

FACULTY ATTITUDES TOWARD INDUSTRIAL RESEARCH ON CAMPUS

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To gauge the attitudes of university faculty concerning the effect of corporate funding on campus research norms, we conducted a study of research faculty in Texas, employing the theoretical framework proposed by Alvin Gouldner. Gouldner theorized that the most privileged academics hold the most conservative social and academic views. In his view, the most highly research-oriented faculty—those who are senior, engaged in professional activities, and in important and secure positions—have careerist values that influence the reward system for other sociologists. These “gatekeepers” control professional dogma, and by means of editorships, board memberships, and other professional peer judgments establish normative behavior for the discipline. By analogy, natural scientists who compete successfully for research grants are in a position of having the most to gain by the status quo, and hence are very conservative; their own success convinces this elite tier of faculty that a meritocracy is at work. Several of our findings corroborated Gouldner’s thesis, particularly in the convergence of ideologies between junior and senior faculty, and the higher propensity of scientists to support applied research. Finally, the impact of disciplinary orientation, as opposed to faculty rank or appointment, is discussed with a view to subsequent research.

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The literature on the academic profession is voluminous, perhaps because faculty enjoy studying their own ranks. This extensive preoccupation has not led to a convergence of views over the years, as scholarship continues to range from Thorstein Veblen’s lament (Veblen, 1918) that faculty serve the narrow corporate culture, to Edward Shils’ equally impassioned view that faculty have capitulated to false liberal ideals (Shils, 1983). Since 1966, faculty attitudes and belief systems have been more systematically studied in opinion surveys (Bayer, 1973; Ladd, 1973, 1975, 1976; Noll and Rossi, 1966), in which they are generally found to be more liberal in social issues than is the general population,

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and quite conservative in the governance of their own workplace. One astute observer, University of California President Emeritus Clark Kerr, noted in 1966, "few institutions are so conservative as the universities about their own affairs while their members are so liberal about the affairs of others . . ." (in Ladd, 1975, p. 33).

On few academic issues is there likely to be more disagreement than over the appropriate role of corporate and proprietary research on campus governance. Since the Vietnam War, there has been considerable debate over the role of universities in government-sponsored research, weapons research, classified military projects, and the increasingly complex high technology of biomedical scientific research (Goggin, 1984, 1987; Ramirez, 1986; Wofsy, 1985). This debate has included potential conflicts of interest (Leskovac, 1985), ethical considerations in research (Delgado and Leskovac, 1987), and legal (Olivas, 1988) or tax consequences of such research (Kertz, 1982). However, relatively little research has attempted to gauge the reaction of faculty to these changes affecting their workplace and professional norms.

This surprising lack of research findings on the effect of corporate funding upon university norms is all the more striking given the large amounts of money involved: in 1982, industries paid a quarter of a billion dollars to universities for basic and applied research (NSF, 1982, p. 13). In addition, the federal government has invested less in university research, at least in nonmilitary sources, leaving a gap to be made up by industry or the states (Board Awards, 1985; NSF, 1982; Stauffer, 1985). To be sure, the major effect of these shifts in research funding patterns will be felt in relatively few research institutions, as 100 institutions receive nearly 85% of all federal R&D funds, while the top 10 institutions account for almost 25% of the total (NSF, 1982, p. 10). Nonetheless, the norms of research "trickle down" and affect practices at other campuses as well, as many institutions aspire to become more research-oriented.

Availability of state government support and reliance upon state fiscal health are even more crucial, as the major source of higher education funds for public institutions (and increasingly, for private institutions) is state operating money. Thus, the fortunes of state higher education budgets are closely linked to a state's economic indicators. In the 1970s, while industrialized midwestern states recovered from difficult economic times, higher education in the South and Southwest prospered. However, in the 1980s, the declining price of oil and other fiscal problems plagued these states, particularly Texas, which has a poor tax structure to cushion it from declining oil revenues (Stauffer, 1985).

Texas would seem a good state for industry-university linkages, as it has a political and tax climate thought of as probusiness and antilabor; it also has fared relatively poorly in federal R&D expenditures, and therefore has relatively less reliance upon federal R&D dollars (Stauffer, 1985; Tolo, 1978). Major

advances in superconductivity research occurred in the labs of Texas colleges ("In the trenches," 1987). Several universities have banded together to seek large scale federal support for a superconducting particle collider, and industry leaders have taken a highly visible and influential role in the consortium as well as in recent Texas school reform (Stauffer, 1985).

Throughout this time, however, very few faculty have been involved in the proceedings. First, only a small number, perhaps several hundred, will actually be conducting any proprietary research, which tends to be concentrated in highly elite fields: eighty percent of all industry-funded research is in machinery, electrical equipment and communications, chemicals, petroleum products, aircraft and missiles, motor vehicles and equipment, and instruments (NSF, 1982, p. 10). Second, the State of Texas is historically management-oriented, with a tradition of strong and active boards of trustees, who are governor-appointed rather than elected. The appointees tend to be conservative businessmen, who frequently have been political and financial supporters of the governor. While this is common in other states as well, it is a long and honorable tradition in Texas.¹ Third, the "right to work" laws (antiunion legislation) and decentralized nature of higher education governance in the state (at the university level, there are 15 separate public systems, each with a governing board; these represent 29 campuses and 360,000 students) have meant that faculty have not banded together for political influence. Distrust of centralized authority or coordinated professional empowerment is a strong streak in Texas. As one commentator of Texas higher education has noted, "Although Texans have begun, albeit slowly, to accept more readily the increasing importance of effective state government decision-making, they continue to place little power or trust in the chief executive of the state" (Tolo, 1978, p. 1).

This study sought to capture Texas faculty attitudes about important issues in which they had little involvement and over which they have little control. Faculty involved in corporate-funded research have some measure of control over their time, although not as much as it may seem. In order to begin to gauge the effect of corporate financed research on campus governance, this study sampled faculty across disciplines in Texas's major research institutions.

THEORETICAL FRAMEWORK

In order to place the phenomenon of proprietary research on campus in an appropriate context, we have drawn from several theoretical approaches to understanding faculty attitudes, most notably the early work of Alvin Gouldner (Gouldner and Sprehe, 1965; Gouldner, 1970). Gouldner's research on academic sociologists, conducted in the 1960s, has several provocative aspects.

He theorized that the most privileged academics hold the most conservative social and academic views. In his view, the most highly research-oriented faculty—those who are senior, engaged in professional activities, and in important and secure positions—have careerist values that influence the reward system for other sociologists. These “gatekeepers” control the professional dogma, and by means of editorships, board memberships, and other professional peer judgments establish normative behavior for the discipline. By analogy, natural scientists who compete successfully for research grants are in a position of having the most to gain by the status quo, and hence are very conservative; their own success convinces this elite tier of faculty that a meritocracy is at work and those less well situated are not well-enough qualified to achieve. Moreover, the older and more senior faculty become, the more pronounced their conservative viewpoints. This hegemony over norms exerts a tremendous influence over young faculty and graduate students, who in turn emulate the successful behavior and ideological conservatism that will enable them to achieve. Gouldner theorizes that successful academics inevitably feel some conflict, for their work makes them aware of societal inequities, but the attractiveness of academic rewards and the necessary compliance with the status quo dispose even the most critical faculty to tolerate the existing system.

Interestingly, Gouldner’s view of the academic world has not been confirmed by his data, as he found the most senior faculty to be the most tolerant of change and the most politically liberal. His data rather revealed that once faculty were secure in their positions, they apparently were freed to be more critical of society and more likely to be involved in liberal causes and social change: his “major survey, while contradicting his own premises, sustains and extends an interpretation of the politics of sociologists as disproportionately left and critical” (Ladd, 1975, pp. 113–114).

Gouldner’s findings, if not his thesis, place him in the mainstream of studies on faculty attitudes. Lazarsfeld and Thielens (1958), Bendix (1970), Noll and Rossi (1966), Lipset (1972), and Lipset and Ladd (1974) all suggested that faculty are more liberal and critical than are persons in the population at large. While this higher commitment to social change varies among disciplines, research literature tends to “agree that achievement in higher education, however measured, has been associated with more liberal-to-left views on a wide array of social and political issues” (Ladd, 1975, p. 147). However, we have chosen Gouldner’s model because of our belief that academics are more likely to be conservative on matters that affect their own behavior, but liberal about matters not involving the university, for example, to be for desegregation of schools and factories but not for integrating faculties, or to be for egalitarian norms in the rest of society but not for more accessible admissions standards in their institutions.

We believe, as does Sheila Slaughter, that

expertise, or the social use of knowledge, is simultaneously technical and ideological. However, no theory of knowledge has been developed that accommodates the insights gained in the 1960s and early 1970s. Currently, conceptions of academic freedom lack a firm base, especially when it comes to formulating principles about the allocation of resources for academic science and for the deployment of expertise by both professors and institutions. The need for such a theory becomes more important as knowledge becomes ever more central to the economy, and its political dimensions become more apparent. (1988, p. 259)

This model would predict that senior faculty, particularly those in the sciences and applied research fields (engineering, agriculture, medicine, pharmacy, etc.) would be the most supportive of corporate or defense research conducted on campus. Not only would they be the most likely to profit from the resources, but they would defend the applied research norm as highly appropriate to the mission of the university. In their view, merit and collegial peer review properly separate the good from the bad research, while scientific methods and professional ethics will keep in check any fraud, conflict of interest, or ethical excesses. This rigor extends to social views and views about university governance as well, as it affirms their advantaged place in the campus hierarchy. There are few minority or women faculty, they insist, because there are few who choose the field or who have the background for the rigorous work.

According to the model, a conservative ideology also prevails in the humanities and social sciences, although to a lesser degree, since it is couched in a different voice. Humanists and social scientists are likely to be more socially critical, and to be less enthusiastic about industrial or defense research, in part because there are fewer opportunities for their participation in the resources, but also because they hold a "higher minded" view of the role of a university and its mission: they will tend to believe that the liberal arts (however defined) are the heart of a college, and a faculty's job is to train students to be more literate, humane, and civic-minded. The liberal arts faculty may be scornful of agricultural research that will lead to a mechanized tomato picker, without regard to its impact upon displaced farm workers, though they are more likely to lament the attendant decline in the quality of tomatoes.

Nonetheless, while they may be somewhat more liberal in their professional activities and belief systems, they will not be likely to question the fundamental structure or roots of society. They will define problems, but will not likely participate in radical social change or restructuring of university norms. These faculty will also be more liberal for others than for themselves, and there will be powerful orthodoxies in research, and establishmentarian attitudes towards university norms. Junior faculty both in sciences and humanities will emulate senior faculty, as successful role playing will more likely assure them that they can achieve tenure and promotion; the strong, normative influences shape those who aspire to the professoriate and those who achieve it. Our findings largely

confirm Gouldner's thesis and provide better corroboration of his hypotheses than did his own data (Gouldner, 1970; Sprehe, 1967).

Although there have been a number of studies that revealed differences in the attitudes among faculty in different disciplines (Finkelstein, 1984; Silva and Slaughter, 1984), for our exploratory purposes, we have resorted to aggregate groupings. We do note, however, that increasingly, many traditional disciplines have grown and developed to the point that there have been interdisciplinary developments that bridge fields: law and economics, history of science, and area studies are examples. Again, Gouldner was in the forefront urging such approaches, and predicting they would infiltrate universities.

METHOD

Subjects

The study population was drawn from 947 faculty members holding graduate faculty rank from five research institutions in Texas. These five four-year institutions were University of Houston (Houston), University of Texas (Austin), Texas A&M University (College Station), Texas Tech University (Lubbock), and Rice University (Houston), the only private institution in the group. In 1988, each of the institutions held research contracts for more than \$40 million. A total of 562 faculty members comprised the sample population for a total response rate of 59.34%.

Procedure

Status, attitudinal, and compensation variables were assessed through a survey conducted in the 1984–85 spring semester. The measure *faculty attitudes about institutional involvement in proprietary research* (PROPRES) was formed from 6 items: (1) "The overall operations of this university would be improved with more administrators having experience in the private for-profit sector." (2) "In order to attract and retain quality faculty this institution should allow faculty greater flexibility in seeking nonuniversity sources of compensation." (3) "Proprietary research is a legitimate activity in a college or university campus." (4) "Faculty at this university should receive added compensation if they participate in product-oriented, corporate-funded, university-based research." (5) "My university should selectively commercialize the product of its own research." (6) "Professors should be able to hold significant shares of stock in companies with parallel research programs."

Two items form the second measure, *faculty attitudes about institutional rights to research* (INSTRIGH): (1) "In collaborative research with industry,

the university should contractually commit itself to monitoring information exchange in order to protect proprietary information.” (2) “This university must always maintain rights to all patents even though corporations provided the necessary research funding.”

The measure *faculty governance* (FACGOV) was formed by five items: (1) “The only responsibility of trustees-regents should be to raise money and gain community support.” (2) “There should be faculty members on the governing board of this institution.” (3) “Growing involvement in research collaboration between this university and industry endangers the autonomy of this institution.” (4) “Collective bargaining by faculty has no place in a college or university.” (5) “Faculty members and/or administrators should not be allowed to serve as board members of for-profit corporations.”

The measure *incompatibility* (INCOMP) was formed by three items: (1) “Classified weapons research is a legitimate activity on a college or university campus.” (2) “U. S. universities and businesses are incompatible in ways that make cooperation in research exceedingly difficult.” (3) “The need for secrecy in corporate-sponsored research is incompatible with the university’s tradition of open scholarly exchange.”

Three items formed the measure *intrainstitutional governance* (INTRA): (1) “This institution would be better off with fewer administrators.” (2) “Chief university administrators are underpaid and should receive salaries and fringe benefits more closely approximating those provided their counterparts in the private sector.” (3) “All off-campus, for-profit faculty activity should be systematically monitored by the administration.”

The measure *faculty equity* (FACEQI) was formed by four items: (1) “At this university serious effort has been made to maintain salary equity between liberal arts and technical departments.” (2) “In general, genuine scholarship is threatened by the proliferation of campus-based research centers.” (3) “This university has placed far too much emphasis on the liberal arts.” (4) “This university adequately supports research across all the disciplines.”

Social consciousness (SOCCON) was formed by four items: (1) “Opportunities for higher education should be available to all high school graduates who want to attend college.” (2) “Public universities should be more responsive to public demands than should private universities.” (3) “This university should be actively engaged in solving social problems.” (4) “Normal academic requirements should be relaxed in appointing members of minority groups to the faculty at this institution.”

All items that formed the attitudinal measures or indicators were measured on a five point Likert-type scale ranging from Strongly Agree to Strongly Disagree with a middle score of No Opinion in between. Several of the items were recoded because of the direction of the coding in the responses.

Compensation variables included salary, salary basis, additional earnings,

and largest source of supplementary income. Each variable was a single-item measure. The first variable, *faculty salaries* (SALARY), was measured by asking, "What is your base institutional salary, prior to tax and deductions, for the current academic year?" The variable *salary basis* (SALBASIS) was assessed by, "Is this based on . . ." ending with one of three options, 9 month appointment, 12 month appointment, or other. The third variable *additional earnings* (ADDEARN) was phrased, "In recent years, roughly how much have you earned over and above your base salary . . ." with faculty choosing from seven compensation indicators: 0%, under 10%, 10%–19%, 20%–29%, 30%–39%, 40%–49%, or 50% and over. The last compensation variable, *largest source of supplementary income* (LARGEST), was measured by asking, "What are the two largest sources of your supplementary earnings?" Faculty were asked to choose from (1) summer teaching at this institution, (2) teaching elsewhere, (3) consulting, (4) private practice, (5) royalties (from publications and patents), (6) fees for speeches/lectures, (7) personal salaries and payments, (8) other, or (9) none, and to indicate which was the largest source of supplementary earnings and the second largest.

Finally, status variables included the academic department in which the faculty member was primarily appointed, type of appointment, number of years at his or her present position, and present rank. Indicators for the type of appointment the faculty members possessed were: (1) regular, with tenure; (2) untenured, but on tenure track; (3) not on tenure track; and (4) other. There were seven indicators for present rank: (1) professor, (2) associate professor, (3) assistant professor, (4) instructor, (5) lecturer, (6) no rank designated, and (7) other. Present rank and type of appointment were recoded for directionality.

Alpha coefficients are not included in this study because, rather than subjecting the items to an exploratory factor analysis and having the results dictate conceptual factors, a confirmatory factor analysis was performed on a LISREL measurement model to determine both the factor loadings and unique variances of observed variables for latent constructs in the causal model. Although the unique variances were somewhat high (ranging from .46 to .96), the chi-square value, Goodness of Fit Index, and the Root Mean Square Residual indicate a good overall fit of the model. These results would indicate that although items which construct the variables need revision, the information reflected in the factors formed from these items was sufficient. We are convinced, from the work of Kahle and Berman (1979), Bentler and Speckart (1981), and others that attitudes cause behavior, and our approach assumes this perspective.

DATA ANALYSIS

Three direct discriminant function analyses (Marascuilo and Levin, 1983;

Tabachnick and Fidell, 1983) were performed on the data utilizing three nonattitudinal variables and seven attitudinal variables to predict group membership. Nonattitudinal predictor variables were income, additional earnings, and years in present position. Groups for the first analysis were tenured, untenured (but on tenure track), and untenured (not on tenure track). The groups for the second analysis included professor, associate professor, and assistant professor. For the last analysis, the groups consisted of membership in 7 "departments" (Business, Social Sciences, Humanities, Education, Sciences, Engineering, and Health).

A total of 561 cases comprised the original sample of which 103 had missing data. Because the missing data were not randomly scattered throughout the data matrix, imputed values were assigned. It was believed that the most appropriate method of handling missing data was to assign the mean of each item derived by sorting the items by institutions and by departments. However, in order to protect against seriously distorting the data, and, because the proportion of missing values was high, all three analyses were repeated using only those cases without missing data. In all three instances, the results of the analyses with and without missing data were similar. A total of 7 cases were identified as multivariate outliers, and were deleted from the analysis. All 7 cases reported 9 month salaries exceeding \$71,000 (more than 3 standard deviations from the mean). The remaining 555 cases were examined for all other assumptions underlying multivariate analysis. In the keen competition to keep faculty superstars, a number of institutions have had to engage in bidding wars for their most visible research faculty "In the Trenches," 1987; "University of Houston," 1988).

RESULTS

Because this is our first publication of these data, we have reported all findings, even those that were not significant. By resuscitating Gouldner's thesis with an emerging area of concern, we hope other scholars will follow suit on this important line of inquiry. Two canonical discriminant functions were identified in the first analysis (appointment), with a combined $X^2(20) = 231.24$, $p < .001$. After the first discriminant function was removed, the remaining discriminant function was highly significant, $X^2(9) = 19.036$, $p = .02$. The between-group variance accounted for by the two discriminant functions was 93.05% for the first, and 6.95% for the second function (see Table 1). A plot of the centroids (see Figure 1) reveals that the first discriminant function discriminates tenured faculty from the other two groups, untenured faculty and untenured but on tenure track. The second discriminant function separates untenured faculty from the other two groups, tenured and untenured but on tenure track.

TABLE 1. Canonical Discriminant Functions and Pooled Within-Groups Correlations Between Discriminating Variables and Canonical Discriminant Functions

Function	Eigenvalues	Canonical R	% Variance	Wilks' Lambda	P
1	.47343	.5668420	93.05	.6554987	<.001
2	.03538	.1848536	6.95	.9658291	.024
		Function 1	Function 2		
YRS		.79758*	-.20507		
SALARY		.60703*	.51011		
INTRA		.04655*	-.02304		
FACEQI		-.10306	-.55614*		
PROPRES		-.19966	.49582*		
INSTRIGH		-.07161	.40066*		
SOCCON		-.07028	-.17934*		
INSTDIRC		.00645	.13419*		
INCOMP		.09015	-.11173*		
ADDEARN		.04181	.10866*		

* Loaded on canonical functions.

An examination of the structure matrix, the pooled within-groups correlations between discriminating variables and canonical discriminant functions (see Table 1), suggests that two variables, years in present position and salaries, load on the first discriminant function which discriminates tenured faculty from the other two groups. The primary variable in the first discriminant function is number of years in present position. Tenured faculty have more years in their present positions (mean number of years = 13.37) than untenured faculty (mean years = 5.63) and faculty untenured but on tenure track (mean years = 3.62). Table 2 displays the means on all attitudinal and nonattitudinal variables for the three groups.

The second variable in the first discriminant function that distinguishes tenured faculty from the other groups is salaries. Tenured faculty earn higher salaries (mean salary = 39876.79) than untenured faculty not on tenure track

TABLE 2. Group Means on Attitudinal and Nonattitudinal Variables (Appointment)

Group ^a	SALARY	YRS	ADD- EARN	PRO- PRES	INST- RIGH	SOCCON	FAC- EQI	IN- COMP	IN- TRA	INST- DIRC
1	37624.045	5.636	3.227	20.500	6.590	12.000	9.500	8.136	8.409	8.363
2	29089.075	3.623	3.021	18.837	5.927	12.729	11.643	8.259	8.397	8.007
3	39876.790	13.370	3.152	17.560	5.785	12.260	10.797	8.568	8.563	8.007

^a 1 = not on tenure track; 2 = not tenured, but on tenure track; 3 = regular with tenure.

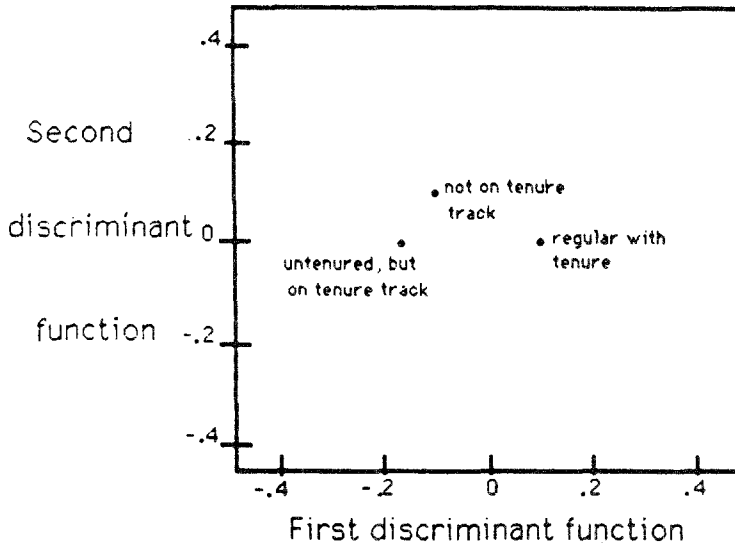


FIG. 1. Plot of three group centroids (appointment) on two discriminant functions derived from eleven status, attitudinal, and compensation variables.

(mean salary = 37624.04), and untenured faculty but on tenure track (mean salary = 29089.07).² No other variable had loadings in excess of .40.

Four variables were identified in the second discriminant function to have loadings in excess of .40. The second discriminant function distinguished untenured faculty from tenured faculty and faculty untenured but on tenure track. The variable with the strongest impact was attitude toward faculty governance. Untenured faculty believe there should be more equity among faculty in all departments and colleges on their campuses (mean attitude toward faculty governance = 9.50) than do tenured faculty (mean attitude = 10.79) and faculty untenured but on tenure track (mean attitude = 11.64). Moreover, untenured faculty view institutions as needing to become more involved in proprietary research (mean attitude toward proprietary research = 20.50) than do tenured faculty (mean attitude toward proprietary research = 17.56) or faculty untenured but on tenure track (mean attitude toward proprietary research = 18.83). A third variable with a loading in excess of .40, which discriminated among untenured faculty and the other two faculty groups, was institutional rights. The untenured faculty group believed that institutions should have more rights to the results of their proprietary research (mean attitude toward institutional rights = 6.59) than did either tenured faculty (mean attitude toward institutional rights = 5.78) or faculty untenured but on tenure track (mean attitude toward institutional rights = 5.92).

The pooled within-group correlations among predictor variables are displayed

TABLE 4. Canonical Discriminant Functions and Pooled Within-Group Correlations Between Discriminating Variables and Canonical Discriminant Functions

Function	Eigenvalues	Canonical R	% Variance	Wilks' Lambda	p
1	1.22133	.7414983	97.60	.4370676	<.001
Function 1					
SALARY	.68022*				
YRS	.57967*				
INSTRIGH	-.10338*				
ADDEARN	.05599*				
SOCCON	-.06828				
INSTDIRC	.00883				
INTRA	.03399				
FACEQI	-.08782				
PROPRES	-.10968				
INCOMP	.03529				

* Loaded on canonical functions.

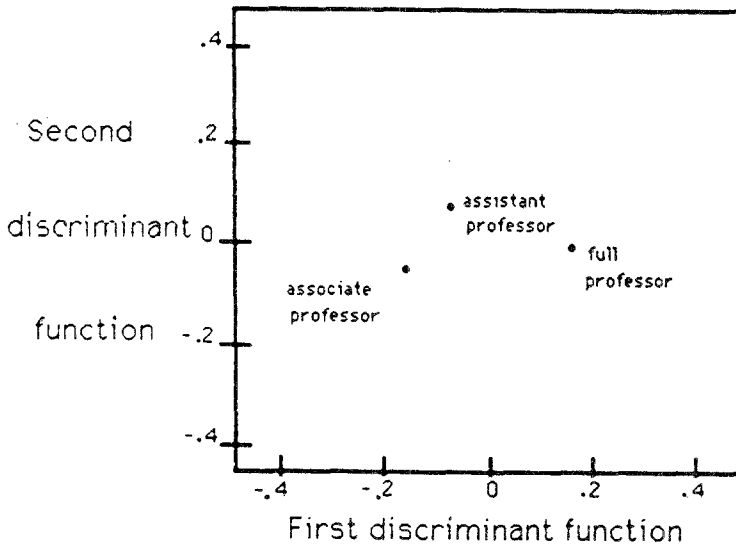


FIG. 2. Plot of three group centroids (rank) on two discriminant functions derived from elven status, attitudinal, and compensation variables.

(departments) with a combined $X^2(70) = 275.49$, $p < .0001$. After removal of the first function, the remaining discriminant function was statistically significant, $X^2(54) = 90.752$, $p = .0013$. The two discriminant functions accounted for 83.38% of the between-group variance, 70.24% by the first function and 13.14% by the second function (see Table 7). A plot of the group centroids (see Figure 3) reveals that the first function discriminates between faculty in Business, Sciences, Engineering, and Health and faculty members in Social Sciences, Humanities, and Education. The second function separates faculty members in Humanities, Sciences, and Engineering from faculty members in Business, Social Sciences, Education, and Health.

The loadings on the structure matrix (see Table 7) suggest that faculty salaries and attitudes on institutional direction form the first discriminant function. Of the two variables, the primary variable in the first function is faculty salaries. Faculty in Business, Sciences, Engineering, and Health have higher salaries (mean salaries = 39169.55, 40764.30, 42020.11, and 45360.90, respectively) than do faculty members in Social Sciences, Humanities, and Education (mean salaries = 35603.49, 32011.75, and 36520.55, respectively). Table 8 displays all attitudinal and nonattitudinal variable means for all 7 groups.

The second variable in the first discriminant function that separates the groups is attitudes about institutional direction. Faculty members in Business, Sciences, Engineering, and Health view their respective institutions as placing too much

TABLE 7. Canonical Discriminant Functions and Pooled Within-Group Correlations Between Discriminating Variables and Canonical Discriminant Functions

Function	Eigenvalue	Canonical <i>R</i>	% Variance	Wilks' Lambda	<i>P</i>
1	.40350	.5361867	70.24	.6032118	<.001
2	.07552	.2649777	13.14	.8466085	.0013
		Function 1	Function 2		
SALARY		.59941*	.26342		
FACEQI		-.38440*	.36658		
YRS		-.00598	.57174*		
PROPRES		.28602	-.49214*		
ADDEARN		.15873	-.22333		
SOCCON		-.02454	-.33885		
INCOMP		.08216	-.04701		
INSTDIRC		.54499	.20529		
INSTRIGH		-.32455	-.21013		
INTRA		.15673	.28440		

* Loaded on canonical variables.

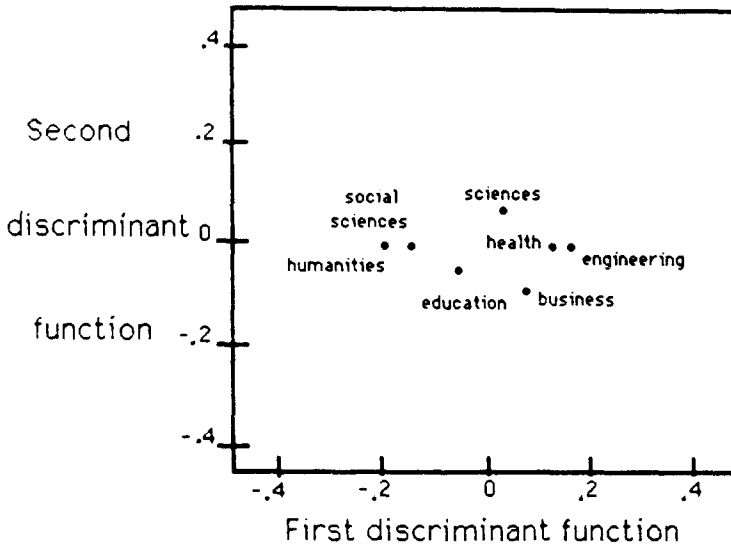


FIG. 3. Plot of seven group centroids (departments) on two discriminant functions derived from eleven status, attitudinal, and compensation variables.

emphasis on nontechnical departments (mean attitudes = 8.44, 8.66, 9.32, and 7.54, respectively) than do faculty in Social Sciences, Humanities, and Education (mean attitudes = 7.69, 6.76, and 7.40, respectively).

Two variables in the second discriminant function were identified to have loadings in excess of .40, number of years in present position and attitudes towards proprietary research. The primary variable, or the variable with the strongest impact in the second function, was number of years in present position. Faculty members in Humanities, Sciences, and Engineering reported more years in their present positions (mean number of years = 11.94, 12.63, and 11.77, respectively) than did faculty members in Business, Social Sciences, Education, and Health (mean number of years = 6.92, 10.66, 10.55, and 10.70, respectively). In addition, faculty members from the Humanities, Sciences, and Engineering believed more strongly that their respective institutions should not become more involved in proprietary research (mean attitudes = 16.49, 17.83, and 18.50, respectively) than did faculty in Business, Social Sciences, Education, and Health (mean attitudes = 20.65, 17.49, 18.04, and 19.60, respectively). The results indicate that the variable, attitudes towards involvement in proprietary research, discriminates more between faculty members in Humanities and faculty members in Business and Health.

Table 9 displays the pooled within-group correlations among the 10 predictor variables. An examination of Table 9 reveals that 14 bivariate correlation coefficients would show statistical significance at $p = .01$ if they were tested individually.

DISCUSSION

In the first discriminant analysis, the findings suggest that faculty views among tenured and untenured professors (senior and junior faculty, respectively) are similar in all respects (most variables were found not to discriminate among the three groups). Even in those variables that did load on the second canonical function, tenured and untenured faculty held similar views: (1) institutions should not become more involved with proprietary research, (2) faculty should not be concerned about patent rights, and (3) present governance structures in respective institutions provide equity among different departments. These similarities in attitudes among senior and junior faculty members are in accord with Gouldner's theory in that there is a convergence of views by junior faculty to emulate behavior and attitudes of senior faculty in order to achieve success. Moreover, agreement by tenured and untenured faculty on present governance structures being equitable among departments is also consistent with Gouldner's theory; existing structures (the status quo) are not only equitable, but should not be changed (a conservative viewpoint).

However, faculty attitudes about proprietary research and institutional rights to patents did not necessarily support Gouldner's theory. We believe that these two variables were not a measure of how "liberal" or "conservative" faculty are in relation to proprietary research. The question was not whether faculty would or would not want their institutions involved in proprietary research, but rather would faculty want their institutions to become *more* involved in proprietary research. In order to retain their academic freedom, faculty may not have wanted more involvement with proprietary research. Funding for research provided by the private (business) sector would require administrative decision-making involvement by those providing the funds; faculty would need to relinquish some of their autonomy over the free choice of research projects. Involvement with the business sector could infringe upon academic freedom of faculty. For example, one tax scholar has warned, "The problems raised by commercial exploitation of scientific research in terms of academic freedom and the role of the university scholar are profound. Faculties are justifiably concerned with whether the role of the scholar/researcher in the university will be altered to require not only contributions to knowledge but also commercial feasibility" (Kertz, 1982-3, p. 70). Another commentator has cautioned,

As high technology takes center stage, the differences between basic and applied research are collapsing. Business, government, and the military are increasingly interested in university-based high technology research in science and engineering. . . . Indeed, university-industry partnerships may yet be another way of redirecting state dollars from research agendas to corporate product development (Slaughter, 1988, pp. 253-254).

In the second discriminant analysis, only one canonical function was

identified that separated professors, associate professors, and assistant professors. Not surprisingly, salaries and number of years in present position distinguished professors from the other two groups. There were no other canonical functions identified on which variables indicative of either conservative or liberal views could distinguish among the three groups; this finding is consistent with Gouldner's theory in that no differences in faculty attitudes would be expected between professors, associate professors, and assistant professors all selected from similar research-oriented institutions. Because the sample in the study represented faculty from research universities, each with an increasing emphasis on research, it would follow that senior and junior faculty members would hold substantially similar views.

The results of the first and second discriminant analysis would indicate that separation among faculty members along conservative or liberal lines may be a function of the different departments in which the faculty are found. In the third discriminant analysis, the first canonical function separated faculty members in Business, Sciences, Engineering, and Health from faculty members in the Social Sciences, Humanities, and Education on two variables: salaries and faculty equity. Faculty members in Business, Sciences, Engineering, and Health receive higher salaries than do the other faculty. Faculty in Business, Sciences, Engineering, and Health perceive the present university structures as equitable among departments. Perceptions of faculty in the other departments would indicate that these faculty view equity as not yet having been achieved across departments. Faculty in the Humanities, Social Sciences, and Education view their institutions as having to place more emphasis on research across all departments, eventually leading to more academic rewards for faculty in all departments.

The second canonical function distinguishes faculty members in the Humanities, Sciences, and Engineering from faculty members in Business, Social Sciences, Education, and Health on two variables, number of years in present position and institutional involvement in proprietary research. The finding indicates an anomaly in the data. We believe that faculty did not separate out according to the first canonical function because of the diversity found in several groups, as a result of the imputation of the departments. Faculty in five of the seven groups (Business, Social Sciences, Engineering, Education, and Health) resembled faculty members in other departments, most of which were more similar to faculty members in the Sciences than they were to their respective group. Only two groups (Humanities and Sciences) were identified in which faculty members were correctly classified (over 60%) in the discriminant analysis.

Faculty in the five institutions were asked to identify their academic department, not their disciplinary orientation or training in a specific field. For example, faculty in the Business department were not all necessarily faculty

members with degrees in Business, but computer analysts, psychologists, sociologists, etc. The same was likely true for faculty in the Social Sciences, Education, Engineering, and Health. Again, the majority of the faculty in these five groups resembled faculty members in the Sciences. Two distinct groups, then, would be formed, those faculty in the Sciences along with those resembling faculty in the Sciences, and those faculty found in the Humanities. In sum, we believe that because of the manipulation of the categorical variable in which faculty were grouped by departments, and not by orientation, the discriminant analysis performed on the data did not capture the separation of the groups along a conservative/liberal distinction, as we would have anticipated by Gouldner's theory.

SUMMARY AND CONCLUSIONS

Several of our findings corroborated Gouldner's thesis, particularly in the convergence of ideologies between junior and senior faculty, and the higher propensity of scientists to support applied research. Because there is an indication that separation among faculty members may be more a function of their disciplinary orientation than either faculty rank or appointment, subsequent research should examine faculty differences not by seniority, but by distinct groupings of faculty; this will require care to account for the heterogeneity in large departments. These groupings more likely will reveal differences among faculty attitudes about institutional involvement with proprietary research. Studies that examine faculty views about proprietary research on campus should not only identify factors that distinguish one group from another, but should test causal models to examine underlying structural patterns among groups. From the findings, we believe that several variables contribute to differences in faculty attitudes towards proprietary research on campuses: being in a specific department with an organizational ethos, having a particular salary, and having spent a number of years in an institution. Questions remain, though, on how these variables are related and how much of the variance in faculty attitudes can be accounted for by these and other variables.

With the exceptions summarized earlier, we believe the Gouldner thesis is promising. It may be that no single state, even one as large and diverse as Texas, can give an adequate portrait of as complex a matter as that under study. In addition, our questionnaire may not have been sufficiently calibrated to detect the complex mood of research faculty; for instance, while we anticipated that departmental norms would exert powerful influences, we had not adequately accounted for the tremendous interdisciplinary range evident in large, research-oriented departments. This phenomenon, particularly evident in the life sciences and some professional schools, is certain to affect assumptions about

traditional disciplinary departments. Another unanticipated event was the explosive growth of resources that came to Texas in MCC, a consortium of microelectronic research companies, or the extraordinary funds that were just becoming available as a result of the Star Wars-Strategic Defense Initiative program. Many faculty may have had these and similar controversial weapons or classified research activities in mind when they were polled. Classified or military research and industrial research pose different threats to the academy, and faculty may not yet have sorted out their support for or opposition to these initiatives. We agree with Sheila Slaughter that a new epistemology is called for:

What is needed is a theory that deals with the ways in which scientific knowledge is *used*, one that accounts for both its technical and ideological properties. Given the increasing interdependence between the university and central social institutions, as well as the increasing amount of resources allocated to research institutions, such a theory will have to provide a basis for thinking about academic freedom in ways that go far beyond the individual professor. Such a theory might guide us in articulating the rights and responsibilities that are part and parcel of academic freedom for individuals as well as the interested and affected collectivities. These would have to include the rights and responsibilities of the individual professor, perhaps the discipline or professional association, certainly the institution, and somehow the public, who very often pays for the development of knowledge and in whose interest that knowledge is supposed to be deployed. Until we are able to develop such a theory of knowledge and articulate principles of academic freedom that guide the conferral of rights and responsibilities for the various interested parties and organizations, we will be hard pressed as a community of professors to defend ourselves against the new challenges to academic freedom that are emerging (1988, p. 259).

In any event, increased sponsored research, whether military or corporate, augurs changes for university faculty, and will fundamentally affect the workplace even for those faculty not directly involved in the laboratories. We believe that Gouldner's provocative thesis, considered to be unconventional and maverick, should become more widely considered as the research stakes increase.

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NOTES

1. One scholar has wryly commented, "Political mileage has been gained in Texas by criticizing the 'overpaid, underworked, job-secure ivory-towered' faculty in the state's institutions" (Tolo, 1978, p. 195). During a recent special legislative session called to address Texas's fiscal troubles

- (August, 1986), one of the first bills introduced was designed to abrogate tenure in the state, so that "faculty deadwood" could be dismissed. The bill was not enacted.
2. There appeared to be an anomaly in the salary ranges of untenured tenure-track faculty, who reported making less money than did nontenure-track appointments. We believe this finding is accounted for by the different fiscal year arrangements available in many research institutions. Most teaching faculty hold 9-month appointments, with prorated summer salaries for any teaching responsibilities. Not all faculty choose to teach in the summer, and many do not have the opportunity to do so. On the other hand, nontenure-track appointments are generally calendar year, 12-month assignments. We believe a number of respondents were mistaken in their answers. Future research should take into account the variety of pay scales and salary structures. In our own experience, faculty may also prefer to use available funds for nonsalary purposes (travel or student support) rather than move into higher tax brackets.

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