors that the political actors could use.

There was tension of the analytical approach with the political process.

In this case it was a case of the paradigm being challenged by the encounter with the real world, not an internal theoretical challenge.

This has a lot to do with my uncomfortableness with economics. There is a theological belief in the traditional form of analysis. And I mean it is a theological belief.

And I just do not buy it as adequate.

The traditional argument is: "You can't do it all anyway, just do a piece of it as well as you can."

I would rather attack the whole problem. And for that you need more than the economics.

This incongruity between his work and his label led to a disparity between the expectations others had of him and his actual activities. With the economics faculty, his applied work belied their expectations of a high-quality economist. He felt that their criteria were inappropriately applied to him because his work was not "economics" and he was not an "economist,"
as they define its meaning. From his perspective, their negative judgment of him was inevitable.

D. The case of Waters: the danger of misplaced omniscience.

The title "economist" carried with it certain preconceptions of the person and the work for the engineering professors, including the department head, Leeds. According to Waters:

The preconception was very badly mistaken by Leeds.

He had a fraudulent intellectual view of social scientists. He thought that an economist is an economist; that any economist would do; they are interchangeable.

Whereas we all know that a civil engineer is not a civil engineer--some know about bridges, some about waves, some about highways.

There was this fallacious abstract notion that a lawyer or an economist or a political scientist could cover all viewpoints.

He was genuinely surprised when he'd call up to ask about something and be told, "I don't know anything about that," or "I can give you my own view, but someone else might see it differently."

This stereotyped view of economists led to an expectation of him which Waters felt was impossible for him to meet:

Leeds felt that his economist must excel as a traditional economist. That was one of his disappointments, my failure to be a good traditional economist (defined by the economics department criteria).

Stereotyping of members of other disciplines is a common phenomenon. The behavior of Leeds, and perhaps other engineering faculty members, illustrates the danger of misplaced omniscience (Luszki, 1958, page 263). With little prior exposure to economists, the engineering faculty might hold overly high expectations about the breadth and depth of knowledge of any single economist. Their high expectations are likely to be coupled with a relatively undifferentiated view of the field and its practitioners. Until there is
substantial communication between engineering professors and economists, the engineering faculty may not realize how many kinds of economists exist. In creating and using their own criteria for judging economists, the engineering faculty may not have thoroughly explored the differences in the criteria used by the economics faculty and Waters himself.

Using the available data, two questions remain unanswered: 1) Did the department faculty stereotype economists and social scientists? 2) If the stereotypes were widespread, have the original assumptions and criteria been reexamined after substantial communication among faculty members?

VII. ORGANIZATIONAL STRUCTURE AND INSTITUTIONAL CULTURE

A. Communications and sharing of criteria.

The last section argued that communication among faculty members is a necessary step to the sharing of their judgmental criteria. "Judgment" as it is used here refers not only to the one-time decision-making of a tenure review committee, but more broadly to the countless appraisals which occur at every interaction between people. The process of judgment postulated here is akin to Vickers' "appreciation" which involves:

...related judgments of reality and value. These appreciative judgments reflect the view currently held by those who make them of their interests and responsibilities, views largely implicit and unconscious which nonetheless condition what events and relations they will regard as relevant to them, and whether they will regard these as welcome or unwelcome, important or unimportant, demanding or not demanding action or concern by them. (Vickers, 1965, page 67)

The criteria used to judge quality in this case are very similar to the Vickers' "schemata of values used to appraise reality."

As Vickers (1958, 1965) points out, the schemata of criteria and
values which make up appreciative systems resist radical change. They tend to change slowly over time by correcting mismatches and internal inconsistencies. Since new categories and new patterns of organization are likely to arise through the interaction of people having different values, communication is crucial in the process of values change. Communication, especially around substantive issues where different viewpoints become apparent, is crucial to the development of a shared set of criteria and values.

In this approach, the sets of criteria used and the judgments made are expressions of the different systems of appreciation used by the actors in this case. The judgments are the reality, as socially constructed by each person and group (Berger & Luckmann, 1967). The integration effort can then be seen as an attempt to create a shared appreciative system, jointly constructed by the social scientists and the engineering faculty. The department head's efforts to create a shared system were hampered by 1) elements of the institutional context which hindered communication, and 2) the rigidity of the existing schema.

B. Reorganization and institutional limitations.

This section further demonstrates the rigidity of the judgmental schema by showing their resistance to change when lines of communication were opened. Certain elements in the institutional culture limited the effectiveness of these communication efforts.

The opportunities for interaction are few in the individualistic world of this university. Professor O'Brian of the construction division describes the limitations he felt due to the lack of informal interaction:

I've been disappointed in the lack of informal interdisciplinary interaction.
Everyone is too busy doing their own thing.

Structured, formal things are possible—joint teaching, joint research proposals and projects. But informal things don't exist because everyone is too busy doing the formal things.

The system won't allow room for the informal—you are forced into the formal structure in order to do anything.

It's the case of the structured driving out the unstructured activities.

I haven't been able to develop informal relationships with people. I've had to do formal things like joint teaching and research to get to interact with people.

The department head, Leeds, tried to stimulate informal communication by grouping people together geographically, to increase the chances of meeting in the halls, the restrooms, etc. Geographic proximity had helped in the development of the critical mass of water resource systems faculty, and he attempted to use it again here.

Leeds tried to change the formal structure when he realized the limitations of the informal communication channels. In 1974, Leeds reorganized the department, in an attempt to encourage communication and to help give the social scientists a stronger collective identity in the department.* He created a matrix organization, with the former functional divisions in one dimension and new disciplinary groups cutting across the divisions orthogonally (see Diagram, next page). He formed three new groups—physical systems (applied mechanics and dynamics in each division), systems methodology, and social and management systems. Each disciplinary

*The effects—and motives—of the move were complex, since Leeds also combined the three construction-related divisions under one head, in addition to creating the cross-cutting disciplinary groups. Earlier we saw evidence that he was trying to force change upon some members of these divisions. One might suspect therefore that this move was part of that persuasion, since it reduced their power. There would only be one division head, not three. He appointed a faculty member from this division to head the physical systems disciplinary group which may have softened the blow.
ORIGINAL STRUCTURE

Department Head

Division Head

WATER RESOURCE DIVISION
Faculty

Division Head

TRANSPORTATION SYSTEMS DIVISION
Faculty

Division Head

STRUCTURES DIVISION
Faculty

Division Head

MATERIALS DIVISION
Faculty

Division Head

SOILS DIVISION
Faculty

NEW STRUCTURE

Department Head

Department Council

Division Head

WATER RESOURCE DIVISION

Division Head

TRANSPORTATION SYSTEMS DIVISION

Division Head

CONSTRUCTED FACILITIES DIVISION

Physical Systems Group

Disc. Group Head

Systems Methodology Group

Disc. Group Head

Social and Management Systems Group

Waters

Laws

Andrews

Egan

O'Brien

Massey

Disc. Group Head
group had a spokesman to speak for the members' activities which were along disciplinary lines. As Professor Leeds said:

(This will give) the faculty some security, some feeling that their efforts will be rewarded. All dimensions of a person's activity will be spoken for. The disciplinary groups will produce some sense of collegiality. Organizing and supporting seminar series, for instance--we have given them money for that. It gives people at the next lower level of responsibility room to swing a cat and a cat to swing.

Each faculty member was assigned to one box in the two-dimensional matrix, in one division and one group. The functional divisions retained most of the resources and power for admitting students and assembling academic programs. But now the disciplines had a spokesman on a new departmental council, made up of the heads of the divisions, the heads of the groups, the chairman of the graduate and undergraduate committees, and the department head.

Leeds intended the move to help encourage the social and management scientists to work together toward a "critical mass" of people and activities; he drew an analogy to his palace revolution within the water division, mentioned earlier. He also said:

The faculty will have to look two ways. We are trying to somehow make more of the parts than they are separately.

Did this attempt to encourage communication, collaboration, and integration succeed? A preliminary evaluation based on the data so far indicates that the matrix structure has been largely ignored. This is true especially of the disciplinary groups. My respondents referred to the groups as: "not important," "non-existent," "non-entities," "don't tie together very well," "almost dead."

The disciplinary groups had not met more than once or twice in two years. Waters describes one of the main reasons why the matrix did not work as intended:
A big problem is the time constraint. It takes time to get together and interact to make the matrix work. And people are so busy with contract research that they don't have the time to devote to the interaction that's necessary to make it work, to see each other and talk with each other.

Thus one of the most salient aspects of the institutional culture was seen as the major obstacle to the operation of the new organizational structure.

The matrix was intended to help the evaluation process by giving each disciplinary group a spokesman. In the long term, this may prove to be a useful role; but Professor Laws feels the group and its spokesman would be helpful in evaluation "only if they (a group of lawyers) were legitimate; only if they had tenure."

C. The case of Laws: underservice and the danger of disconnection.

Law's tenure decision raised a different issue about the structure of the department. As he describes it:

I built a strong substantive case. There were about 25 letters, lots of input from the people I worked with on the national committees, presidents of Bar Associations, etc.

Now I've been told there is no programmatic context for me.

My work is not really just in water resources, because I've worked on radiation standards and other issues.

Should it be in civil engineering then? My work transcends civil engineering too--I'm dealing with agency decision-making, and not just in civil but other fields as well. So maybe it should be engineering-school-wide, or some other kind of position.

The case was turned over to the Dean. He didn't really know how to handle it.

He appointed two committees to review my case--an inside committee and an outside committee to review the substantive case.
Apparently the outside committee approved the substantive merit of the case, because it went to the inside committee. So it was left to the inside committee, and they decided there is no programmatic context for me.

Their next question was: "Should we create a new kind of professorship?" since they felt that was what was required.

And their decision was that this is not the time to do this major structural change.

A school-wide appointment was too great a change in the structure of the school, and Laws had weak ties to the existing structure of the department, leaving him with "no programmatic context." His ties to the department were weak because he did very little work in collaboration with the water division, his nominal home. Laws recalls that:

Leeds told us that we were accountable to him, not to the division head or anybody else. Once a year we reported to him about what we had done and were doing.

It is possible that this lack of any strong substantive tie to the division may have led Laws and the division's head and its members to have little commitment to each other.

Proposition 5) The loyalty of the lawyer to his discipline rather than to his department left him disconnected from the department.

Laws encountered the issue of loyalty to discipline or department when department members asked him to act as a service resource for their projects. He recalls:

They wanted things that were often very trivial to a lawyer.

For example, in water resources, much of their work is in thermal pollution models. They are no longer developing the model as such, but are applying it at various sites around the country. So they would call up to ask what the State of Connecticut will say if we don't include a certain fish in our model.

That's not what a lawyer would want to do; it's such a trivial thing.
Q. Did you expect it?

A. Yes--but I made no effort to get into it.

They see you as a sort of resource they can call on with a problem.

There is no integration into the department, into the work. You are not included in the research, you have no part in the conceptualizing of the project. You just get called up at the end to finish up this little problem.

His reaction was similar to that of the social scientists in the existing university departments who felt it was "professionally degrading" to participate on such terms. Laws, however, had difficulty in participating at a higher conceptual level:

(My research) has been primarily projects of my own, say 10 to 12 projects in the last 5 or 6 years. In the first few years, I was drafted into some large technological projects. But it was usually late in the game or for some trivial problem, in some limited capacity.

Some projects outside the department allowed the early participation in the conceptualization. But within civil, I was unable to get to be involved and integrated into their projects.

His efforts to participate only on his own terms may have prevented him from "building bridges" to the engineering professors at any level:

The opportunity to be independent and autonomous, not to have to do what somebody else tells me to do, is very important to me.

Laws' stressing the importance of autonomy is consistent with research which shows that autonomy is a central value in the academic profession (See Schein, 1970). Laws sees this independence as a major obstacle to interdisciplinary work.

In summary, it seems that Laws was willing to be a resource to a technical project, but only on his own terms. The engineering faculty may
have seen it as a refusal to give them the service they requested. His
disconnection from the division and the department may have been a factor
in the "lack of programmatic context" given as a reason for denying him
tenure. As he said:

I paid attention to outside criteria, to government
involvement and outside activities. I didn't pay
enough attention to criteria in this department.

D. The case of Waters: overservice and the danger of cooptation.

Earlier discussion showed that Waters was apparently penalized by the
economists because he was willing to be a resource for the engineering
department. Laws commented: "Waters did more work that was locally
relevant." Waters himself had this comment:

My own personal view is that if you don't help the
engineers, they will go do something worse. If you
don't do something for them, then what they do will
be worse than if you did at least something.

Waters' view of his field, water resources, as interdisciplinary may have
led him to see the interdisciplinary participation more positively. In
discussing his connection to the organizational structure of the division,
department and school, he said:

It is normal in water resources to have interdisciplinary
approaches and practices at other places in water resources.
This department is my natural home, my normal home of all
the departments here. I am doing normal work in water
resources.

As we saw previously, he defines his field as water resource planning,
although his degree is in economics. His graduate program was interdisciplinary,
including course work in economics and political science and research with
representatives of engineering and public administration. Lest the reader
hastily conclude that Waters became the servant economist in the department,
this additional quote modifies his view:
Leeds would call up and say "an economist is needed in ocean, or in transportation, or whatever--go do something." And I would generally ignore it. I prefer to be autonomous.

Although he was willing to work with the engineering faculty, he set his own limits on which requests he would respond to. Professor Egan saw him as responsive to the "resource demand":

Waters has never built bridges to the economics department. He loves working with the engineers.

Andrews, the anthropologist, brought up a danger in being perceived as too cooperative:

There is a chance of social scientists being co-opted by the local culture--losing perspective of social science, losing their social science character. I'm talking about applied social scientists, not pure researchers.

If disconnection from the organization is the risk of underservice, then disconnection from one's own discipline and cooptation by the organization may be the risk of too much service work (See Schein, 1972, page 66).

E. The case of Egan: It works, if...

Professor Egan seems to have found a way to accommodate both the organization's need for a resource service and the disciplinary values of autonomy and quality which mitigate against doing trivial work:

I have a large grant from the Department of Transportation with a professor from aeronautical engineering. He is an engineer with some economics background.

We are doing a large project on policy models of the transportation industry.

This particular project is less fraught with conflicts than one might expect. We can do both the elegant and exotic economic analysis and the nuts and bolts that the engineers want. There is enough breadth and scope to allow this.
This allows her to fulfill her obligation to the engineering department in a way that is consistent with her values as a theoretical economist. Her case is not just a matter of a large project, however:

Let me tell you why I think interdisciplinary work is easier for me than for some of the others. Basically it has to do with the fact that I have tenure and the others do not.

I came here on a joint appointment with the transportation division of civil and the economics department.

The economics department had talked about this and had decided that any joint appointment should be at the tenure level. It would not work to have someone trying to service the engineers and still gain tenure in economics.

From the faculty meetings it was generally agreed that this was almost impossible to do at the non-tenure level. If one were to service the engineers, he would be unlikely to do work sufficiently to fit the professional standards of the economics department.

I am able to sort of finesse this issue at the tenure level.

Her comment suggests that once one has passed the qualifying evaluation and attained the status of tenured professional, one is less subject to organizational demands.

VIII. THE ACADEMIC DEPARTMENT AS CULTURE BROKER FOR DISCIPLINES AND ORGANIZATION.

This study focuses on the addition of new content to an academic discipline within the institutional context of a single academic department within a specific university. In this study, the academic department is viewed as the meeting place for the two sets of factors which influence academic development. The department is influenced both by the norms and practices of the disciplinary fields to which its members belong and by the norms and practices prevalent in the specific university of which it is a part.
A. Disciplinary factors.

The set of disciplinary factors for a department of civil engineering (as in this case) has two sources. In its training of engineers, the department acts as part of the applied profession of civil engineering practice. In its scholarly research, the department acts as an academic/scientific discipline.

Ben-David (1972) describes the rapid rise of the "scientific-professional schools" which combine research, teaching and training for professional practice. He characterizes the kind of research done in schools such as this as "applied or problem-oriented science," or "quasi-disciplinary research." The term "adequately distinguishes (these disciplines) from those fields that originated from attempts to solve problems defined by the internal traditions of a given science" (page 97).

Although their research is not in the strictest sense "science," the work of civil engineering professors shares many of the features of the work of academic scientists. The most important commonality is the overwhelming emphasis put on research and research-oriented training of academicians, rather than on training practicing engineers. Faculty members in such departments are clearly part of the "academic profession" of civil engineering, as scholars who do research as well as faculty who teach (Light, 1974).

However, the academic discipline of civil engineering is not a unified profession. Each faculty member is a member of a number of applied scientific specialities, based on his research, teaching and service. Therefore, civil engineering is seen more appropriately as a collection of such specialties--for example, structural engineering, transportation network modelling, hydraulics. Each of these academic disciplines constitutes a culture with specific norms about membership, appropriate research topics and methods,
and standards for evaluating scholarly work. The scholarly audiences exercise the functions of professions in judging the quality of scholarly work and deciding who is qualified for academic positions (Wilson, 1942).

The evaluation of research by disciplinary peers is clearly more important than the evaluation of teaching by departmental colleagues in the overall judgment of quality of academic work in such departments. Disciplinary audiences are reached through publication of scholarly research and through joint work and service on professional society activities. The judgment of quality of research is usually made by those within a particular specialty, according to criteria which are more or less specific to that specialty. All scholarly fields emphasize 1) the relevance or importance of the problem to the field; and 2) the quality of problem-statement, methods and solution. However, the specific meanings of these generic criteria are interpreted by members of the specific field.

The data here indicated that there was a conflict within the discipline of economics about criteria of quality. The applied economist in engineering believed that the use of the criteria for a theoretical economist was inappropriate for his work. He also questioned whether he was indeed a member of the economics discipline, and therefore whether the criteria from economics should be used to judge his work. The signals from the economics discipline were thus complex and contradictory. This may have hampered the engineering faculty in their encounter with a new discipline (economics) while attempting to judge whether social science should be added to the base of professional knowledge in engineering (Riesman, 1958; Bucher & Strauss, 1961).
B. Local definition of the field.

Although many universities have departments of civil engineering, no two departments offer exactly the same version of the field. Each department defines the field locally.

Any academic department "defines the field" to which it lays claim via its membership, its activities, and its relationships with other non-department scholars. By including specialists in some subfields and excluding those in others, the department's membership reflects some summary view of how the members view the field. Regardless of the method of decision-making or the degree of agreement among faculty members, the subfields represented by the members indicate which portions of the field are seen as important and worth addressing. In similar fashion, the teaching and research activities of the faculty reflect their view of the discipline through the breadth of coverage and choice of perspectives or subfields emphasized in the curriculum and research programs. Through their dealings with members of the academic community outside the department and the university, the department members define their niche in the overall intellectual terrain.

The social scientists changed the department of civil engineering in three ways: 1) they added a new type of member by being social scientists; 2) they added new types of activities by doing social science research and teaching; 3) they added a new set of relationships to the department by interacting with their disciplinary colleagues outside the department and the university.

These changes were temporary, it seems, because the social scientists left the department. Yet, the social science activity may still continue, carried on by engineering faculty who believe social science has a place in engineering.
C. Organizational factors.

The department is embedded in larger organizational domains--e.g., the school of engineering and the university. Each organizational level represents a set of contextual, institutional factors which influence the department as a whole, and department members as individuals. The university's policies on program content can influence the ability of any given department to support a set of activities.

The influence of the organization may be direct, through the power to grant or withhold university funds; or it may be indirect, through encouragement of certain activities via public statements of support and the like. Organizational policies about recruiting, staffing, and rewards such as promotion and tenure may directly determine key decisions in the career of a faculty member. The availability of university funds for research, teaching, space and equipment--and the conditions for their availability--directly influence the activities of every faculty member.

In addition to formal policies, universities and schools within them develop norms about the relative importance of research and teaching. These norms influence faculty choices about their activities. These norms are usually most salient in the arguments made during and after key decisions on promotions and tenure, as faculty invoke the local standards to support their statements about the merit of some fellow member's activities. Judgment of teaching and service is usually made within the department, as the department acts on behalf of the whole university. In schools where research is very important, the department's deliberation about promotion is usually the first in a series of evaluative steps going up the organizational levels.
D. Conclusion: the department as culture broker.

The department is the arena where the criteria and methods of several disciplines, plus those of the university, come together. Occasionally the interpretation and evaluation of faculty member activities differs drastically from one discipline to another, or differences occur between disciplinary norms and organizational norms. Here the department acts as a "culture broker" to make the translations, compromises, and adjustments necessary to accommodate the diverse cultures represented by its constituents.

The department from which the data in this study are drawn was cast in the role of culture broker in evaluating the membership, activities, participation and relationships of the social scientists within an engineering-science-oriented faculty and a university with strong values of research excellence and strength in basic scientific research and theory-building.
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1975 Ehrmann, S. E. Personal communication on work in progress.


1967- Reports of the President.
1970

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1976


# APPENDIX: DRAMATIS PERSONAE

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<th>Pseudonym</th>
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