

The College of Engineering:
Status and Future

-- A presentation for the
Executive Officers

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NOVEMBER 4, 1981 EXECUTIVE OFFICERS MEETING WITH

THE COLLEGE OF ENGINEERING

AGENDA

7:30 1. INTRODUCTORY REMARKS BY VICE-PRESIDENT FRYE

2. CHARACTERISTICS OF THE COLLEGE (Duderstadt)

Introduction

Mission of the College

Academic and Administrative Structure

Reputation of the College

Students

student characteristics

enrollment trends

engineering manpower needs

Faculty

faculty characteristics

promotion, tenure, and salary policies

staffing policies and projected needs

Physical Facilities

history of North Campus move

present status and needs

major decisions before University

Budget

general features

General Fund component

research component

other resources

Research incentives, indirect cost, and "venture capital" needs

7:50 **QUESTIONS AND DISCUSSION**

8:00 3. PRIORITIES, OBJECTIVES, AND OPPORTUNITIES (Duderstadt)

Present Concerns

Major Objectives

Strategic Planning Activities

determination of priorities

programmatic reviews

resource reallocation decisions and implementation

Specific Objectives and Priorities

faculty

programmatic

research

space

equipment and support staff
development
Opportunities for the College
An overview of major issues to be covered in presentation
research issues
academic (instructional) issues
facilities and the North Campus move
industrial and development activities
other (GMI, Robotics Institute, etc.)

8:20 **QUESTIONS AND DISCUSSION**

8:30 4. RESEARCH ISSUES (Atkins)

Research characteristics
quantity and quality
research support (status and prospects)
research environment in College
Importance of research activities in College
reputation
instructional programs
attraction and retention of outstanding faculty
sponsored research support of other College activities
Research goals of the College
Review major barriers to achieving these goals
Needs for seed funding and research administration support
Other recommendations
research administration
research support services
graduate student support
Decentralization of research administration
research autonomy for the College
Engineering Research Institute

8:45 **QUESTIONS AND DISCUSSION**

8:50 5. ACADEMIC AND INSTRUCTIONAL ISSUES (Fogler)

Quality of instruction in the College
evaluation procedures
reputation
Present difficulties
inadequate instructional staff
inadequate classroom space
Central Campus/North Campus split
Major issues
shift to graduate/research focus
professional school status (junior level admission)
new instructional modes (co-op, post-grad education)
New directions in engineering education

9:05 **QUESTIONS AND DISCUSSION**

9:10 6. THE NORTH CAMPUS MOVE (Vest)

Review of history of North Campus Move
University and State commitment to Engineering Building I
Present plan for completing move
Proposal to Executive Officers
 specific actions proposed for existing engineering buildings
 specific actions proposed involving building reassignment
 strategy for stimulating release of funds for Bldg. I
Other issues
 North Campus Instructional Center
 Engineering and Transportation Library

9:25 **QUESTIONS AND DISCUSSION**

9:35 7. INDUSTRIAL INTERACTION AND DEVELOPMENT ACTIVITIES (Duderstadt)

Importance of College to Michigan industry
Strength of industrial ties
College Industry Committee
New efforts to re-establish and strengthen ties with industry
Possible problems arising from increased industrial support
Development program
 objectives
 strategy
 activities

9:45 **QUESTIONS AND DISCUSSION**

9:50 8. SUMMING UP: DOLLAR GOALS AND STRATEGIES

Brief review of objectives
Needs of the College
Sources of support
 reallocation within College
 reallocation within University
 direct State support
 sponsored research support
 industrial support
 private giving
 tuition

10:00 **FINAL QUESTIONS AND DISCUSSION**

OUTLINE OF THE PRESENTATION

1. INTRODUCTORY REMARKS (V.P. Frye)
2. CHARACTERISTICS OF THE COLLEGE (J. Duderstadt)
3. PRIORITIES, OBJECTIVES, AND OPPORTUNITIES (J. Duderstadt)
- *4. RESEARCH ISSUES (D. Atkins)
- *5. ACADEMIC AND INSTRUCTIONAL ISSUES (S. Fogler)
- *6. THE NORTH CAMPUS MOVE (C. Vest)
7. INDUSTRIAL INTERACTION AND DEVELOPMENT (J. Duderstadt)
8. SUMMING UP: DOLLAR GOALS AND STRATEGIES

NOTE: The Executive Officers of the University must decide on the following major issues before the College of Engineering can refine its strategic planning activities and move toward its objectives:

1. RESEARCH SUPPORT: Will the University provide the College with the incentives and support it needs to expand significantly its research activities?
2. NORTH CAMPUS MOVE: Will the University approve the general plan of the College to complete the move in a timely and cost-effective fashion that makes the most effective use of existing space?
3. GENERAL FUND BUDGET: Will the University work with the College to provide a level of General Fund support adequate to meet existing enrollments?

GENERAL STATEMENT

For over a century the College of Engineering at the University of Michigan has ranked among the leading engineering programs in the world, with claims to unusual strength across the full spectrum of technical interest. Each of the eleven academic programs of the College is ranked among the top such programs in the nation, and several of these are generally regarded as national leaders.

It is our belief that the College will play a critical role during the next decade as the State and the nation become increasingly dependent on engineering to revitalize industry and the economy. Today our nation faces an engineering manpower crisis of unprecedented proportions that poses the most serious implications for national productivity and defense. There is every indication that this shortfall in engineering manpower will persist at least through the next decade, as engineering programs are constrained in expanding their capacity by the availability of engineering doctorates. The College of Engineering can play a major role in meeting the engineering needs of the State and the nation through its engineering graduates and the research activities of its faculty.

To meet these challenges as well as the opportunities that will lie before the College over the next decade, we have set very ambitious objectives. We intend to assume a position of leadership in engineering education and research over the next several years in several of our key programs. We intend to be the best. We have no illusions about the challenge presented by this objective. We recognize that it will require a major rededication to the achievement of excellence in education, in scholarship and research, and in the professional activities of our faculty and students. It will require that we establish an environment within the College that will stimulate, reward, and, indeed, demand excellence in our research and instructional activities. We must create an environment that can be used to attract and retain faculty of truly outstanding capability. It will also be necessary to acquire the physical facilities and funding from both internal and external resources necessary to support and sustain such an environment. To be the best--certainly this is an ambitious goal--but it is a goal that we feel is well within reach, and we will refuse to settle for anything less.

1. OPENING REMARKS

DR. BILLY E. FRYE

VICE-PRESIDENT FOR ACADEMIC AFFAIRS

2. CHARACTERISTICS OF THE COLLEGE

MAJOR POINTS

1. The College of Engineering has both the potential and the determination to become the leading engineering program in the nation.
2. The already critical needs of both the State and the nation for the graduates of the College and the creative achievements of its faculty will intensify over the next decade with the increasing dependence on technology to revitalize national productivity and defense.
3. The College has neither the funding nor the physical facilities to handle its present enrollment levels while maintaining instructional quality (much less to address the serious engineering manpower needs of the state and the nation).
4. In contrast to most academic units, research activity is the key factor determining the reputation, resources, and instructional quality of the College.
5. The University must recognize and respond to the College's need for research incentives and support if it is to be successful in its goal of increasing the quality and quantity of its research activities.

DATA SUMMARY
FOR THE COLLEGE OF ENGINEERING

1. STUDENTS

Enrollment (Fall-81)	4,217 747 <u>352</u> 5,316	Undergraduates (19% women, 5% minority) M.S. Ph.D.	
			(growth of 48% since 1975)
Degrees Conferred (1980-81)	917 462 57	B.S. M.S. Ph.D.	(up by 50% since 1975)
Student Quality	SAT: 1200 23% in 99% 78% in 90%	(In 1980-81 a typical B.S. graduate received 5 job offers at \$25 -\$26 K. 1981-82 --> \$28-\$30 K)	

2. FACULTY

	<u>80-81</u>	<u>81-82</u>
Staff Size:		
Professors	161	165
Associate Professors	42	50
Assistant Professors	<u>48</u>	<u>48</u>
Faculty	251	263
Age Distribution:		
25-30:	10	
31-35:	34	
36-40:	27	
41-45:	25	
46-50:	37	
51-55:	41	
56-60:	34	
61-65:	42	
66:70:	23	
	<u>80-81</u>	<u>81-82</u>
Salary		
Assistant Professors:	\$22,536	\$29,400
Associate Professors:	27,115	31,900
Professors:	37,424	42,100

(Typical appointment: Academic year: 80% General Fund
20% Sponsored Research
Summer: 100% Sponsored Research)

3. QUALITY: Michigan is generally ranked 5th nationally behind M.I.T., Stanford, U.C. Berkeley, and Illinois. More detailed rankings of each of our academic programs is provided in accompanying material.

4. BUDGET

1980-81 Budget Expenditures:

Instruction (General Fund)	\$11,275,105
Research (Federal, Industrial)	16,141,467
Service (Various)	<u>5,572,131</u>
	\$32,988,703

1980-81 Actual Income:

Research (Direct Costs)	\$11,321,570
Research (Indirect Costs)	4,819,897
Student Fees	12,245,000
Other	<u>5,572,131</u>
	\$33,958,598

(Note that income exceeded budget expenditures by \$969,985. While this accounting does not recognize Plant Operations and maintenance, staff benefits, and general administrative expenses, it does suggest that in 1980-81 the College was in the interesting position of generating a "profit" for the General Fund.)

5. PHYSICAL FACILITIES

Present:

Central Campus:	West Engineering East Engineering UGLI	(Civil, IOE, ME, Admin) (ECE, Humanities, ChE, MME, ME) Engineering/Transportation Library
North Campus:	Aero Space Sciences Cooley Naval Arch. GGBL-Auto Lab	Aero A&OS Nuclear (+ ECE labs) NAME labs of ME, Civil, Chem E

Future:

Central Campus:	West Engineering	Admin (+ Towing Tank)
North Campus:	Aero Space Sciences Cooley Naval Arch. Dow (6/1/82) GGBL-Auto (82) Res Ad Engineering Building I (???)	Aero A&OS Nuclear NAME ChE, MME ME, Civil IOE ECE, Admin

WHAT IS ENGINEERING?

ENGINEERING is that profession in which a knowledge of science and mathematics is applied to meet the needs of society.

Scientists: search for the fundamental laws of nature.

Engineers: translate scientific knowledge into useful forms.

"The scientist explores what is--the engineer creates what had not been".

T. von Karman

Engineers are problem solvers, applying the tools of science and technology to solve the problems of society.

Major change in engineering practice and education over the past two decades:

experienced-based -----> knowledge-(science) based

Engineering at Michigan has had an exceptionally strong focus on fundamental scientific research.

MISSION

The College of Engineering is maintained for the purpose of serving the state and the nation through:

Providing instruction.

Conducting scholarly investigations and research in those branches of knowledge that form the basis of modern culture, professional practice, and leadership in our business and industrial society.

Applying the knowledge of the physical, biological, social, and engineering sciences to the solution of the problems of our society.

IMPORTANCE OF THE COLLEGE OF ENGINEERING

TO THE NATION:

- ...to meet the serious needs for talented engineers
- ...to provide the leaders of American industry
- ...to provide the engineering faculty of tomorrow
- ...to provide through research the technological knowledge vital to national productivity and defense

TO THE STATE:

- ...to meet the critical engineering manpower needs of Michigan industry
- ...to assist in revitalizing the productivity of existing Michigan industry
- ...to provide through its creative activities the seeds for new industrial development in Michigan
- ...to use its reputation and capability to attract new high technology industry to Michigan
- ...to provide residents of the State with access to one of the leading engineering programs in the world

TO THE UNIVERSITY:

- ...to contribute to the University's tradition of excellence in research, instruction, and service
- ...to demonstrate in a convincing fashion the University's commitment to assist the State in rebuilding its industry and economic base
- ...to establish important new ties with industry
- ...to attract major external resources to the University from both the public and private sectors

1980 GORMAN RANKINGS OF ENGINEERING PROGRAMS

	UG	G			
<u>AEROSPACE</u>	MIT Michigan Princeton Minnesota Illinois Stanford Brown Ohio State Iowa State Kansas	MIT Caltech Michigan Princeton Stanford Cornell Illinois Purdue Minnesota Georgia Tech	<u>CHEMICAL</u>	Princeton Wisconsin Cal-Berkeley Minnesota MIT Stanford Illinois Caltech Michigan Delaware	Wisconsin Princeton Cal-Berkeley Minnesota MIT Illinois Stanford Caltech Michigan Delaware
<u>CIVIL</u>	Cal-Berkeley Illinois MIT Stanford Cornell Purdue Michigan Columbia Northwestern Carnegie	Cal-Berkeley Illinois MIT Stanford Cornell Caltech Purdue Michigan Columbia Wisconsin	<u>ELECTRICAL</u>	MIT Stanford Cal-Berkeley Illinois Michigan Princeton Purdue Cornell Minnesota Wisconsin	MIT Cal-Berkeley Stanford Illinois Michigan Princeton Caltech Purdue Cornell UCLA
<u>INDUSTRIAL</u>	Stanford Michigan Cal-Berkeley Purdue Northwestern Georgia Tech Cornell Ohio State Columbia Texas A&M	Michigan Cal-Berkeley Stanford Purdue Wisconsin Cornell Georgia Tech Northwestern Columbia Ohio State	<u>MECHANICAL</u>	MIT Stanford Cal-Berkeley Michigan Brown Minnesota Illinois Purdue Cornell Princeton	MIT Stanford Cal-Berkeley Caltech Michigan Minnesota Illinois Purdue Princeton UCLA
<u>METALLURGICAL</u>	Illinois Colorado Missouri Columbia Minnesota Penn State Carnegie Case Michigan Ohio State	Illinois Columbia Pittsburgh MIT Carnegie Colorado Penn Minnesota Michigan Lehigh	<u>NUCLEAR</u>	Columbia Michigan Wisconsin Virginia Penn State RPI Texas A&M Arizona Illinois Cal-Berkeley	MIT Michigan Wisconsin Cal-Berkeley Georgia Tech Virginia Columbia Illinois RPI Texas A&M
<u>NAVAL</u> (UG only)	MIT Michigan Webb Institute	<u>MATERIALS</u> (UG only)	Cornell Northwestern Michigan Cal-Berkeley MIT Brown RPI Vanderbilt Case Carnegie	<u>ENVIRONMENTAL</u> (UG only)	Caltech Harvard Michigan Northwestern Penn State RPI Texas Florida
<u>ENG SCI</u> (UG only)	Caltech Harvard Michigan Georgia Tech Penn State Iowa State Yale				

SOME RECENT HISTORY (1971 - 1981)

GOOD NEWS

Enrollment has increased by 40% (1550 students).

SCH taught by College have increased by 45%.

Applications for admission have increased by 60%.

Visits by industrial recruiters have increased by 57%.

Tuition revenue generated by College has increased by 165%.

Indirect cost recovered by the College has increased by 126%.

BAD NEWS

The College General Fund base budget has been cut by 15%.

The College General Fund budget has declined by \$3,458,000 relative to growth of the rest of the University.

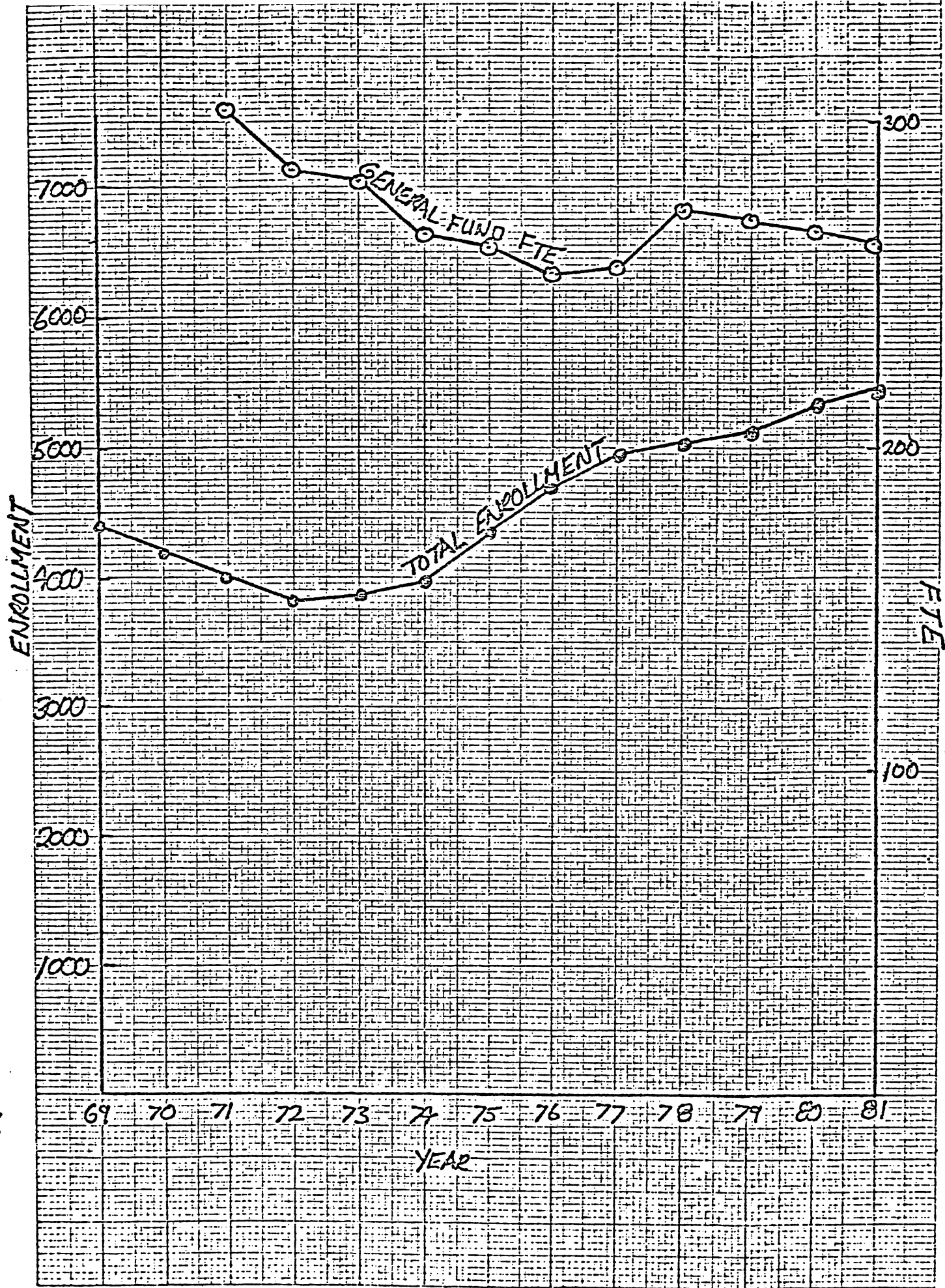
Instructional staff has fallen by 15% (302 - 261 = 42).

Support staff fell by 9% (152 - 138 = 15).

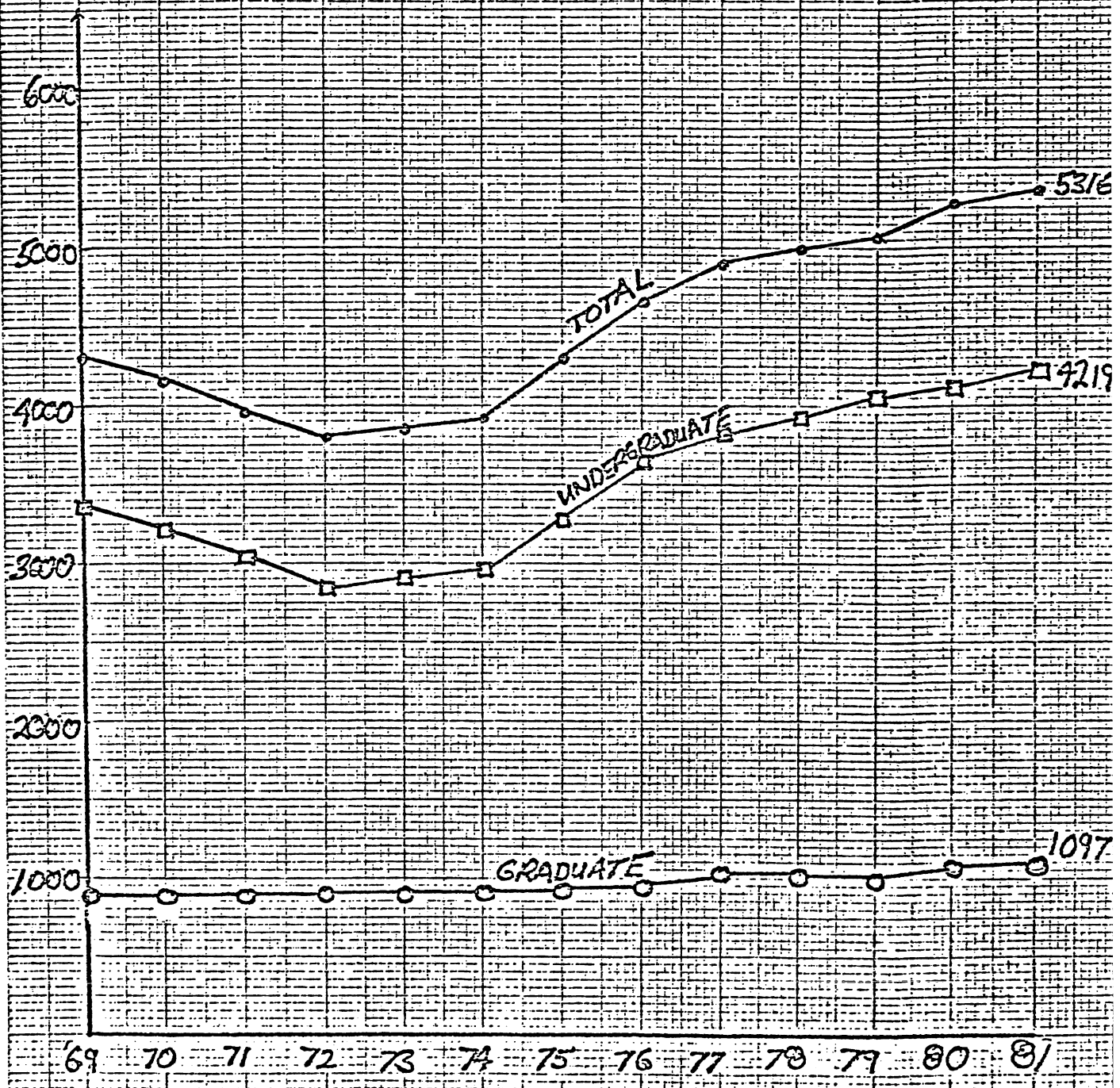
SCH/FTE increased by 45%.

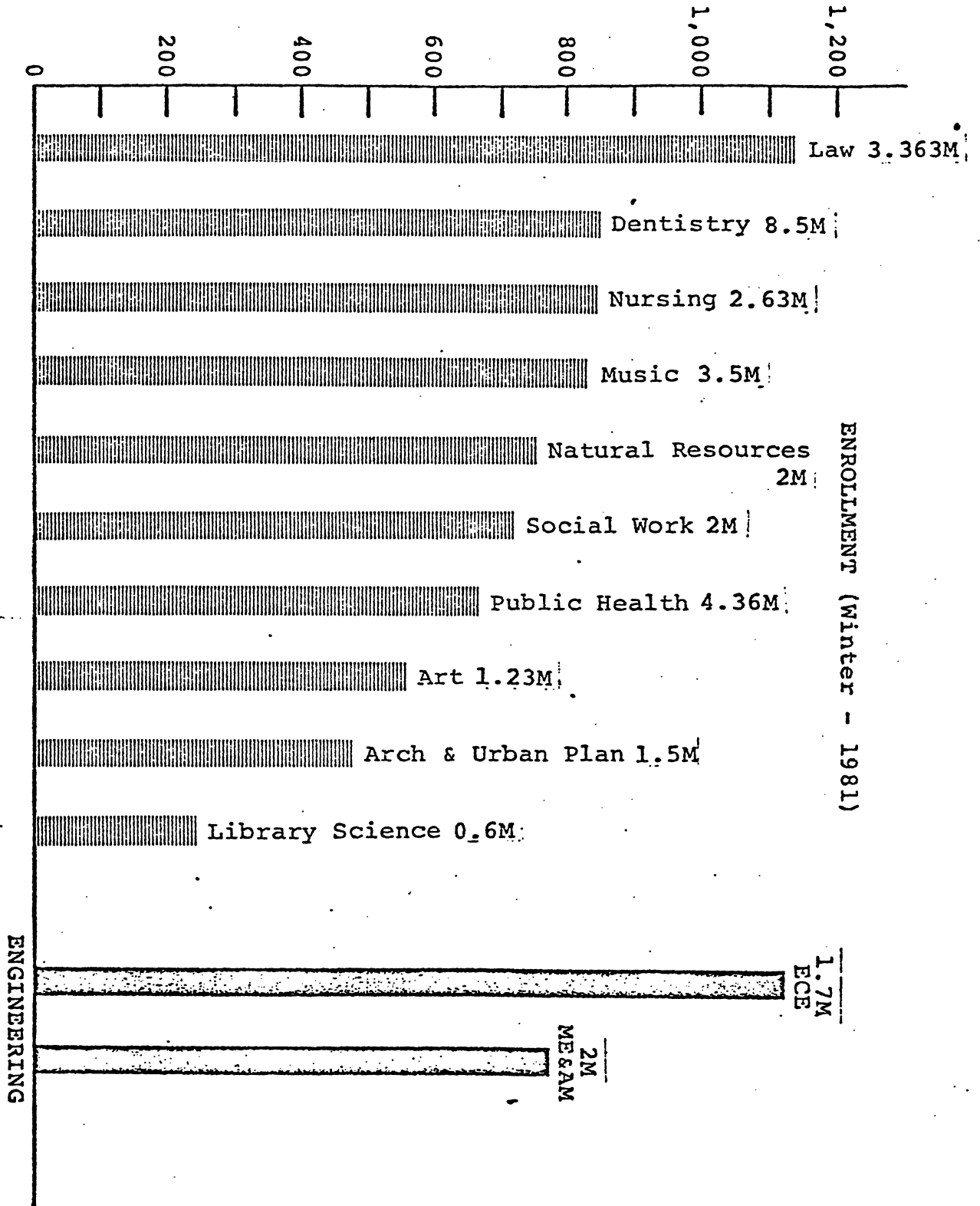
The State has not fulfilled its commitment to match private contributions to complete the move to North Campus.

The College's General Fund support per enrolled student is now the lowest in the University.



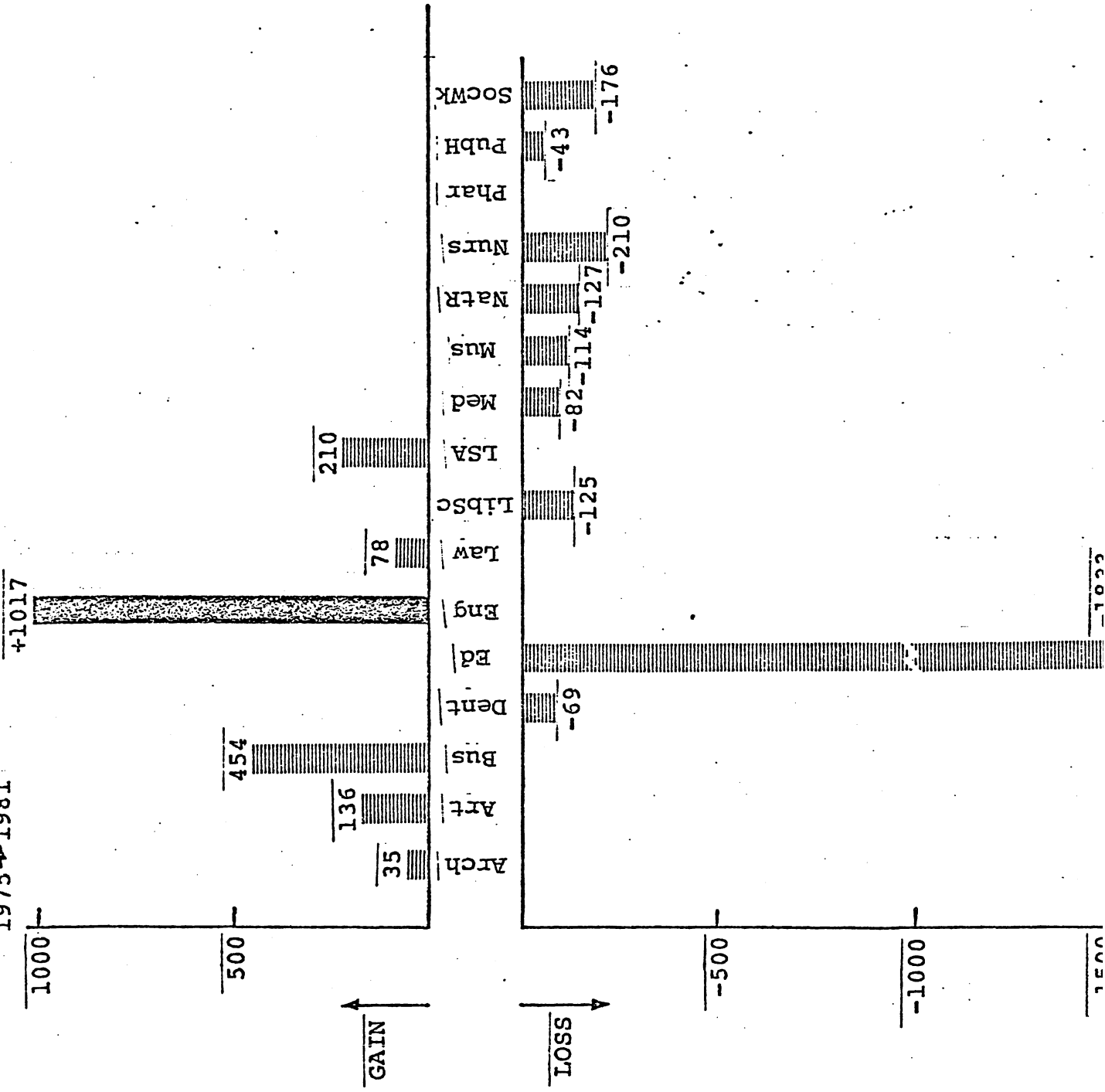
ON-CAMPUS HEADQUARTER ENROLLMENT

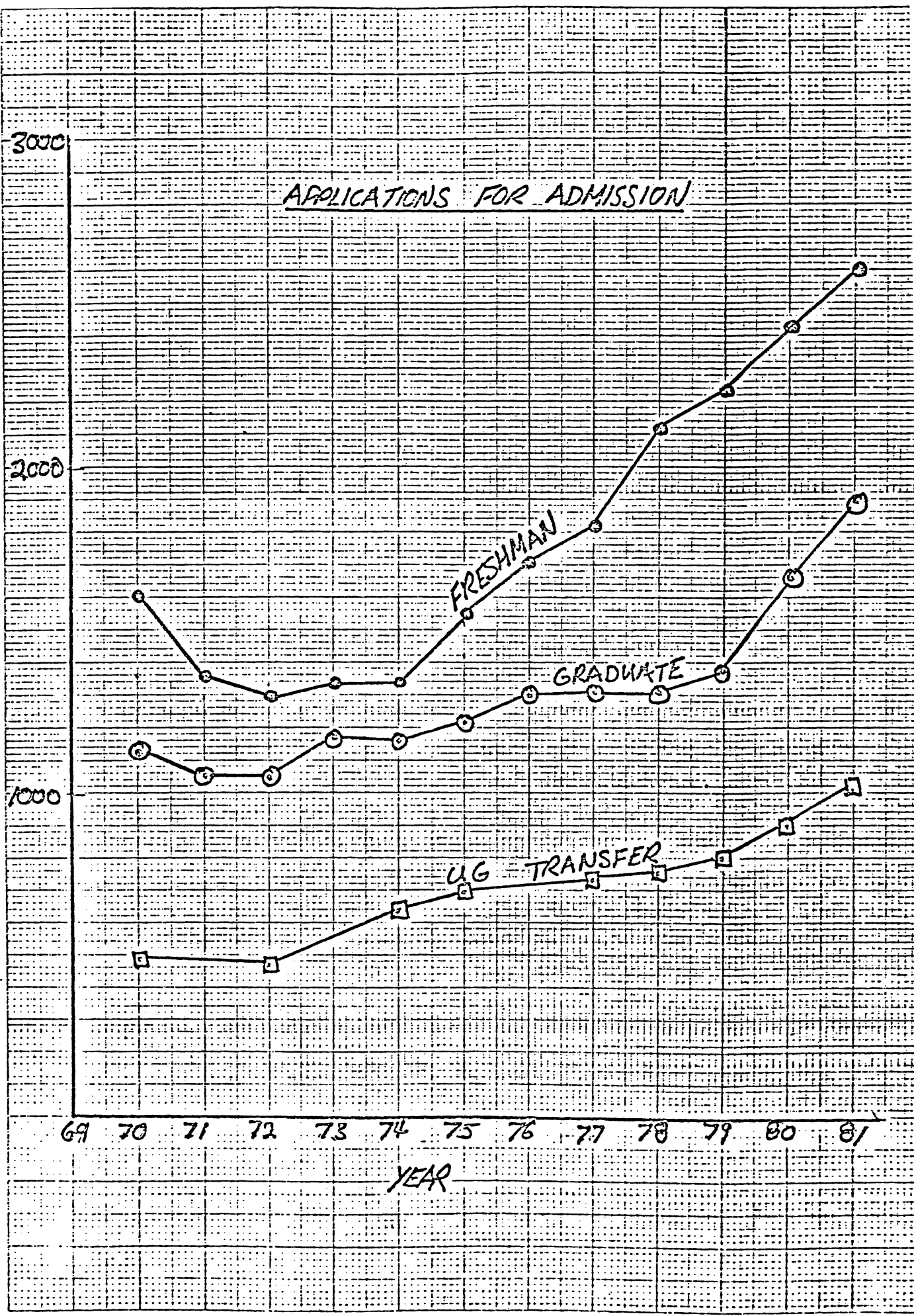




ENROLLMENT CHANGES (Absolute)

1975-1981





STUDENT CHARACTERISTICS (1981)

ENROLLMENT: 4,217 Undergraduates
 747 M.S.
 352 Ph.D.
 5,317 Total

Minority: 142 Black
 28 Hispanic
 16 American Indian
 186 Total (4.4%)

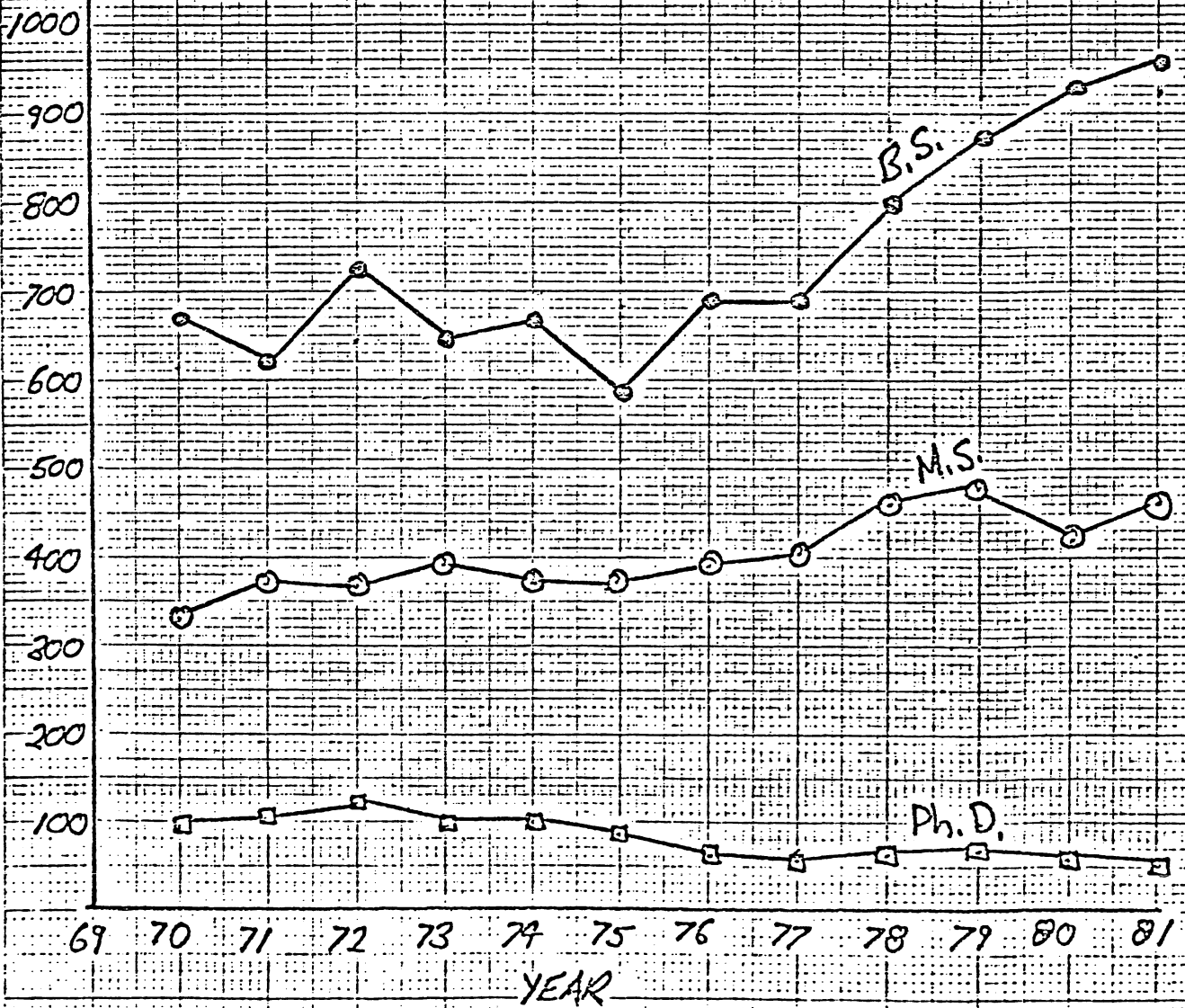
Women: 805 (19%)

DEGREES CONFERRED: 917 B.S.
 462 M.S.
 57 Ph.D.

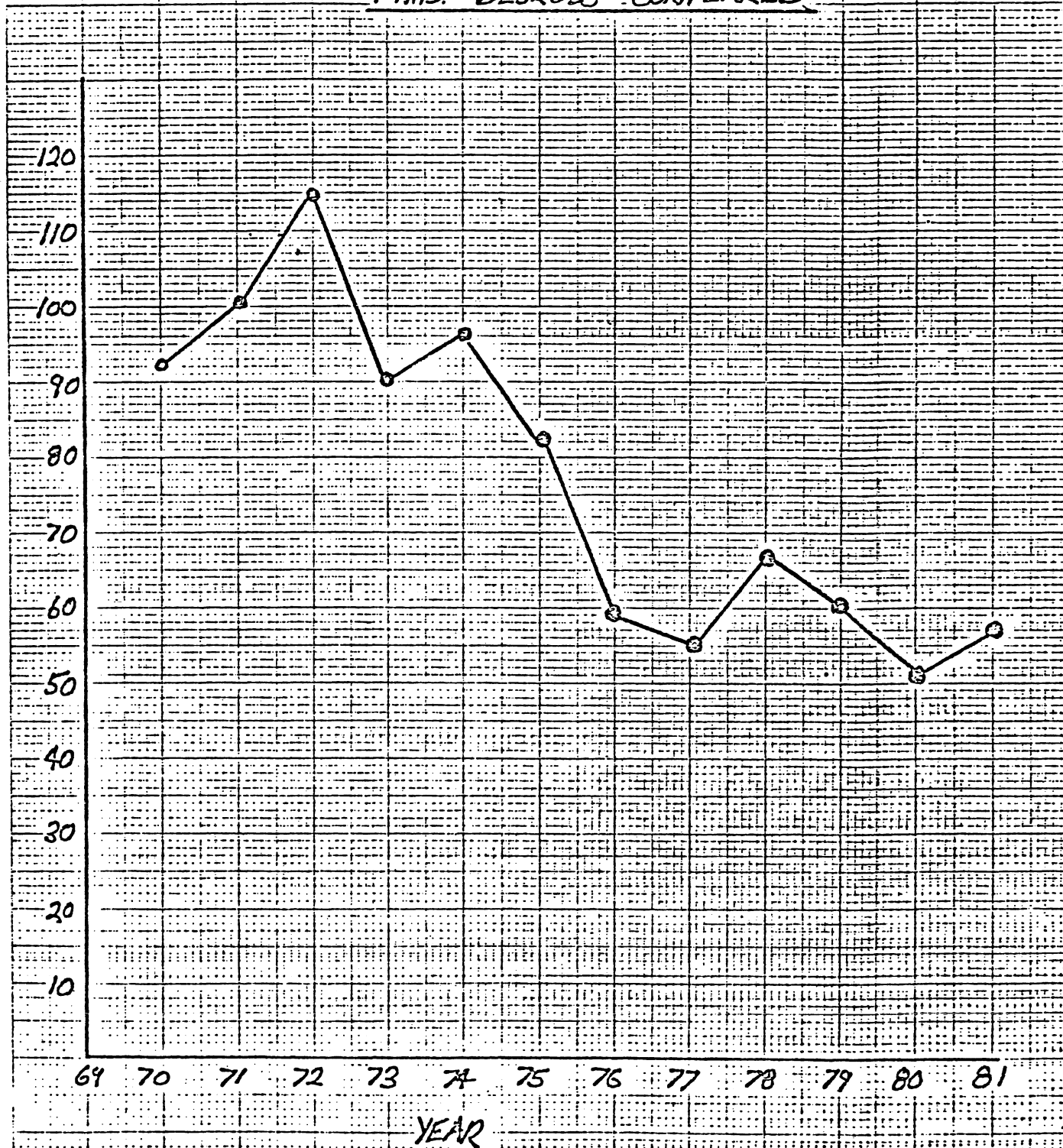
QUALITY:

Entering Freshmen: SAT Average 1200
 23% in 99th percentile
 80% in 90th percentile
 25% have 4.0 GPA

DEGREES CONFERRED



Ph.D. DEGREES CONFERRED



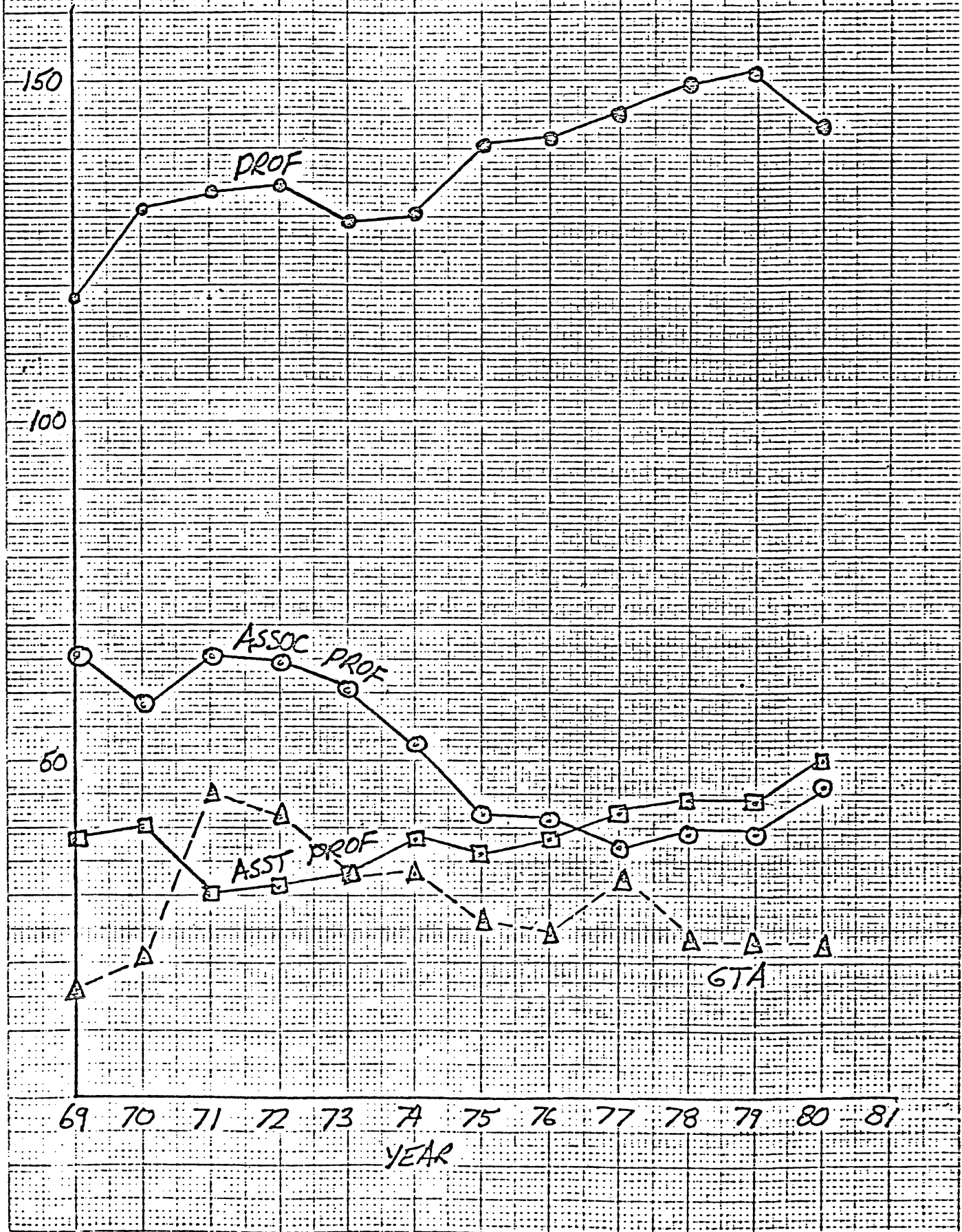
A MAJOR OBJECTIVE OF THE COLLEGE:

TO IMPROVE THE QUALITY, ACHIEVEMENTS, AND REPUTATION OF
FACULTY OF THE COLLEGE.

PLANS:

1. TO IMPLEMENT POLICIES CONCERNING HIRING, PROMOTION,
TENURE, AND SALARY THAT STRONGLY EMPHASIZE EXCELLENCE.
2. TO AGGRESSIVELY AND RAPIDLY RECRUIT SENIOR SCHOLARS
WITH INTERNATIONAL REPUTATIONS.
3. TO ESTABLISH A RESEARCH ENVIRONMENT WITHIN THE COLLEGE
ADEQUATE TO ATTRACT AND RETAIN OUTSTANDING SCHOLARS.

BUDGETED GENERAL FUND FTE STAFF



TYPICAL FACULTY APPOINTMENT MODELS

Appointment Funding

Academic Year: 80% General Fund .
 20% Sponsored Research
 (responsibility of individual
 faculty member)

Summer: 100% Sponsored Research

Appointment Loads

Instruction: 5 courses (3 hr) per academic year
 (up from 3 courses/ay in early 70s)
 advising and dissertation supervision of
 2.1 MS and 1.6 PhD

Research: 20%

Service: counseling, administration, committees

Consulting: average - 10 days/year (max allow: 1d/wk)

MEAN SALARIES

\$50,000

40,000

30,000

20,000

10,000

69 70 71 72 73 74 75 76 77 78 79 80 81

PROF

ASSOC PROF

ASST PROF

PHYSICAL PLANT

Present:

Central Campus:	West Engineering East Engineering UGLI	(Civil, IOE, ME, Admin) (ECE, Humanities, ChE, MME, ME) Engineering/Transportation Library
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North Campus:	Aero Space Sciences Cooley Naval Arch. GGBL-Auto Lab	Aero A&OS Nuclear (+ ECE labs) NAME labs of ME, Civil, Chem E
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Future:

Central Campus:	West Engineering	Admin (+ Towing Tank)
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COLLEGE OF ENGINEERING BUDGET CHARACTERISTICS

KEY POINTS:

1. GENERAL BUDGET CHARACTERISTICS
2. SERIOUS EROSION IN GENERAL FUND SUPPORT OVER PAST DECADE
3. REVENUE GENERATION IN THE COLLEGE ("BREAKEVEN" ???)
4. IMPORTANCE OF RESEARCH COMPONENT

1980-81 BUDGET CHARACTERISTICS

1980-81 BUDGET EXPENDITURES:

INSTRUCTION (GENERAL FUND)	\$11,275,105
RESEARCH (FEDERAL, INDUSTRIAL)	16,141,467
SERVICE (VARIOUS)	<u>5,572,131</u>
TOTAL EXPENDITURES	\$32,988,703

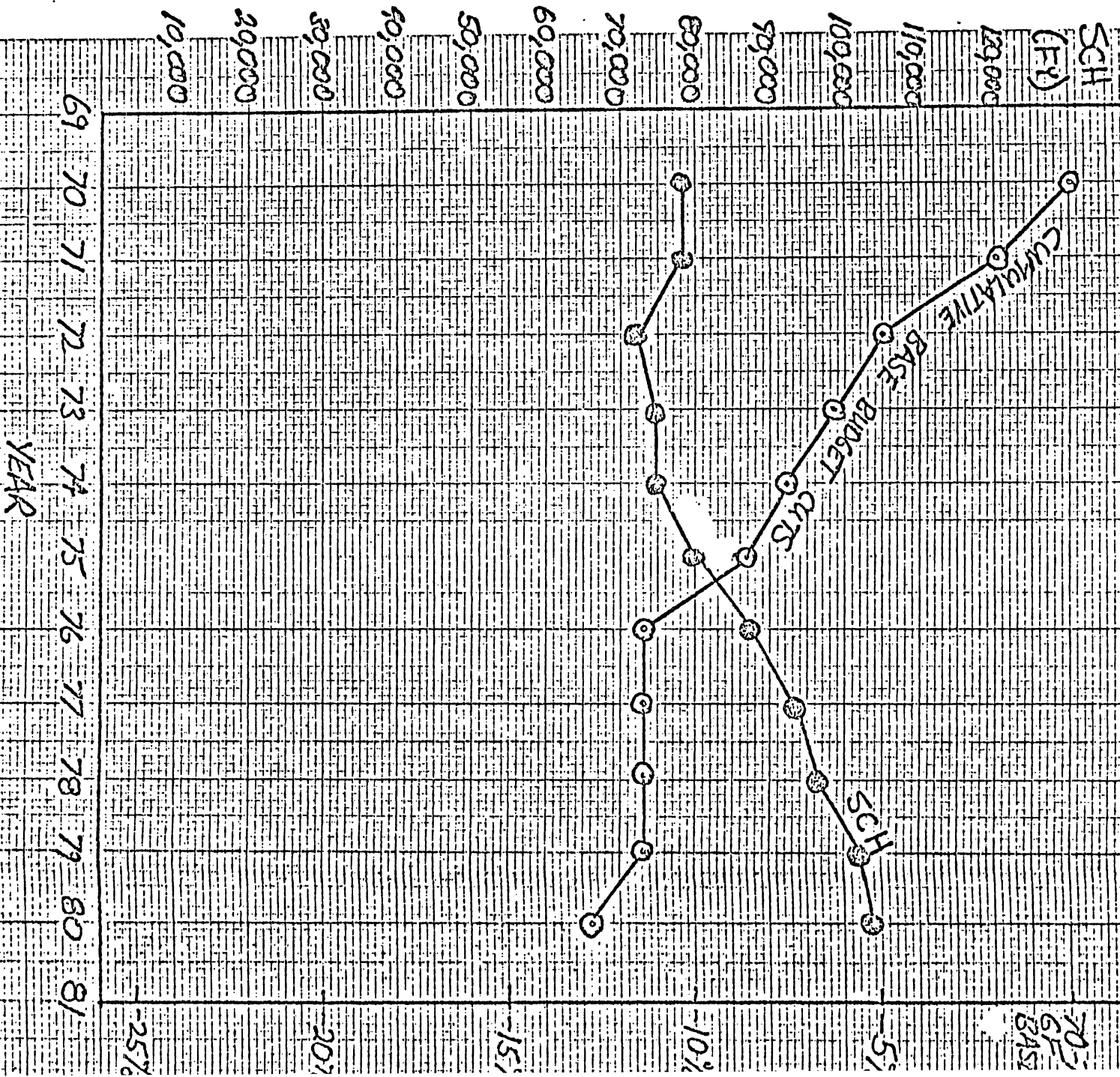
1980-81 RECOVERED INCOME

RESEARCH (DIRECT COSTS)	\$11,321,570
RESEARCH (INDIRECT COSTS)	4,819,897
STUDENT FEES	12,245,000
OTHER	<u>5,572,131</u>
TOTAL INCOME	\$33,958,598

NOTE: INCOME - EXPENDITURES = \$969,985

(WHILE THIS ACCOUNTING DOES NOT INCLUDE PLANT OPERATIONS AND MAINTENANCE, STAFF BENEFITS, AND GENERAL ADMINISTRATIVE EXPENSES, IT DOES SUGGEST THAT IN 1980-81 THE COLLEGE WAS IN THE INTERESTING POSITION OF GENERATING A "PROFIT" FOR THE GENERAL FUND OF THE UNIVERSITY.)

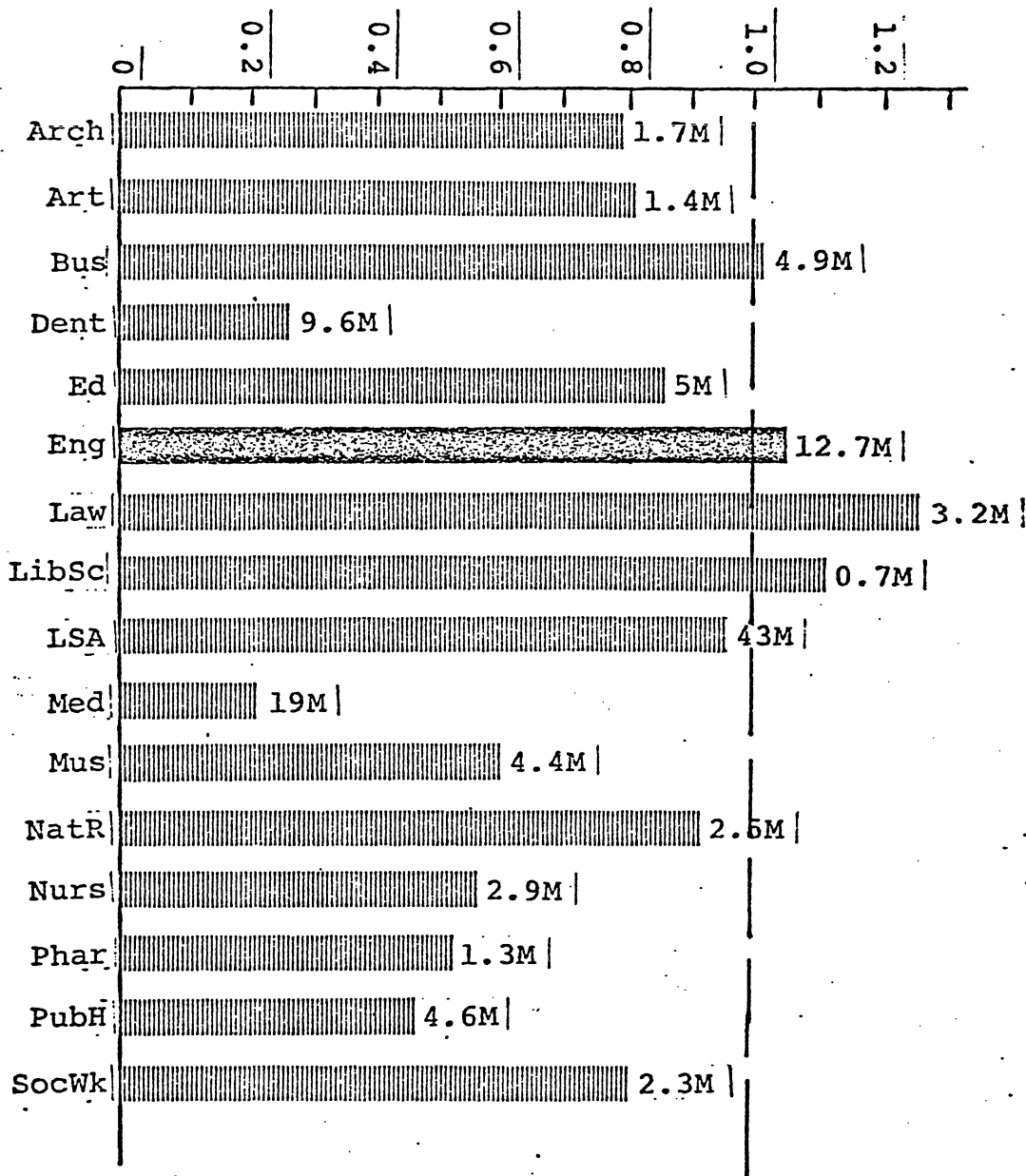
GENERAL FUND BASE BUDGET CUTS



RANK ORDERING OF ANNUAL COMPOUND GROWTH RATES IN EXPENSE CATEGORIES WITHIN SCHOOLS AND COLLEGES
1969-70 THROUGH 1977-78

SCHOOL/ COLLEGE	TEACHING SALARY	SCHOOL/ COLLEGE	NON-TEACHING SALARY	SCHOOL/ COLLEGE	NON-SALARY	SCHOOL/ COLLEGE	TOTAL
Nursing	12.14	Arch. & U.P.	13.18	Art	14.22	Dentistry	10.75
Pharmacy	11.54	Art	11.64	Arch. & U.P.	12.85	Nursing	10.18
Dentistry	11.33	Dentistry	10.38	Lib. Sci.	11.44	Lib. Sci.	9.62
Lib. Sci.	10.91	Social Work	10.06	Bus. Ad.	10.51	Medicine	9.39
Pub. Health	10.04	Medicine	9.42	Nursing	9.06	Pharmacy	8.48
Medicine	9.45	Education	7.67	Medicine	8.69	Pub. Health	8.09
Nat. Res.	8.64	Music	7.54	Dentistry	7.20	Social Work	7.95
Bus. Ad.	7.99	Law	6.46	LSA	7.16	Nat. Res.	7.83
Soc. Work	7.61	Nat. Res.	6.29	Music	6.21	Arch. & U.P.	7.00
Art	5.62	Lib. Sci.	5.95	Nat. Res.	5.75	Art	6.99
LSA	5.59	Engin.	5.57	Law	3.54	Bus. Ad.	6.87
Arch. & U.P.	5.49	LSA	5.54	Social Work	3.29	LSA	5.67
Music	4.98	Pharmacy	5.30	Education	1.08	Music	5.50
Law	4.65	Bus. Ad.	3.29	Engin.	- 1.79	Law	4.99
Engin.	4.18	Pub. Health	3.19	Pharmacy	- 2.62	Education	4.21
Education	3.49	Nursing	0.65	Pub. Health	- 5.99	Engin.	4.05
All Schools/ Colleges	6.69		7.15		5.37		6.70

OAPA 11/22/78



RATIO OF TUITION REVENUE TO GENERAL FUND BUDGET

1980-81 EXPENDITURE ELEMENTS

Professorial Salaries	78.5%	General Fund	8,063,000
	21.5%	Res./Other	2,212,000
Other Staff Salaries	23.5%		1,911,000
	76.5%		6,240,000
Scholarship/Fellowship	16.2%		171,600
	83.8%		883,700
Mat/Supp/Services	9.3%		342,400
	90.7%		3,336,600
Travel	10.1%		74,000
	89.9%		659,700
Equipment	44.5%		565,100
	55.5%		705,100
TOTAL	50.4%		\$11,127,100
	49.6%		\$10,937,100

IMPORTANCE OF RESEARCH IN THE COLLEGE

DETERMINES REPUTATION OF THE COLLEGE

DETERMINES FACULTY QUALITY

DETERMINES INSTRUCTIONAL QUALITY

PROVIDES 49% OF COLLEGE BUDGET

21% OF FACULTY SALARY SUPPORT

77% OF NONINSTRUCTIONAL SALARY FUNDS

82% OF GRADUATE STUDENT SUPPORT

78% OF EQUIPMENT SUPPORT

PRESENT CONCERNS

Despite the importance of the College of Engineering to the University, the State, and the nation, it is nevertheless true that the College faces serious difficulties at the present time. An External Review Committee for the College identified a number of "danger signs" in a report presented in June of 1980. These included low faculty morale, a decline in Ph.D. production, a decline in staff size in the face of surging enrollments, research disincentives, insufficient general fund support, the absence of competitive salary programs, the disruption caused by the inability to complete the North Campus move, and the absence of formalized planning activities. (Refer to Table.)

We would summarize the concerns that appear to require the most immediate attention below:

(i) There has been a serious erosion in University support of the College over the past decade. In recent years enrollment in the College has surged by over 35% to its present level of 5300 students, student credit hours have increased by 45%, while faculty size (FTE) has decreased by 11%. At the present time the College has neither the human resources nor the physical facilities to handle this enrollment while maintaining its traditional level of excellence in its instructional and research programs.

(ii) The research and instructional programs of the College have been handicapped by deteriorating physical facilities, outdated laboratories, and obsolete equipment. This situation has been aggravated by our inability to complete the move to the North Campus. We are presently facing the difficulties caused by the physical separation of our faculty, our laboratories, and our instructional activities on two campuses.

(iii) There has been a serious deterioration in our research and graduate programs, due in part to the increased instructional load on our faculty, but also due to administrative decisions made over the decade that have tended to de-emphasize graduate education and research.

(iv) Faculty morale is low. The faculty is frustrated by the increased instructional loads, inadequate salaries, the deteriorating environment for research, and archaic physical facilities and obsolete equipment. Apathy on the part of many faculty members is a particularly serious concern.

(v) There has been a notable absence of long range planning with the College.

DANGER SIGNS IDENTIFIED BY EXTERNAL REVIEW COMMITTEE (JUNE, 1980)

LOW MORALE OF FACULTY

INACTIVITY IN RESEARCH

DECREASE IN PH.D. DEGREES

INADEQUATE GENERAL FUND BUDGET

INADEQUATE INSTRUCTIONAL STAFF SIZE FOR ENROLLMENT

DISCOURAGEMENT FOR DOING RESEARCH

INSTRUCTIONAL LOADS (DESPITE 80% APPOINTMENTS)

DISRUPTION OF NORTH CAMPUS MOVE

LACK OF COMPETITIVE SALARY PROGRAM

ABSENCE OF COMPREHENSIVE LONG-RANGE PLANNING

LITTLE INTERACTION WITH OTHER SCHOOLS AND COLLEGES

IT IS OUR BELIEF THAT DESPITE THESE CONCERNS, THE COLLEGE HAS THE POTENTIAL AND DETERMINATION TO RISE TO THE TOP--OVERTAKING ILLINOIS AND BERKELEY WITHIN THE NEXT 5 YEARS AND SETTING OUR SIGHTS ON MIT AND STANFORD BY THE END OF THE DECADE.

BUT THIS OBJECTIVE REQUIRES YOUR HELP!

INDEED, WITHOUT YOUR HELP, THERE IS LITTLE DOUBT THAT THE QUALITY AND REPUTATION OF THE COLLEGE WILL FALL MARKEDLY OVER THE NEXT SEVERAL YEARS.

AND THERE IS ALSO LITTLE DOUBT THAT IF THAT HAPPENS, MICHIGAN WILL HAVE LOST ONE OF ITS MOST VALUABLE RESOURCES FOR REVITALIZING THIS STATE AND MEETING NATIONAL NEEDS.

3. PRIORITIES, OBJECTIVES, AND OPPORTUNITIES

MAJOR POINTS

1. SERIOUS CONCERNS: INADEQUATE UNIVERSITY SUPPORT
INADEQUATE RESEARCH ENVIRONMENT
INABILITY TO COMPLETE NORTH CAMPUS MOVE
INSTRUCTIONAL OVERLOADS
FACULTY MORALE
ABSENCE OF LONG-RANGE PLANNING
2. PRIMARY OBJECTIVE: NATIONAL LEADERSHIP IN ENGINEERING
3. COMMITMENT TO MAJOR STRATEGIC PLANNING ACTIVITIES AND RESOURCE REALLOCATION WITHIN THE COLLEGE
4. SPECIFIC OBJECTIVES: IMPROVED FACULTY QUALITY
INCREASE IN RESEARCH QUALITY AND QUANTITY
SHIFT TO UPPERCLASS/GRADUATE FOCUS
RAPID EXPANSION OF PHD PROGRAMS
COMPLETE NORTH CAMPUS MOVE
STRENGTHEN INDUSTRIAL INTERACTIONS
AGGRESSIVE DEVELOPMENT PROGRAM
LONG-RANGE PLANNING ACTIVITY
FAIR, EFFECTIVE RESOURCE ALLOCATION POLICIES
5. UNIQUE OPPORTUNITIES: ENGINEERING MANPOWER CRISIS
STUDENT DEMAND FOR ADMISSION
IMPORTANCE OF COLLEGE TO STATE AND NATION
PRINCIPAL INTERFACE WITH INDUSTRY
OPPORTUNITY TO MOVE IN NEW DIRECTIONS
WITHIN STRIKING DISTANCE OF BEING THE BEST

MAJOR OBJECTIVE:

TO BE THE BEST--TO RISE TO A POSITION OF LEADERSHIP AMONG
ENGINEERING INSTITUTIONS

GENERAL GOALS:

1. TO ACHIEVE EXCELLENCE IN EDUCATION, SCHOLARSHIP AND RESEARCH, AND IN THE PROFESSIONAL ACTIVITIES OF OUR FACULTY AND STUDENTS.
2. TO ESTABLISH AN ENVIRONMENT WITHIN THE COLLEGE THAT NOT ONLY ALLOWS FOR EXCELLENCE, CREATIVITY, AND INNOVATION, BUT ACTIVELY STIMULATES, REWARDS, AND DEMANDS SUCH QUALITIES.
3. TO SEEK AND OBTAIN THE RESOURCES NECESSARY TO SUPPORT SUCH AN ENVIRONMENT.

STRATEGIC PLANNING ACTIVITIES

GENERAL GUIDELINES:

1. TO KEEP AS OUR PRIMARY OBJECTIVE THE ACHIEVEMENT OF EXCELLENCE IN OUR RESEARCH AND INSTRUCTIONAL PROGRAMS.
2. TO MAINTAIN THE FLEXIBILITY TO RESPOND TO CHANGING NEEDS AND PRIORITIES.
3. TO BE PREPARED TO SHIFT RESOURCES WHEN NECESSARY, POSSIBLY REDUCING OR EVEN ELIMINATING SOME PROGRAMS AND ACTIVITIES IN ORDER TO IMPROVE OR INITIATE OTHERS.

PLANNING STRUCTURE

WORKING GROUPS:

DEANS

EXECUTIVE COMMITTEE

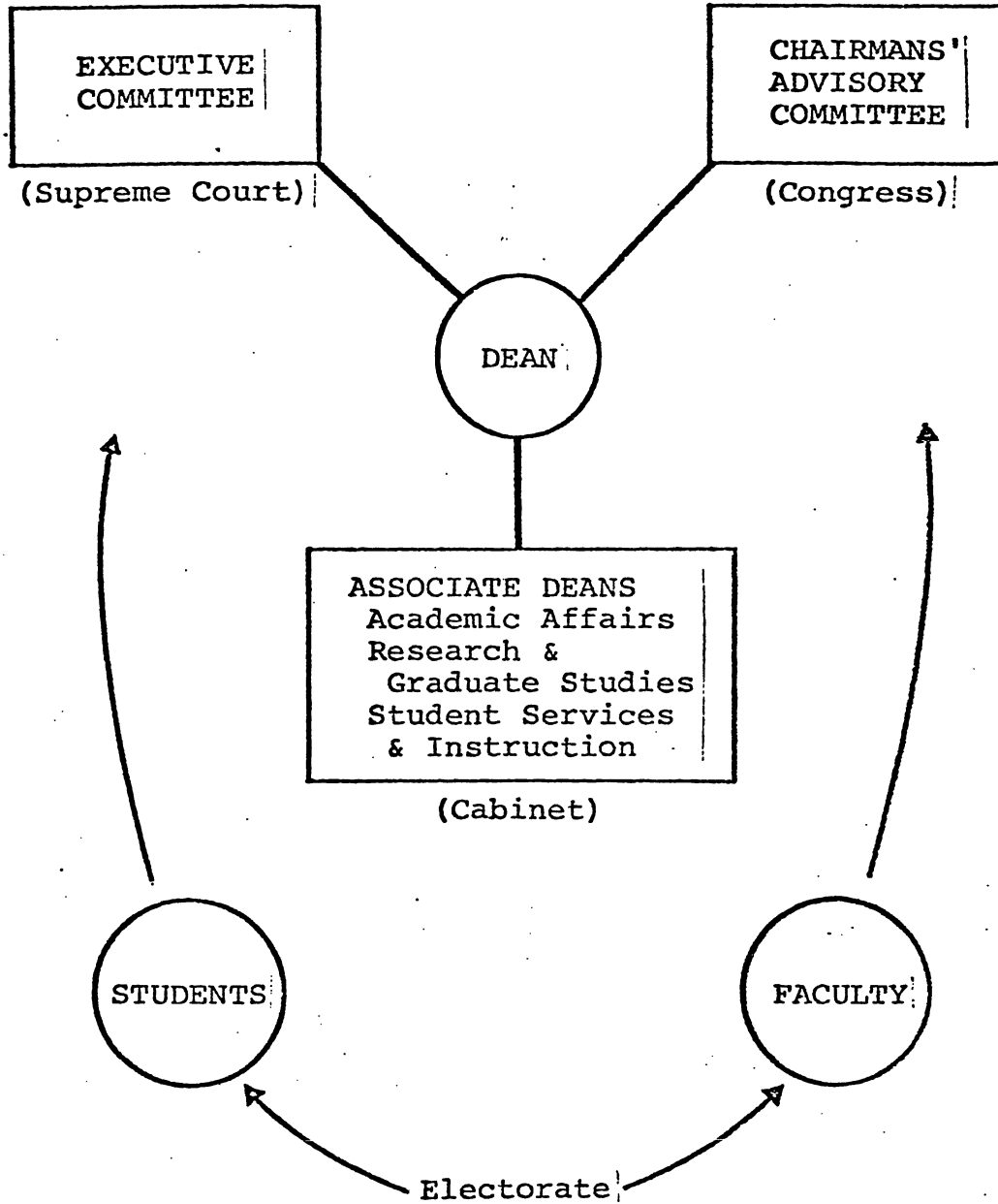
CHAIRMANS' ADVISORY COMMITTEE

MAJOR INPUT:

FACULTY

EXTERNAL ADVISORY COMMITTEES

STRUCTURE FOR STRATEGIC PLANNING
AND POLICY DEVELOPMENT



REVIEW PROCESSES:

1. PAST REALLOCATIONS FORCED BY BASE BUDGET CUTS DURING
A TIME OF RAPID ENROLLMENT GROWTH.
2. COLLEGE "GAME PLAN"
3. LONG-RANGE PLANNING AND PROGRAM REVIEWS BUILT INTO
ANNUAL BUDGET PROCESS
4. 5-YEAR DEPARTMENT REVIEWS (CHAIR SEARCHES)
5. SPECIAL REVIEW FOR RESOURCE REALLOCATION POTENTIAL

REVIEW CRITERIA:

1. CENTRALITY TO THE MISSION OF THE COLLEGE
2. QUALITY
3. COST-EFFECTIVENESS
RESOURCE REQUIREMENTS
EXTERNAL RESOURCE GENERATION

THE COLLEGE OF ENGINEERING GAME PLAN

"We saw no evidence of a comprehensive long-range plan or of any formalized planning." External Review Committee for College of Engineering (March, 1980).

GOAL: To honestly assess the present status of the College, establish objectives over the next decade, and develop plans to achieve these objectives. The "Game Plan" document was intended to assist in the preliminary stages of this activity by:

- (i) outline the College's short term urgencies
- (ii) suggesting long-term goals
- (iii) identifying internal courses of action to achieve these goals
- (iv) suggest appropriate actions ("proposals") to the Central Administration of the University

Game Plan is intended as an "evolutionary" document and is being modified as actions are taken and goals are achieved.

SCHEDULE:

- 1) Initial draft of Game Plan and supporting documentation and proposals (Spring-Summer, 1981)
- 2) Review by College Executive Committee (including revisions) (July-August, 1981)
- 3) Submission to University Executive Officers (August 18, 1981)
- 4) Review by Chairmans' Advisory Committee (September, 1981)
- 5) Revision and submission to College Faculty (December, 1981)

PLANNING WITHIN THE BUDGET PROCESS

GOALS:

- TO DEVELOP FAIR AND EFFECTIVE POLICIES FOR RESOURCE ALLOCATION
- TO RETURN PRIMARY RESPONSIBILITY FOR COST MANAGEMENT TO DEPARTMENTS
- TO STIMULATE ONGOING LONG RANGE PLANNING AND PROGRAM REVIEW

ACTIONS TAKEN:

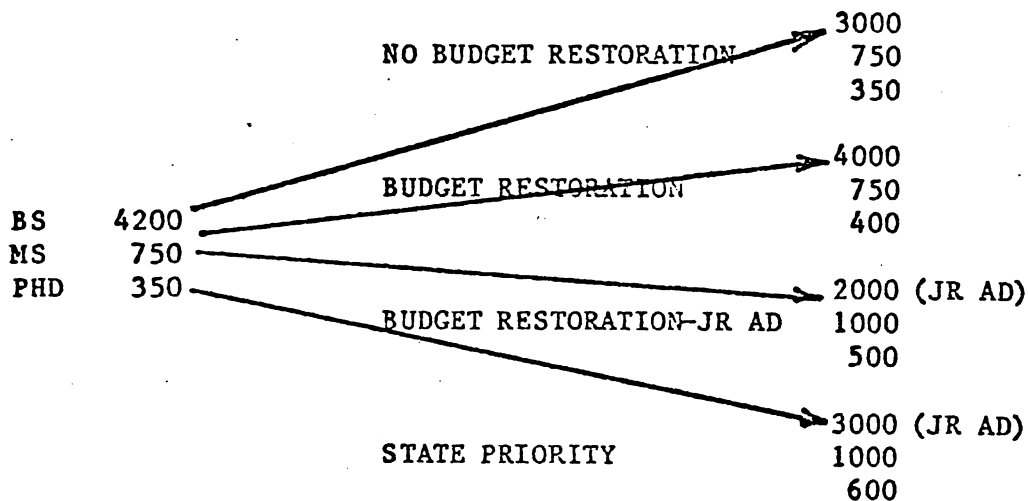
1. DEVELOPING EQUITABLE CRITERIA FOR RESOURCE ALLOCATIONS
2. ANALYZING VARIOUS RESOURCE ALLOCATION MODELS
3. ASSEMBLING A COMPUTER DATA BASE TO SUPPORT RESOURCE ALLOCATION
4. IMPLEMENTED A POLICY OF SELECTIVE ENROLLMENT AND ADMISSION CONTROL AT THE DEPARTMENT LEVEL
5. INCORPORATING LONG RANGE PLANNING AT THE DEPARTMENT LEVEL INTO BUDGETING AND STAFFING PROCEDURES

MAJOR OBJECTIVES OF THE COLLEGE

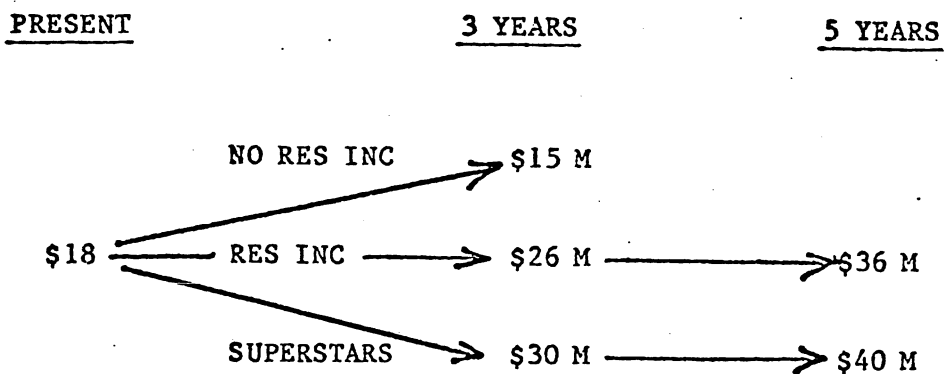
1. TO IMPROVE THE QUALITY, ACHIEVEMENTS, AND REPUTATION OF THE FACULTY OF THE COLLEGE BY IMPLEMENTING POLICIES CONCERNING HIRING, PROMOTION, TENURE, AND SALARY THAT STRONGLY EMPHASIZE EXCELLENCE IN SCHOLARSHIP.
2. TO INCREASE VERY SUBSTANTIALLY THE QUANTITY AND QUALITY OF RESEARCH PERFORMED BY THE COLLEGE.
3. TO SHIFT THE FOCUS OF THE INSTRUCTIONAL PROGRAMS OF THE COLLEGE TOWARD UPPERCLASS/GRADUATE LEVEL EDUCATION.
4. TO RAPIDLY AND DRAMATICALLY IMPROVE AND ENLARGE THE GRADUATE PROGRAMS OF THE COLLEGE, PARTICULARLY AT THE PHD LEVEL.
5. TO COMPLETE THE MOVE OF THE COLLEGE TO THE NORTH CAMPUS AS RAPIDLY AS POSSIBLE.
6. TO REBUILD THE EQUIPMENT INVENTORIES AND SUPPORT STAFF LOST THROUGH BUDGET CUTS OVER THE PAST DECADE.
7. TO GREATLY STRENGTHEN THE COLLEGE'S RELATIONSHIPS WITH INDUSTRY.
8. TO ESTABLISH AN AGGRESSIVE DEVELOPMENT PROGRAM AIMED AT SECURING SUPPORT FROM BOTH CORPORATE AND PRIVATE DONORS.
9. TO DEVELOP A CONTINUING LONG RANGE PLANNING ACTIVITY.
10. TO DEVELOP FAIR AND EFFECTIVE POLICIES FOR RESOURCE ALLOCATION.

SOME QUANTITATIVE GOALS

ENROLLMENT GOALS:



SPONSORED RESEARCH LEVELS:



FUTURE PROSPECTS AND OPPORTUNITIES

1. NEVER BEFORE HAS THE DEMAND FOR OUR GRADUATES BEEN HIGHER. THIS DEMAND IS EXPECTED TO INTENSIFY AT LEAST THROUGH THE NEXT DECADE.
2. BOTH THE QUALITY AND QUANTITY OF STUDENTS APPLYING FOR ADMISSION HAVE NEVER BEEN HIGHER.
3. THE COLLEGE IS IN A UNIQUE POSITION TO PLAY A VITAL ROLE IN THE REBUILDING OF MICHIGAN INDUSTRY AND THE ATTRACTION OF NEW INDUSTRY TO THE STATE.
4. BOTH THE NATION AND THE STATE HAVE BEGUN TO RECOGNIZE THE IMPORTANT ROLE THAT ENGINEERING WILL PLAY IN PRODUCTIVITY AND NATIONAL DEFENSE, AND BOTH ARE BECOMING MORE RECEPTIVE TO THE SUPPORT OF ENGINEERING EDUCATION.
5. THE COLLEGE IS THE PRINCIPAL INTERFACE BETWEEN THE UNIVERSITY AND INDUSTRY.
6. THERE IS A CLEARLY PERCEIVED NATIONAL CRISIS IN THE EDUCATION OF ADVANCED-DEGREE ENGINEERS. THE COLLEGE IS IN A UNIQUE POSITION TO BECOME A LEADER IN GRADUATE EDUCATION IF IT TAKES STRONG ACTIONS NOW.
8. ANTICIPATED RETIREMENTS IN THE COLLEGE WILL PROVIDE SOME DEGREE OF FLEXIBILITY TO MOVE IN NEW DIRECTIONS AND EMPHASIZE NEW PROGRAMS.
9. THE COLLEGE IS WITHIN STRIKING DISTANCE OF HAVING THE LEADING ENGINEERING PROGRAMS IN THE NATION IN SEVERAL KEY AREAS. WE BELIEVE THAT OVER THE NEXT DECADE THE COLLEGE HAS BOTH THE POTENTIAL AND DETERMINATION TO BECOME A NATIONAL LEADER IN ENGINEERING EDUCATION AND RESEARCH.

4. RESEARCH ISSUES

(D. E. ATKINS)

RESEARCH CHARACTERISTICS

QUANTITY (\$ AND EFFORT IN FTE)
(1980-81)

- RESEARCH FUNDS

DIRECT COSTS	\$11.3 M
INDIRECT COSTS	<u>4.8 M</u>
TOTAL	\$16.1 M

- ALL FUNDS \$33.0 M

- DETAILS OF EXPENDITURE ELEMENTS

- EFFORT

FACULTY, PRINCIPAL RESEARCH 50/270 FTE

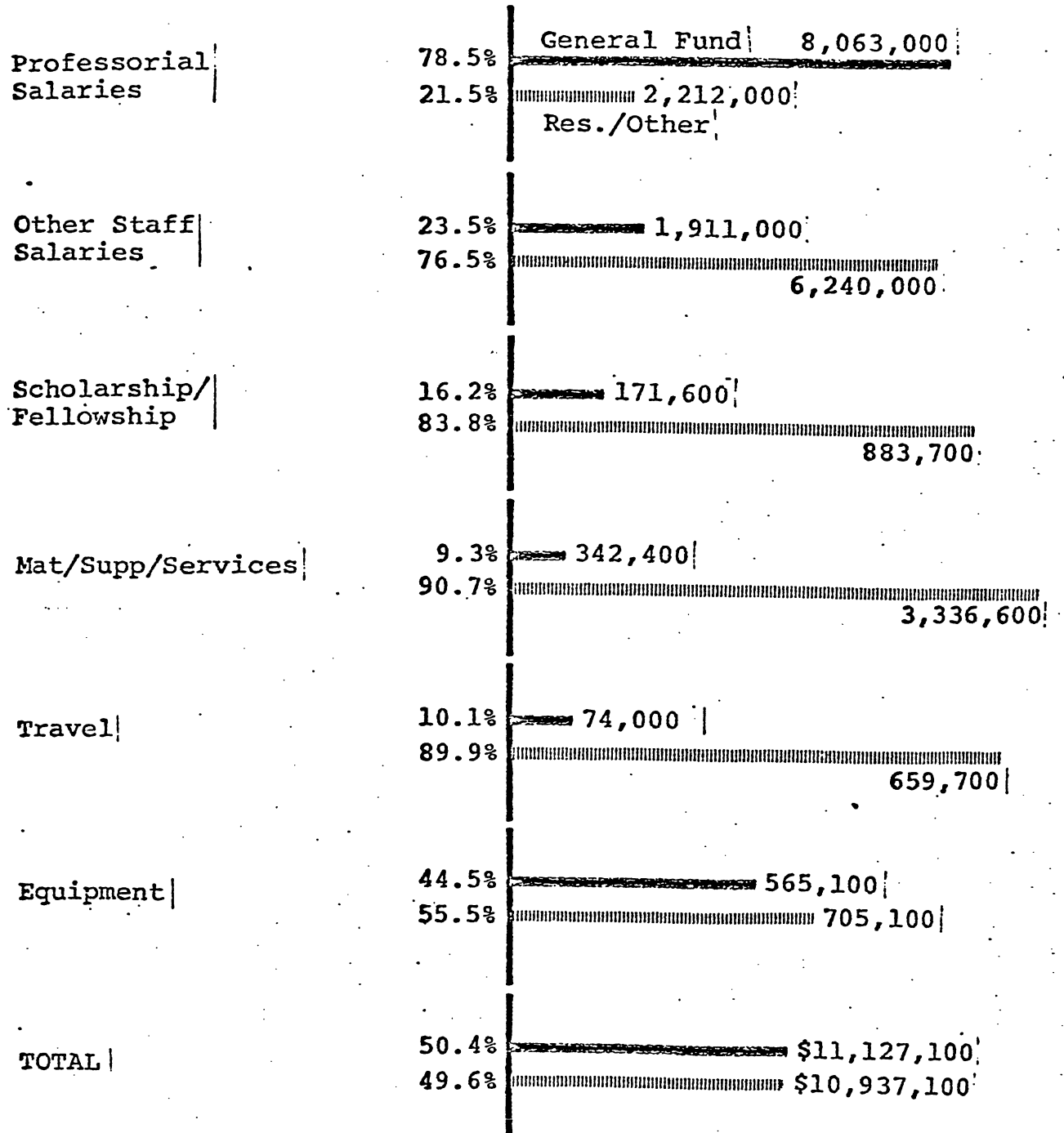
19% DEVOTED TO SPONSORED RESEARCH

SUPPORT STAFF 267/405 FTE

66% DEVOTED TO SPONSORED RESEARCH

ADDITIONAL TIME IS CONTRIBUTED BY FACULTY
FOR PROPOSAL GENERATION

1980-81 EXPENDITURE ELEMENTS



QUANTITY (PAST)

- TABLE OF RESEARCH FUNDING HISTORY
- GRAPH OF EFFORT HISTORY
- OBSERVATIONS
 - MAINTENANCE OF FTE FOR PI'S;
DROP IN FTE OF SUPPORT STAFF
 - DROP IN INDUSTRIAL SUPPORT \$1.5 M
 - DROP IN NASA SUPPORT 1.0 M
 - INCREASE IN NSF, DOE 1.5 M
 - BUT MORE IMPORTANTLY
 - EVIDENCE OF FACULTY SATURATION DUE TO
HIGH TEACHING LOADS
 - ANECDOTAL EVIDENCE OF STAFF'S LOW
MORALE AND UNWILLINGNESS TO SACRIFICE
FURTHER

COLLEGE OF ENGINEERING RESEARCH FUNDING

<u>Year</u>	<u>Direct Costs</u>	<u>Indirect Costs</u>	<u>Total</u>	<u>Percent Change</u>
70-71	\$ 5,750,678	\$2,029,704	\$ 7,780,382	
				6.0%
71-72	5,984,217	2,260,479	8,244,696	
				11.4%
72-73	6,397,318	2,790,562	9,187,880	
				4.1%
73-74	6,810,420	2,758,578	9,568,998	
				3.9%
74-75	6,978,226	2,969,049	9,947,275	
				6.8%
75-76	7,278,642	3,346,539	10,625,181	
				11.1%
76-77	8,010,647	3,799,455	11,810,102	
				19.5%
77-78	9,626,313	4,490,413	14,116,726	
				20.0%
78-79	11,705,513	5,232,364	16,937,877	
				.4%
79-80	11,911,889	5,103,275	17,015,164	
				(5.7)%
80-81	11,393,117	4,819,897	16,213,014	

FTE

General Fund Instruction

74-75	217.6	5,385,569
75-76	207.7	5,703,675
76-77	209.1	5,945,454
77-78	224.2	6,492,779
78-79	221.5	6,824,139
79-80	218.95	7,439,750
80-81	220.1	8,089,544

Research

74-75	48.8	1,209,294
75-76	46.1	1,265,718
76-77	44.3	1,258,677
77-78	50.5	1,463,432
78-79	50.9	1,568,369
79-80	51.3	1,742,775
80-81	50.0	1,838,785

General Fund Staff Support

74-75	158.7	1,936,132
75-76	151.2	1,889,454
76-77	148.2	1,967,785
77-78	137.0	1,979,778
78-79	141.5	2,173,432
79-80	138.1	2,196,908
80-81	138.2	2,397,113

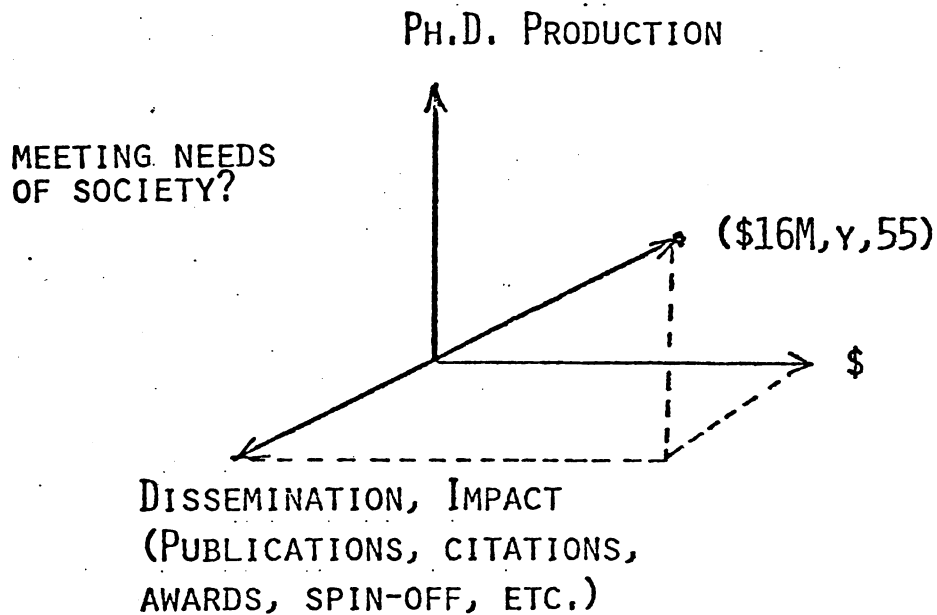
Research Staff Support

74-75	282.7	3,448,772
75-76	285.2	3,564,247
76-77	289.5	3,844,179
77-78	305.6	4,417,042
78-79	332.1	5,101,959
79-80	339.2	5,396,183
80-81	266.6	4,625,000

QUALITY OF RESEARCH

WE ARE CONCERNED ABOUT QUALITY NOT ONLY DOLLAR VOLUME.

RESEARCH QUALITY "SPACE"



WE ARE ASSIGNING RATINGS TO VARIOUS REGIONS OF THIS SPACE TO BE USED TO EVALUATE INDIVIDUALS AND UNITS.

FOR EXAMPLE, A POINT LOCATED ON ANY AXIS IS NOT GIVEN A "PASS".

THE COLLEGE EXECUTIVE COMMITTEE IMPLICITLY RATED
VARIOUS REGIONS IN THE SPACE IN MAKING MARKET SALARY
ADJUSTMENTS FOR FULL PROFESSORS THIS YEAR

<u>RESEARCH RATING</u>	<u>NO. GIVEN RATING</u>
A	34
A-	7
B+	7
B	15
B-	5
C+	2
C	4
C-	1
BELOW C	90
TOTAL	165
ABOVE "D"	45%

WE WILL DEVELOP BETTER METHODS TO QUANTIFY THIS SPACE
AND TO COMPUTE INSTANTANEOUS VALUES, INTEGRALS, AND
PREDICTIONS.

PROSPECTS

FACTORS IN PREDICTION

- FEDERAL R&D FUNDING POLICIES
- INDUSTRIAL RESPONSE TO "CRISES"
- NEW NEEDS OF SOCIETY
- NEW RESEARCH MODES: COORDINATED/INTERDISCIPLINARY
- RATE OF PROPOSAL GENERATION
- MOVEMENT TO/FROM SPONSORED RESEARCH AND CONSULTING OR ADMINISTRATION.
- JUNIOR FACULTY "ARRIVING"
- FACULTY "BURNOUT"

WITH MINOR PERTURBATION OF RESEARCH ENVIRONMENT ASSUMING WILLINGNESS OF SOME FACULTY TO WORK WELL "BEYOND THE CALL" ON LARGE PROPOSALS IN NEW AREAS.

ESTIMATED INCREASE OF \$5M OVER NEXT 3-5 YEARS, (30%).
OPTIMISTIC

SUBSTANTIAL MOVEMENT BEYOND THIS REQUIRES:

- MAJOR EXTERNAL FUNDING INITIATIVES, E.G. THE COLLEGE BECOME THE NUCLEUS OF THE PROPOSED ROBOTICS INSTITUTE.
- RESOURCES TO BECOME COMPETITIVE IN GROWTH AREAS, E.G.
 - VLSI SYSTEMS
 - LARGE-SCALE COMPUTATION, CAD
 - TECHNICAL INFORMATION MANAGEMENT
 - BIO-TECHNOLOGY
- NEW INCENTIVES, ORGANIZATIONAL CHANGES.

ASSUMING THE UNIVERSITY IS ABLE TO MAKE DECISIONS IN THE DIRECTIONS WE ARE REQUESTING AND THAT WE ARE ABLE TO ESTABLISH TWO MORE "CENTERS OF EXCELLENCE".

ESTIMATED INCREASE OF \$12M OVER NEXT 3-5 YEARS
(75%)

NOTE: RELATIONSHIP DEVELOPED BETWEEN CRIM AND ROBOTICS INSTITUTE COULD VARY ESTIMATE BY -\$5 TO +\$20 M PER YEAR.

RESEARCH ENVIRONMENT

(RELATIVE TO WHAT WE NEED TO MOVE UP)

PROFESSORIAL SALARIES: LOW BUT GETTING BETTER.

SUPPORT STAFF SALARIES: MODERATE TO LOW; NON-COMPETITIVE
IN SOME HIGH DEMAND AREAS.

FACULTY LOADING: BAD BUT HOPES OF GETTING BETTER.

GRADUATE STUDENT SUPPORT: NEED BIG IMPROVEMENT TO
EXPAND PH.D. PRODUCTION.

STUDENT QUALITY: GOOD BUT NEED MORE STARS.

EQUIPMENT: WITH FEW EXCEPTIONS, VERY INADEQUATE.

COMPUTING: HISTORICALLY GOOD BUT QUICKLY SLIPPING
BEHIND THE TIMES.

SUPPORT SERVICES: NOT MEETING NEEDS; NOT USING NEW
DOCUMENT PREPARATION TECHNOLOGY.

SPACE: LACK OF QUANTITY AND QUALITY.

LIBRARY: GOOD BUT NEEDS TO MOVE TO USE OF NEW TECHNOLOGY.

IMPORTANCE OF RESEARCH ACTIVITIES IN COLLEGE

- CONTRIBUTE TO SCIENCE AND TECHNOLOGY.
- KEY COMPONENT IN REPUTATION AND RATINGS (THE BEST GET BETTER)
- HELPS KEEP INSTRUCTIONAL PROGRAMS AT THE LEADING EDGE IN CONTENT AND EQUIPMENT.
- ATTRACTS AND RETAINS OUTSTANDING FACULTY AND GRADUATE STUDENTS
- SPONSORED RESEARCH SUPPORTS ABOUT HALF OF THE COLLEGE BUDGET.

GENERAL RESEARCH GOALS OF THE COLLEGE

- MOVE TO A REGION OF EXCELLENCE IN THE "RESEARCH QUALITY SPACE" IF GOAL IS TO DOUBLE PH.D. PRODUCTION, OTHER DIMENSIONS MUST CHANGE ACCORDINGLY.
- CONTRIBUTE TO THE GOOD OF SOCIETY IN GENERAL AND SPECIFICALLY TO THE NEEDS OF THE STATE. FOSTER UNIVERSITY INDUSTRIAL RESEARCH INTERACTION.
- DEVELOP THE NEXT GENERATION RESEARCH TOOLS: INTEGRATION OF TECHNICAL LIBRARY FUNCTIONS, TECHNICAL COMMUNICATION (TECHNICAL DOCUMENT PREPARATION), AND ADMINISTRATION.
- CREATE ORGANIZATIONS AND POLICIES TO ENCOURAGE COORDINATED PROJECT RESEARCH. ESTABLISH AND MAINTAIN SEVERAL CENTERS OF EXCELLENCE.

MAJOR BARRIERS TO ACHIEVING GOALS:

LACK OF SEED FUNDING OR "VENTURE CAPITAL" TO
STIMULATE NEW RESEARCH ACTIVITIES.

INADEQUATE SUPPORT OF ONGOING RESEARCH ACTIVITIES.

INADEQUATE SUPPORT OF RESEARCH ADMINISTRATION IN COLLEGE.
(IN THEORY, \$1,250,000 SHOULD BE PROVIDED TO COLLEGE)

INEQUITABLE POLICIES GOVERNING ALLOCATION OF UNIVERSITY
RESOURCES TO SUPPORT SPONSORED RESEARCH. (COLLEGE
GENERATES 25% OF UNIVERSITY INDIRECT COST RECOVERY
BUT RECEIVES ONLY 8% OF UNIVERSITY SUPPORT)

DIFFICULTY IN COMPETING WITH PEER INSTITUTIONS IN ACQUIRING
SPONSORED RESEARCH OR ATTRACTING FACULTY.

GENERAL ABSENCE OF INCENTIVES.

SEED FUNDING AND RESEARCH ADMINISTRATION SUPPORT

- FUNDING PATTERNS AND "NEEDS OF SOCIETY" REQUIRE GREATER EMPHASIS ON TECHNICAL AFFINITY GROUPS AND CENTERS TO COORDINATE, FOCUS, AND DISSEMINATE RESEARCH.
- WE WILL BE SHUT OUT OF FUNDING IN KEY AREAS WITHOUT ABILITY TO DO THIS.
- WE MUST HAVE DISCRETIONARY FUNDS TO PROVIDE TANGIBLE INCENTIVES FOR FACULTY TO DEVELOP COLLABORATIVE/SYNERGIST RESEARCH AND TO SUPPORT THE ADDITIONAL ADMINISTRATIVE COST REQUIRED.

WARNING: UNLESS RAPID ACTION IS TAKEN TO ADDRESS THIS ISSUE, OUR EFFORTS TO IMPROVE THE QUALITY AND QUANTITY OF OUR RESEARCH AND GRADUATE PROGRAMS ARE DOOMED TO FAILURE.

SOLUTION:

1. FAIR AND EQUITABLE POLICIES GOVERNING ALLOCATION OF UNIVERSITY RESOURCES TO SUPPORT SPONSORED RESEARCH.
2. DECENTRALIZATION OF RESEARCH ADMINISTRATION LEADING TO GREATER RESEARCH AUTONOMY OF UNITS.

DECENTRALIZATION OF RESEARCH ADMINISTRATION

WHILE UNITS OUTSIDE THE COLLEGE MAY PROVIDE SERVICES, PRIMARY RESPONSIBILITY AND RESOURCES FOR RESEARCH ADMINISTRATION FOR THE COLLEGE SHOULD EVOLVE TOWARD THE ASSOCIATE DEAN FOR RESEARCH.

SPECIFIC CHANGES IN RESEARCH ADMINISTRATION DATA MANAGEMENT SYSTEMS ARE REQUIRED, E.G.;

- PUT ON-LINE.
- SHARE "CREDIT" BETWEEN MULTIPLE INVESTIGATORS.
- MORE ASSISTANCE IN MEASURING AND IN PREDICTING.
- INCLUDE THE TWO OTHER DIMENSIONS BESIDES \$.
- MONITOR GRADUATE STUDENT PROGRESS.

RESEARCH SUPPORT SERVICES SHOULD BE HANDLED AT THE COLLEGE OR DEPARTMENT LEVEL. PEOPLE PROVIDING THESE SERVICES SHOULD BE RESPONSIBLE TO AND PHYSICALLY NEAR THE PEOPLE THEY SERVE.

- MODERN TECHNICAL WORD PROCESSING SYSTEMS SHOULD BE USED.
- PROPOSAL PREPARATION DATABASES SHOULD BE ESTABLISHED AND MAINTAINED.
- NEED BETTER "EARLY WARNING SYSTEM" FOR FUNDING OPPORTUNITIES.
- NEED TO MAKE QUICKER RESPONSES TO "TARGETS OF OPPORTUNITIES".
- RESEARCH PROSPECTING SHOULD BE DONE AND DONE BY TECHNICAL PEOPLE.

- THE RESEARCH GOALS OF THE COLLEGE ARE TOTALLY CONSISTENT WITH THE CHARTER OF SUCH UNITS AS THE INSTITUTE FOR SCIENCE AND TECHNOLOGY (IST).

- THESE GOALS, AT LEAST FOR THE COLLEGE, ARE BETTER FULFILLED THROUGH MANAGEMENT AT THE COLLEGE LEVEL WITH TIGHT COUPLING TO ACADEMIC PROGRAMS.

- COORDINATION OF RESEARCH BETWEEN COLLEGES AND SCHOOLS SHOULD BE HANDLED BY A COMMITTEE OF RESEARCH DEANS AND THEIR STAFF.

- FUNDING TO ENCOURAGE INTERDISCIPLINARY WORK AND INDUSTRIAL INTERACTION SHOULD BE GIVEN DIRECTLY TO THE ACADEMIC UNITS INVOLVED VIA THE DEAN OF THE COLLEGE.

PROPOSAL

PREMISE:

1. IMPORTANCE OF STIMULATING SPONSORED RESEARCH
2. NEED FOR SEED FUNDING AND INCENTIVES
3. APPROPRIATENESS OF INDIRECT COST RECOVERY AS AN INDEX OF SUCCESS IN ACQUIRING EXTERNAL RESEARCH SUPPORT

PROPOSAL:

UNIVERSITY FUNDS USED TO SUPPORT SPONSORED RESEARCH ACTIVITIES (INCLUDING OVERRUNS AND DISALLOWANCES, UNDER-RECOVERY OF INDIRECT COSTS, COST-SHARING, DEPARTMENT ADMINISTRATION, AND EQUIPMENT AND RENNOVATION) SHOULD BE ALLOCATED TO UNITS IN DIRECT PROPORTION TO INDIRECT COST RECOVERY.

IMPACT:

1. PROVIDES STRONG INCENTIVES TO SEEK AND ACQUIRE SPONSORED RESEARCH FUNDING.
2. WOULD NOT REQUIRE ADDITIONAL RESOURCES FROM GENERAL FUND.
3. WOULD IMPROVE COST-EFFECTIVENESS OF SPONSORED RESEARCH ACTIVITIES BY REWARDING THOSE UNITS THAT MAXIMIZE INDIRECT COST RECOVERY AND MINIMIZE COST-SHARING AND CONTRACT OVERRUNS.
4. WOULD PROVIDE THE "VENTURE CAPITAL" NECESSARY TO STIMULATE NEW RESEARCH ACTIVITIES.
5. WOULD PROVIDE THE FUNDS NECESSARY TO SUSTAIN RESEARCH ACTIVITIES (INCLUDING TECHNICAL AND ADMINISTRATIVE SUPPORT AND GRADUATE STUDENT SUPPORT).

5. ACADEMIC AND INSTRUCTIONAL ISSUES

(H. S. FOGLER)

AN ENGINEERING EDUCATION SECOND TO NONE

- COLLEGE PROVIDES STRONG, BROAD, TECHNICAL UNDERGRADUATE PROGRAM WHICH

AFFORDS A MAXIMUM RANGE OF OPTIONS

CAN INTERFACE WITH SOCIETAL PROBLEMS

CONTINUES TO UPDATE INFORMATION

THE AMOUNT OF TECHNICAL KNOWLEDGE HAS DOUBLED SINCE 1970

THE COLLEGE WILL FOCUS MORE ON

- DEVELOPING LIFELONG LEARNING SKILLS

- DEVELOPING PROBLEM SOLVING SKILLS

CLOSE-ENDED PROBLEMS

OPEN-ENDED PROBLEMS

AN ENGINEERING EDUCATION SECOND TO NONE

- COLLEGE PROVIDES STRONG, BROAD, TECHNICAL UNDERGRADUATE PROGRAM WHICH

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- DEVELOPING LIFELONG LEARNING SKILLS

- DEVELOPING PROBLEM SOLVING SKILLS

CLOSE-ENDED PROBLEMS

OPEN-ENDED PROBLEMS

TEACHING ENGINEERING

- MODELING PROBLEM SOLVING
- PRACTICING PROBLEM DEFINITION
- NUTURING THE SKILL OF MAKING ASSUMPTIONS
- PROVIDING FEEDBACK AS THE STUDENT PROGRESSES
- HAVING THE STUDENT EVALUATE HIS OWN SOLUTION OR DESIGN

STUDENT NEEDS TO LEARN WHY HIS ASSUMPTION IS CORRECT OR
INCORRECT

DEVELOPING THE STUDENTS' SKILLS TO MAKE ASSUMPTIONS AND
APPROXIMATIONS WHICH ARE INCISIVE IS ONE OF THE KEY
COMPONENTS TO ENGINEERING EDUCATION

REQUIRES STUDENT/FACULTY INTERACTION

ARE ENROLLMENTS AND LIMITED CLASSROOM SPACE REDUCING THE QUALITY OF ENGINEERING EDUCATION BELOW AN ACCEPTABLE LEVEL?

1. KEY COURSE CLOSINGS

CLASSES ARE CLOSED WITH NUMBERS WELL ABOVE MAXIMUM PRESET ENROLLMENT AND STILL HAVE LONG WAITING LISTS TO ENROLL IN THE COURSE

2. PROBLEMS IN THE LABORATORY

- A. EVENING OFFERINGS
- B. GREATER FREQUENCY OF EQUIPMENT FAILURE
- C. NOT STATE OF THE ART

3. SIGNIFICANT DEMANDS ON FACULTY TIME

- A. HELPING STUDENTS OUTSIDE THE CLASSROOM
- B. COORDINATING MULTIPLE SECTIONS
- C. GRADING AND RECORD KEEPING

ARE ENROLLMENTS AND LIMITED CLASSROOM SPACE REDUCING THE QUALITY OF ENGINEERING EDUCATION BELOW AN ACCEPTABLE LEVEL?

4. QUALITY OF EDUCATION

- A. OPEN-ENDED PROBLEMS AND RESEARCH PAPERS VIRTUALLY ELIMINATED IN UPPER DIVISION COURSES
- B. LESS FEEDBACK FOR BOTH FACULTY AND STUDENTS
- C. TAs AND GRADERS NOT AVAILABLE FOR SOME SENIOR AND GRADUATE LEVEL COURSES
- D. CROWDED LAB GROUPS/LESS EXPERIMENTATION

5. INADEQUATE PHYSICAL FACILITIES

- A. MANY CLASSES CLOSED DUE TO LACK OF SPACE
- B. MANY CLASSES GOING TO VARIOUS OTHER BUILDINGS ON CAMPUS AT INCONVENIENT TIMES
- C. ADDITION OF CHAIRS TO CLASSROOMS HAS RESULTED IN MANY CLASSROOMS STRETCHING THE CAPACITY PER SQUARE FOOT LIMITS SET BY THE FIRE MARSHALL

NORTH CAMPUS/

CENTRAL CAMPUS/

SPLIT

- SIGNIFICANT DRAIN OF FACULTY'S

TIME

ENERGY

RESOURCES

- STUDENTS HAVE GREATER DIFFICULTY
LOCATING PROFESSORS OUTSIDE OF
CLASS AND OFFICE HOURS

THE FUTURE

THE CHRYSLER CENTER

	<u>1981</u>
NUMBER OF STUDENTS	925
NUMBER OF COURSES TAUGHT	25
INCOME	<u>\$600,000</u>

INDUSTRY/UNIVERSITY INTERACTION

- 1) RESEARCH GRANTS
- 2) FELLOWSHIPS TO DEPARTMENTS

THE FUTURE

REALLOCATION OF OUR INSTRUCTIONAL RESOURCES

NEED TO IDENTIFY

INFORMATION DISSEMINATION COURSES - LARGE CLASSES

DESIGN PROBLEM SOLVING COURSES - SMALL CLASSES

COOPERATIVE EDUCATION PROGRAM

- EDUCATIONAL EXPERIENCE RATHER THAN WORK/STUDY
- AFTER SOPHOMORE YEAR
- ALTERNATING TERMS OF WORK/SCHOOL
- PILOT PROGRAM TO BEGIN JANUARY 1982

COMPUTER AIDED INSTRUCTION (CAI) DESIGN AND MANUFACTURING

- SIMULATION
- DESIGN
- INSTRUCTION - OPEN-END PROBLEM SOLVING THROUGH
MULTIPLE BRANCHING

VIDEO TAPES INTEGRATED WITH CAI

PLATO

- SLIDES INTEGRATED WITH INTERACTIVE COMPUTING

6. THE NORTH CAMPUS MOVE

(C. M. VEST)

ENGINEERING ON NORTH CAMPUS: HISTORY

FIRST DECADE (1950's)

- COOLEY MEMORIAL BUILDING (ELECTRONICS LABORATORY)
- PHOENIX MEMORIAL LABORATORY (NUCLEAR REACTOR)
- PROPULSION LABORATORIES
- AUTOMOTIVE ENGINEERING LABORATORY
- FLUIDS ENGINEERING BUILDING (G.G.BROWN LABORATORY)

PLAN:

- CONSTRUCT HEAVY-SCALE ENGINEERING LABORATORIES.
- OFFICES, CLASSROOMS, LIGHT-SCALE LABORATORIES TO FOLLOW SHORTLY.

HISTORY, CONT'D

SECOND DECADE (1960's)

- EXPANSION OF G. G. BROWN LABORATORY
- CHRYSLER CENTER OF CONTINUING ENGINEERING EDUCATION
- RESEARCH ACTIVITIES BUILDING
- SPACE RESEARCH BUILDING

ACTIVITIES:

- COMPREHENSIVE PLAN FOR ENGINEERING ON NORTH CAMPUS DEVELOPED.

PLAN:

- CONSTRUCT HEAVY-SCALE ENGINEERING LABORATORIES.
- OFFICES, CLASSROOMS, LIGHT-SCALE LABORATORIES TO FOLLOW SHORTLY.

HISTORY, CONT'D

THIRD DECADE (1970's)

- AEROSPACE ENGINEERING BUILDING
- ENGINEERING BUILDING IA (WATER RESOURCES)

ACTIVITIES:

- ★ DETAILED NORTH CAMPUS PLAN DEVELOPED (SWANSON ASSOC'S).
- ★ STATE LEGISLATURE RESOLUTION TO FUND NORTH CAMPUS CONSTRUCTION IS PASSED.
- ★ ENGINEERING COLLEGE CAPITAL CAMPAIGN RAISES \$20M AND COMMITS \$10M TO DOW BUILDING CONSTRUCTION.
- ATMOSPHERIC & OCEANIC SCIENCES DEPARTMENT CONSOLIDATES IN SPACE PHYSICS/RESEARCH BUILDINGS.
- NAVAL ARCHITECTURE & MARINE ENGINEERING DEPARTMENT REFURBISHES AND OCCUPIES FORMER CYCLOTRON BUILDING.
- NUCLEAR ENGINEERING DEPARTMENT CONSOLIDATES IN COOLEY BUILDING.

EVENTS:

- FOUR SMALL DEPARTMENTS ARE CONSOLIDATED ON NORTH CAMPUS.
- SOME LARGE DEPARTMENTS BECOME BADLY FRAGMENTED BETWEEN CAMPUSES.
- COLLEGE BELIEVES ITS COMMITMENTS ARE MET AND CONSOLIDATION ON NORTH CAMPUS IS ABOUT TO OCCUR.
- LEGISLATIVE APPROPRIATION IS NOT MADE.
- DOW BUILDING CONSTRUCTION IS INITIATED USING ENGINEERING CAPITAL CAMPAIGN FUNDS.

THE EXISTING PLAN FOR A
NORTH CAMPUS ENGINEERING COMPLEX
CONSISTS OF:

- BUILDING I: CIVIL ENGINEERING
INDUSTRIAL & OPERATIONS ENGINEERING
MECHANICAL ENGINEERING & APPLIED MECHANICS
INSTRUCTIONAL MEDIA CENTER
ENGINEERING ADMINISTRATION
- BUILDING II: (DOW BUILDING)
CHEMICAL ENGINEERING
MATERIALS & METALLURGICAL ENGINEERING
- BUILDING III: ELECTRICAL & COMPUTER ENGINEERING

STATE OF MICHIGAN

Motions and Resolutions

Rep. Hellman, on behalf of the Joint Capital Outlay Subcommittee, offered the following concurrent resolution:

House Concurrent Resolution No. 252.

A concurrent resolution authorizing the College of Engineering of The University of Michigan to construct certain facilities on the North Campus of The University of Michigan.

Whereas, Every study of facilities available for the College of Engineering at The University of Michigan has concluded that these require updating and modernization and

Whereas, The University and the State of Michigan agreed in 1952 to relocate the College of Engineering on a new site in the North Campus; and

Whereas, By 1973 this relocation had been only partially accomplished; and

Whereas, A facility development study authorized by the State of Michigan in 1973 concluded that four Engineering buildings were required to accomplish the modernization and relocation program; and

Whereas, The College of Engineering of The University of Michigan discussed with the Legislature the requirements for completing that move through the construction of these buildings at a cost of \$35,000,000.00 and agreed to raise 40% of that amount through private fund raising; and

Whereas, The fund raising campaign conducted by the College of Engineering of The University of Michigan has been exceedingly successful; and

Whereas, The present financial situation of the State of Michigan has not permitted recognition of these four projects for construction funding; and

Whereas, The College of Engineering of The University of Michigan must keep faith with its donors as well as move toward resolution of its facility problems; now, therefore, be it

Resolved by the House of Representatives (the Senate concurring), That the College of Engineering at The University of Michigan be permitted to construct, using its own funds, a \$10,000,000.00 structure for Chemical, Materials and Metallurgical Engineering and a \$500,000.00 structure for Naval Architecture and Marine Engineering; and be it further

Resolved, That the Legislature express its intent through this resolution, to fund the remaining two buildings required for the complete relocation for the College of Engineering to such an extent that the State of Michigan will have invested 60% of the total development cost in the four-building Engineering complex, or \$21,000,000.00, whichever amount is the lesser, subject to the vicissitudes of the legislative process; and be it further

STATE OF MICHIGAN
Motions and Resolutions cont'd

Resolved, That a copy of this resolution be transmitted to the Board of Regents of The University of Michigan and to the Dean of the College of Engineering.

The concurrent resolution was referred to the Committee on Appropriations.

CURRENT STATUS (1981 - THE FOURTH DECADE)

- DOW BUILDING NEARING COMPLETION
- MAJOR DEPARTMENTS (CIVIL, ELECTRICAL & COMPUTER, INDUSTRIAL & OPERATIONS, AND MECHANICAL & APPLIED MECHANICS) ARE PRIMARILY HOUSED IN DETERIORATING FACILITIES ON CENTRAL CAMPUS WITH LABORATORIES AND OFFICES FRAGMENTED BETWEEN CAMPUSES.
- NO KNOWN PROSPECTS FOR THE STATE HONORING ITS COMMITMENT TO BUILDING I.
- STATE/INDUSTRY/UNIVERSITY COMMITMENT TO HIGH TECHNOLOGY AND MODERN PRODUCTION ENGINEERING IS INCUBATED.
- COLLEGE PRESENTS A NEW PROPOSAL TO EXECUTIVE OFFICERS.

PROPOSAL TO THE EXECUTIVE OFFICERS

THE COLLEGE OF ENGINEERING PROPOSES A PLAN TO CONSOLIDATE RAPIDLY AS MUCH OF THE COLLEGE AS POSSIBLE ON THE NORTH CAMPUS MAKING MAXIMUM USE OF EXISTING FACILITIES.

THE UNIVERSITY:

- COMMITS CERTAIN BUILDINGS ON NORTH CAMPUS TO ENGINEERING AND FACILITATES CERTAIN SPACE TRADES.
- ENABLES RECONFIGURING OF SOME EXISTING ENGINEERING BUILDINGS ON NORTH CAMPUS.

THE COLLEGE OF ENGINEERING:

- RELINQUISHES ITS CONCEPT OF A NEW, ARCHITECTURALLY-INTEGRATED NORTH CAMPUS COMPLEX BY
 1. DROPPING BUILDING III FROM ITS PLANS, AND
 2. ACCEPTING GOOD BUT NON-OPTIMAL BUILDINGS.
- ELIMINATES NORTH CAMPUS SPACE FOR
 1. PROCESS METALLURGY LABORATORY
 2. NAVAL MANEUVERING TANK.
- PLANS FOR OPTIMAL USE OF EXISTING BUILDINGS AND CONCENTRATES ON ACTIVITIES WITHIN THEM.
- RECONFIGURES PROPOSED ENGINEERING BUILDING I, AND
 1. FORMS A COMMITTEE OF INDUSTRIAL LEADERS TO LOBBY FOR ITS FUNDING BY THE STATE.
 2. MOUNTS A CAMPAIGN FOR PRIVATE FUNDING OF SPECIALIZED INSTRUCTIONAL AND RESEARCH FACILITIES.

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 2. MOUNTS A CAMPAIGN FOR PRIVATE FUNDING OF SPECIALIZED INSTRUCTIONAL AND RESEARCH FACILITIES.

SPECIFIC ACTIONS PROPOSED FOR
EXISTING ENGINEERING BUILDINGS

1. G. G. BROWN LABORATORY (NORTH CAMPUS):
 - MINOR RENOVATIONS PERMIT OCCUPANCY BY MECHANICAL ENGINEERING AND APPLIED MECHANICS.
 - MID-LEVEL RENOVATIONS PERMIT OCCUPANCY BY CIVIL ENGINEERING.

2. DOW BUILDING (NORTH CAMPUS):
 - BASEMENT IS USED FOR INSTRUCTIONAL CENTER (NOT LIBRARY)

3. EAST ENGINEERING BUILDING (CENTRAL CAMPUS):
 - MINOR RENOVATION CREATES ADEQUATE FACILITIES FOR ELECTRICAL AND COMPUTER ENGINEERING FOR NEAR FUTURE.
 - THE PROCESS METALLURGY LABORATORY REMAINS IN THIS BUILDING.
 - CONSIDERABLE SPACE IS RELINQUISHED TO UNIVERSITY FOR REASSIGNMENT.

4. WEST ENGINEERING BUILDING (CENTRAL CAMPUS):
 - 1/3 OF SPACE IS RELINQUISHED FOR REASSIGNMENT.
 - 2/3 OF SPACE IS USED FOR FRESHMAN/SOPHOMORE INSTRUCTION OF OF ENGINEERS BY LSA AND ENGINEERING FACULTY.
 - NAVAL TOWING TANK REMAINS IN THIS BUILDING.
 - D.R.D.A. MIGHT OCCUPY PART OF SOUTH WING.

SPECIFIC ACTION PROPOSED FOR BUILDING REASSIGNMENT

RESEARCH ADMINISTRATION BUILDING (NORTH CAMPUS):

- TO BE REASSIGNED TO ENGINEERING TO HOUSE INDUSTRIAL AND OPERATIONS ENGINEERING PLUS SOME INSTRUCTIONAL SPACE.
-

RESULTS OF THE ABOVE ACTIONS:

- 70% OF THE COLLEGE IS CONSOLIDATED ON NORTH CAMPUS:

AEROSPACE

MECHANICAL & APPLIED MECHANICS

ATMOS. & OCEANIC SCI.

MATERIALS & METALLURGICAL

CHEMICAL

NAVAL ARCH. & MARINE ENGINEERING

CIVIL

NUCLEAR

INDUSTRIAL & OPERATIONS

- 30% OF THE COLLEGE REMAINS ON CENTRAL CAMPUS:

ELECTRICAL & COMPUTER

HUMANITIES

ENGINEERING ADMINISTRATION AND PLACEMENT CENTER

MAJOR REMAINING PROBLEMS:

- ENGINEERING AND TRANSPORTATION LIBRARY REMAINS ON CENTRAL CAMPUS.
- ELECTRICAL & COMPUTER ENGINEERING REMAINS ON CENTRAL CAMPUS.
- PLACEMENT/CO-OP EDUCATION/STUDENT SERVICE FACILITIES REMAIN ON CENTRAL CAMPUS.
- INADEQUATE INSTRUCTIONAL FACILITIES ON NORTH CAMPUS.
- INSTRUCTIONAL TV SYSTEM REMAINS ON CENTRAL CAMPUS OR IS INADEQUATELY HOUSED IN CHRYSLER CENTER.

ADDITIONAL BUILDING REASSIGNMENT PROPOSED

1. HOUSING FOR ENGINEERING/TRANSPORATION LIBRARY
(TECHNICAL INFORMATION CENTER):
 - IST BUILDING
 - OR • PART OF IST BUILDING PLUS PRINTING SERVICES BUILDING
 - OR • PRINTING SERVICES BUILDING PLUS NEW CONSTRUCTION.

2. HOUSING FOR PLACEMENT/CO-OP ED./STUDENT SERVICES:
 - NORTH LIBRARY ANNEX

MAJOR REMAINING PROBLEMS:

- ELECTRICAL & COMPUTER ENGINEERING REMAINS ON CENTRAL CAMPUS.
- INADEQUATE INSTRUCTIONAL FACILITIES ON NORTH CAMPUS.

NEW CONSTRUCTION PROPOSED

1. INSTRUCTIONAL CENTER IN BASEMENT OF DOW BUILDING

- COLLEGE TO ASSIST BY SEEKING PRIVATE FUNDS.
- THIS WOULD INCLUDE CLASSROOMS AND INSTRUCTIONAL TV SYSTEM.

2. ENGINEERING BUILDING I

- COLLEGE TO FORM A COMMITTEE OF INDUSTRIAL LEADERS TO LOBBY FOR THE STATE TO HONOR ITS COMMITMENT TO THIS.
- THIS BUILDING TO HOUSE ELECTRICAL AND COMPUTER ENGINEERING ENTIRELY.
- THIS BUILDING TO HOUSE ENGINEERING ADMINISTRATION.
- THIS BUILDING TO HOUSE PART OF MECHANICAL ENGINEERING AND APPLIED MECHANICS TO PERMIT SLIGHT EXPANSION OF THAT DEPARTMENT AND CIVIL ENGINEERING.

SOME IMPACTS OF PROPOSED MOVE

<ul style="list-style-type: none"> ○ CURRENT CLASSROOM: SPACE 	CENTRAL CAMPUS: 57,202 SQ. FT. NORTH CAMPUS: <u>10,693</u> SQ. FT. 67,895 SQ. FT.
<ul style="list-style-type: none"> ○ AFTER "MINIMUM MOVE" ME/AM, CH.E, AND M & ME TO NORTH CAMPUS : 	CENTRAL CAMPUS: 50,260 SQ. FT. NORTH CAMPUS: <u>16,933</u> SQ. FT. 67,193 SQ. FT.
<ul style="list-style-type: none"> ○ POTENTIAL NORTH CAMPUS CLASSROOM SPACE: 	DOW BASEMENT: 22,000 SQ. FT. RES. ADMIN.: 3,200 SQ. FT. CHRYSLER CTR.: <u>13,317</u> SQ. FT. (GROUND FLOOR) 38,517 SQ. FT.

-
- DEPARTMENTAL SPACE TYPICALLY SHRINKS 10-15%
 - COMPENSATED BY SINGLE LOCATION EFFICIENCIES.

7. INDUSTRIAL INTERACTION AND DEVELOPMENT ACTIVITIES

MAJOR POINTS

1. THE COLLEGE REPRESENTS AN IMPORTANT INTERFACE BETWEEN THE UNIVERSITY AND INDUSTRY.
2. A MAJOR OBJECTIVE OF THE COLLEGE OVER THE NEXT DECADE INVOLVES A SUBSTANTIAL STRENGTHENING OF ITS ALREADY STRONG TIES WITH INDUSTRY.
3. THE COLLEGE HAS UNDERTAKEN AN AMBITIOUS AND AGRESSIVE DEVELOPMENT PROGRAM WITH AN OBJECTIVE OF \$118 MILLION FOR FACILITIES, PROGRAMS, AND ENDOWMENT OVER THE NEXT DECADE.
4. ACTIVITIES SUCH AS THE MICHIGAN ROBOTICS INSTITUTE AND A POSSIBLE RELATIONSHIP WITH THE GENERAL MOTORS INSTITUTE HAVE THE POTENTIAL FOR GREATLY STRENGTHING THE RELATIONSHIP BETWEEN THE COLLEGE AND MICHIGAN INDUSTRY.

IMPORTANCE OF CLOSE TIES BETWEEN THE COLLEGE AND INDUSTRY

1. INDUSTRY IS THE MANIFESTATION OF ENGINEERING, THE APPLICATION OF SCIENCE AND TECHNOLOGY TO MEET THE NEEDS OF SOCIETY.
2. THE SHIFT OF AMERICAN INDUSTRY FROM EXPERIENCED-BASED TO KNOWLEDGE-BASED TECHNOLOGY ("HIGH TECH") WILL INTENSIFY INDUSTRIAL NEEDS FOR ENGINEERING GRADUATES AND RESEARCH.
3. INDUSTRY IS BOTH CAPABLE AND SHOWING INCREASING WILLINGNESS TO PROVIDE SIGNIFICANT RESOURCES TO THE COLLEGE, SINCE IT HAS BECOME APPARENT THAT SUCH GRANTS ARE IN ITS DIRECT SELF-INTEREST.
4. THE UNIVERSITY HAS AN OBLIGATION TO ASSIST IN THE REVITALIZATION OF EXISTING MICHIGAN INDUSTRY AND TO ATTRACT NEW INDUSTRY INTO THE STATE. THE COLLEGE WILL PLAY A MAJOR ROLE IN THIS ACTIVITY.

AN IMPORTANT FACT OF LIFE:

THE COLLEGE MUST EARN THE SUPPORT OF INDUSTRY!

IT MUST APPROACH INDUSTRY WITH A WILLINGNESS TO LEARN ABOUT AND RESPOND TO INDUSTRIAL NEEDS.

IT MUST DEMONSTRATE THAT INDUSTRIAL SUPPORT OF THE COLLEGE IS IN THE DIRECT BEST INTEREST OF INDUSTRY.

ACTIONS TO STRENGTHEN RELATIONSHIPS WITH INDUSTRY:

1. COLLEGE INDUSTRY COMMITTEE
2. NATIONAL ADVISORY COMMITTEE
3. PROGRAM DEVELOPMENTS IN KEY AREAS
 - ROBOTICS
 - INTEGRATED MANUFACTURING
 - VLSI, MICROELECTRONICS
 - CAD/CAM
 - MATERIALS PROCESSING
4. CO-OPERATIVE EDUCATION PROGRAMS
5. CONTINUING ENGINEERING EDUCATION AND UPDATE PROGRAMS
6. FACULTY/INDUSTRY EXCHANGES AND RECRUITING

COLLEGE OF ENGINEERING DEVELOPMENT ACTIVITIES

IMPORTANCE:

REPLACING DWINDLING PUBLIC FUNDING WITH PRIVATE SUPPORT
PRIVIDING THE "MARGIN OF EXCELLENCE" FOR THE COLLEGE

ACTIVITIES:

RESTRUCTURED DEVELOPMENT OFFICE
REACTIVATED NATIONAL ALUMNI COMMITTEE
ASSEMBLED A TECHNICAL PROJECTS ACTIVITY
ASSEMBLED A DETAILED LIST OF DEVELOPMENT OBJECTIVES FOR THE '80S
HAVE BEGUN A SEARCH FOR A SENIOR DIRECTOR OF DEVELOPMENT

AN IMPORTANT POINT TO KEEP IN MIND:

BECAUSE OF THE PRESENT ENGINEERING MANPOWER CRISIS AND THE
IMPORTANCE OF ENGINEERING TO THE REVITALIZATION OF INDUSTRIAL
PRODUCTIVITY AND NATIONAL DEFENSE, THE COLLEGE IS IN A UNIQUE
POSITION TO OBTAIN SIGNIFICANT EXTERNAL SUPPORT FROM BOTH
PUBLIC AND PRIVATE SOURCES.

WITH THE ASSISTANCE AND COMMITMENT OF THE UNIVERSITY TO OUR
DEVELOPMENT OBJECTIVES, WE BELIEVE THAT OUR DEVELOPMENT GOALS
FOR THE NEXT DECADE ARE WELL WITHIN REACH.

OTHER FACTORS AFFECTING COLLEGE/INDUSTRIAL RELATIONS

1. CENTER FOR ROBOTICS AND INTEGRATED MANUFACTURING
AND THE MICHIGAN ROBOTICS INSTITUTE
2. MICHIGAN RESEARCH CORPORATION
3. GENERAL MOTORS INSTITUTE

8. SUMMING UP: DOLLAR GOALS AND STRATEGIES

MAJOR POINTS

1. MOVING TOWARD THE COLLEGE OBJECTIVES OF NATIONAL LEADERSHIP IN ENGINEERING EDUCATION WILL ENTAIL MAJOR RESOURCE NEEDS.
2. THE CRITICAL IMPORTANCE OF THE GRADUATES AND RESEARCH OF THE COLLEGE TO BOTH THE STATE AND THE NATION PLACES IT IN A UNIQUE POSITION TO ACQUIRE RESOURCES FROM A VARIETY OF SOURCES.
3. FOR THE COLLEGE TO TAKE ADVANTAGE OF THESE OPPORTUNITIES, THE UNIVERSITY MUST MOVE RAPIDLY TO ADDRESS THE MOST SERIOUS NEEDS OF THE COLLEGE BY RESPONDING POSITIVELY TO ITS PROPOSALS IN THE AREAS OF:
 - (I) RESEARCH INCENTIVES AND SUPPORT
 - (II) THE NORTH CAMPUS MOVE
 - (III) GENERAL FUND BASE BUDGET SUPPORT

1980 GORMAN RANKINGS OF ENGINEERING PROGRAMS

	UG	G			
<u>AEROSPACE</u>	MIT Michigan Princeton Minnesota Illinois Stanford Brown Ohio State Iowa State Kansas	MIT Caltech Michigan Princeton Stanford Cornell Illinois Purdue Minnesota Georgia Tech	<u>CHEMICAL</u>	Princeton Wisconsin Cal-Berkeley Minnesota MIT Stanford Illinois Caltech Michigan Delaware	Wisconsin Princeton Cal-Berkeley Minnesota MIT Illinois Stanford Caltech Michigan Delaware
<u>CIVIL</u>	Cal-Berkeley Illinois MIT Stanford Cornell Purdue Michigan Columbia Northwestern Carnegie	Cal-Berkeley Illinois MIT Stanford Cornell Caltech Purdue Michigan Columbia Wisconsin	<u>ELECTRICAL</u>	MIT Stanford Cal-Berkeley Illinois Michigan Princeton Purdue Cornell Minnesota Wisconsin	MIT Cal-Berkeley Stanford Illinois Michigan Princeton Caltech Purdue Cornell UCLA
<u>INDUSTRIAL</u>	Stanford Michigan Cal-Berkeley Purdue Northwestern Georgia Tech Cornell Ohio State Columbia Texas A&M	Michigan Cal-Berkeley Stanford Purdue Wisconsin Cornell Georgia Tech Northwestern Columbia Ohio State	<u>MECHANICAL</u>	MIT Stanford Cal-Berkeley Michigan Brown Minnesota Illinois Purdue Cornell Princeton	MIT Stanford Cal-Berkeley Caltech Michigan Minnesota Illinois Purdue Princeton UCLA
<u>METALLURGICAL</u>	Illinois Colorado Missouri Columbia Minnesota Penn State Carnegie Case Michigan Ohio State	Illinois Columbia Pittsburgh MIT Carnegie Colorado Penn Minnesota Michigan Lehigh	<u>NUCLEAR</u>	Columbia Michigan Wisconsin Virginia Penn State RPI Texas A&M Arizona Illinois Cal-Berkeley	MIT Michigan Wisconsin Cal-Berkeley Georgia Tech Virginia Columbia Illinois RPI Texas A&M
<u>NAVAL</u> (UG only)	MIT Michigan Webb Institute	<u>MATERIALS</u> (UG only)	Cornell Northwestern Michigan Cal-Berkeley MIT Brown RPI Vanderbilt Case Carnegie	<u>ENVIRONMENTAL</u> (UG only)	Caltech Harvard Michigan Northwestern Penn State RPI Texas Florida
<u>ENG SCI</u> (UG only)	Caltech Harvard Michigan Georgia Tech Penn State Iowa State Yale				

OBJECTIVES AND NEEDS

MAJOR GOAL

MAJOR OBJECTIVES

RESOURCE NEEDS

RECURRING (BASE)

NATIONAL LEADERSHIP IN ENGINEERING	FACULTY QUALITY	
	SALARY PROGRAMS	\$ 400,000 (10-15%/Y)
	HIRING STARS	1,000,000 (10,000,000)
	EARLY REPLACEMENT	2,000,000
	RESEARCH	
	INCENTIVES	1,100,000
	SUPPORT	700,000
	FACILITIES	
	MOVES INTO GGBL/DOW	(2,500,000)
	IOE INTO RES AD	(150,000)
	INSTRUCTIONAL CENTER	(3,000,000)
	LIBRARY INTO IST	(3,500,000)
	ENG BLDG I	(30,000,000)
	ENVIRONMENT	
	SUPPORT STAFF	700,000
	EQUIPMENT	1,200,000 (18,400,000)
	COMPUTER	1,500,000 (11,000,000)
	ENROLLMENT SHIFTS	
	MEET PRESENT LEVELS	2,650,000
	SHIFT TO UPCL/GRAD	2,650,000
	EXPAND BS OUTPUT	5,650,000
	NEW PROGRAM DEVELOPMENT	20% Internal Reallocation Capacity
	STUDENT FINANCIAL AID	
	UNDERGRADUATE	2,500,000
	GRADUATE	3,000,000

SOURCES OF SUPPORT

1. INTERNAL REALLOCATION WITHIN THE COLLEGE
2. REALLOCATION WITHIN THE UNIVERSITY
3. DIRECT STATE SUPPORT
4. SPONSORED RESEARCH SUPPORT
5. INDUSTRIAL SUPPORT
6. PRIVATE GIVING
7. ENTREPRENEURIAL ACTIVITIES
8. TUITION

MEETING THE NEEDS OF THE COLLEGE

<u>OBJECTIVES AND NEEDS</u>	<u>AMOUNT RECURRING (BASE)</u>	<u>POSSIBLE SOURCES OF SUPPORT</u>
FACULTY QUALITY		
SALARY PROGRAMS	\$ 400,000 (10-15%/Y)	Gen Fund/U Reallocation
HIRING STARS	1,000,000 (\$10 M Endow)	Private/Industry
EARLY REPLACEMENT	2,000,000	Direct State/Industry
RESEARCH		
INCENTIVES	1,100,000	Gen. Fund ("IC Return")
SUPPORT	700,000	Gen. Fund ("IC Return")
FACILITIES		
MOVES INTO GGBL/DOW	(2,500,000)	University
IOE INTO RES AD	(150,000)	University
INSTRUCTIONAL CENTER	(3,000,000)	University/Industry
LIBRARY INTO IST	(3,500,000)	Industry/Private
ENG BLDG I	(30,000,000)	Direct State
ENVIRONMENT		
SUPPORT STAFF	700,000	Gen Fund/Direct State
EQUIPMENT	1,200,000 (18,400,000)	G F/St/Spon Res/Indus
COMPUTER	1,500,000 (11,000,000)	St/Spon Res/Indus
ENROLLMENT SHIFTS		
MEET PRESENT LEVELS	2,650,000	Gen Fund/Direct State
SHIFT TO UP/GRAD	2,650,000	Gen Fund/Direct State
EXPAND BS OUTPUT	5,650,000	Direct State
NEW PROGRAM DEVELOPMENT	2,500,000	Internal Reallocations
STUDENT FINANCIAL AID		
UNDERGRADUATE	2,500,000	Private/Gen Fund/Indus
GRADUATE	3,000,000	Spon Res/Indus/Gen Fun
OTHER NEEDS	2,000,000	Private Giving

THE NATIONAL CRISIS IN ENGINEERING MANPOWER

OUR NATION IS PRESENTLY FACING AN ENGINEERING MANPOWER CRISIS OF UNPRECEDENTED PROPORTIONS THAT POSES THE MOST SERIOUS IMPLICATIONS FOR INDUSTRIAL PRODUCTIVITY AND NATIONAL DEFENSE.

SOME INDICATIONS:

1. DURING THE PAST YEAR SOME 20,000 ENGINEERING POSITIONS WENT UNFILLED. THE AMERICAN ELECTRONICS ASSOCIATIONS IS PROJECTING A SHORTFALL OF MORE THAN 100,000 ENGINEERS BY 1985.
2. IT IS NOW APPARENT THAT THIS INCREASING DEMAND FOR ENGINEERING GRADUATES IS NOT DUE TO A CYCLIC TREND AND WILL INTENSITY OVER THE NEXT DECADE.
3. THE PER CAPITA PRODUCTION OF ENGINEERS IN THE UNITED STATES HAS DROPPED TO THE LOWEST AMONG MAJOR INDUSTRIAL NATIONS.
4. THIS SITUATION HAS BEEN AGGRAVATED BY RECENT DECISIONS BY SEVERAL LEADING ENGINEERING COLLEGES (ILLINOIS, PURDUE, NORTHWESTERN) TO DRAMATICALLY REDUCE ENROLLMENTS UNTIL ADEQUATE FUNDS ARE PROVIDED TO MEET ENROLLMENT PRESSURES.
5. THE SHORTAGE OF PHD GRADUATES WILL LIMIT THE ABILITY OF UNIVERSITIES TO EXPAND ENGINEERING ENROLLMENT--EVEN IF ADEQUATE FUNDS ARE PROVIDED.

IT IS A UNIQUE TIME OF OPPORTUNITY AND RESPONSIBILITY FOR THE COLLEGE,
DUE IN PART TO:

1. THE ENGINEERING MANPOWER CRISIS FACED BY OUR NATION,
2. THE IMPORTANCE OF THE ROLE OF THE COLLEGE FOR MICHIGAN'S
EFFORTS TO REVITALIZE ITS INDUSTRY AND REBUILD ITS ECONOMY,
3. THE GROWING PUBLIC AWARENESS OF TECHNOLOGICAL REVOLUTION,
4. THE GROWING AWARENESS OF THE IMPORTANCE OF GRADUATE
EDUCATION AND RESEARCH IN ENGINEERING IN PROVIDING
THE TECHNOLOGICAL LEADERSHIP FOR AMERICA'S FUTURE,
5. THE OPPORTUNITIES FOR INCREASED SUPPORT FROM BOTH THE
PUBLIC AND PRIVATE SECTOR.

THE COLLEGE OF ENGINEERING IS AT A CRITICAL POINT IN ITS HISTORY.

IT WILL REQUIRE THE IMMEDIATE AND SIGNIFICANT SUPPORT OF THE UNIVERSITY
IF IT IS TO MEET ITS PRESENT CHALLENGES AND RESPONSIBILITIES AND TAKE
ADVANTAGE OF THE OPPORTUNITIES THAT LIE BEFORE IT DURING THE 1980S.

