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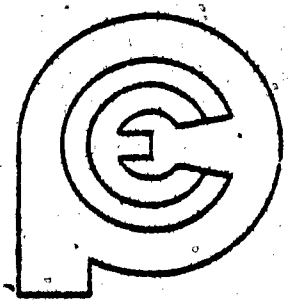
ABSTRACT

The development and impact of recent actions by the University of California, the California State University, and the California Maritime Academy to enhance recruitment and retention of engineering faculty are examined. In addition, national data on engineering faculty salaries and incentives are summarized, based on 1982 findings of a California Postsecondary Education Commission survey. Other relevant studies regarding recruitment and retention of engineering faculty are also reviewed, and recommendations for action by state government, industry, and higher education are offered. The 1982 survey of 109 colleges other than California public institutions covered the amount of engineering salaries, salary flexibility within engineering, range of starting salaries, graduate assistant salaries, use of other faculty incentives, and outside income of faculty. It is concluded that improved recruitment and retention of engineering faculty can be accomplished through a variety of means, including nonsalary benefits, increased salaries, and graduate support for potential faculty. Appended materials include: portions of the text of California Assembly Bill No. 2023, a section of the 1982 survey report, policy statements on outside income of faculty, and a bibliography. (SW)

RECRUITMENT AND RETENTION OF ENGINEERING FACULTY

A Report to the Legislature in Response to Assembly Bill 2023



CALIFORNIA POSTSECONDARY EDUCATION COMMISSION

The California Postsecondary Education Commission was created by the Legislature and the Governor in 1974 as the successor to the California Coordinating Council for Higher Education in order to coordinate and plan for education in California beyond high school. As a state agency, the Commission is responsible for assuring that the State's resources for postsecondary education are utilized effectively and efficiently; for promoting diversity, innovation, and responsiveness to the needs of students and society; and for advising the Legislature and the Governor on statewide educational policy and funding.

The Commission consists of 15 members. Nine represent the general public, with three each appointed by the Speaker of the Assembly, the Senate Rules Committee, and the Governor. The other six represent the major educational systems of the State.

The Commission holds regular public meetings throughout the year at which it takes action on staff studies and adopts positions on legislative proposals affecting postsecondary education. Further information about the Commission, its meetings, its staff, and its other publications may be obtained from the Commission offices at 1020 Twelfth Street, Sacramento, California 95814; telephone (916) 445-7933.

Commission Report 83-16

Adopted March 21, 1983

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PREFACE

During 1981 and 1982, the Legislature took action on three items to improve the quality of technological education and thereby help California maintain its technological advantages and contribute to State and national economic recovery:

- One, contained in the Governor's 1981-82 Budget, launched the Microelectronics Innovation and Computer Research Opportunities (MICRO) program at the University of California, with the long-range goal of spurring the growth of microelectronics and computer industries in the State. The Legislature approved first-year funding for MICRO of $1 million, with the stipulation that these funds had to be matched one-for-one by industrial grants. This stipulation was more than met: Twenty-five firms provided $1,344,218 in cash and equipment grants, enabling 31 of 47 faculty research proposals to be funded. For 1982-83, the Legislature then appropriated $2 million, and 51 proposals were approved for a total of $1,728,000, with matching funds coming from 33 firms.

- The second was the "Investment in People" program to improve mathematics and science instruction in California's schools, expand vocational education for information-based jobs, and improve engineering, computer science, and related instruction and research at California's public universities and Community Colleges. For 1982-83, the Legislature appropriated $1 million to the University, $2.25 million to the California State University, and $1.9 million to the California Community Colleges.

- The third, AB 2023 (Elder), sought to address the problems of recruitment and retention of engineering faculty in the State's four-year colleges and universities. As first introduced, it would have appropriated to the Trustees of the California State University and the Regents of the University of California an unspecified amount of money to increase the salaries of engineering faculty by 20 percent on July 1, 1981. In that form, it became a two-year measure and the subject of an interim hearing. After several amendments, it was adopted as Chapter 1017 of the Statutes of 1982 (reproduced in Appendix A). It requires that the California Postsecondary Education Commission report to the Legislature during its 1983 session on relevant State, regional, and national studies and on actions taken by the Trustees and the Regents regarding the recruitment and retention of engineering, business, and accounting faculty at the University and the State University and of marine engineering faculty at the California Maritime Academy, and it directs the Commission to make "related, specific recommendations for action by the Legislature, industry, and educational institutions." It calls for the Commission's report on engineering faculty by March 31 and its report on business and accounting faculty by June 30.

This document is the first of these two reports. Part One examines the development and impact of recent actions by the University, State University, and Maritime Academy to enhance recruitment and retention of engineering faculty. Part Two summarizes data on engineering faculty salaries and incentives nationally, based on a survey by the Commission. Part Three reviews other relevant studies regarding recruitment and retention of engi-

neering faculty. And Part Four offers recommendations for action by State government, industry, and higher education, as called for by the Legislature.

In part, this report draws on a study of engineering and computer science education in California public higher education that the Commission undertook in early 1982. That study (Commission Report 82-33) described the importance of high technology industries to the economy of California and the nation, reviewed differing opinions about the demand for and supply of engineers, examined enrollments and degrees conferred by California's public universities, discussed major problems regarding enrollments, depicted the shortage of engineering faculty nationally and in California, identified problems of obsolete equipment and facilities, commented on the preparation of students, noted incentives that industry is providing universities and that other states are offering their universities to develop technological expertise, and pointed to the educational and financial implications of these issues for educational policy in California.

The present document supplements that earlier report and seeks to respond to the specific concerns of AB 2023 regarding faculty salaries and incentives. It will be followed later this year with a similar report on business and accounting faculty.

The Commission wishes to express its appreciation to the many deans of engineering throughout the United States who supplied data in response to its questionnaire survey; to the members of the Commission's liaison committee on the study for their advice and assistance; and to the chairs of the Academic Senates of the University and State University as well as presidents of the United Professors of California and the Congress of Faculty Associations for their statements of position on the topic of salary differentials.

ONE

EFFORTS OF CALIFORNIA'S PUBLIC UNIVERSITIES AND MARITIME ACADEMY TO IMPROVE ENGINEERING FACULTY SALARIES AND INCENTIVES

Both the University of California and the California State University have revised their salary schedules for engineering, computer science, and business faculty effective Fall 1982, and both have applied some investment in People funds to the improvement of teaching and research in engineering and computer science. The following paragraphs describe these actions and their results to date, together with the salary structure and relevant personnel practices of the California Maritime Academy.

THE UNIVERSITY OF CALIFORNIA

Development and Impact of Salary Differentials

Concerns about the inadequacy of the University of California's salary structure to compete for faculty in business and engineering led, in part, to the creation of an ad hoc committee on personnel matters, in 1979, chaired by Professor David H. Templeton of the Chemistry Department at Berkeley. The Committee was faced with the fact that, with the exception of law, medicine, and certain other health sciences, the University had a uniform salary structure with about one step of overlap between ranks. Although by using what are called "off-scale" salaries, individual faculty members can be compensated more than the salary indicated on the published scale for a given rank and step, limits exist on how extensively these special salaries can be awarded without destabilizing the University's entire faculty compensation system. This is particularly true in trying to deal with persistent noncompetitiveness of salaries for an entire discipline, in contrast to recruiting and retaining a few outstanding individuals.

The Templeton Committee studied and debated the issues of separate salaries for faculty in business, engineering, and other disciplines at length, but the issue for University administrators became clear--either the University had to adopt a salary structure that responded to market salary requirements, or it had to reduce its role and mission in business and engineering commensurate with noncompetitive salaries. Despite strongly held and sharply divergent views on almost every aspect of the issue, within both the faculty and the administration, President Saxon concluded that the University's single salary system could not resolve the growing problem of recruiting and retaining faculty in these areas. In July 1981, he alerted the Regents to the problem. In November, he presented a progress report on the topic, and the Regents endorsed, in principle, his proposal of special salary scales for business and engineering faculty with the understanding that he would present specific data concerning the proposal at a later meeting. In January 1982, the Regents adopted a common specific salary schedule for business and

engineering faculty effective the following June 30. Although the State budget did not provide funds for salary increases for 1982-83, the Regents implemented new scales out of the University's base budget.

This new schedule permitted the University to offer assistant professors in engineering an "11- to 12-month salary of between $28,400 and $35,800 rather than the general faculty salary for 11-12 months of $22,900 to $30,100. Nonetheless, even this range compared unfavorably with starting salaries for PhDs in engineering generally in 1982, which according to the College Placement Council (CPC) averaged $36,228 for chemical engineers, $34,212 for civil engineers, $37,188 for electrical engineers, and $35,508 for mechanical engineers. In spite of this special scale, the University's typical starting salary for assistant professors in engineering is about $8,000 below average. (The CPC survey covers engineering PhDs in all fields, including education, government, business, and industry.)

University officials have noted no impact of the special salary scale thus far on their ability to recruit recent PhD graduates with the qualifications that the University requires.

Use and Impact of Investment in People Funds

Under the Investment in People program, in 1982-83 the University received $1 million to promote research and education in engineering, computer science, and related basic sciences. Of the $1 million for engineering, computer science, and related fields, $875,000 was designated for acquisition of state-of-the-art equipment for advanced undergraduate instruction. The remaining $125,000 was targeted for retention of underrepresented minority students (American Indian, Black, Chicano, Latino, and Filipino) at the six campuses with the greatest number of underrepresented minorities in engineering and computer science.

While the amount of funds is small, and these funds were not made available to campuses until mid-Fall, University officials claim that they are beginning to have their intended direct benefits on the quality of engineering education and research and on the numbers of students that the University can serve. Their effects on faculty recruitment and retention, however, are largely indirect except for microelectronics and stem largely from improvements in the working environment of faculty members through updated teaching equipment.

THE CALIFORNIA STATE UNIVERSITY

Development and Impact of Salary Differentials

In September 1980, the Trustees of the California State University considered three options for a revision of the system's entire faculty salary schedule, and in January 1981 it adopted in principle the third of the three.

- Option I would have sought to meet the competition of the marketplace by adding five new steps to the salary schedule at the assistant professor level and three steps at the associate and full professor levels, all in 5 percent gradations as in the present schedule.

- Option II would have provided a more flexible system of merit rewards by extending the existing salary schedule upward in the three professorial ranks and dividing steps in the schedule into 2 1/2 percent increments. Through merit review, individuals could be awarded one, two, or three salary increments.

- Option III sought to meet the competition of the marketplace as well as allow for the reward of merit by preserving the 5-step structure of the existing schedule while introducing 2 1/2 percent steps as an upward extension in the professorial ranks.

The first-year cost of Option III was calculated at $1.6 million, and the Trustees requested that the Governor augment the State University's budget accordingly. Their request was denied, and no salary increases were granted by the State in 1982-83.

Effort to Improve Recruitment and Retention of Faculty: State University campuses, continuing to experience difficulty in competing with industry and other institutions for faculty in certain disciplines, (principally engineering, computer science, and business administration), have increasingly made appointments into upper academic ranks, rather than into the assistant professor level, even though applicants may not have demonstrated all of the qualifications normally required for those levels. In order to prevent further deterioration of the hiring situation and provide limited flexibility in the placement of newly-hired faculty in the disciplines of engineering, computer science, and business administration, in March 1982, the Trustees adopted two "annotations" of the salary schedule. The first was directed toward improvement of recruitment, whereby newly hired assistant professors in these disciplines could be placed, if necessary, at the associate professor level for salary purposes only. The second was directed towards retention, would have allowed top-step assistant professors to be advanced to the first step of associate professor in salary while retaining the rank of assistant professor. These two annotations were to be effective from April 1, 1982, until June 30, 1983, with funds to implement them derived from either the Investment in People program or through legislative action. Neither of these sources materialized. The 1982-83 Budget Act contained supplemental language precluding the use of Investment in People funds to augment faculty salaries except when additional work was provided and prohibiting the annotation which would have allowed top-step assistant professors to be advanced to the first salary step for associate professor without a change in rank. According to the Legislature's Committee on Conference (Supplementary Report, Item 6610-001-001, Number 6), "CSUC shall not add additional steps or step advancement procedures to the 1981-82 faculty salary schedule because specific funds for such purpose have not been provided by the Legislature," and "It is further the intent of the Legislature that proposed alternatives to the current faculty pay schedule be determined through the appropriate collective bargaining process."

With no funds available for salary increases in 1982-83, the Trustees left the decision about paying differential starting salaries in high-demand disciplines to each campus, with the campus having to generate the needed revenues out of its own sources of funds. Because of budget cuts, only two campuses--Long Beach and San Luis Obispo--utilized the higher scale for assistant professors, and it was applied to only one faculty member on each campus.

Currently, starting salaries for assistant professors at the State University range from $19,000 to $22,896 for nine months or from $21,852 to $26,316 for 12 months. They are thus some $8,500 below the average reported by CPC for recent PhD graduates with the qualifications the State University seeks. The alternative of making new appointments at the associate professor level in order to be competitive may have undesirable long-term consequences.

Further Efforts to Improve Retention of Existing Faculty: In October 1982, Chancellor Reynolds issued Executive Order No. 402, authorizing two-step salary advancement of existing faculty in cases "where it is necessary to retain essential faculty in engineering, computer science, and business" and "where salary level is a major factor in retention."

In December, the two competing faculty unions, the United Professors of California (UPC) and the Congress of Faculty Associations (CFA), registered their protest to the Executive Order by filing unfair labor practice complaints with the Public Employees Relations Board. The unions registered different degrees of opposition, with the UPC opposing the principle of differential salaries and the CFA recognizing the State University's need to react to shifts in market supply and demand while objecting that the Chancellor acted unilaterally. An informal hearing on the complaints has been scheduled by the Public Employees Relations Board for late February, but meanwhile the Executive Order remains in effect. So far, for the entire system, two-step advancements have been given to only three faculty members on two campuses--one at Long Beach and two at San Luis Obispo.

These efforts have thus far been ineffective in solving recruitment and retention problems.

Use and Impact of Investment in People Funds

The California State University proposed to use its $2.25 million appropriation under the Investment in People fund for 1982-83 on "Engineering and Computer Science Program Enhancement" in three major areas, as follows:

1. Faculty Development Activities

   a. Retraining of presently tenured CSU faculty from related disciplines.

   b. Augmentation of funds to assist in the relocation of newly hired faculty in engineering and computer sciences.

   c. Summer salary augmentation for engineering and computer science faculty.

d. Academic year salary augmentation for engineering and computer science faculty.

e. Programs to improve the recruitment and retention of women and ethnic minorities in engineering and computer sciences (directed at students).

2. Program Productivity Improvement Activities

a. Provision of additional technical/clerical support.

b. Accelerated curricular innovation.

c. Campus-based programs.

3. Purchase of New and Replacement Equipment

As noted above, through budget control language the Legislature prohibited augmentation of engineering and computer science faculty salaries (Item 1d) unless additional work was provided.

After solicitation and evaluation of campus proposals, 51.7 percent of the funds was allocated for the purchase of instructional equipment (Item 3); 10.9 percent was allocated to programs designed to promote the recruitment and retention of women and minority students (Item 1e), and 37.5 percent, or $835,000 was allocated to faculty development and program productivity improvement activities. As at the University, officials of the State University report that the Investment in People resources have been directed to improving instruction at the State University through acquisition of state-of-the-art equipment in engineering and computer science and the working conditions of faculty in these fields. But only limited funds have been available to aid recruitment and retention of engineering faculty as was planned in Items 1b and 1c: instead they have gone primarily into the retraining of present faculty from related disciplines (Item 1a) and into curricular innovation (Items 2a and 2b).

THE CALIFORNIA MARITIME ACADEMY

The California Maritime Academy is unique not only because it is the only maritime academy on the west coast and one of but six in the United States, but also in the nature of its programs. Its marine engineering technology program (for marine engineering officers) is accredited by the Accreditation Board for Engineering and Technology, and its nautical industrial technology program for deck officers is accredited by the National Association of Industrial Technology. Academically, the Academy's programs represent a hybrid between engineering technology and engineering. The professional qualifications for its technology faculty members include a graduate degree in engineering, relevant experience, and the added qualification of possession of a valid U.S. Coast Guard license.

Since 1979, faculty appointments at the Academy have been divided into three categories; general studies, nautical industrial technology, and marine engineering technology. Separate salary schedules exist for general studies and technology at the rank of assistant professor, where technology salaries range about 7 percent higher than general studies--from $25,488 to $30,756 for the 12-month year on which the Academy operates instead of $21,852 to $26,316 for general studies faculty. The goal of the Academy is to extend these separate schedules to other ranks and to bring their average salaries up to those of the State University. Currently, the Academy's salary for assistant professors in technology remains $5,000 below market. The inadequacy of the Academy's salary differential is illustrated by the fact that over the years from 1975 to 1981, it suffered an average faculty turnover rate of 11 percent, with turnover in 1981-82 rising to 26 percent, with the bulk of this turnover occurring in technology.

Part of the Academy's problem in attracting faculty may stem from the unusual way in which personnel operations are handled for the Academy. When it was given semi-independent status from the Department of Education in 1979 through the creation of its own Board of Governors, its personnel transactions remained with the Department. In conjunction with the Academy and the State Personnel Board, the Department handles labor relations, classifications, transactions for appointments and testing. All faculty and academic administrative positions are exempt classes. Position descriptions have been developed in the standard Personnel Board format for job specifications. The faculty is represented by the California State Employees Association (CSEA) Unit 3, Education and Library.

TWO

COMPETITION FROM OTHER INSTITUTIONS

The University of California, the California State University, and the California Maritime Academy face major competition for engineering faculty not only from industry but also from other colleges and universities. This chapter describes the salary policies and other incentives for recruiting and retaining faculty of other institutions, based on a December 1982 survey conducted by the California Postsecondary Commission of Engineering Deans in the 203 American colleges and universities--other than California's public institutions--that offer more than one engineering major accredited by the Accreditation Board for Engineering and Technology. One hundred and nine of the deans responded to the questionnaire.

EXTENT OF FLEXIBLE SALARY STRUCTURES

Unlike California's public colleges and universities, 92 of the 103 institutions responding to this question utilize flexible overlapping salary ranges that allows all schools or departments to compete for personnel within their respective markets. Only 8 of the 103 adhere to a fixed step-by-step salary schedule that applies to all disciplines.

At one institution, each school or college on its campus has its own separate flexible salary structure. At two others, salary differentials exist at the assistant professor level only, but one of the two expects to expand differentials to other levels in order to compete in the marketplace.

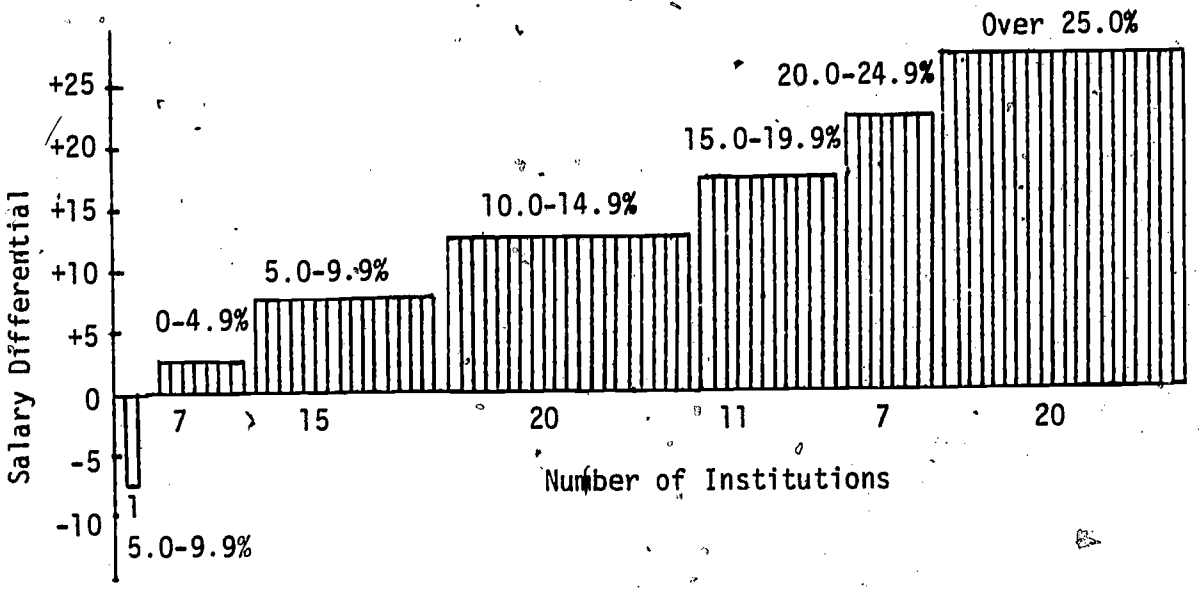
AMOUNT OF ENGINEERING SALARIES

Engineering faculty salaries differ from those in other disciplines such as liberal arts by an average of 13 percent in those institutions whose deans were able to specify the current percentage. They differ by over 25 percent at a fourth of these institutions and by over 10 percent in 72 percent of the institutions. At only 28 percent of the institutions is the differential less than 10 percent. One campus with a differential of between 0 and 4.9 percent will increase its differential this year. Only one institution pays engineering faculty between 5 and 10 percent less than liberal arts faculty--but it pays new engineering faculty an average of $28,500, which is still above average for the 103 institutions.

At two institutions where starting salary is the only flexible salary item because of collective bargaining, one offers starting salary differentials for engineering faculty of between 20 and 24.9 percent, while the other offers over 25 percent.

A graph of salary differentials paid to engineering faculty appears in Figure 1. The higher differentials tend to occur at institutions with larger programs, and hence the weighted average differential is somewhat greater than 13 percent. This average of 13 percent, equals the salary factor determined by the American Association of State Colleges and Universities for its institutions, which grant primarily bachelor's degrees, but it is much lower than the 20 percent determined for the institutions belonging to the National Association of State Universities and Land-Grant Colleges, most of which offer the doctorate. (Details of these other studies appear on pages 13-14 below. In addition, further information on salaries appears in the annual reports of the Engineering Manpower Commission, which analyze salaries in a variety of industries and education in terms of the years since individuals received their bachelor's degrees.)

FIGURE 1 Average Engineering Faculty Salary Differentials Compared to Liberal Arts, Fall 1982



Source: California Postsecondary Education Commission Survey.

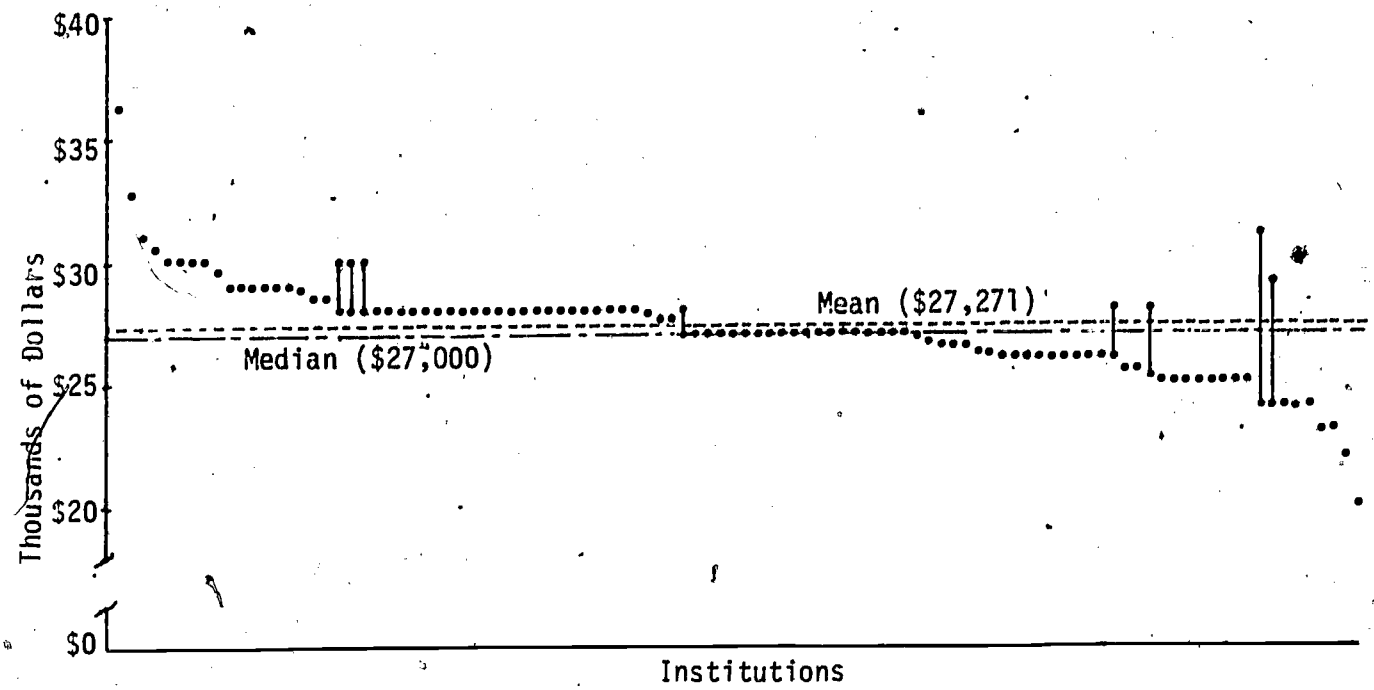
SALARY FLEXIBILITY WITHIN ENGINEERING

At 68 percent of the institutions, engineering salaries differ by major or specialization in response to the availability of faculty.

RANGE OF STARTING SALARIES

The average nine-month equivalent starting salaries that 102 of the institutions offered in Fall 1982 to recent engineering Ph.D. graduates joining their faculty ranged from a low of $22,000 to a high of $36,207.60, with a mean of $27,271 and a median of $27,000. Figure 2 displays the distribution of these starting salaries. For eight of the 74 institutions that offer salary differentials among engineering specialties, bars on the graph represent the range of their starting salaries rather than the average.

FIGURE 2 Average Nine-Month Faculty Starting Salaries for Recent Engineering Ph.D. Graduates at 102 Accredited Engineering Schools or Colleges, Fall 1982



Source: California Postsecondary Education Commission Survey.

SALARIES FOR GRADUATE ASSISTANTS

The most common salary range for nine-month graduate research/teaching assistantships is between $5,000 and $7,499 (reported by 50 of the institutions or 56 percent) 18 institutions or 20 percent offer assistantships of less than $5,000; but eight provide assistantships in the range from $7,500 to $9,999; three offer between $10,000 and $12,499; and three offer from $12,500 to $14,999. In California, public university stipends range from $3,400 to $8,000. Most all of the assistantships are for half-time appointments and include tuition waivers. Some institutions provide differentials at the M.S. and Ph.D. levels, and some differentiate between teaching and research.

Respondents by and large assert that stipends for half-time graduate assistants must be raised substantially in order to attract more domestic students to graduate study. On the average, they suggest stipends averaging over $11,000, and two suggest stipends amounting to one-half the average starting salary offered to graduates with B.S. degrees plus tuition.

USE OF FACULTY INCENTIVES BESIDES SALARY

Sixteen percent of the institutions do not use any special incentives to attract and retain engineering faculty beyond those offered to all faculty. The other institutions use one or more of the following incentives, and some probably employ them in other disciplines besides engineering.

Summer Employment: Summer teaching or research is the incentive most frequently used by institutions. Two-thirds of the 86 offer it, although four of the 57 guarantee summer support for only a limited period--three of them for only a faculty member's first summer, and the fourth for the first two summers. Another pays new faculty two months salary during the first summer from gift funds, with the faculty involved either in teaching, research, or course and laboratory development.

Payment of Moving Expenses: The second most common incentive--offered by 40 percent of the 86--is payment of moving expenses. All but one of the 34 considered their moving allowance to be "generous."

Travel: The third most frequent incentive--cited by 37 percent--is to provide added travel funds.

Reduced Load and Added Assistance: Two incentives tie for fourth place--reduced workload, and additional technical or research assistance. Both are offered by more than a quarter of the institutions. The form of these incentives varies widely:

- One institution offers new faculty a light teaching load of one course for the first year coupled with seed money for research followed by two quarters with no teaching responsibilities to develop research initia-

tives which are then funded on a competitive basis among all engineering faculty.

- A second, in addition to reduced teaching load for new faculty, provides them with modest expense budgets to use for whatever purpose advances the instructional and research program of the institution.

- A third provides new faculty with a half-time teaching load during the first two years, one or two graduate assistants, and $25,000 in equipment funds to develop new laboratory and research capabilities.

- A fourth grants each new faculty member $25,000 from unrestricted funds as seed money for research.

- A fifth supplies equipment funds and three graduate research assistants over a two-year period to help the new assistant professor develop instructional and research capabilities.

Pre-Arranged Consultation Opportunities: Nine of the 86 institutions establish firm commitments for consulting opportunities prior to the individuals appointment to the faculty.

Support Services: Nine others provide added secretarial or technical support services.

Housing Aid: Seven of the 86 provide low-interest mortgage subsidies to engineering faculty while six provide on-campus or low-cost housing to new faculty. One of these six limits its campus or low-cost housing to three years.

Other Incentives: Further incentives that aid recruitment and retention of engineering faculty include:

- assistance in locating consulting opportunities on a one day per week basis (six campuses);

- hiring new faculty at higher than normal rank in order to attract them (six campuses);

- avoidance of the "publish or perish" syndrome (several undergraduate institutions);

- concentration on issues of "quality of life" for young faculty (many institutions);

- contributions of industry and private donors (three institutions);

- campus location and growth potential as positive factors (several institutions);

- full remission of tuition for spouse and children (one institution);

- forgivable loans to non-Ph.D. faculty to allow them to complete their degree programs (one institution);

- immediate vesting and portability of its TIAA/CREF retirement program (one institution); and
- "outstanding teacher" and "outstanding researcher" awards of $2,500 per year, from a $100,000 gift (one institution).

An open-ended question about incentives that aid recruitment and retention of engineering faculty elicited the following observations:

Provide adequate space and equipment for teaching and research.

Industrial support plans may be helpful but there are too few.

Maintain prestige and state-of-the-art faculties.

Quality programs attract quality faculty.

We provide modest individual faculty expense budgets which they control.

Utilize accelerated salary improvement for strong scholarly output.

Use discretionary funds to reward outstanding achievement.

Adoption of a true merit system is necessary for the long term.

A tough problem because supply is limited in high demand areas (CAD/CAM, and others).

Concentrate on "quality of life" issues, maintain reputation, stimulate environment.

Guarantee one or two summers of support and light teaching load for development of research.

Lack of graduate program relieves pressure for research and publication.

Unionized faculty leaves entry level salary as the only element under control.

Difficult problem--must compete with industry. We have lost 10 percent or more of our faculty each year. Poor ones to ask the question.

Our location is an asset.

Our good intentions are compromised by lack of funds.

The best way is money.

A number of deans report difficulties in recruiting faculty, despite special incentives. Sixteen percent of the 109 are employing more faculty than usual who do not hold the Ph.D., and 18 percent are employing persons with less experience than desired. Several have found it necessary to increase their number of part-time faculty, and nearly 10 percent are hiring more

foreign nationals despite their preference for domestic faculty. Some cite the language and cultural problems of foreign nationals, but for others a larger problem is their lack of industrial experience and an understanding of American industry. Some institutions that are unable to recruit qualified faculty are limiting enrollment rather than hiring faculty who do not meet their standards.

COMPARATIVE SALARY DATA

The survey responses lend support to the conclusion of many experts that the competition for faculty lies in industry and that universities must compete with industry through competitive salaries, state-of-the-art equipment, and a satisfactory working environment. The problem of adequate salaries and other incentives afflicts many other institutions besides those in California, but many of these institutions operate under more flexible salary structures and with greater incentive programs than California's public institutions.

The survey confirms published reports that 'flexible' salary ranges are the norm and not the exception in colleges and universities with engineering programs. Although only eight states and a limited number of institutions have initiated programs that specifically increase salaries for engineering faculty above general faculty salaries through a "salary differential," most institutions have sufficient salary-setting flexibility through overlapping salary ranges to pay more to hire or retain faculty in high-demand fields, be it engineering or some other discipline. That is, their salary practices result in significantly different average salaries between fields, although they may not have an explicit policy of salary differentials for certain fields.

Among studies that demonstrate this fact, the annual salary survey that John Minter and Associates conducts for The Chronicle of Higher Education shows that for 1982-83, engineering salaries topped those of the seven other fields surveyed, as Table 1 indicates, and that starting salaries for engineering faculty increased by the highest percentage of all eight fields over 1981-82.

And in an annual survey of member institutions of the National Association of State Universities and Land-Grant Colleges, M. L. Gilliam has found that as of 1981-82, new assistant professors in engineering received salaries 20 percent higher than the average of similar professors across all disciplines, while the salaries of all assistant professors in engineering were 16 percent above average, those of associate professors were 10 percent above, and those of professors, 6 percent above. In electrical engineering--a field particularly short of faculty--these same differences were 24 percent, 20 percent, 13 percent, and 8 percent, respectively.

In a survey of 204 public colleges and universities that are primarily baccalaureate oriented, the American Association of State Colleges and Universities, in cooperation with the College and University Personnel Association, found that among 21 selected disciplines as defined by the

Higher Education General Information Survey (HEGIS) taxonomy, average engineering salaries for all ranks are 9 percent higher than the average for all disciplines--the highest discipline difference reported. Salaries for new assistant professors are highest in business administration at 16 percent, followed by computer sciences at 14 percent, and engineering at 13 percent above the all-discipline average. Disciplines with lower average salaries at each rank are biological sciences, communications, fine and applied arts, foreign languages, English, home economics, and library sciences.

To meet the competition of other colleges and universities, as well as that of industry, the State of California should reconsider the 1968 recommendation of the Coordinating Council for Higher Education, based on the advice of specialists in compensation outside higher education, that all funds appropriated for salary and countable fringe benefits for faculty or academic personnel at the University and the State University be available in a lump sum without restricting the ability of their respective governing boards to provide differential salaries in order to assist their campuses to accomplish their responsibilities as recognized in the Master Plan and the Donahoe Higher Education Act (Resolution No. 227, Report 68-21).

TABLE 1 Faculty Salaries for 1982-83 by Rank and Discipline, Selected American Colleges and Universities

	All Institutions			
	Average (a)	Increase (b)	High (c)	Low (d)
Arts, fine and applied				
Professor	$31,275	6.3%	$34,936	$26,456
Associate professor	24,114	7.5%	27,279	22,844
Assistant professor	19,592	8.4%	22,258	18,002
All ranks (a)	24,628	7.0%	30,820	18,300
Business and economics				
Professor	32,754	6.3%	38,777	26,731
Associate professor	27,861	7.6%	31,182	24,541
Assistant professor	24,022	7.2%	27,413	20,631
All ranks (a)	28,229	6.6%	34,037	22,421
Engineering				
Professor	36,367	7.5%	40,532	32,202
Associate professor	28,812	9.7%	32,056	25,568
Assistant professor	24,343	10.4%	27,092	21,594
All ranks (a)	30,381	8.5%	35,000	24,863
Humanities (f)				
Professor	32,086	7.2%	37,401	26,063
Associate professor	24,062	7.0%	27,243	20,881
Assistant professor	19,256	6.8%	21,444	17,068
All ranks (a)	24,776	7.2%	30,456	19,096
Physical education				
Professor	29,533	9.0%	32,774	26,292
Associate professor	24,338	7.0%	26,747	21,929
Assistant professor	20,044	7.6%	22,713	18,575
All ranks (a)	24,073	6.7%	29,247	20,099
Science and mathematics				
Professor	31,876	6.4%	36,600	27,151
Associate professor	25,829	7.3%	32,133	25,606
Assistant professor	21,456	9.4%	23,857	19,059
All ranks (a)	26,189	6.8%	31,436	20,942
Social sciences				
Professor	32,451	7.4%	37,281	27,621
Associate professor	24,729	9.6%	28,776	20,681
Assistant professor	19,874	7.6%	22,013	17,735
All ranks (a)	26,756	8.0%	32,831	20,681
Vocational education (g)				
Professor	31,368	4.4%	36,325	26,412
Associate professor	25,303	6.6%	28,103	22,503
Assistant professor	20,011	6.4%	23,827	17,094
All ranks (a)	23,406	0.6%	27,561	19,251

Source: The Chronicle of Higher Education, January 19, 1983, p. 28.

DATA ON OUTSIDE INCOME OF FACULTY

The most recent data on earnings of faculty conducted by members beyond their basic nine-month salaries is for 1980-81 in a survey by John Minter Associates for The Chronicle of Higher Education. Among faculty members surveyed at all types of colleges and universities, 81 percent had extra earnings that averaged $5,756, or 24 percent of their base salaries.

Two-thirds of all faculty reported receiving a substantial part of their additional income from their own institution, either through research work, administrative assignments, or teaching summer, night, and other classes beyond the normal teaching load. Among private institutions, 87 percent of the faculty members increased their income by an average of $11,124--more than one-third of their base income. At public universities, 80 percent had outside income averaging $6,744 and increased their base salaries by 26 percent. Only a small portion of faculty reported extra earnings from outside their institutions. The average of such income, derived either from teaching and research at other institutions or for consulting and other services, was $3,578.

Data from the survey are shown in Table 2 for type of institution and in Table 3 for discipline. Too few assistant professors in engineering were

TABLE 2 Estimated Earnings of Faculty Members Beyond Their Base Salaries for 1980-81

Annual income above base salary earned within the institution | *Annual extra income earned outside the institution*

Type of institution	Public 4-year institutions			Private 4-year institutions			All institutions			Public 4-year institutions			Private 4-year institutions			All institutions		
	Per cent reporting earnings	Average amount of earnings	Per cent of base salary	Per cent reporting earnings	Average amount of earnings	Per cent of base salary	Per cent reporting earnings	Average amount of earnings	Per cent of base salary	Per cent reporting earnings	Average amount of earnings	Per cent of base salary	Per cent reporting earnings	Average amount of earnings	Per cent of base salary	Per cent reporting earnings	Average amount of earnings	Per cent of base salary
Ph.D.-granting universities																		
Professor	66.3%	$6,147	19.1%	66.8%	$6,786	25.8%	66.5%	$6,847	21.0%	56.9%	$4,838	14.8%	73.3%	$6,882	24.3%	63.0%	$5,866	17.2%
Assoc. professor	66.9%	4,636	19.3%	79.3%	4,872	18.2%	71.5%	4,648	18.9%	56.8%	3,888	15.1%	58.6%	6,191	24.7%	58.3%	4,298	17.8%
Asst professor	50.0%	3,929	18.0%	75.8%	5,248	24.7%	64.2%	4,291	21.2%	46.7%	3,586	18.0%	54.5%	4,013	18.1%	48.8%	3,869	18.5%
All ranks	66.8%	4,962	19.2%	71.1%	7,001	23.8%	67.2%	5,508	21.0%	53.3%	4,041	16.2%	66.4%	7,272	23.7%	57.1%	4,804	17.7%
Institutions granting other graduate degrees																		
Professor	54.9%	$4,400	8.1%	78.2%	$3,867	14.3%	61.1%	$4,254	10.8%	56.9%	$3,388	11.9%	56.7%	$3,148	11.3%	59.7%	$3,304	11.7%
Assoc. professor	78.5%	2,984	17.8%	74.5%	4,102	18.5%	77.0%	4,018	18.3%	47.3%	3,925	17.2%	58.2%	4,314	18.5%	51.4%	3,948	17.9%
Asst professor	58.2%	2,908	15.4%	80.5%	3,282	18.0%	64.2%	3,001	16.1%	46.1%	2,062	0.9%	38.9%	1,486	8.8%	43.1%	1,909	10.2%
All ranks	66.0%	3,786	10.8%	66.7%	3,713	16.8%	66.8%	3,786	13.8%	50.0%	3,306	13.3%	56.8%	3,196	14.3%	52.0%	3,208	13.7%
Institutions granting only bachelor's degrees																		
Professor	—	—	—	64.4%	$2,089	6.9%	64.4%	$2,089	6.9%	—	—	—	58.0%	$2,862	11.8%	58.0%	$2,862	11.8%
Assoc. professor	—	—	—	72.1%	1,397	7.5%	72.1%	1,397	7.5%	—	—	—	50.8%	5,022	25.8%	50.8%	5,022	25.8%
Asst professor	—	—	—	63.8%	1,781	10.8%	63.8%	1,781	10.8%	—	—	—	46.8%	2,810	17.4%	42.0%	2,818	17.4%
All ranks	—	—	—	63.5%	1,708	9.2%	63.5%	1,708	9.2%	—	—	—	47.8%	3,384	17.8%	47.8%	3,384	17.8%
2-year colleges																		
All ranks	—	—	—	—	—	—	78.2%	$6,094	14.8%	—	—	—	—	—	—	38.1%	$3,732	16.1%
All types combined																		
Professor	66.8%	$6,178	17.9%	66.3%	$4,988	17.8%	63.2%	$4,881	16.8%	56.8%	$4,018	13.1%	63.8%	$4,884	16.8%	58.9%	$3,774	13.2%
Assoc. professor	73.9%	4,278	18.9%	74.8%	3,577	18.3%	74.2%	3,988	17.9%	58.3%	3,788	16.3%	56.2%	4,981	22.9%	53.4%	4,262	16.9%
Asst professor	66.3%	2,388	17.4%	66.0%	2,514	16.9%	66.8%	2,234	17.0%	46.3%	2,736	14.1%	43.9%	2,881	14.6%	43.0%	3,129	16.8%
Instructor	66.7%	2,867	16.8%	51.7%	1,144	7.3%	57.9%	2,287	15.2%	42.9%	2,299	14.8%	66.1%	3,174	28.8%	46.0%	2,548	15.8%
All ranks	66.1%	4,398	17.9%	67.0%	4,288	18.2%	66.4%	4,014	17.4%	51.7%	3,578	14.2%	56.3%	4,881	18.8%	51.7%	3,873	16.2%

Source: The Chronicle for Higher Education, December 9, 1981, p. 14.

surveyed to provide a reliable estimate of extra income derived from within their institution or from ouside the institution for public or private institutions separately, but Table 3 shows that associate professors in engineering had the highest outside income of any group surveyed. Samples in the survey were determined in such a manner that there is a 95 percent probability that the average amount of extra earnings for faculty members of

TABLE 3 Faculty Members' Earnings, by Discipline, Beyond Their Base Salaries in 1980-81

Annual income above base salary earned within the institution

Discipline group	Public 4-year institutions			Private 4-year institutions			All institutions		
	Per cent reporting earnings	Average amount of earnings	Per cent of base salary	Per cent reporting earnings	Average amount of earnings	Per cent of base salary	Per cent reporting earnings	Average amount of earnings	Per cent of base salary
Arts (g)									
Professor	47.4%	$3,666	13.4%	47.1%	$3,640	11.7%	46.2%	$3,657	12.6%
Assoc. professor	77.2%	2,668	12.0%	68.8%	1,660	7.4%	70.2%	2,439	10.8%
Asst professor	58.2%	2,088	12.0%	58.0%	1,736	8.5%	58.1%	1,878	10.7%
All ranks	64.3%	2,748	12.9%	51.2%	2,288	8.9%	58.2%	2,568	11.5%
Business (h)									
Professor	87.5%	$6,467	21.3%	58.6%	$5,123	16.8%	66.4%	$6,087	17.7%
Assoc. professor	80.8%	5,712	22.6%	66.4%	3,918	15.8%	69.4%	4,848	20.3%
Asst professor	62.9%	4,667	21.3%	71.4%	4,070	20.6%	71.0%	4,088	19.8%
All ranks	70.2%	5,478	21.1%	66.8%	4,417	17.7%	70.8%	4,588	18.8%
Engineering (e)									
Professor	74.2%	$6,736	21.0%	72.7%	$7,911	26.8%	73.1%	$7,139	23.8%
Assoc. professor	68.8%	5,873	23.1%	91.7%	6,462	26.3%	78.2%	5,844	23.9%
Asst professor	—	—	—	—	—	—	78.6%	4,381	20.2%
All ranks	70.1%	5,838	21.9%	86.1%	7,086	27.8%	72.9%	6,778	25.8%
Humanities (d)									
Professor	42.4%	$3,347	11.7%	64.8%	$2,668	8.9%	56.4%	$3,360	12.8%
Assoc. professor	67.8%	4,136	16.6%	66.2%	1,842	8.0%	68.1%	3,788	17.2%
Asst professor	52.4%	2,236	12.9%	52.4%	1,288	8.2%	58.8%	2,047	11.8%
All ranks	54.3%	3,427	15.2%	66.8%	2,288	10.3%	61.8%	3,178	14.8%
Physical education (e)									
Professor	—	—	—	—	—	—	57.1%	$4,040	18.4%
Assoc. professor	—	—	—	—	—	—	62.1%	3,889	18.1%
Asst professor	—	—	—	—	—	—	64.8%	3,470	16.7%
All ranks	65.4%	$3,979	18.2%	67.0%	$4,078	19.2%	73.0%	3,818	17.7%
Sciences (f)									
Professor	58.7%	$4,667	16.2%	63.9%	$6,008	18.9%	66.8%	$4,899	17.0%
Assoc. professor	62.5%	3,962	17.0%	66.2%	2,822	13.2%	78.7%	3,374	15.2%
Asst professor	64.0%	3,583	19.2%	60.0%	2,307	17.3%	60.6%	3,240	17.5%
All ranks	58.5%	4,404	17.8%	62.5%	2,979	17.3%	66.2%	4,064	17.1%
Social sciences (g)									
Professor	67.4%	$4,408	15.4%	72.7%	$6,999	15.8%	71.9%	$6,877	14.4%
Assoc. professor	78.2%	4,142	18.8%	78.0%	3,736	16.7%	72.5%	3,798	17.1%
Asst professor	50.0%	3,886	20.8%	91.8%	2,988	14.8%	66.0%	3,288	17.7%
All ranks	67.9%	4,088	17.1%	66.4%	3,536	15.4%	67.8%	3,818	16.8%
Vocational education (k)									
Professor	—	—	—	—	—	—	66.0%	$6,118	10.8%
Assoc. professor	63.8%	$3,488	15.3%	—	—	—	67.4%	3,447	16.3%
Asst professor	58.4%	3,127	16.4%	66.2%	$2,887	15.4%	66.2%	2,883	15.4%
All ranks	53.3%	3,408	15.8%	56.1%	2,767	15.0%	66.8%	3,088	16.1%

Annual income above base salary earned outside the institution

Discipline group	Public 4-year institutions			Private 4-year institutions			All institutions		
	Per cent reporting earnings	Average amount of earnings	Per cent of base salary	Per cent reporting earnings	Average amount of earnings	Per cent of base salary	Per cent reporting earnings	Average amount of earnings	Per cent of base salary
Arts (g)									
Professor	66.2%	$2,366	6.1%	78.6%	$6,751	21.7%	64.1%	$3,657	12.6%
Assoc. professor	63.6%	1,662	3.2%	108.0%	3,224	16.4%	67.8%	2,568	12.1%
Asst professor	62.5%	1,667	3.9%	71.4%	1,438	7.8%	66.4%	1,716	8.1%
All ranks	64.2%	2,348	5.9%	78.7%	4,944	18.3%	64.9%	3,268	14.1%
Business (h)									
Professor	66.5%	$7,566	24.0%	66.5%	$6,664	21.2%	64.2%	$6,618	20.2%
Assoc. professor	66.4%	5,918	23.6%	66.2%	7,066	28.2%	66.1%	6,787	24.8%
Asst professor	54.2%	2,966	13.9%	42.9%	2,778	12.7%	48.4%	3,228	15.7%
All ranks	66.6%	6,866	21.6%	67.4%	5,841	22.6%	66.6%	6,267	21.1%
Engineering (e)									
Professor	67.1%	$4,670	14.8%	72.7%	$4,446	16.0%	66.6%	$4,146	14.0%
Assoc. professor	72.7%	6,866	27.8%	91.7%	9,866	41.1%	78.7%	10,466	43.6%
Asst professor	—	—	—	—	—	—	64.3%	3,966	16.8%
All ranks	78.1%	6,647	20.1%	76.6%	6,946	26.7%	76.4%	6,741	25.8%
Humanities (d)									
Professor	24.2%	$3,163	10.8%	54.6%	$2,264	6.8%	40.6%	$2,426	8.7%
Assoc. professor	38.2%	2,716	12.0%	64.3%	966	3.2%	44.1%	2,066	9.5%
Asst professor	47.8%	2,201	12.9%	33.3%	966	6.0%	36.8%	3,217	16.1%
All ranks	36.1%	2,917	13.0%	46.8%	1,866	6.1%	37.9%	2,626	11.8%
Physical education (e)									
Professor	—	—	—	—	—	—	32.1%	$2,250	8.0%
Assoc. professor	—	—	—	—	—	—	22.1%	1,618	6.9%
Asst professor	—	—	—	—	—	—	36.5%	2,077	13.8%
All ranks	22.7%	$1,466	6.3%	43.8%	$2,467	11.1%	31.8%	2,190	8.8%
Sciences (f)									
Professor	51.4%	$3,718	12.1%	48.2%	$3,566	13.1%	48.0%	$3,966	14.2%
Assoc. professor	37.5%	1,979	9.2%	31.8%	4,814	24.8%	36.8%	2,646	13.3%
Asst professor	—	—	—	28.8%	3,347	18.7%	22.7%	2,866	14.9%
All ranks	36.6%	3,430	12.2%	38.2%	4,080	18.8%	37.1%	3,470	13.6%
Social sciences (g)									
Professor	66.2%	$6,666	8.7%	63.6%	$4,740	15.9%	64.9%	$6,966	10.6%
Assoc. professor	66.0%	3,311	14.8%	66.0%	1,116	5.1%	67.0%	2,564	12.0%
Asst professor	31.8%	1,219	6.7%	34.8%	6,378	36.1%	36.3%	2,734	15.9%
All ranks	66.8%	2,923	10.4%	46.7%	3,844	16.9%	46.7%	2,776	11.6%
Vocational education (k)									
Professor	—	—	—	—	—	—	66.0%	$6,366	7.9%
Assoc. professor	50.0%	$4,136	17.6%	—	—	—	56.8%	4,946	23.0%
Asst professor	66.6%	4,266	22.2%	66.4%	2,366	14.3%	62.1%	3,361	17.7%
All ranks	66.7%	3,481	16.4%	66.9%	3,013	17.0%	66.8%	3,612	17.6%

— indicates too few data for reliable estimate.
f Includes mathematics.
g Includes architecture, area studies, communications, and theology.
h Includes economics.
j Includes computer sciences.
k Includes education, English language, journalism, literature, philosophy, religion, and speech.
m Includes nursing and recreation.

(d) Includes mathematics.
(e) Includes education.
(g) Includes agriculture, architecture and engineering technologies, health, home economics, nursing, occupational and physical therapy, and textiles.
(h) One-fourth of the faculty members reporting other earnings received more than this amount.
(k) One-half of the faculty members reporting other earnings received more than this amount.
(m) One-fourth of the faculty members reporting other earnings received less than this amount.

Source: The Chronicle for Higher Education, December 16, 1981, p. 6.

all ranks at all institutions is within $156 of the average found in the sample. Consequently, it is reasonable to expect these amounts are typical for faculty in the State University and the University of California.

Tables 2 and 3 should be interpreted cautiously because 48 percent of all faculty members who reported no extra earnings were not included in the survey's calculation of average amounts, but they indicate that the extra income earned by business and engineering faculty--the two highest disciplines at public institutions among faculty who responded to the survey--was less than two-ninths of their base salary. In other words, two months of income during the summer computed at their monthly academic year rate would account for the reported annual income above base salary.

The Business-Higher Education Forum analyzed the results of the NSF-ACE survey and concluded that, usually, most of this "extra compensation" is regular salary payment derived from additional work during a period when the faculty member is not normally employed or otherwise paid by the institution. The Forum concluded (1982, p. 10):

> On the issue of salaries, the matter of consulting income of engineering faculty should be considered. The image of the average engineering faculty member's doubling or tripling his or her salary as a sought-after professional consultant is more image than fact and often more red herring than perception. It is a convenient illusion too frequently invoked by central budget offices to rationalize their reluctance to advocate academic engineering salaries that are reasonably related to the alternative twelve-month incomes available in engineering positions outside academe. However, it is only an illusion.

Policies on outside income of faculty at the University and State University are presented in Appendix C. Basically their policy is to rely on campus administrators to allow income from off-campus sources but to hold individual faculty members' outside activities to reasonable levels so as not to impinge on their primary responsibility to the institution.

THREE

CONCLUSIONS OF REGIONAL, STATE, AND NATIONAL STUDIES

Over the past three years, many state, regional, and national studies have been undertaken that are relevant to recruitment and retention of engineering faculty in California public higher education. Among regional studies, the most relevant is that by the Western Interstate Commission for Higher Education (WICHE) on high-technology manpower. In its 1982 draft report, which represents the work of 41 leaders from industry, education, state government, and other organizations from 13 western states, it suggests that educational institutions and state governments, in expanding efforts to recruit and retain top faculty members in high-demand fields, consider:

a. Establishing differential pay scales;

b. Providing "enrichment" of salaries on an ad hoc basis through corporate contributions;

c. Establishing shared appointments between education institutions and industry to provide enhanced salaries;

d. Establishing program differential pricing--tuition differentials--with increased funds allocated to faculty salaries (p. 48).

More analyses have been undertaken at state and national levels than regionally. The following paragraphs summarize recent conclusions, first at the state level and then at the national.

COMMISSION AND SEGMENTAL STUDIES

In its recent report on engineering and computer science education in California, the California Postsecondary Education Commission summarized the faculty recruitment and retention efforts and results at both the University and the State University over the past three years. That summary, reproduced in Appendix B below along with comparable data from the Maritime Academy, indicates that these engineering schools are falling increasingly behind in their recruitment of faculty and, as a result, must occasionally appoint faculty at higher ranks than they would prefer--thereby causing salary compaction for young faculty, shortening the tenure review period, and creating severe problems of equity and morale for both junior and senior faculty.

Since the publication of that report, further evidence indicates little change in this trend.

- At San Jose State University, with one of the larger engineering programs in California, nearly one-third of its tenure-track positions in engineering remained unfilled this year, and 42 percent of the classes were taught by part-time instructors. If it is to maintain even its present

level of two-thirds filled positions, it must more than triple its present rate of hiring. Over the past five years, it has been able to recruit an average of only 2.5 new engineering faculty per year, in spite of the fact that the Dean has been able to locate summer employment for candidates and has even arranged employment for their spouses. Over the next five years, between 30 and 45 of the current faculty are likely to leave for more lucrative jobs in industry or other institutions or retire. Were these current rates of recruitment, resignation, and retirement to continue, San Jose's engineering program would cease to exist in seven more years--by 1990.

- Fresno State has conducted a similar analysis. It has had to reduce engineering enrollments by 15 percent this past year due to its inability to attract new faculty at current salary levels. Unless conditions improve, by 1985, it will need to cut enrollments by another 40 percent, and by 1990 its engineering faculty will cease to exist.

- Even the University of California, Berkeley, which enjoys the highest reputation among California's public engineering schools is encountering recruitment and retention problems because of inadequate salaries. In 1981, testifying to this fact, Dean Karl S. Pister told the Assembly Ways and Means Subcommittee No. 2:

> The College of Engineering at Berkeley has for some years abandoned the hope that the State of California would support our programmatic needs. Our laboratories and classrooms are functioning only because of federal and private support. Our research programs are almost exclusively non-state funded; our Bechtel Engineering Center is a tribute to the principle of private support. The faculty salary issue is the one issue that can be solved through use of state funds.

He reports that his conclusion still holds.

- Recently, the University's Program Review Committee on Engineering, which was established jointly by the Academic Senate and Systemwide Administration, concluded that across the whole institution, undergraduate engineering enrollments should not be increased, despite tremendous demand, unless "significant new resources" are provided "both to cover the costs for increased enrollments and to make up . . . an accumulated deficit of resources . . . ." The committee concludes, "If there are no new resources, or if resources must be reduced, we recommend that enrollments be reduced in order to maintain quality" (Notice, 1982, p. 3).

- The State University had determined that of the 74 engineering faculty who resigned during the past three years--half of whom had gained tenure --39 or more than half were hired by industry; 32 were employed by other universities; and the remainder accepted employment in government. At the University of California, the statistics are comparable. Over the same three-year period, of its 47 engineering faculty who resigned--half of whom had tenure--24 or more than half accepted positions in industry; 17 joined other universities; and the remaining five went to government

or some other unspecified position. Not counting deaths and retirements, the turnover rate for engineering faculty for the three-year period at the State University was 10 percent and at the University 9 percent. In total, industry has been the major beneficiary of departing faculty.

These figures are consistent with the findings of a recent NSF-supported survey of the top 50 institutions nationally in terms of engineering research and development budgets that was conducted by the American Council on Education (Atelsek and Gomberg, 1981).

The major difference between the other institutions and the State University is that it has three times their vacancy rate, while the University has twice their vacancy rate.

The NSF-ACE study indicates that in the six scientific and technological fields surveyed, the highest level of exchange of staff between academia and other employers occurs in engineering and that engineering is the only broad field in which industry is a major source of faculty--although transfers between industrial and academic engineering involve only some 2 percent of the engineering faculty annually. In 1978-79, as Table 4 shows, 28 percent of those who departed from full-time engineering faculty positions accepted non-academic employment in business or government, while as Table 5 indicates, 17 percent of new full-time faculty in engineering came from industry. Nationally, as in California, academia is a net donor of experienced engineers to other employers.

CALIFORNIA INDUSTRIAL OBSERVATIONS

On September 15, 1982, representatives of six organizations--the Aerospace Industries Association, the American Electronics Association, the Associated General Contractors of California, the CSU Industry Advisory Council, the Electronic Industries Association, and the Western Oil and Gas Association--made a common presentation to the Trustees of the State University on "California's Crisis in Engineering Education." Calling attention to the dramatic decline in quality of engineering education in the United States, they cited data from the Accreditation Board of Engineering and Technology (ABET), indicating that in 1981, 71 percent fewer colleges and universities received full six-year ABET accreditation than in 1980 and 45 percent were noted as "needing improvement." This decline was attributed to a lack of qualified faculty and a shortage of equipment. Following a discussion of California's need for engineers and quality engineering education, they arrived at the following joint conclusions:

> The single most important factor determining the quantity and quality of engineering graduates is faculty. The California State University System is hard-pressed to recruit and retain additional qualified faculty members in the present marketplace because it offers lower salaries for engineering faculty than most other major public universities in the United States.

TABLE 4 Reasons for Departures of Full-Time Science/Engineering Faculty Who Left Their 1978-79 Positions, by Percent

Field	Total		Voluntary resignation			Involuntary resignation		
		Retirement	Illness or death	Another academic position	Non-academic position	Other	Failure to receive tenure	Other
All selected fields	100	20	4	34	20	6	12	5
Engineering	100	23	5	32	28	6	5	1
Physical sciences	100	27	6	21	23	8	13	3
Biological sciences	100	23	4	32	14	6	16	6
Mathematical/computer sciences	100	11	5	39	20	5	12	9
Social sciences	100	19	3	39	13	6	14	7
Psychology	100	12	2	42	21	3	17	3

Source: National Science Foundation, 1981, p. 8.

TABLE 5 Prior Professional Status for Full-Time Faculty Hired in 1979-80, by Percent

Field	Total	Full-time graduate student	Post-doctorate	Full-time faculty or staff	Full-time industrial employee	Other or unknown
All selected fields	100	34	22	33	6	5
Engineering	100	41	10	26	17	6
Physical sciences	100	18	42	30	5	5
Biological sciences	100	11	51	34	2	3
Mathematical/computer sciences	100	43	10	36	2	9
Social sciences	100	51	5	36	3	4
Psychology	100	39	15	39	1	7

Source: National Science Foundation, 1981, p. 8.

- A serious shortage of qualified faculty members exists now, and it is expected to become even more critical in the near future . . . .

The following measures would help to correct the urgent problems we now face:

- Immediately pursue a differential pay scale that will set engineering faculty compensation at a level competitive with industry or, at least, with the University of California system . . . .

California industry pledges to intensify its efforts in any way necessary to help the California State Universities solve California's crisis in engineering education.

At the same meeting of the Trustees, Peter McCuen, chairman of McCuen and Steele, Inc., made a separate presentation on behalf of the American Electronics Association and noted:

> the cause of the engineer shortfall is not lack of qualified and interested students, for these exist in abundance. Rather, the cause is a serious shortage of engineering faculty, and also of laboratory equipment and facilities. We have the anomalous situation at some of our schools of rejecting engineering applicants with less than a 3.8 GPA while accepting applicants from other disciplines with only a 2.5 GPA, even though the availability of jobs might suggest another course of action.

In calling attention to the contributions of the American Electronics Association to education, Dr. McCuen stated that AEA committees in northern California and Orange County have set a first-year goal to raise $2.2 million for area colleges and universities. At the time of his presentation, more than $110,000 in faculty development awards, equipment, and maintenance grants had been made to four campuses, and additional awards were pending.

Charles Swall, vice-president of the General Products Division of IBM Corporation, called the Trustees' attention to industrial concerns about engineering faculty shortages, obsolete laboratories and equipment, and the burdens being placed on the students themselves. With respect to faculty he stated:

> Engineering faculty recruitment and retention must be considered the number one problem in the CSU system. As an employer of several thousand engineers, including many with doctorates, I find the salary structure in the CSU system extremely deficient. Industry hires a Ph.D. at $35,000 whereas the CSU system offers the same person between $19,000 and $21,000. The engineers with B.S. degrees make more than this their first year out of school. The CSU system cannot compete with other universities. For example, engineering faculty salaries at Texas A & M are approximately $7,000 more than the CSU faculty salaries, and in our own state, the University of California recently implemented a salary differential for their engineering professors.

Mr. Swall called for (1) recognition by educators and state government of the crisis in engineering education, (2) implementation of a differential pay scale for engineering professors, and (3) increased emphasis on university-industry relations.

Wendell Reed, president of the Associated General Contractors of California, stated to the Trustees:

> The Association's present outlook places more emphasis on financial support for recruiting and maintaining competent instructors and less emphasis on scholarships. This is due to the realization that unless the disparity in salary ranges between industry and instructors is narrowed there will be insufficient instructors in the future to meet the engineer demands of industry.
>
> The construction industry stands ready to aid in finding solutions to the problems caused by a shortage of qualified faculty, obsolete equipment and inadequate facilities. If these problems are not addressed with long term solutions, it is obvious that the future shortfall in qualified engineers will be devastating, not only to the industries that hire them directly but to the whole economy that depends upon them. For our industry and our country to remain strong, we must have quality engineering education with sufficient graduates to meet our growing needs.

John F. Tormey, director of Corporate Technology Policy for Rockwell International Corporation, stated:

> We in the high-technology aerospace industry in California, while fully aware of the continued dedication to educational quality manifest by the Board and by the CSU Engineering Deans, nevertheless see CSU engineering quality under assault at the present time; and we fear that unless ameliorating steps are taken soon, the CSU engineering graduate may emerge after four years only <u>marginally</u> prepared for a career in the California high-technology industry of the 2000's . . . .
>
> We are concerned that the CSU system, working within its tight budget, its legislative mandates, and its open-door policy for students, will find it very difficult to keep up with this flood of new-technology course demands. Thus, its product, the new B.S., will be less well prepared than graduates from other schools, public and private. Even today, my examination, admittedly non-professional, of CSU engineering curriculum has turned up ominous gaps and cracks at some of the schools that can well grow to failure unless remedial measures are taken soon. There is no quick academic solution, as you people well know, nor is there a quick financial solution. You have harsh realities of time and money to face. We in industry also have harsh realities--international competitors, need for new technologies, economic growth, profit. When we find CSU graduates are not what we think new B.S. engineers should be, we will be forced to switch to other sources. But that, in the long run, is not going to help anyone.

It is my hope, and my recommendation to you, that the CSU system will move in the following directions as regards its engineering schools:

1. Set a CSU engineering quality level; make it high; make it public.

2. Set admission academic requirements to match.

3. Put a limit on admissions that is consistent with educating at the quality level and with the amount of State money available to operate there.

4. Put in place an operation to continually evaluate and upgrade the course content of engineering within the CSUC system.

Much has been said in the past few years about numbers of engineers, how many are needed, when, etc. This has been well and good. But never must CSU, or any university, trade numbers for quality! The last thing California industry needs are vast quantities of second-rate engineers. We can't let that happen.

STATE COMMISSION AND PROFESSIONAL ASSOCIATION ANALYSES

In its 1982 report, "Winning Technologies," the California Commission on Industrial Innovation (CCII) stated (p. 45):

> The CCII prioritizes providing professors with income and conditions competitive with the private sectors. The CCII supports increasing:
>
> -- faculty research grants and summer instructional opportunities;
>
> -- opportunities for faculty graduate and post-Doctoral training;
>
> -- joint faculty appointments to universities and private companies for consulting and research, particularly during the summer;
>
> -- the endowment of Chairs by private companies;
>
> -- the availability of up-to-date instructional and research equipment through public sector donations and university equipment purchases.
>
> The CCII also supports calls for increasing facilities so as to allow engineering schools to increase enrollment.

A two-day working conference sponsored by the California Engineering Foundation in late 1981 on the topics of engineering education in California,

employer needs, and policy constraints that was attended by many of the State's educational, industrial, and governmental leaders led to these conclusions in its summary report (p. 2-5):

> A large disparity exists in engineering salaries and way of life for engineers entering the educational field versus those practicing engineering in industry. Unless the total compensation package for engineering faculty is made competitive with other engineering employment, the quality and quantity of engineering education in California will be seriously hampered, resulting in a degradation in economic vitality of the State's technological industry.

The participants in the conference recommended that:

> A task force should be formed under the aegis of the California Engineering Foundation, composed of representatives from industry, government, private engineering firms, and professional societies, to spearhead immediate action to improve the compensation package for engineering faculty. The total package must recognize the competition for engineering talent in the marketplace. A long-range plan to accomplish this goal should be formulated to include:
>
> 1. Communication, through the appropriate channels, with the California Legislature to illuminate the crisis that exists in engineering education and how faculty way-of-life disparity affects the crisis. This communication should focus on the urgency of resolution of this problem in the public institutions in California, particularly the University of California (UC) and the California State University (CSU) systems.
>
> 2. Communication with the UC Regents and the Trustees of the CSU to urge the establishment of differential salary grades for engineering faculty in light of the competition in the marketplace for engineering talent. The UC and the CSU should communicate with the legislature and request a redefinition of legislative intent in salary differentials for university faculty in different teaching fields.
>
> 3. Programs to be developed and implemented in industry and the educational institutions that provide for part-time consulting assignments, research grants, and specialized project contracts that permit faculty to improve their total compensation package (p. 2-5).

ACADEMIC SENATE AND FACULTY ASSOCIATION POSITIONS

In addition to industrial and professional groups who have asserted the need for increased salaries for engineering faculty, various academic bodies have taken positions regarding salary differentials in high-demand disciplines.

The Academic Senate of the University of California has participated actively in discussions within the University about salary differentials for faculty in engineering and business administration and recognizes these differentials as essential if the University is to remain competitive and preserve quality.

In contrast, the Academic Senate of the California State University has adopted resolutions that opposed AB 2023 "or any other bill which legislatively allocates faculty salary augmentations in selected professions" (underlining added) and opposed the special salary augmentation to aid in the recruitment and retention of faculty in certain areas proposed by the Chancellor to the Board of Trustees.

Two faculty associations--the United Professors of California (UPC) and the Congress of Faculty Associations (CFA)--are presently competing to represent the faculty of the State University in collective bargaining.

UPC opposed AB 2023 in its original form for three reasons: (1) while it recognized the State University's difficulty in attracting and retaining quality faculty in high technology areas, it did not believe that the proposed pay differential would solve the problem; (2) a supply demand model for salaries would produce conflict within the institution and divide the faculty; and (3) the Legislature has mandated, and the faculty of CSU has decided, that salaries in the CSU will be determined through the collective bargaining process.

The CFA has proposed to the Board of Trustees that their action to establish special rates be broadened to include all academic departments through annual establishment of salary-above-minimum (SAM) authorizations for each discipline. SAMs would range from 1.000 to 1.2617 and be determined on relevant market supply and demand conditions through a complicated process by each campus. Funds received for SAM authorizations should be held entirely separate from funds allocated to the faculty salary base. CFA has also suggested revisions in AB 2023 to accomplish these objectives.

NATIONAL STUDIES AND OBSERVATIONS

Trends in Engineering Employment

National studies of employment of engineers fall into three major types: analyses of historical data; examinations of the current situation; and engineering manpower models for the future.

Historical Data on Engineering Employment: The impression that engineering employment and engineering enrollments are subject to violent and rapid fluctuations and are thus often cyclically out of phase has been repeated so frequently that it has gained general acceptance. To the contrary, the historical pattern of engineering employment is unusually stable and runs counter to assertions in the mass media and elsewhere about its cyclical nature.

Engineering Degree Production: Figures 3, 4, and 5 trace the history of all degrees conferred, the number of engineering degrees, and the proportion of engineering degrees to all degrees at the baccalaureate, master's, and doctoral levels since 1950.

Daniel Drucker, president of the American Society for Engineering Education, has plotted and analyzed B.S. engineering degree data since 1930. He has found that, with the exception of the large deviation caused by World War II, the data lie within ±15 percent bounds of a smooth upward trend that is essentially linear over the past 45 years (Business-Higher Education Forum, pp. 13-14). Figure 3 clearly demonstrates that since 1955 the trend in engineering bachelor's degrees granted has been on a relatively stable upward trend with only moderate fluctuations in response to shifts in economic, social, and demographic conditions. At the same time, the percentage of engineering degrees to all baccalaureate degrees has been on a gradual decline since 1950 with an upward trend beginning in 1976.

As shown in Figure 4, master's degrees awarded in all fields have declined since 1977 following a reasonably steady increase since the 1950s. The number of M.S. degrees awarded in engineering held relatively stable during the 1970s but the percentage of master's degrees granted in engineering has declined since 1965.

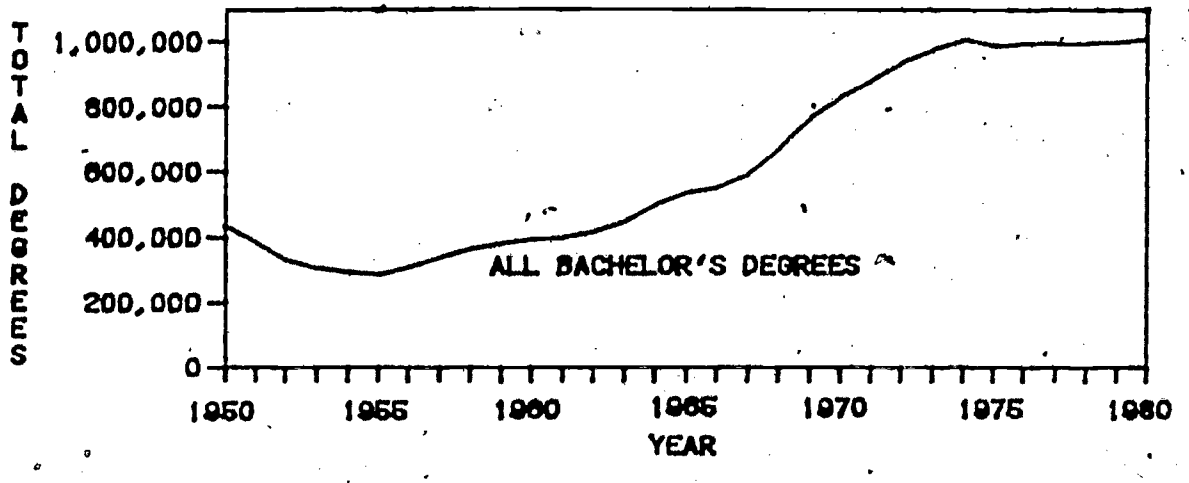
Doctoral degrees awarded in all fields have been relatively stable since the early 1970s, but the proportion of doctoral degrees in engineering has declined drastically since 1970 (Figure 5). The decline in engineering doctoral degrees since the 1970s has been accompanied by mushrooming enrollments of foreign students. While this influx has occurred at all levels, the greatest impact has clearly been from the large increase in non-immigrant students at the doctoral level. The effects have been described in the Commission's report on engineering and computer sciences.

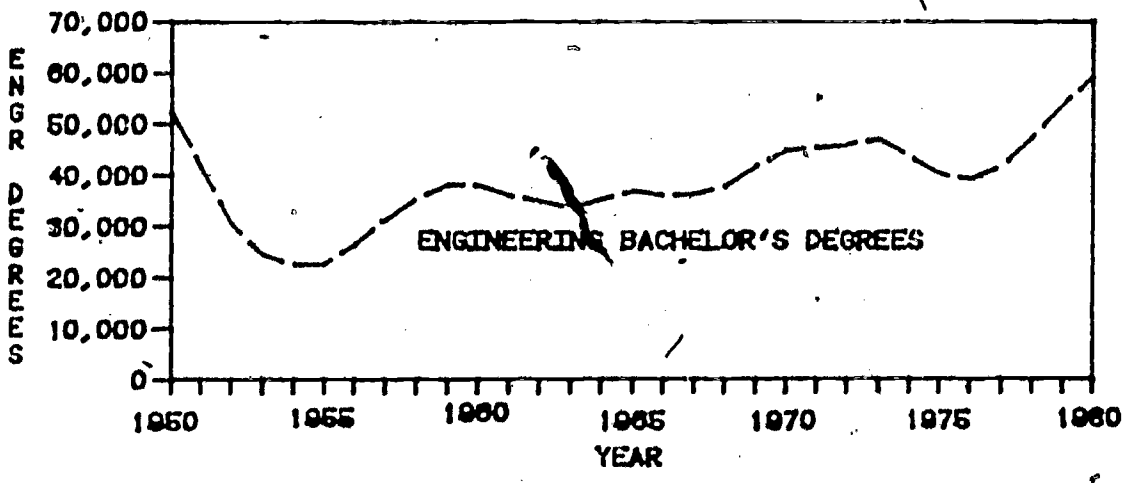
These data on engineering degrees awarded belie the image of violently fluctuating numbers of engineering graduates.

Employment of Engineers: Since 1963, unemployment of engineers has fluctuated only slightly from year to year:

1963	1.2%	1973	1.0%
1964	1.5	1974	1.4
1965	1.1	1975	2.6
1966	0.7	1976	2.0
1967	0.7	1977	1.3
1968	0.7	1978	1.2
1969	0.8	1979	1.2
1970	2.2	1980	1.3
1971	2.9	1981	1.4
1972	1.9		

FIGURE 3 Relationship of Baccalaureate Degrees Granted in Engineering to Baccalaureate Degrees in All Fields, 1950-1980





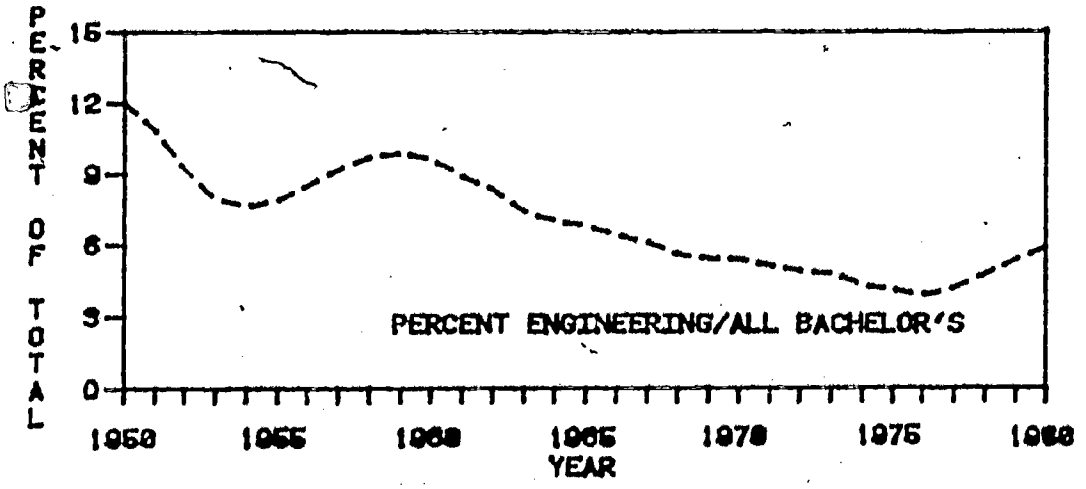
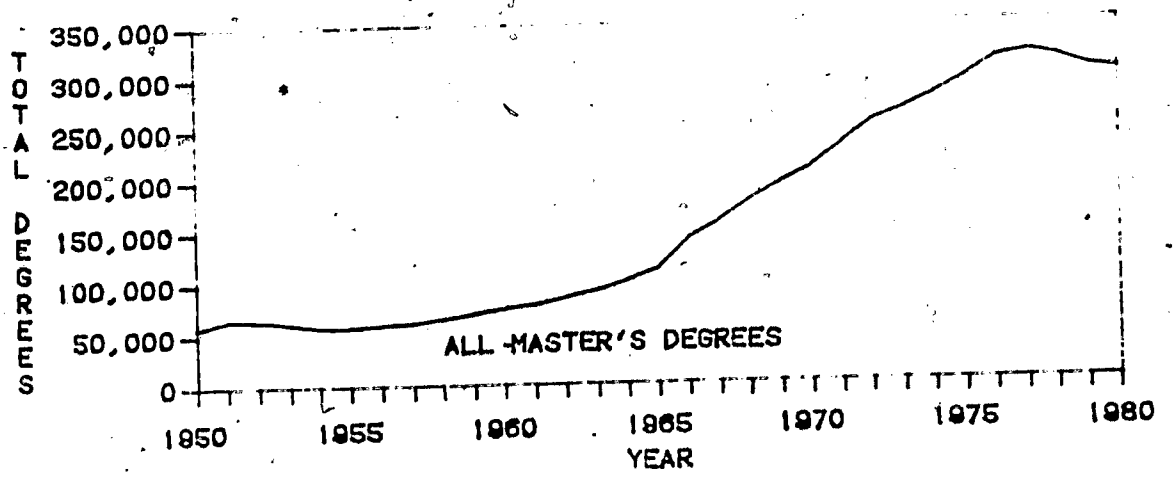
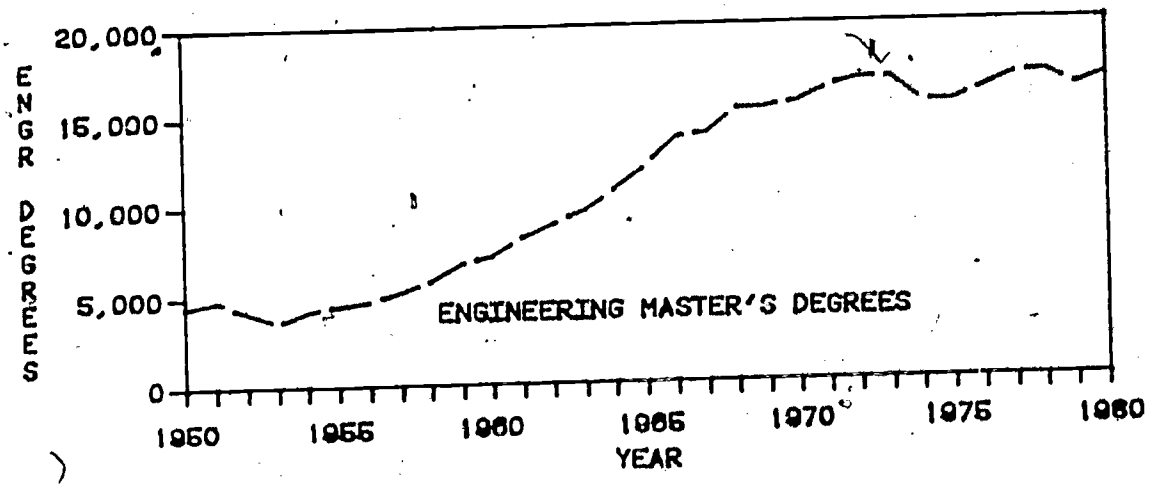


FIGURE 4 Relationship of Master's Degrees Granted in Engineering to Master's Degrees in All Fields, 1950-1980





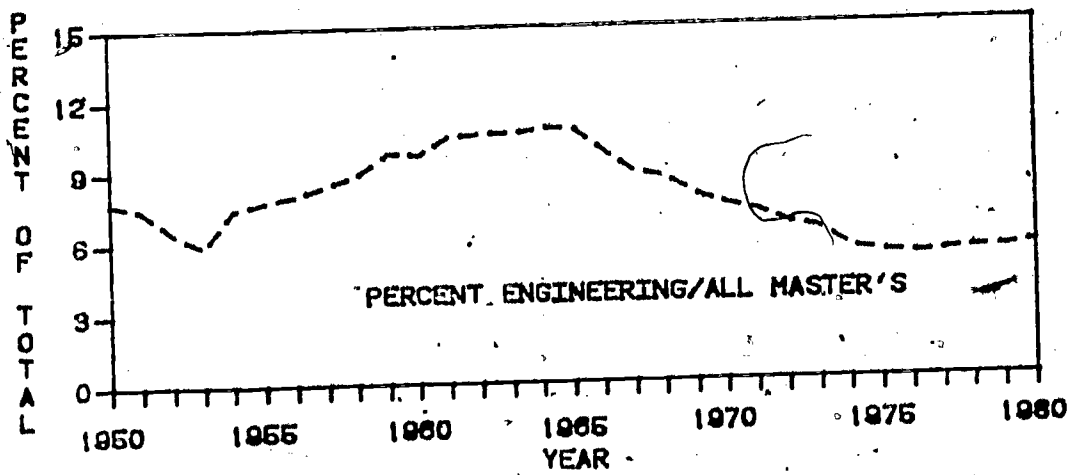
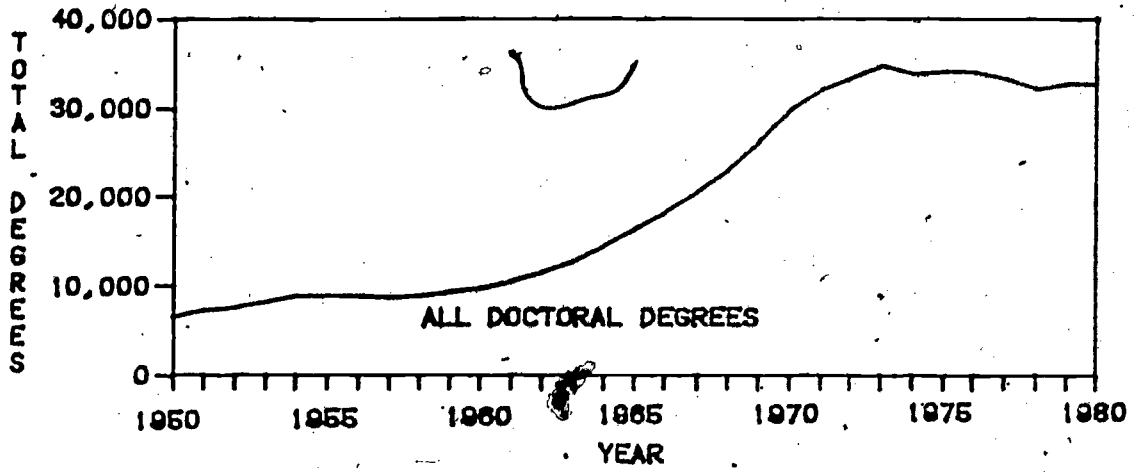
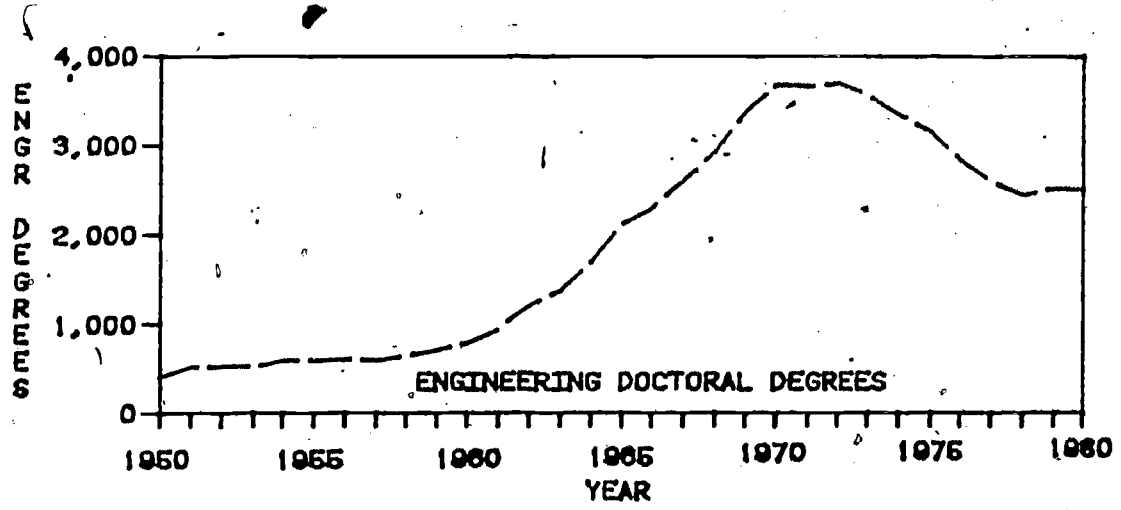
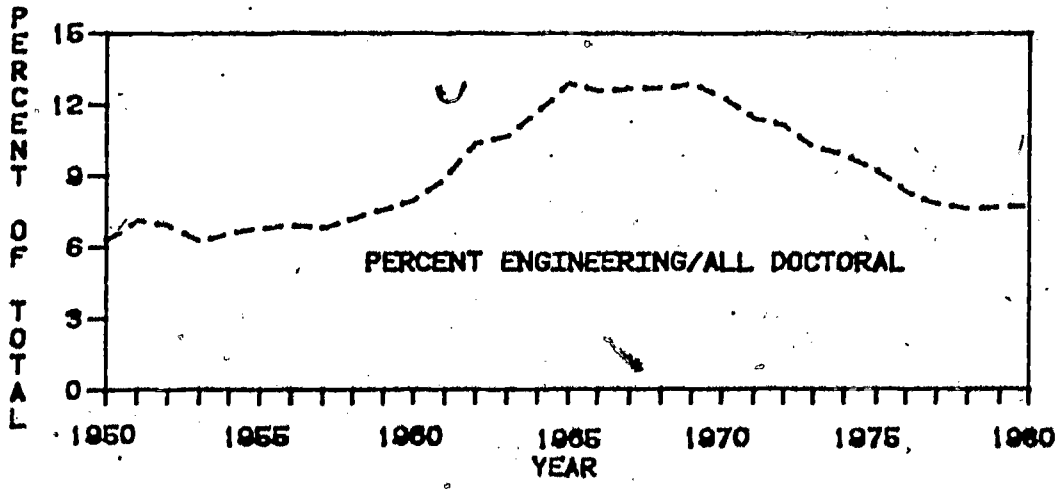


FIGURE 5 Relationship of Doctoral Degrees Granted in Engineering to Doctoral Degrees in All Fields, 1950-1980



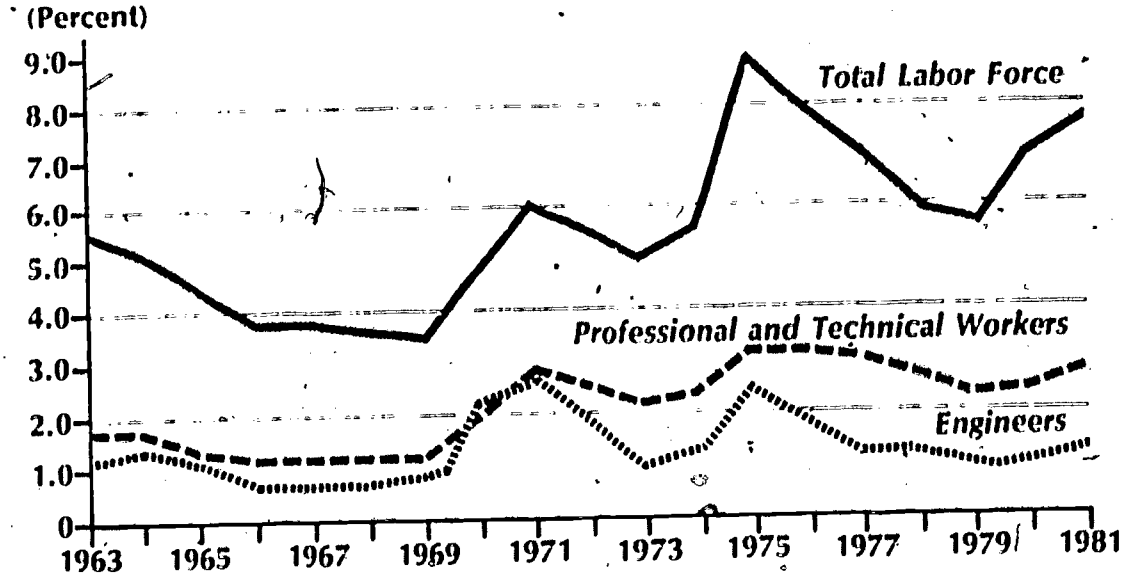




The highest levels, 2.9 percent in 1971 and 2.6 percent in 1975, were substantially lower than those reported for any other major discipline and, as Figure 6 shows, lower even than that for all professional and technical workers except in 1970. As Daniel Drucker has pointed out, "engineering is just about the only profession or occupation other than medicine in which every graduate who wishes to be employed as a member of the profession can obtain a position, unless the economy is in terrible shape" (Business-Higher Education Forum, 1982, p. 14).

As Figure 6 shows, even in 1981, the unemployment rate for engineers remained below 1.5 percent, compared to 2.8 percent for all professional and technical workers and a total labor force rate of 7.6 percent.

FIGURE 6 Unemployment Rates for the Total Labor Force, Professional and Technical Workers, and Engineers, 1963-1981

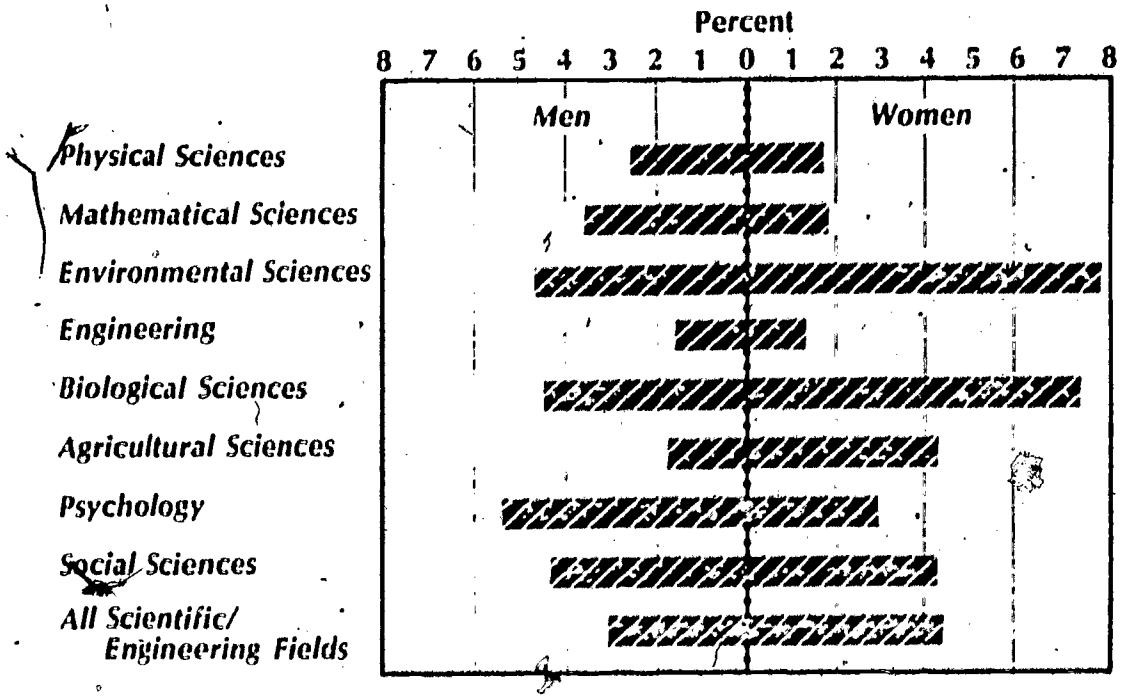


Source: Electronic Industries Association, 1982, p. 68.

Figure 7 shows unemployment rates of 1978 bachelor's graduates in eight scientific and technological fields as of 1980. Even among these recent graduates, engineering had the lowest unemployment rate of all eight disciplines. Although women scientists and engineers have a higher overall unemployment rate than men, women engineers have a slightly lower unemployment rate than the men with whom they graduated--a fact worthy of attention by school and college counselors.

Current Data on Engineering Employment: The College Placement Council (CPC), in its study of 1980-81 beginning salary offers to college graduates, noted that offers in engineering accounted for 65 percent of all bachelor's offers and for 30 percent of all master's offers. Yet, engineering graduates made up only 5.9 percent of the total bachelor's degree recipients that year and 5.6 percent of the master's candidates. The 1980-81 engineering salary offers rose 10 to 14 percent above those made a year earlier, and no significant difference existed between men's and women's salary offers in engineering, while in business, humanities, social sciences, and science groups, average salary offers to women were lower in all cases except accounting.

FIGURE 7 1980 Unemploment Rates of 1978 Bachelor's Graduates



Source: Electronic Industries Association, 1982, p. 70.

In January 1982, CPC noted that for the previous six months, 60 percent of all offers to bachelor's degree candidates went to engineering as did 28 percent of all offers to master's degree candidates. In March, the percentages remained nearly constant, 60 percent and 30 percent, respectively. In July, the percentage began to drop--57 percent and 28 percent--and the decline continued into January 1983 to 44 percent and 26 percent, respectively. But, as CPC noted, each of these groups comprise only about 6 percent of all graduates. CPC also noted that the drop in engineering job offers stemmed less from a marked decline in the job market for engineers than from the fact that because the number of engineering graduates did not come close to matching demand in earlier years, employers had had to make numerous offers to fill vacancies. Recently, engineering supply and demand have been more closely balanced, in that employers have had to make fewer offers to fill a position. Nonetheless, the major difference is simply fewer offers per student: salary offers as of January 1983 were 5.7 percent higher than in the previous July.

Projections of Engineering Supply and Demand: Human resource or manpower forecasting is difficult at best, and the forecasting efforts of the Bureau of Labor Statistics and the National Center for Education Statistics, as well as data collection by the National Science Foundation may be severely reduced by planned or possible budget cuts and reorganizations. Satisfactory predictive models for engineering manpower are still to be achieved, but the Bureau of Labor Statistics' simplistic projection of manpower needs in many disciplines, which is based on assumptions of an increase in the Gross National Product and greater productivity in the labor force, points to excellent opportunities for new graduates in computer science and good opportunities for graduates in engineering. But as Figure 8 shows, it paints a gloomy picture for graduates in the life sciences, psychology, and other social sciences, and a less than encouraging picture for economics, mathematics, and statistics.

A manpower model developed by Robert P. Stanbaugh that has been updated with data from the Bureau of Labor Statistics and the National Center for Education Statistics is shown in Figure 9 on page 36. It focuses on bachelor's and master's degree graduates and does not clearly represent the special problems associated with the supply of, and demand for, Ph.D. engineers, but it projects an annual unmet need for engineers through 1990 of 29,500 to 38,200 as shown in the lower left corner.

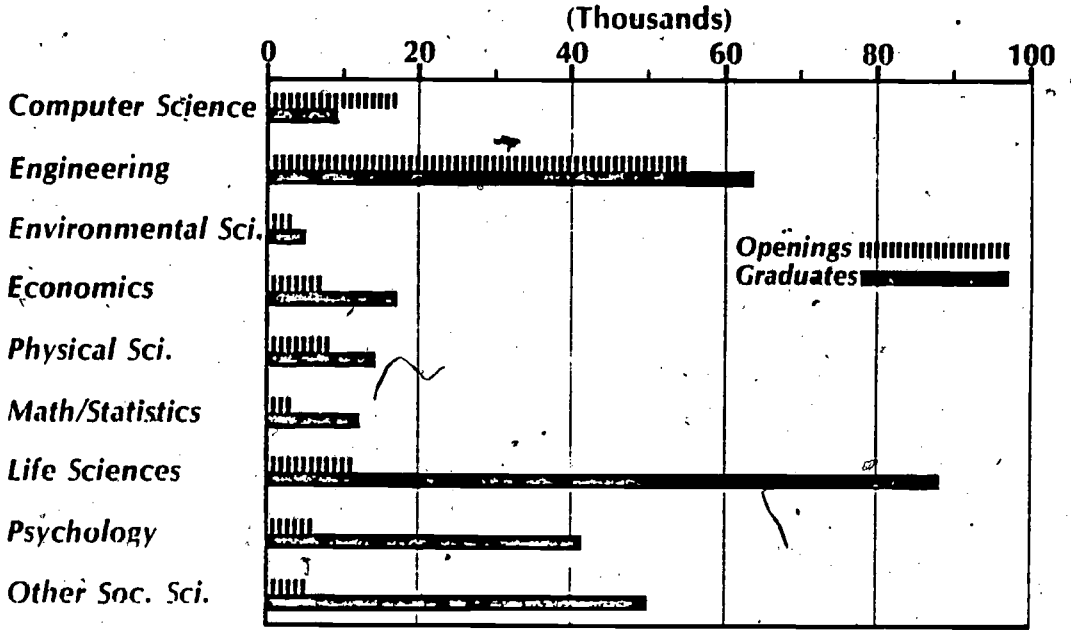
Recruitment Initiatives in Other States

As noted by the Commission in its report, Engineering and Computer Science Education in California Public Higher Education (1982, page 80), ten major corporations--AT&T, du Pont, Exxon, General Electric, General Motors, General Telephone and Electronics, Hewlett-Packard, IBM, Rockwell International, and Union Carbide--are donating $100,000 per year for two years to support a national action program to counter increasing engineering faculty shortages and disincentives. The sponsor of this "Engineering College Faculty Shortage Project" is the American Association of Engineering Societies (AAES), while the American Society for Engineering Education (ASEE) provides the secretariat. John W. Geils, on leave from AT&T, serves as the project director.

One of Mr. Geil's first actions was to compile a catalog of initiatives throughout the nation directed toward alleviating the shortage and overcoming problems of the engineering Ph.D. pipeline. He reported that 11 states have implemented programs to improve laboratory equipment and that 11 more plan to do so. Six states are considering programs to increase engineering salaries--besides the eight that have already done so:

- The Florida Legislature has appropriated $3 million to create new faculty positions, increase selected salaries, and establish support positions in the state's engineering schools.
- The Kansas Legislature has appropriated $900,000 to supplement engineering, computer science, and business faculty salaries by an average of $3,000 per position, distributed on a discretionary basis.
- The Montana Legislature has allocated "Critical Area Money" for designated faculty salaries in engineering, physics, business, and veterinary medicine, with engineering receiving the largest amount.

FIGURE 8 Average Annual Openings and Average Annual Bachelor's Graduates, 1978-1990



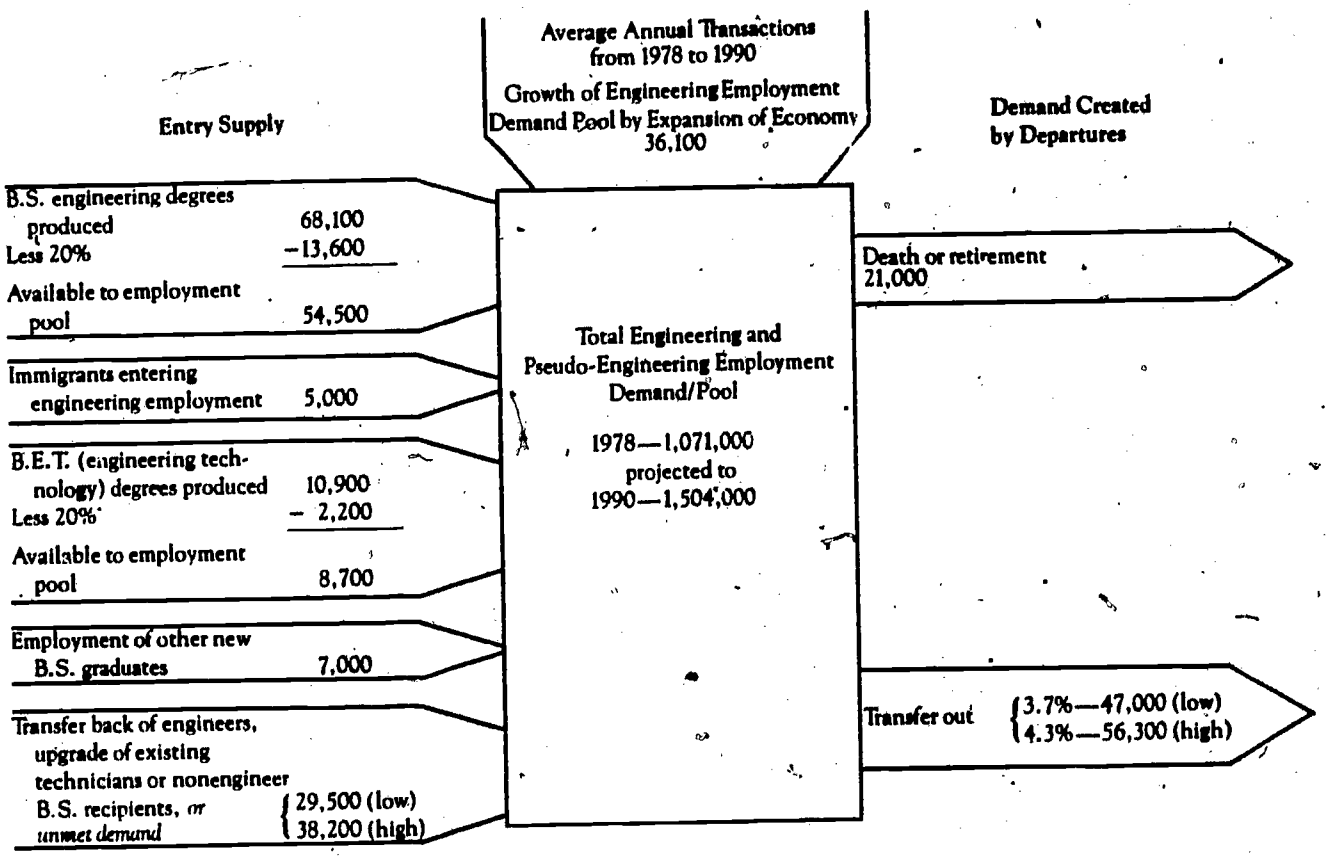
Source: Electronic Industries Association, 1982, p. 38.

- The Nebraska Legislature has appropriated $225,000 for merit salary adjustments for engineering, technology, and business administration faculty.

- The Rhode Island Legislature has appropriated $1 million to the University of Rhode Island for high technology, of which $48,000 is earmarked for guaranteeing summer salaries for new engineering faculty.

- The South Carolina Legislature has appropriated $1 million for salary adjustments in physics, mathematics, business, computer science, and engineering to be distributed at the University of South Carolina's discretion.

FIGURE 9 Projected Engineering Manpower Transactions, 1978-1990



Source: Business-Higher Education Forum, 1982, p. 17.

- The South Dakota Legislature, in cooperation with industry, has helped increase faculty salaries at the School of Mines and Technology an average of 15 percent.

- And in Texas, the Coordinating Board has incrementally increased engineering faculty salaries beyond across-the-board salary increases for all faculty.

Role of Salaries in Recruitment and Retention

Several recent national studies point to the importance of adequate salaries in recruitment and retention of engineering faculty. For example, the ten principal findings in the National Science Foundation and the Department of Education in their report on Science and Engineering Education for the 1980s and Beyond, cited "a widening gap between academic and nonacademic salaries" along with "the obsolescence of facilities and technical resources needed for research" as two of the causes for the faculty shortage (1980, p. 16); and the 1981 Blue Ribbon Committee on Engineering Education of the American Electronics Association (AEA) concluded that the shortage results "primarily from high B.S.-level industrial salaries and disincentives to enter teaching careers" (p. 16).

As a result, the Board of Directors of the AEA approved the establishment of an industry-wide standard of 2 percent of a company's R&D expenditures for support of education, either directly by the company or through an AEA-created foundation. This action is expected to produce between $30 million to $50 million per year for engineering schools. Suggested uses for these resources include equipment, adjunct or visiting professors, teaching "chairs," graduate fellowships, and general grants.

In a compendium of working papers on "Adequacy of U.S. Engineering Education," panelists of the National Science Foundation concluded:

> there are indications of a general deterioration in the quality of engineering education in the United States. A principal cause is the decreasing ability of engineering schools to recruit adequate numbers of qualified faculty members from among the declining population of engineering Ph.D's . . . salaries for the 16,000 engineering faculty members in U.S. engineering schools will have to become competitive with salaries in private industry. More reasonable levels of funds for graduate fellowships and assistantships are also needed to induce those qualified to pursue full-time graduate study in engineering (pp. 60-61).

In its resulting report to Congress, The 5-Year Outlook on Science and Technology, the National Science Foundation stated (1981, pp. xi, 9):

> unless current faculty recruitment problems are resolved, university engineering and computer science departments may not be able to maintain enrollments at a level sufficient to continue to meet anticipated demand at the bahcelor's degree level. In addition, the lack of sufficient numbers of qualified faculty members,

coupled with the growing obsolescence of instruments and facilities, could have a negative effect on basic engineering research in the country . . . .

the total pool from which new doctoral-level engineers can be drawn to staff a research faculty has been decreasing, while, at the same time, competition from industry has been increasing. Not only can industry offer Ph.D. engineers better salaries than universities can, but, importantly, research facilities available in industry have become decidely superior to those in universities, a situation that has grown worse during the past decade with the improvement of industrial laboratories and some deterioration of university engineering laboratories. Imbalances between aggregate supply and demand for engineers in industry may well be resolved by free market mechanisms. On the other hand, problems faced by engineering and computer sicence departments in universities have resulted in large measure from their failure to compete for qualified personnel.

Among nationally prominent individuals who have called attention to the shortage of engineering faculty, Joseph M. Pettit, president of the Georgia Institute of Technology, has stated (1981, p. 26):

In the United States at this time we are undergoing what must be called a crisis in engineering education, and indeed in the supply of engineers for industry and government . . . The fact is we have a serious imbalance among (1) a high industrial demand for engineers, (2) a low graduate rate, especially at the master's and doctoral level, (3) a high undergraduate enrollment, (4) a shortage of engineering professors, and (5) old and obsolete laboratory equipment, financial constraints, etc.

Courtland Perkins, president of the National Academy of Engineering, has declared that "the defense of the country and its economic growth are both endangered by the decline in available engineering talent resulting from serious problems existing in our engineering education programs" (1981, p. 1). He states that these problems are primarily a shortage of competent faculty and adequate teaching facilities.

Arthur Hansen, president of Purdue University, agrees that the term "crisis" appropriately describes the current scientific and technological manpower problem. Among several proposals for recovery of America's position as a technological leader and maintenance of its economic competitive position, he advocates increased pay for skilled military personnel; increased in-service training for primary- and secondary-school mathematics and science teachers; greater motivation of students by government, industry, and education to pursue courses in science and mathematics; and greater education, government, industry, and professional efforts to reverse the growing faculty shortages (1981, pp. 20-24).

Role of Financial Aid in Graduate Study

Of course, increasing faculty salaries would not, by itself, solve the shortage of engineering faculty. This shortage is caused by low graduation rates at the Ph.D. level as well as by the inability of educational institutions to compete with industrial salaries. As a result, governmental and industrial programs are being launched to increase the supply of potential faculty. Legislation is pending in New York State to provide 50 loans a year to graduate students who plan to teach in shortage programs, with the loans forgiven on a year-by-year basis if the recipients teach in a New York college or university. And North Carolina offers 20 one-year fellowships of $10,000 for students beginning graduate study in microelectronics at any of the five universities cooperating in the State's Microelectronics Center.

The need for graduate teaching and research assistantships cannot be overemphasized. A recent study conducted by the National Research Council (1982, p. 9) reveals that over 60 percent of the doctoral students in engineering depend primarily on this source of support from the institution, and that another 11 percent depend on federal fellowships. Only 14 percent are self-supporting either through their own earnings, their spouse's earnings or family contributions. The Board of Directors of the Institute of Electrical and Electronic Engineers has recommended that graduate stipends be increased to 50 percent of the starting salaries of baccalaureate engineering graduates ("Quality is Main Problem in Engineering Crisis," 1982, p. 32).

As noted on page 21, the National Science Foundation reports that 41 percent of newly appointed engineering faculty come directly from graduate schools (1981, p. 1). It behooves the State and industry to encourage domestic students to enroll in graduate study through increased stipends, forgiveable loans to those who teach in a California institution of higher education, or other means, since this is still the primary source of engineering faculty.

Recommendations of the National Engineering Action Conference

The most significant and thorough recommendations that have been formulated to address the problems of engineering education have come from the April 1982 National Engineering Action Conference, attended by some 50 government officials, university presidents, and corporate executives. The conference was conceived by Paul Gray, president of MIT, and chaired by E. E. David, Jr., president of Exxon Research and Engineering. As the Commission's report on engineering and computer science education states (1982, pp. 87-88): With the theme, "the time for action to deal with the precarious state of engineering education has come," the Conference participants concluded that if present trends continue, with more than 1,600 engineering faculty positions already vacant and outmoded campus engineering laboratories deteriorating, young men and women will not receive the engineering education they deserve and that America's economy and society urgently require. Their "call to action" includes this agenda:

For higher education:

- Set engineering faculty compensation at a level competitive with the market;

- Increase graduate student stipends to encourage a larger number of U.S. residents to become doctoral students;
- Give highest priority to modernizing instructional and research equipment;
- Reconsider the Ph.D. requirement and place greater reliance on practical skill and knowledge in filling faculty positions;
- Consider establishing semi-autonomous colleges of engineering, such as exist in other professional disciplines; and
- Improve research and instructional productivity by providing optimum technical assistance.

For academic and professional societies:

- Expand scholarship and fellowship aid to engineering doctoral students using related educational foundations, and make direct grants to the schools;
- Establish programs to aid the exchange of engineers between industry and academe; and
- Monitor the manpower supply and demand model in order to help identify actions that will maintain an adequately prepared supply of graduates and faculty.

For industry:

- Provide direct financial support to U.S. resident master's and doctoral candidates in the form of traineeships, scholarships, and awards;
- Assist engineering departments in modernizing their equipment and instrumentation, through financial grants, donation of new surplus equipment, and innovative debt financing;
- Create opportunities for junior faculty to increase their income through consulting, summer employment, tutorials and grants;
- Encourage and provide incentives for qualified employees to teach in engineering as part-time, loaned or full-time faculty members; and
- Actively pursue opportunities for purchasing research from universities instead of conducting it in-house.

For government:

- Support programs for providing fellowships, summer internships, traineeships, and other aid to doctoral candidates through NSF and other mission agencies;

- Place high priority on helping educational institutions modernize equipment and facilities in engineering laboratories;
- Enlarge support for university government cooperative research; and
- Support studies and hearings to determine the nature and national scope of the engineering faculty shortage. ("National Engineering Action Conference," 1982; see also David, 1982.)

These recommendations have been endorsed by many societies and industries, including the Business-Higher Education Forum, founded by the American Council on Education in 1978 to promote greater understanding between the chief executives of major American corporations and institutions of higher learning.

In supporting the Conference's recommendation pertaining to faculty compensation, the Forum has stated (1982, pp. 1, 9):

> Universities must establish professionally competitive salaries independent of campuswide scales in order to retain current faculty, recruit new faculty members, and attract substantially increased numbers of well-qualified students to pursue doctoral degrees . . . .
>
> If universities continue to ignore the external market competition for the same bright, able engineers who must be attracted to faculty positions, they cannot realistically expect to maintain high-quality engineering education programs. Higher education must abandon the posture that salary structures for engineering faculty must be held down to "parity" with faculty salaries in other campus disciplines. Precedents for change have been set by the structures already established for professional faculties in law and medicine.

FOUR

RECOMMENDATIONS AND CONCLUSIONS

In adopting AB 2023, the Legislature sought ways to improve the recruitment and retention of faculty in high-demand disciplines, and it directed the Commission to make specific recommendations for action by industry and educational institutions as well as the Legislature.

The Commission has concluded that improved recruitment and retention in engineering faculty can be accomplished through a variety of means, including non-salary benefits, increased salaries, and graduate support for potential faculty.

NON-SALARY BENEFITS

Apart from increased salaries, possible changes in benefits and working conditions that improve the quality of faculty life can include more state-of-the-art equipment, increased support for research, added technical and clerical assistance, housing subsidies, reduced teaching loads, released time for consulting, additional paid leaves, and similar inducements used by other colleges and universities, as reported through the Commission's survey of institutional practices in other states.

Benefits that would lead to the need for more faculty, however, are counter-productive, and the Commission cannot recommend them. As examples, reduced teaching loads, added released time for consulting and research, and additional paid leaves for engineering faculty would require the recruitment of more faculty in order to serve the same number of students. Moreover, existing policies of the University of California and the California State University regarding consulting, as described in Appendix C, appear to be generous and consistent with those of other institutions, and no change is recommended in them.

In contrast, more state-of-the-art equipment is urgently needed and highly recommended, both to attract top-flight faculty and avoid their demoralization or resignation and even more to assure adequate education of students in new technologies. Modern instructional and research equipment is more essential to engineering education today than at any time in the past. As the Commission noted in its report on engineering and computer science education, the problem of outmoded equipment at the University and State University has become so serious that the integrity of many current courses is questionable. Industry can be of valuable aid here through donating new surplus equipment and permitting joint use of highly specialized facilities. Thus the Commission recommends that the State give high priority to modernizing instructional and research equipment in engineering and that industry assist engineering departments to modernize their equipment and instrumentation through financial grants, donations of new equipment, and shared use of specialized facilities.

Technical and clerical support are essential to effective utilization of faculty in any discipline, in freeing professors from typing correspondence, duplicating course materials, and setting up classroom and laboratory equipment, and in allowing them to concentrate on instructional and research responsibilities for which they are uniquely qualified. Faculty in engineering and the natural sciences need more technical assistance than most professors because of the character of their subject matter, but present supplements for this aid are inadequate at the University, the State University, and the Maritime Academy. Thus the State and its educational institutions should provide further aid to assure that engineering faculty are relieved of non-instructional activities that detract from their primary commitments.

Housing subsidies appear to assist the recruitment of new faculty, although their impact on the retention of present faculty is difficult to evaluate. Administrators of the Maritime Academy believe that additional housing units beyond those currently available would greatly enhance their ability to retain as well as recruit faculty. The State University has no housing available to faculty, but its leaders believe that in high-cost housing areas of the State a pilot program of housing assistance would be a worthy experiment. Since 1979, the University has developed a variety of housing programs because the high price of real estate in virtually all urban areas of the State was proving to be a major impediment to hiring outstanding faculty. These programs are described on pages 44-47 of the Commission's Final Annual Report on Faculty and Administrative Salaries for 1982-1983 (Commission Report 82-38), but in brief:

- The first, the Faculty Home Loan program, used $25 million in revenue bonds to aid those disciplines facing severe recruitment problems at all nine campuses, and is now fully committed, having made 196 loans--69 of them to professors, 31 to associate professors, 80 to assistant professors, and 16 to librarians, provosts, deans, and other personnel.

- The Faculty Mortgage Program began in 1982 and has been used by 64 faculty members on all campuses--34 of them newly recruited and 30 presently on the faculty.

- The Short-Term Housing Loan Program is designed to assist new faculty during their first five years with the University through loans of up to $25,000 for rental, mortgage payments, or relocation expenses.

- And the Salary Differential Housing Allowance Program provides authorization for the campuses to raise their own funds individually to aid prospec tive faculty members.

Housing subsidies have their pitfalls, of course. The Faculty Mortgage Program, for example, was initiated through bank underwriting of $15 million of mortgages at 12 percent, but the decline in interest rates has made these mortgages no longer attractive. In addition, changing tax regulations at both the State and federal levels may alter the attractiveness of what may look like a good plan today within a few years. Nevertheless, such subsidies are one proven means to recruit and retain faculty. Thus the Commission recommends that in high housing cost areas of California, such experiments should continue and be expanded to the State University with their effectiveness on recruitment and retention examined thoroughly during 1984-85.

Finally, modified fringe benefit programs offer another way in which recruitment and retention of faculty can be improved without increasing salaries, but because these modifications cannot be reduced over time as easily as salary once shortages no longer exist, the Commission does not recommend differentials in them for engineering faculty.

SALARIES

Despite the role that non-salary benefits can play in faculty recruitment and retention, adequately competitive salaries remain the most crucial element in the process. Many state, regional, and national studies, including those by the California Commission on Industrial Innovation, the Western Interstate Commission for Higher Education, the national Business-Higher Education Forum, and the National Engineering Action Conference, have come to this conclusion.

Academic salaries do not need to equal those in business and industry, since the psychic reward that creative individuals find in teaching, self-directed research, and the stimulation of campus life compensates in part for lower salaries and fringe benefit packages than those offered in the private sector. But in the State University, the first salary step for nine-month assistant professors has fallen to approximately $6,500 below the average annual beginning salaries for bachelor's degree recipients in engineering; at the Maritime Academy, beginning twelve-month salaries for assistant professors of technology are more than $6,000 below the bachelor's degree level; and in the University, despite its new special salary scales for engineering and business faculty, beginning salaries for first step nine-month assistant professors are still $1,000 below this level.

Even more important, these salaries in California's public institutions are no longer competitive with other comparable academic institutions. The Commission's survey of engineering salaries and benefits in institutions approved by the Accreditation Board of Engineering and Technology indicates that this year, starting salaries at the assistant professor level in engineering for recent college graduates average $27,271 nationally for nine-month appointments. Yet first-step assistant professor salaries for twelve-month appointments at the Maritime Academy are only $25,488. Comparable nine-month salaries at the University of California are only $24,500. And those at the State University are only $19,044.

These facts explain in large part why, in the past 12 months, 25 percent of the prospective engineering faculty to whom the University of California offered appointments rejected its offers, with Berkeley, UCLA, and Santa Barbara experiencing the highest number of rejections. In a majority of these cases, non-competitive salaries led to these rejections. At the California State University, nearly four out of five prospective faculty in engineering who rejected offers cited inadequate salary as their reason. The State University has practically had to abandon the assistant professor range in high-demand disciplines because it is so noncompetitive with other institutions. Thus in order to fill 54 of 97 tenure track vacancies in engineering during 1981-82, it had to make three-fourths of these appoint-

ments at the associate and full-professor ranks, in contrast to only one-fourth in letters, foreign languages, and social sciences. At the Maritime Academy, the turnover rate among technology faculty reached 26 percent this past year and is likely to remain high without improved salaries.

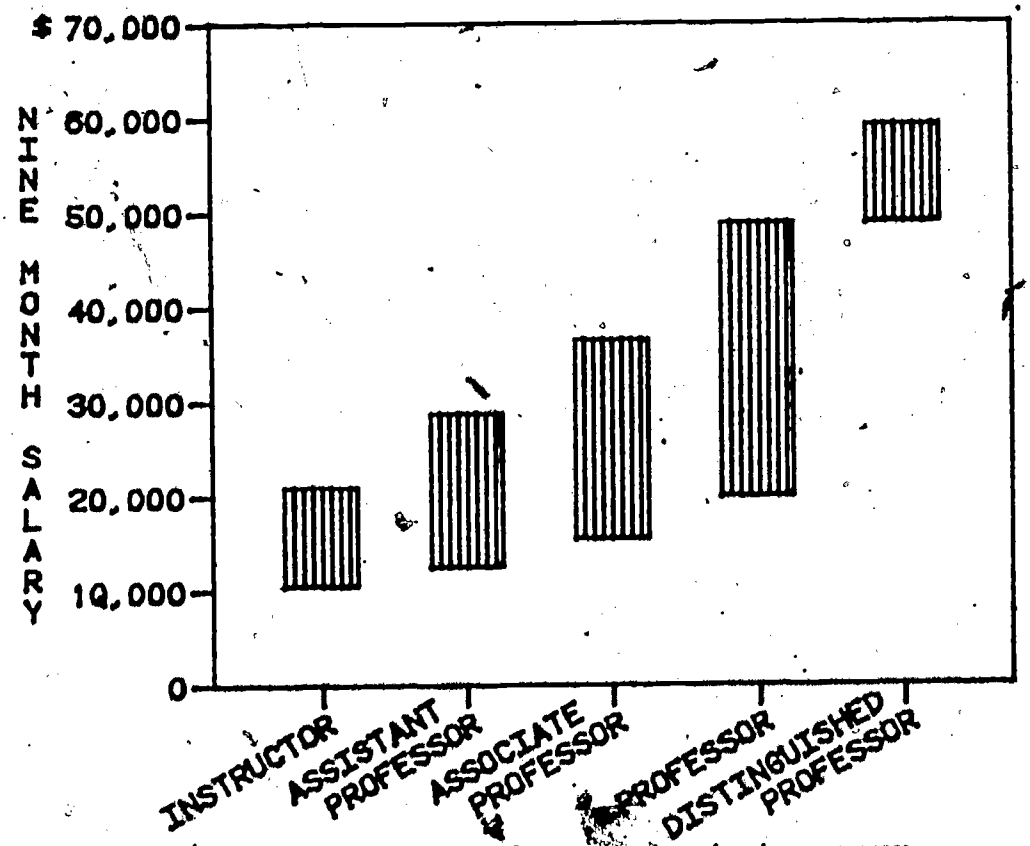
As a short-range solution to the problem of recruitment and retention of engineering faculty, the Commission thus recommends further use of the concept of salary differentials. The University of California should continue its efforts to provide differential salaries in order to compete effectively in the academic marketplace for engineering faculty. The California State University should be encouraged to develop and implement differential salary schedules for engineering faculty at all ranks to compete effectively with its comparable institutions. The California Maritime Academy should be encouraged to continue its development of differential salaries for other ranks of its technology faculty beyond merely the assistant professor level. All three institutions should work cooperatively with industry to extend opportunities for engineering faculty to increase their income through summer employment, continuing education instruction, grants, and consulting. And industry should actively pursue opportunities to sponsor faculty research through contracts or grants to universities instead of conducting all research in-house.

These salary differentials for engineering faculty are preferable to increasing fringe benefits because they can be adjusted more easily than can benefits if changes occur among high-demand fields. The cost of implementing adequate salary differentials represents only a small fraction of the State's total commitment to higher education. Using data developed by the National Association of State Universities and Land-Grant Colleges (described on page 13 above) and that provided by the segments (outlined in Appendix B below), the Commission calculates that over the next five years, the University, State University, and Maritime Academy will need to recruit 180 new engineering faculty to accommodate existing enrollments while retaining some 420 part-time faculty. Not counting any general faculty cost-of-living increases or a State "buy-out" of the differential salary schedule already adopted and funded by the Regents (which amounts to approximately $2.4 million including changes in benefits tied to salaries), some $3,781,000 in salary funds will be required, as shown at the top of page 47.

	University of California	California State University	California Maritime Academy
Added funds needed to improve engineering faculty retention	$1,435,000	$1,446,000	part of $135,000
Added funds needed to fill 20 percent of vacant full-time positions	59,000	102,000	0
Added funds for recruitment due to retirements	46,000	58,000	part of $135,000
Added funds to retain part-time faculty	165,000	335,000	0
Total funds needed	$1,705,000	$1,941,000	$135,000
Grand Total		$3,781,000	

Salary differentials are, however, only a temporary or short-term aid in improving faculty recruitment in high-demand fields, be it engineering or other disciplines, in California's public colleges and universities. While being mindful of the implications of collective bargaining, as a long-range solution the Commission recommends that the State encourage the Regents of the University, the Trustees of the State University, and the Board of Governors of the Maritime Academy to phase in overlapping salary ranges with sufficient flexibility to accommodate changes in demand within engineering.

Unlike California's public institutions, most American colleges and universities utilize overlapping salary ranges that allow administrators to negotiate individual salaries in order to provide adequate yet equitable compensation for faculty while at the same time assuring quality. As an example, one large state system elsewhere in the country in which the faculty is unionized uses nine-month salary ranges that, when plotted to scale, appear graphically as follows:



Source: California Postsecondary Education Commission survey.

As can readily be seen, except for the "distinguished professor" rank, extensive overlap occurs among these ranges. The top salary for an instructor, for instance is higher than the lowest salary for a full professor as well as for an assistant or an associate professor. (Although not evident from the figure, this state system also makes provision for over-scale appointments, and it has been allocated $1 million for disparity income during 1983 that will likely be directed toward increasing engineering faculty salaries as well as for recruitment of women and minority faculty. In addition, it has negotiated salary increases of 9, 8, and 8 percent, respectively, over the next three years.)

The flexibility that such overlapping salary ranges provide for this state system and 90 percent of all American colleges and universities is not available to California's public institutions of higher education. They deserve such flexibility in order to respond rapidly to changing demands of the academic marketplace in all disciplines and in order to avoid abnormal skewing of rank distribution. Rather than operating under a system of limited salary differentials for certain specific fields and being forced to manipulate ranks for adequate recruitment and retention, they would be able to set salaries within general ranges at levels competitive with comparable institutions across all academic disciplines. To inaugurate this new system, the segments can develop guides for the ranges from data obtained from their respective comparison institutions, as they do now for the Commission's annual reports on faculty salaries. Further information can be obtained

from the detailed salary studies conducted annually by the American Association of State Colleges and Universities and the National Association of State Universities and Land-Grant Colleges as well as John Minter Associates. The two association surveys seek to provide comprehensive salary information not only so that academic administrators will know the going rates for quality appointments but also that legislators and other public officials can view state salaries in national context and so that faculty members will know average salaries in their disciplines in weighing institutional offers. In addition, these surveys are useful in long-range budget planning, since by applying various cost indices to them, such as the Consumer Price Index or the Higher Education Price Index, future faculty costs can be projected.

INCREASING THE SUPPLY OF POTENTIAL FACULTY

Two sources of new faculty warrant attention: engineers employed in business and industry, and graduate students in engineering. The need for faculty cannot be met solely from business and industry, but the Commission urges corporations in the private sector to encourage and provide incentives for qualified employees with special expertise to teach in engineering as part-time, loaned, or full-time faculty members; and it recommends that the University, State University, and Maritime Academy work cooperatively with industries and professional societies in establishing and expanding programs to aid the exchange of engineers between industry and the campus.

In the long run, however, California's colleges and universities must look to graduate students for their largest supply of engineering faculty. As noted on pages 39-40, 41 percent of newly appointed engineering faculty come directly from graduate schools. But only 14 percent of graduate engineering students are self-supporting, either through their own earnings, their spouse's earnings, or family contributions. Eighty-six percent of them depend on institutional or federal fellowships.

Overwhelming evidence and near consensus point to a severe shortage of domestic doctoral-level engineers, both currently and in the foreseeable future. Little or no elasticity exists in the engineering doctoral supply-demand system, in that persons trained in other disciplines can seldom assume the teaching and research functions of the doctoral engineer.

Unlike other states, California is fortunate in that an unusually high proportion of its engineering graduates at all levels--approximately 90 percent of all those from the University and the State University--remain in California. This high percentage means that the State's investment in engineering education has immediate payoffs to California's economy. Thus, in order to increase the supply of domestic doctoral students in engineering, the Commission recommends that stipends and assistantships for these students be increased; that the State establish a new loan program with forgiveness provisions for these students who are enrolled full time, if the recipient teaches in a California college or university. It also recommends that professional societies and industry expand their support of domestic master's

and doctoral candidates through direct grants to institutions or related educational foundations and to students in the form of traineeships, scholarships, and awards.

CONCLUSION

The evidence is clear that the inability of California's and the nation's engineering colleges to attract and retain the necessary qualified faculty members is adversely affecting the quality and productivity not only of engineering education programs but of the engineering profession. Unless the problem of attracting and retaining qualified faculty is rectified, it will jeopardize the future of California's technologically based industries and the future competitiveness of America's economy. The Legislature, California's industries, its public institutions of higher education, and professional associations all can play a role in reversing this current trend, through a combination of improved non-salary benefits, salary differentials, greater flexibility in salary administration through overlapping salary ranges, increased exchange of engineers between academic institutions and industry, and additional support for graduate study. No one agency can solve the problem, just as none of these efforts by themselves will suffice. In consort, however, they can meet the need.

Assembly Bill No. 2023

CHAPTER 1017

An act relating to public postsecondary education, and declaring the urgency thereof, to take effect immediately.

[Approved by Governor September 13, 1982. Filed with Secretary of State September 14, 1982.]

LEGISLATIVE COUNSEL'S DIGEST

AB 2023, Elder. Engineering, business, and accounting faculty: CSU and UC.

Existing law provides for the California State University, the University of California, and the California Maritime Academy to be administered by the trustees, the regents, and the California Maritime Board of Governors, respectively.

This bill would declare the Legislature's findings concerning the recruitment and retention of engineering, business, and accounting faculty at the University of California and the California State University, and that of marine engineering faculty at the California Maritime Academy.

This bill would require the California Postsecondary Education Commission to review various studies and to report to the Legislature regarding actions undertaken by the University of California and the California State University regarding engineering, business, and accounting faculty, as specified.

The bill would take effect immediately as an urgency statute.

The people of the State of California do enact as follows:

SECTION 1. The Legislature hereby finds and declares that the recruitment and retention of engineering, business, and accounting faculty at the University of California and the California State University are of significant importance in maintaining the prominence of those university systems. The Legislature also finds the recruitment and retention of marine engineering faculty at the California Maritime Academy to be a matter of legislative concern.

SEC. 2. The California Postsecondary Education Commission shall, by March 31, 1983, report to the Joint Legislative Budget Committee on the impact of actions taken for 1982–83 by the University of California, the California State University, and the California Maritime Academy, as well as studies conducted by related professional associations, with regard to changes in engineering faculty salaries, new employee salary differentials, and uses of investment in people funds as faculty incentives in response to legislative intent.

In addition, the commission shall also review relevant state,

regional, and national studies and make related, specific recommendations for action by the Legislature, industry, and educational institutions.

The commission shall also review actions or studies undertaken by the University of California and the California State University, as well as studies conducted by related professional associations, to address problems of recruitment and retention of faculty in business administration and accounting. The results of this review, and relevant recommendations, shall be reported to the Legislature by June 30, 1983.

SEC. 3. This is an urgency statute necessary for the immediate preservation of the public peace, health or safety within the meaning of Article IV of the Constitution and shall go into immediate effect. The facts constituting the necessity are:

Due to the critical shortage of teaching personnel in the fields of engineering, business administration, and accounting, it is necessary to determine as soon as possible the extent of the progress by institutions of higher learning regarding recruitment and retention of these individuals so that California's highest standards of academic excellence can be maintained.

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APPENDIX B

Faculty Recruitment and Retention Efforts of the University of California, the California State University, and the California Maritime Academy

NOTE: The following information about the University of California and the California State University is reproduced from pp. 53-55 and 50-52, respectively, of the Commission's 1982 report, Engineering and Computer Science Education in California Public Higher Education. Officials of the two systems report that these facts remain substantially the same today. The information about the California Maritime Academy has been prepared especially for this report.

THE UNIVERSITY OF CALIFORNIA

The University currently has 529.33 full-time engineering and computer science faculty, including 83 assistant professors, 81 associate professors, 356.33 professors, and 9 lecturers. One and one-half percent of these full-time faculty are women, while 20 percent are non-U.S. citizens. In order to meet its instructional load, the University employs 306.66 part-time instructors representing the equivalent of 99.06 full-time faculty. Four percent of these instructors are women and 14 percent are non-citizens.*

The employment of some part-time faculty is of course desirable: it not only augments full-time faculty with persons having special expertise, but it also provides some flexibility for the peaks and valleys of cyclical enrollment patterns. Yet according to the respondents to the Commission's survey of engineering deans, two-thirds or 204 of the part-time positions would be filled with full-time faculty if qualified candidates could be hired.

Resignations and Retirements

During the past three years, 46 faculty have resigned--23 with tenure and another 23 without tenure. Seventeen of them accepted positions at other universities while 24 accepted positions in industry, and the remaining five went to government or some other unspecified position. In total, the turnover rate is running about 9 percent over three years (excluding retirement), with industry being the major beneficiary of departing faculty and with administrative officials concerned about increased turnover in the future.

*One of the eight UC campuses surveyed did not report the number of positions occupied by non-citizens.

Twenty-two full-time faculty retired during the past three years, for an annual average rate of about 1.4 percent. Two percent of the current faculty are expected to retire before 1986, and 7 percent more between 1986 and 1990.

The retirement rates observed for the last three and projected for the next four years are about normal for university faculty nationally; beginning in 1986, however, the rate will be nearly double what has been considered normal in higher education. This rate change has been anticipated for some time, since many faculty who were hired during the growth period of the 1950s and '60s will reach retirement age during the latter part of the '80s. This will intensify recruitment of new faculty, but, at the same time, it may allow for internal readjustments in faculty distribution among disciplines not otherwise easily achieved.

Faculty Recruitment

In spite of its prestige and other positive factors, the University's recruitment efforts have not been fully successful:

- For example, one campus has been able to fill only nine of its 12 vacant full-time engineering positions over the past three years. The number of applicants for each position has averaged around 50, with a low of 11 and a high of 70. One position that has been vacant for over three years continues unfilled due to the lack of qualified candidates.

- A second campus reports receiving about 100 applications for each of nine positions over the past three years. Of these applications, only about five percent were qualified. Its acceptance rate for its offers is running about 50 percent.

- A third reports filling only eight of 15 positions vacant during the past three years with full-time faculty because of an insufficient number of qualified applicants. It made 11 offers to fill the positions, but three of its offers were rejected.

- A fourth reports filling eight positions but having 11 current openings. It suffered six rejections, but without the new salary schedule adopted by the Regents for engineering and business administration, this number most likely would have been larger.

- A fifth summarized its recruitment situation as follows: In searching for 12 positions over the last three years, found 95 qualified candidates out of 627 applicants; interviewed 74 at national meetings, during vacation or on campus; and made 14 offers, of which 10 were accepted and four were rejected, leaving the campus a net shortage of two faculty positions.

- The sixth campus in 1979-80 received 48 applications in computer sciences and made two appointments. In 1980-81, it received 66 applications for a junior faculty vacancy but made no offers because of the low quality of applicants. That year, it made one offer for a senior-level faculty vacancy, but it was declined. In 1981-82, 65 applications were received, one offer was declined, and one is still outstanding.

The revised salary schedule for professors in business/management and engineering adopted by the Regents for implementation in 1982-83 represents new scales that increase salaries for all professorial ranks, with the highest percentage increases, at amounts from 24.4 to 33.8 percent, going to assistant and associate professors. Nonetheless, even adding in summer employment, the schedule is still $5,000 to $9,000 below industrial competition at the first-step assistant professor level. And because the new schedule has only four steps in the assistant professor range, appointments at the top of the range will still be $1,000 to $2,000 below beginning industrial salaries at the 90th percentile of Ph.D. salaries in Table 4 on page 19.

In response to Commission questions about the effects that faculty and equipment shortages are having on the quality of programs and on students, three deans indicated that program quality has been affected, and all commented that students were being affected by oversubscribed classes, resulting in delays in obtaining degrees; large laboratory groups, which tend to make students spectators rather than active participants in experiments; and decreased amounts of time for individual consultations with students. One dean commented that instruction by temporary faculty is inferior to that of regular faculty. Another felt that the most serious consequence is that many qualified students cannot gain admission because of the high GPA scores used to limit enrollments--3.9 for high school graduates, and 3.3 for community college transfers. A third hopes to initiate a computer literacy requirement but has been unable to implement it yet because only one-third of the pre-enrolled students can thus far be accommodated.

THE CALIFORNIA STATE UNIVERSITY

The California State University employs 721 full-time engineering and computer science faculty on its 13 campuses that offer engineering. Of these faculty members, 403 are professors, 172 are associate professors, 56 are assistant professors, 86 are lecturers, and 4 are instructors. Women comprise 3.5 percent of these full-time faculty, and non-citizens constitute 8.4 percent.

In order to meet its instructional load in engineering and computer science, the State University also employs 726 part-time faculty,

equivalent to 221.8 full-time equivalent positions, of whom 5.6 percent are women and 13.0 percent are non-citizens. If the State University were able to compete effectively in the faculty recruitment marketplace, it would fill 65 percent, or 472 of these part-time-equivalent positions with full-time faculty. This would leave 77 full-time positions reserved to employ some 320 individuals as part-time faculty to capitalize on their special expertise and to retain flexibility as student demands and interests change.

Resignations and Retirements

Within the past three years, 37 tenured and 37 non-tenured faculty have resigned. Thirty-nine were hired by industry, 32 accepted positions at other universities, and 4 sought government or other employment. Thus industry is the major competitor for State University faculty, followed closely by other universities.

The retirement rate for full-time faculty has been about normal for the past three years, but is expected to double during 1982-1986, and more than double during the years 1986-1990.

Faculty Recruitment

The recruitment picture for the State University is very discouraging:

- One large campus has attempted to fill 20 tenure-track positions in engineering over the past three years. From a total of 215 applications, it made 22 offers--but 10 were rejected.

- To fill three assistant professor positions, 11 associate professor positions, and four professor positions in computer science, another large campus has made a total of 15 offers over the past three years, resulting in only three acceptances, two of whom have subsequently resigned. This campus has found recent changes by the Trustees to hire assistant professors at associate professor salaries useless because salaries are still far below the marketplace.

- After three years of intensive recruiting, a third large program has fewer full-time faculty than in 1979, due to inadequate salaries and high housing costs.

- After recruiting for 31 positions over the past three years (including duplicates that could not be filled), a fourth campus has made seven appointments, but during this time seven more faculty departed. Many of its faculty are engaged in consulting because, as one of them stated, "we have to consult to support our teaching habit."

- A fifth campus reports filling 12 of 20 positions in three years. A sixth has made three offers for five vacancies in the past three years and filled only one. A seventh has filled its computer science vacancies despite a 50 percent rejection rate to offers, but has found only nine faculty for 16 vacant engineering positions--and one of the nine resigned after one semester.

- An eighth campus with five vacancies received large numbers of applications from foreign nationals but only a few from U.S. citizens and hardly any from women or minorities. A ninth, located in a metropolitan area, has had applications only from aliens who are in the U.S. on student visas, and cannot attract citizens to apply because of low salaries. And a tenth, also in a metropolitan setting, receives applications primarily from foreign nationals with no industrial experience and has made 14 offers in the past three years for four acceptances and 10 rejections.

To overcome these recruitment problems, the Trustees of the State University have adopted the policy that from April 1, 1982, until June 30, 1983, new faculty in engineering, computer sciences, and business administration may be hired at steps 1 to 5 of the associate professor level, where necessary. Yet even this temporary action places the State University at a level attempting to recruit new Ph.D.s in engineering at $700 to $9,582 a year below the beginning average industrial salary for Ph.D.s, assuming summer employment, based on salary offers at the 50th and 90th percentile to Ph.D.s reported in Table 4 on page 19 above. In fact, this new salary range competes mainly with salaries offered to graduates with B.S. degrees and inexperienced M.S.-degree holders.

In response to the Commission survey, deans and directors reported that program quality is being weakened because of the faculty shortage. When asked to identify the three most significant problems of their programs in priority order, they listed:

1. Lack of full-time faculty.
2. Need for new equipment.
3. Need for a reasonable long-range equipment replacement program.

They indicate that while students are receiving good instruction in theory, their classes and laboratory groups are too large and new state-of-the-art techniques are not included in laboratories because of obsolete equipment. Students are taking longer to graduate because needed class sections are closed. One dean acknowledged that because of low salaries he was not always able to select the best qualified faculty and that the advising load of full-time faculty is too heavy for adequate advice because of the high number of part-time instructors.

Most of the deans and directors suggested a differentiated salary scale in the neighborhood of $10,000 per year as a solution to the faculty shortage, and many proposed reduced teaching loads as an alternative, with funds for faculty renewal mentioned in two instances.

THE CALIFORNIA MARITIME ACADEMY

The number of faculty positions at the Maritime Academy has stabilized at 34 for the last three years. Twenty seven are in technology and seven are in general studies. At this time, all positions are filled. From 1976-77 through 1980-81, the turnover of faculty remained relatively constant at 11.6 percent. In 1981-82, it rose sharply to 26 percent. During that year, four of the nine faculty in marine engineering technology left the Academy as did two of the nine faculty in nautical industrial technology. In addition, there was one retirement of a full professor in the deck department and there are three retirements of full professors scheduled in the engineering technology department next year. Considerable talent is being lost through this turnover. It has been and will continue to be difficult to recruit appropriate replacements.

Most of the faculty who left the institution voluntarily during the past five years have indicated that higher pay or a "better job" was the reason for leaving. Two persons indicated that their departure was due to unhappiness with the promotion system, and two indicated unhappiness with the environment of the campus. Those persons who were unhappy with the promotion system would tend to be highly experienced professional merchant mariners with senior licenses but with limited graduate study, since such persons are normally not eligible for promotion to full professor. Those people who were unhappy with the environment may resent the required wearing of uniforms and the occasional duty officer responsibilities that the professional faculty have to assume, but such people would most likely be graduates of federal or state maritime or service academies which had similar environments so they were not unaware of the nature of life at the Academy when they originally joined the faculty.

APPENDIX C

Policies on Outside Income of the California State University and the University of California

THE CALIFORNIA STATE UNIVERSITY

BAKERSFIELD · CHICO · DOMINGUEZ HILLS · FRESNO · FULLERTON · HAYWARD · HUMBOLDT
POMONA · SACRAMENTO · SAN BERNARDINO · SAN DIEGO · SAN FRANCISCO · SAN JOSE
LONG BEACH · LOS ANGELES · NORTHRIDGE
SAN LUIS OBISPO · SONOMA · STANISLAUS

OFFICE OF THE CHANCELLOR
(213) 590-5515

March 4, 1983

Dr. Russell L. Riese
California Postsecondary Education
Commission
1020 12th Street
Sacramento, California 95814

Dear Russ:

You have asked for information regarding any Board of Trustee policy concerning consulting activities for faculty, particularly as it may concern engineering and business professors seeking to augment their teaching salaries.

The nineteen individual campuses are required to develop campus guidelines for outside employment of faculty and ensure that employees are aware of the guidelines. The Presidents are responsible for seeing that this is done and that the policies are adhered to. The full statement of this presidential responsibility, required by the Board of Trustees, is found in Section 5295 of the University and Colleges Administrative Manual of The California State University:

> Outside Employment and Incompatible Activities
> Presidents are responsible and accountable to the Board of Trustees for ensuring that academic, administrative, and executive employees maintain high professional standards in meeting their assigned responsibilities and do not engage in outside activities that in any way conflict with or interfere with their regular assignments. Presidents should develop individual campus guidelines for outside employment and ensure that employees are aware of the guidelines.

There is also a policy of the system which limits overload employment in The California State University such as teaching extension courses to 25% above normal workload.

I hope this has been helpful and responds to your request.

Sincerely,

John M. Smart
Assistant Vice Chancellor
Institutional Relations

JMS:pfz

cc: Dr. Kenneth B. O'Brien
Dr. Anthony J. Moye
Dr. Robert E. Tyndall

GOLDEN SHORE, LONG BEACH, CALIFORNIA 90802 INFORMATION: (213) 590-5506

UNIVERSITY OF CALIFORNIA SYSTEMWIDE ADMINISTRATION

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO — SANTA BARBARA • SANTA CRUZ

Office of the President

BERKELEY, CALIFORNIA 94720

April 13, 1979

INTERNAL CORRESPONDENCE

CHANCELLORS
LABORATORY DIRECTORS
MEMBERS, EXPANDED PRESIDENT'S ADMINISTRATIVE COUNCIL

Dear Colleagues:

The attached Policy on Outside Professional Activities of Faculty Members, effective immediately, reflects an extensive and careful development and review process.

Originally based on the report of the President's Advisory Committee on Faculty Consulting (the Sammet Committee), this final version now reflects comments and suggestions made by the Academic Senate divisions, by several University-wide Senate standing committees, and by administrators on the campuses, at the Laboratories, and within Systemwide Administration including General Counsel's office. In May and July of 1978, the Committee on Finance of the Board of Regents discussed existing University policies regarding faculty consulting as well as the proposed policy on outside professional activities of faculty members.

Vice President Kleingartner will be responsible for the development of guidelines for implementation of this policy. These guidelines will be issued soon.

Sincerely,

David S. Saxon

David S. Saxon
President

Attachment

cc: Principal Officers of The Regents

POLICY ON OUTSIDE PROFESSIONAL ACTIVITIES OF FACULTY MEMBERS

The University of California invites to its faculty scholars whose training, interests, and accomplishments give promise that they will contribute effectively to the University's responsibilities for the communication and advancement of knowledge. When scholars join the University faculty, they accept the University's responsibilities as their own, and they participate in a number of activities in fulfilling their responsibilities to the University.

For purposes of advancement and promotion, the performance of faculty members is evaluated by grouping their activities into four interrelated categories: teaching, research and creative work activity, professional competence and activity, and University and public service. Of these, teaching and scholarly or creative activity clearly are primary activities and receive the largest commitment of effort and energy, but faculty members are also expected to participate in University activities and to contribute to their professions and to the community.

Depending on the professional field of a faculty member, a wide spectrum of outside professional activities is possible. Typical examples include, but are not limited to, serving on a committee, panel, or commission established by a Federal, state, or local governmental agency; acting in an editorial capacity for a professional journal; reviewing journal manuscripts, book manuscripts, or grant or contract proposals on an ad hoc basis; serving as a committee member or as an officer of a professional or scholarly society; accepting a commission for a specific service such as a work of art or dance; participating in a musical, dramatic or other artistic performance; practicing a profession on a part-time basis; providing professional services to clients or corporate or governmental agencies; testifying as an expert in a court of law. The same standards of performance should be applied to all outside professional activities as to any other area of academic endeavors.

Existing University policies on outside professional activities apply principally to those for which compensation is received. Regents' Standing Order 103.1(b) states that faculty members shall not allow outside employment to interfere with primary University duties. Pertinent provisions of Regulation No. 4 (Special Services to Individuals and Organizations) implement the Standing Order and reinforce the concept that outside professional activities are a valuable contribution to the University and to an individual's professional growth as long as the activities are undertaken in a manner consistent with the full performance of the faculty member's primary University obligations.

This policy supplements and amplifies these earlier University policies by incorporating within its scope the total array of compensated and uncompensated outside professional activities that are undertaken by faculty members when such activities involve agencies other than the University or programs which are not administered through the University. Further, this policy augments existing professional school policies in such areas as the health sciences but does not replace them.

Outside professional activities of faculty members should (1) give the individual experience and knowledge valuable to teaching or research, (2) be suitable research through which the individual may make worthy contributions

to knowledge, or (3) be public service appropriate for the University. Outside professional activities shall be part of the record evaluated in the academic review process for advancement or promotion.

The basic principle stated earlier is that University faculty must fully meet their obligations to the University in teaching, research and creative work, professional competence and activity, and University and public service that demonstrate or enhance professional competence. The most efficient and effective approach to accomplishing this is to focus the University's review processes on precisely those activities when evaluating the quality of the faculty member's contribution to the University and to apply the same rigorous standards to each type of activity.

A faculty member's record is reviewed annually by the Department Chairperson (Academic Personnel Manual, Section 52-80 b). As part of that review, the chairperson shall review the faculty member's performance in the four areas listed in the above paragraph. University policy, effective with this statement, is that information regarding outside professional activities related to a faculty member's academic specialty shall be supplied to department chairpersons or equivalent unit heads through annual reports. These annual reports shall consist of a description of the organization, group, or individual for which service was performed and a description of the type of service performed during the period of the academic appointment. These reports will be used by chairpersons or equivalent as part of their annual review of faculty members for possible recommendation for advancement. The reports are considered to be non-confidential in nature and are subject to public inspection. Information regarding time and effort devoted to outside professional activities shall be separately provided in accordance with guidelines to be issued by the President.

If the department chairperson has any concern about whether a faculty member is meeting the standards of this policy, the chairperson will discuss this with the faculty member. If a satisfactory resolution cannot be reached, the chairperson will advise the appropriate Dean or Provost of the problem and of the specific steps that have been taken in attempting to resolve the issue. Further attempts at resolution shall follow the procedures for implementing the University Policy on Faculty Conduct and other applicable regulations.

UNIVERSITY OF CALIFORNIA SYSTEMWIDE ADMINISTRATION

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO SANTA BARBARA • SANTA CRUZ

Office of the President

BERKELEY, CALIFORNIA 94720

August 11, 1982

CHANCELLORS
LABORATORY DIRECTORS
MEMBERS, EXPANDED PRESIDENT'S ADMINISTRATIVE COUNCIL

Dear Colleagues:

On June 23, 1980, I issued the University's overall policy on conflict of interest, with its attached Compendium of Specialized University Policies, Guidelines, and Regulations Related to Conflict of Interest.

This compendium is intended for the use of University employees should the question of a possible conflict of interest arise. If, after considering these policies, guidelines, and regulations, an individual is still uncertain about the propriety of a particular action or relationship in connection with University duties, a Conflict of Interest Coordinator should be consulted.

Enclosed is a revised Compendium which should be substituted for the attachments to the June 23 policy statement. The only change to the Compendium is the addition of the April 8, 1982 Policy on Disclosure of Financial Interest in Private Sponsors of Research.

I have asked Vice President Kleingartner to assume Universitywide responsibilities for answering inquiries about conflict of interest matters and to also be responsible for issuing future revisions or up-dates to this compendium.

The best and most important safeguard against the occurrence of conflict of interest remains the integrity of University employees and officials. I hope the enclosed compendium will be useful for those inevitable occasions when some guidance is necessary. I encourage you to make it available to all interested parties.

Sincerely,

William B. Frethe

David S. Saxon
President

Enclosure
cc: Principal Officers of The Regents
Chair, Academic Council
Chair, University Committee on Academic Personnel
Conflict of Interest Coordinator Crooks
Chair, Council of UC Staff Assemblies
Chair, Student Body Presidents' Council

COMPENDIUM OF SPECIALIZED UNIVERSITY POLICIES, GUIDELINES, AND REGULATIONS RELATED TO CONFLICT OF INTEREST*

INDEX

*Full copies of the material can be obtained from the Office of the Vice President--Academic and Staff Personnel Relations if not readily located through other University sources.

1. Standing Order of The Regents of the University of California 103.1(b), Special Provisions Concerning Officers, Faculty Members, and Employees of the University--Service Obligations (January 22, 1971).

   Summary: No portion of time due the University shall be devoted to private purposes and no outside employment shall interfere with performance of University duties.

2. University Regulation No. 3, Privileges and Duties of Members of the Faculty, Section 3a (February 15, 1935).

   Summary: Faculty are assumed to devote full "working" time to the University. Service includes classroom teaching, conference with students, studying and writing, research, committee work, administration, and public service, with time devoted to each varying and dependent upon involvement with each type of activity.

3. University Regulation No. 4, Special Services to Individuals and Organizations (June 23, 1958) and Principles Underlying Regulation No. 4 (June 23, 1958).

   Summary: Faculty may render professional or scholarly services for compensation and may engage in the practice of their professions to maintain professional competency if such service does not interfere with University commitments and if it gives experience and knowledge of value to his or her teaching or research; is suitable research through which he or she may make worthy contributions to knowledge; or is appropriate public service. When consultants or outside services are such as to interfere with recognized University duties, they may be undertaken only on the basis of a leave of absence. University laboratories, bureaus, and facilities are not to be used for work of a purely commercial character except when it can be shown conclusively that satisfactory facilities for such services do not exist elsewhere.

4. University Regulation No. 5, Academic Freedom (June 15, 1944).

   Summary: The function of the University is to train students in processes whereby truth is to be made known. Its obligation is to see that conditions under which questions are examined are those which give play to intellect. To convert or make converts is alien and hostile to this dispassionate duty. When considering political, social, or sectarian movements, they are to be dissected and examined--not taught--and the conclusion left to the logic of the facts.

5. University Policy on Faculty Conduct and Administration of Discipline (June, 1974), including The Faculty Code of Conduct (May, 1974).

   Summary: The policy includes in its statement on ethical principles that the professor "determines the amount and character of the work he does outside his institution with due regard to

his paramount responsibilities within it...." The policy also lists as one type of unacceptable conduct the "unauthorized use of University resources or facilities on a significant scale for personal, commercial, political, or religious purposes" and contains sanctions where abuse is demonstrated.

6. Policy on Outside Professional Activities of Faculty Members (April 13, 1979).

   Summary: Amplifies previously issued policies on expected duties of a faculty member and clarifies expectations of performance of compensated or uncompensated outside professional activities which relate to a faculty member's academic specialty. Requires annual reports on such activities to departmental chairpersons.

7. Policy on Additional Compensation for Services as Faculty Consultant, Academic Personnel Manual Section 154 (December 1, 1979).

   Summary: If not regularly engaged on the project concerned, a member of the faculty may, on occasion, receive additional compensation for consultant services on projects conducted under the auspices of the University.

8. Statement of Conflict of Interest (issued by the President, October 5, 1967 and October 12, 1967).

   Summary: The Statement recognizes the potential conflict of interest from sponsored research, consulting contracts, and staff involvement in the management of private companies and illustrates for guidance the kinds of situations which may give rise to conflicts of interest (excerpted from a 1964 joint statement of the American Council on Education and the American Association of University Professors).

9. Instructions to Review and Appraisal Committees, Academic Personnel Manual Section 51 (1977).

   Summary: The instructions state that "Superior intellectual attainment, as evidenced both in teaching and in research or other creative achievement, is an indispensable qualification for appointment or promotion to tenure positions." Creative work includes recognized artistic production in architectural or engineering designs; professional competence; demonstrated distinction in the profession; and public service, service to the community, state, and nation.

10. University Policy Regarding Patents (April 1, 1980).

    Summary: In order to equitably administer intellectual property, the discoveries and inventions of members of the faculties, employees, and others associated with the University are subject to the patent policy. The use of University

facilities or services, particular assignments of duties, possible claims of a cooperating agency where research is supported from extramural funds, and other situations may give rise to a complex of interrelated equities or rights. Specific requirements of the policy are set forth, including No. 4, which states: "An agreement to assign inventions and patents to the Regents, except those resulting from permissible consulting activities without use of University facilities, shall be mandatory for all employees...." By letters of March 13, 1980, January 14, 1976, and July 14, 1976 and their attachments, President Saxon extended patent policy regulations to non-compensated researchers, certain visiting scholars and consultants, and graduate students.

* 11. Policies on Appointment of Near Relatives, Academic Personnel Manual Section 113, revised 1971, and Staff Personnel Policy 211.26 (January 1, 1980)

Summary: Appointment of near relatives in the same department is permitted, subject to reasonable safeguards against conflict of interest.

12. Policy on Acceptance or Offering of Gifts and Gratuities by University Employees (February 6, 1980).

Summary: No officer or employee should accept any gift or gratuity from any source which is offered or appears to be offered because of the University position held by the officer or employee. Also prohibits offers of a gift or gratuity by University officers or employees. Defines gifts and gratuities.

13. Policies Applying to Campus Activities, Organizations, and Students (January 3, 1979).

Summary: Included in this document is the policy that University facilities may be used only for University-related purposes or in furtherance of such purposes.

14. University of California Conflict of Interest Code (financial), approved by the Fair Political Practices Commission, January 25, 1978, with requirement of April 1, 1980, as the date for initial filing.

Summary: The Code requires public filing of financial disclosure statements by designated officials and disqualification from governmental decision-making of any employee who has a financial interest. Programmatic teaching and research decisions are not considered governmental decisions under the Code.

15. Policy Regarding Employee-Vendor Relationships (July 28, 1971).

Summary: Goods or services shall not be purchased from a University officer, employee, or near relative unless there is a specific determination that the goods or services are not available otherwise.

16. Materiel Management, Business and Finance Bulletin BUS-43 (October 22, 1979).

Part 2: Responsibility and Authority, Section X (p. 15), Personal Purchases.

Summary: University credit, purchasing power, and facilities are used for the purchase of goods and services that relate directly to University business and should not be used to purchase material for individual or non-University activities.

Organizations and activities closely allied to or officially associated with the University (such as faculty club or ASUC), with the approval of the Chancellor, may be permitted to purchase materials that are not subject to Federal tax from campus storehouses.

Part 9: Employee Vendor Relationships, (pp. 35-37)

Summary: Separation of Interest—It is the policy of the University to separate an employee's University and private interests and to safeguard the University and its employees against charges of favoritism in acquisition of goods and services.

Conflict of Interest - The State of California Political Reform Act prohibits an employee from making or participating in the making of a decision if there exists a financial conflict of interest. Requirements governing such decision-making are set forth in the University's Conflict of Interest Code and shall be observed in purchases of goods and services by the University.

Determination—No purchase, lease of goods, or contract for service shall be made from any employee or near relative unless there has been a specific determination by the Materiel Manager or designee that the goods or services are not available either from commercial sources or from the University's own facilities.

Inspection—The responsible administrative officer or representative whenever necessary to ensure an understanding of facts presented shall inspect the business premises and records of an employee-vendor or near relative-vendor from whom the University is considering acquiring goods or services.

Exceptions--Each responsible administrative officer is delegated authority, within constraints imposed by the Political Reform Act, for approving exceptions to policy when there are unusual or extenuating circumstances.

Introduction (p. 1) and Appendix B, Principles and Standards or Purchasing Practice Advocated by National Association of Purchasing Management, and Code of Ethics of National Association of Educational Buyers.

Summary: The University is committed to maintaining high standards of performance based upon fair, ethical, and professional business practices. It, therefore, expects each Materiel Manager and anyone else authorized to make purchases to abide by the purchasing codes of conduct attached in Appendix B.

17. Independent Consultants, Business and Finance Bulletin BUS-34 (September 28, 1979).

Summary: Proposals from independent consultants shall include the name and University position of any officer, faculty member, or other employee of the University who holds a position of director, officer, partner, trustee, manager, or employee in the consultant organization. Selection of the independent consultant shall be made on the basis of qualifications, resources, experience, needs of the University, and cost to the University. In the selection process, any officer or employee participating in the decision must keep in mind the disqualification requirements for financial conflict of interest of the State of California Political Reform Act of 1974. The University policy regarding employee-vendor relationships applies to services as an independent consultant. If an employee-vendor relationship exists, the reporting requirements of Business and Finance Bulletin BUS-43 shall be followed.

18. Ethical Professional Conduct: Internal Audit Code of Ethics.

Summary: The University subscribes to the Code of Certified Internal Auditors, which subscribes to avoidance of any conflict of interest or manifestation of bribery.

19. University of California Police Rules and Regulations (March 1, 1974).

Summary: The Regulations include the Law Enforcement Code of Ethics as an introduction and a section on Code of Conduct for University Police employees. Specifically, employees shall conduct their private and professional lives in such a manner as to avoid bringing discredit upon the department or upon themselves and, for example, shall not solicit or accept gratuities, use his or her position to obtain privileges, or permit endorsements for advertising purposes based upon the employee's University position.

20. Policy on Disclosure of Financial Interest in Private Sponsors of Research (April 8, 1982)

Summary: University Policy on Disclosure of Financial Interest in Private Sponsors of Research issued by President Saxon on April 9, 1982, and State regulations mandated by the Fair Political Practices Commission under the Political Reform Act (2 Cal. Admin. Code Section 18705) require that a principal investigator must disclose whether or not he or she has a direct or indirect financial interest in the sponsor of research which is funded in whole or in part: 1. through a contract or grant of $250 or more with a non-governmental entity; or 2. by a gift from a non-governmental entity which is earmarked by the donor for a specific research project or a specific principal investigator, provided the amount of the gift, or the aggregate over a 12 month period, from the same donor is $250 or more.

When an interest in a principal investigator in the sponsor is disclosed a campus committee must review whether the contract, grant, or gift can be accepted.

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