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ABSTRACT

This publication provides charts (with backup tables) and text for a basic presentation on current and projected career and employment opportunities in the various fields of science and engineering. The charts are organized under four headings: (1) supply of scientists and engineers; (2) utilization of scientists and engineers; (3) future supply of and demand for scientists and engineers; and (4) summary and conclusions. Additional data are provided in 20 appendix tables. The presentation is designed for college students and individuals planning to reenter the labor market in science or engineering, as well as for policymakers, science teachers, placement specialists, counselors, and other advisors of students. The presentation may be read by individuals or presented to groups by photocopying the charts as transparencies or handouts, or photographing them for use as slides. Although the information included emphasizes the growing participation of and opportunities for women in science and engineering fields, it is equally relevant for mixed groups. Any segments may be omitted as desired by a speaker to fit particular audiences, and additional information may be added in any field by utilizing the data found in the appendix tables. (JN)

OPPORTUNITIES IN SCIENCE AND ENGINEERING

A Chartbook Presentation

SCIENTIFIC MANPOWER COMMISSION
1776 Massachusetts Avenue, N.W.
Washington, D.C. 20036

November, 1984

The Scientific Manpower Commission, A Participating Organization of the American Association for the Advancement of Science, is a nonprofit corporation whose Commissioners represent its sponsoring scientific societies.

The Commission is charged with the collection, analysis and dissemination of reliable information pertaining to the manpower resources of the United States in the fields of science and technology; promotion of the best possible programs of education and training for potential scientists, engineers and technicians; and the development of policies of utilization of scientific and technological manpower by educational institutions, industry and government for optimum benefit to the nation.

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OPPORTUNITIES IN SCIENCE AND ENGINEERING

A Chartbook Presentation

by

Betty M. Vetter

EXECUTIVE DIRECTOR

SCIENTIFIC MANPOWER COMMISSION

Second Edition

Price: $15.00

November, 1984

FOREWORD

THIS PUBLICATION PROVIDES CHARTS (WITH BACKUP TABLES) AND TEXT FOR A BASIC PRESENTATION ON CURRENT AND PROJECTED CAREER AND EMPLOYMENT OPPORTUNITIES IN THE VARIOUS FIELDS OF SCIENCE AND ENGINEERING. THE PRESENTATION IS DESIGNED FOR COLLEGE STUDENTS AND INDIVIDUALS PLANNING TO RE-ENTER THE LABOR MARKET IN SCIENCE OR ENGINEERING, AS WELL AS FOR POLICY MAKERS, SCIENCE TEACHERS, PLACEMENT SPECIALISTS, COUNSELORS AND OTHER ADVISORS OF STUDENTS. ADAPTATION FOR OTHER AUDIENCES IS ENCOURAGED.

THE PRESENTATION MAY BE READ BY INDIVIDUALS OR PRESENTED TO GROUPS BY PHOTOCOPYING THE CHARTS AS TRANSPARENCIES OR HANDOUTS, OR PHOTOGRAPHING FOR SLIDES. ALTHOUGH THE INFORMATION INCLUDED EMPHASIZES THE GROWING PARTICIPATION OF AND OPPORTUNITIES FOR WOMEN IN THESE FIELDS, IT IS EQUALLY RELEVANT FOR MIXED GROUPS. ANY SEGMENTS MAY BE OMITTED AS DESIRED BY A SPEAKER, TO FIT PARTICULAR AUDIENCES, AND ADDITIONAL INFORMATION MAY BE ADDED IN ANY FIELDS BY UTILIZING THE APPENDIX TABLES.

THIS CHARTBOOK PRESENTATION GREW OUT OF TWO GRANTS FROM THE NATIONAL SCIENCE FOUNDATION. THE FIRST (NO. SPI-79-13025) WAS A PILOT AUDIO-VISUAL PROJECT CARRIED OUT BY THE AUTHOR IN 1978. A SECOND GRANT TWO YEARS LATER (NO. SPI 81-60172) RESULTED IN THE FIRST EDITION OF THE CHARTBOOK, PUBLISHED IN NOVEMBER 1982 AND NOW OUT OF PRINT THIS SECOND EDITION IS THE RESULT OF CONTINUING REQUESTS FOR THE CHARTBOOK, PLUS THE AVAILABILITY OF NEW DATA.

SPECIAL THANKS ARE EXTENDED TO TIM BABCO, WHO PREPARED MANY OF THE CHARTS, AND TO THE STAFF OF THE SCIENTIFIC MANPOWER COMMISSION.

BETTY M. VETTER

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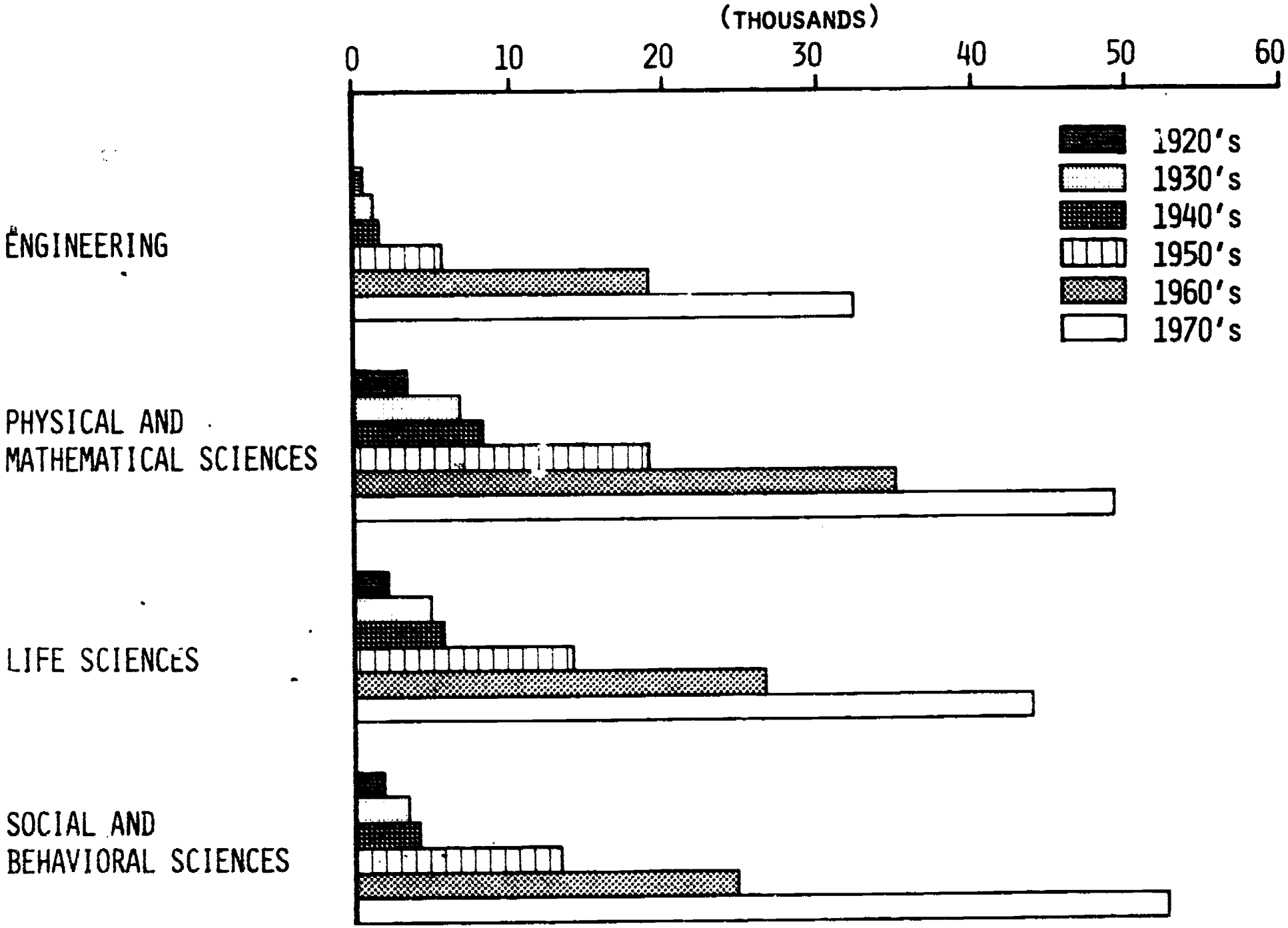
DOCTORATE DEGREES AWARDED, 1920's - 1970's



SOURCE: NATIONAL RESEARCH COUNCIL

IT IS PROBABLY TRUE THAT ABOUT 90% OF ALL SCIENTISTS AND ENGINEERS EVER BORN ARE ALIVE TODAY - PARTICULARLY IN THE UNITED STATES.

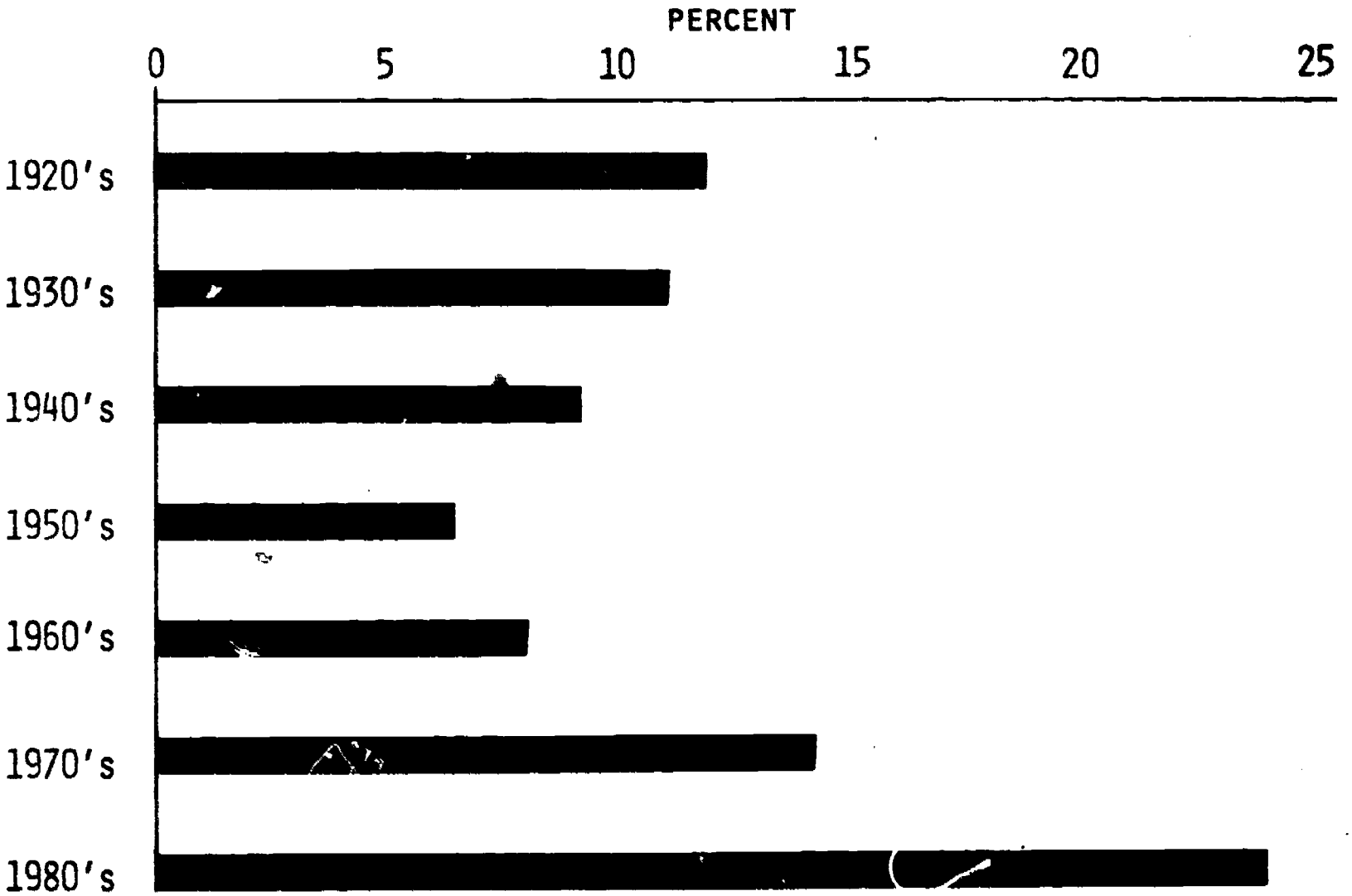
MORE DOCTORATES IN SCIENCE AND ENGINEERING WERE AWARDED IN THE 1950'S THAN HAD BEEN EARNED IN THE THREE PRECEDING DECADES. THE NUMBER DOUBLED AGAIN IN THE SIXTIES, AND GREW ANOTHER 67 PERCENT IN THE SEVENTIES.

SOME FIELDS GREW FASTER THAN OTHERS. THE GREATEST GROWTH IN THE PHYSICAL AND MATH SCIENCES OCCURRED IN THE SIXTIES, WHILE THE SOCIAL SCIENCES INCREASED FASTER IN THE SEVENTIES. IN THE FIRST FOUR YEARS OF THE EIGHTIES, GROWTH CONTINUES IN THE LIFE AND SOCIAL SCIENCES, BUT HAS LEVELED OFF IN THE PHYSICAL AND MATHEMATICAL SCIENCES.

Data Source: Appendix Table 1

PERCENT OF SCIENCE AND ENGINEERING DOCTORATES EARNED BY WOMEN

1920's - 1980's



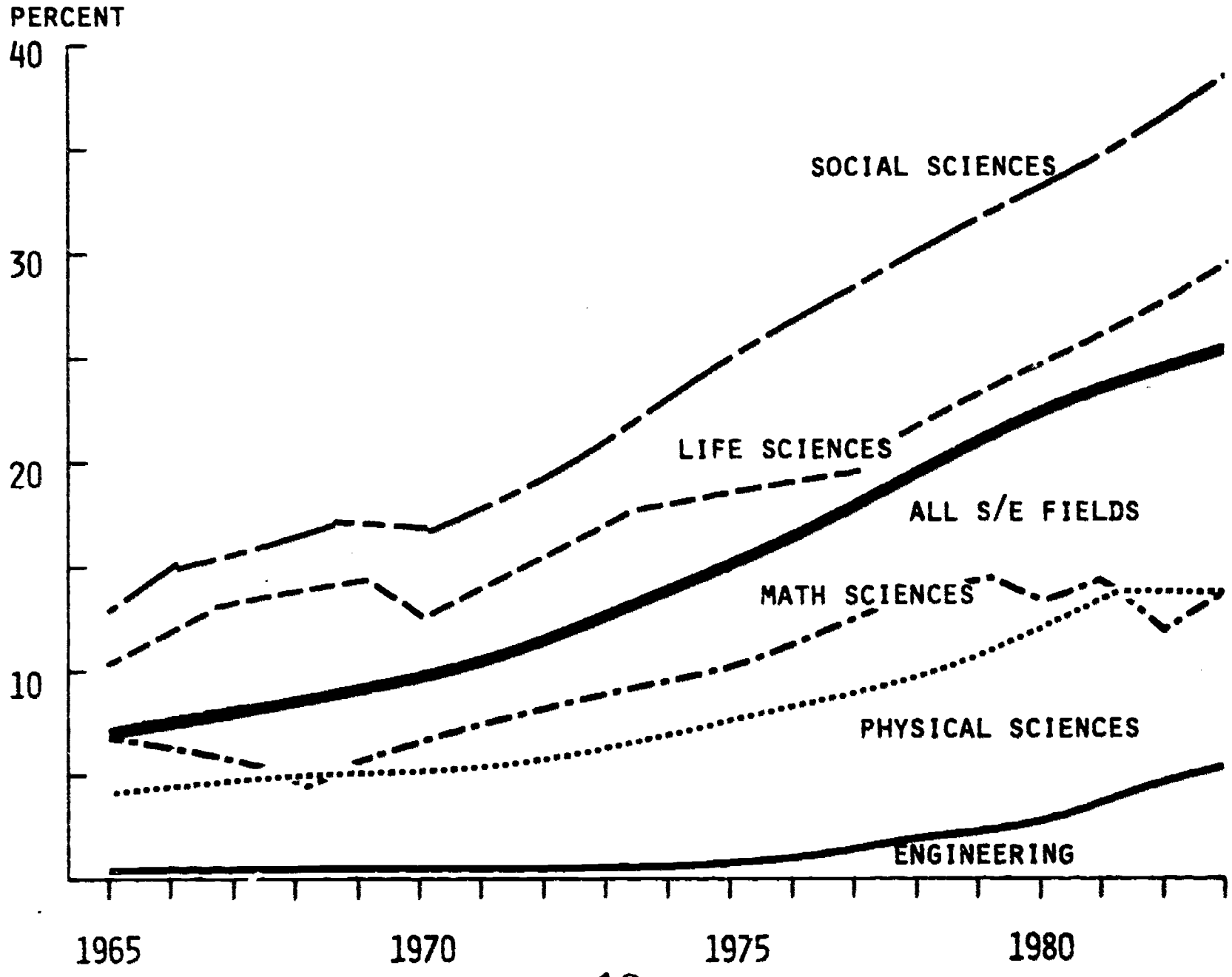
SOURCE: NATIONAL ACADEMY OF SCIENCES

TWELVE IN EVERY HUNDRED WHO EARNED THESE DEGREES IN THE 1920'S WERE WOMEN, BUT THAT PROPORTION FELL DURING THE DEPRESSION OF THE THIRTIES, AND FELL EVEN FASTER IN THE FORTIES AND FIFTIES AS THE MEN WHO FOUGHT IN WORLD WAR II RETURNED HOME AND UTILIZED THEIR GI BILL BENEFITS.

NOT UNTIL THE MID-SEVENTIES DID WOMEN REACH THE SAME PROPORTION OF SCIENCE AND ENGINEERING DOCTORATES THEY HAD EARNED IN THE TWENTIES, BUT BY THE END OF THE DECADE, THEY HAD SURPASSED ALL PREVIOUS RECORDS, AND BY 1983, ONE IN EVERY FOUR DOCTORAL DEGREES AWARDED IN THESE FIELDS WAS EARNED BY A WOMAN.

Data Source: Appendix Table 1

PERCENT OF S/E PH.D'S EARNED BY WOMEN

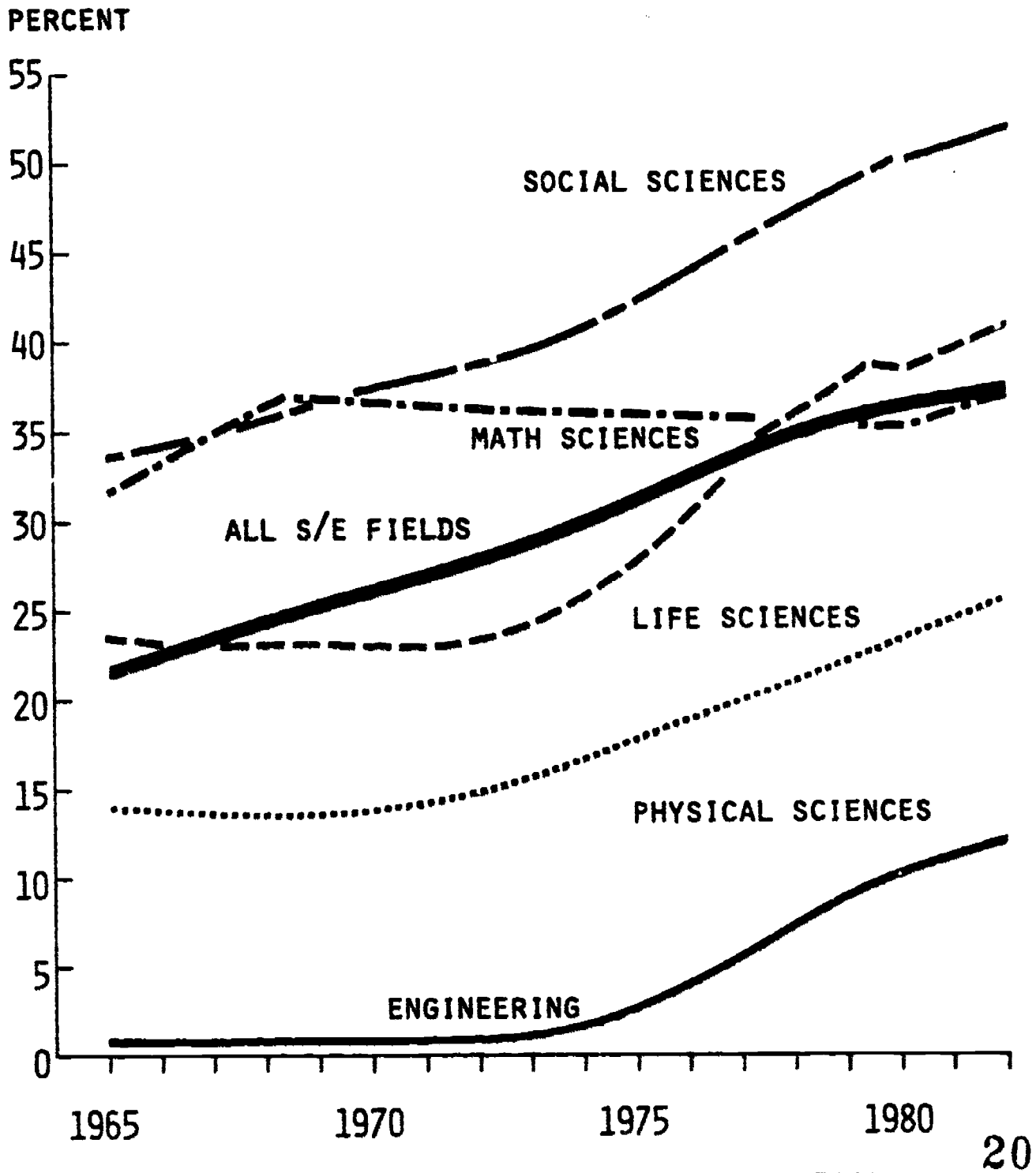


WOMEN'S SHARE OF SCIENCE AND ENGINEERING DOCTORATES GREW FROM SEVEN PERCENT TO 26 PERCENT BETWEEN 1965 AND 1983.

ALTHOUGH THE FIELDS CHOSEN BY WOMEN CONTINUE TO BE DOMINATED BY THE SOCIAL AND LIFE SCIENCES, BY 1983, WOMEN EARNED A SUBSTANTIAL FRACTION OF ALL SCIENCE DEGREES, AND HAD RAISED THEIR SHARE OF ENGINEERING DOCTORATES FROM LESS THAN ONE PERCENT TO FOUR PERCENT.

Data Source: Appendix Table 2

PERCENT OF S/E BACHELOR'S DEGREES EARNED BY WOMEN



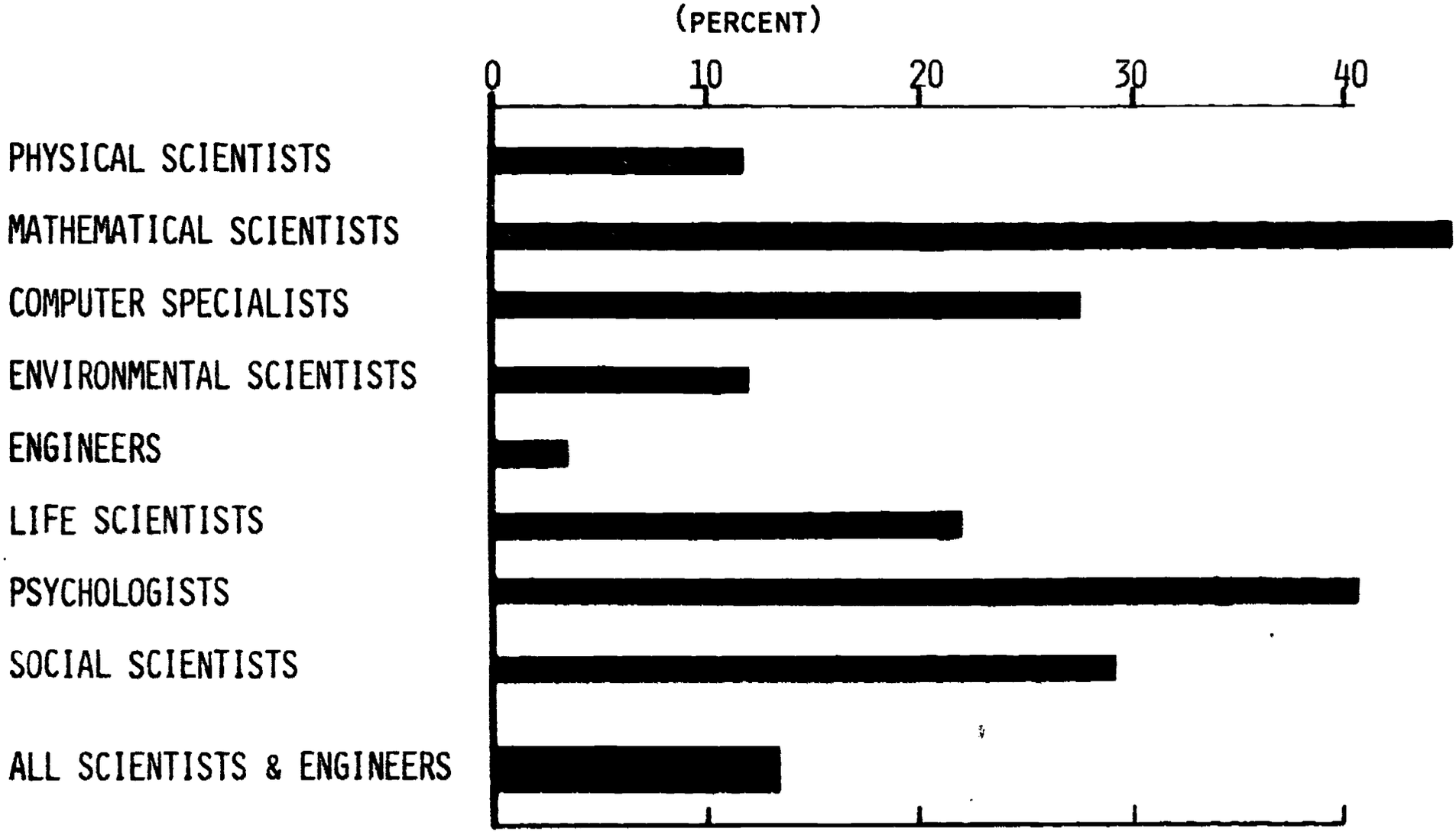
SOURCE: NATIONAL CENTER FOR EDUCATION STATISTICS

THIS INCREASING PROPORTION OF DOCTORATES EARNED BY WOMEN WAS, OF COURSE, PRECEDED BY AN INCREASE IN THEIR SHARE OF BACHELOR'S DEGREES, WHICH HAS CLIMBED FROM 22 PERCENT TO 36 PERCENT OF ALL SCIENCE AND ENGINEERING DEGREES SINCE 1965.

THEIR SHARE WITHIN FIELDS FOLLOWS THE SAME PATTERN AS IN THE DOCTORAL DEGREES, WITH SOCIAL AND LIFE SCIENCES PREDOMINATING AND WITH ENGINEERING CLIMBING TO THIRTEEN PERCENT IN 1983.

Data Source: Appendix Table 3

PERCENT WOMEN IN THE SCIENCE & ENGINEERING LABOR FORCE, 1982



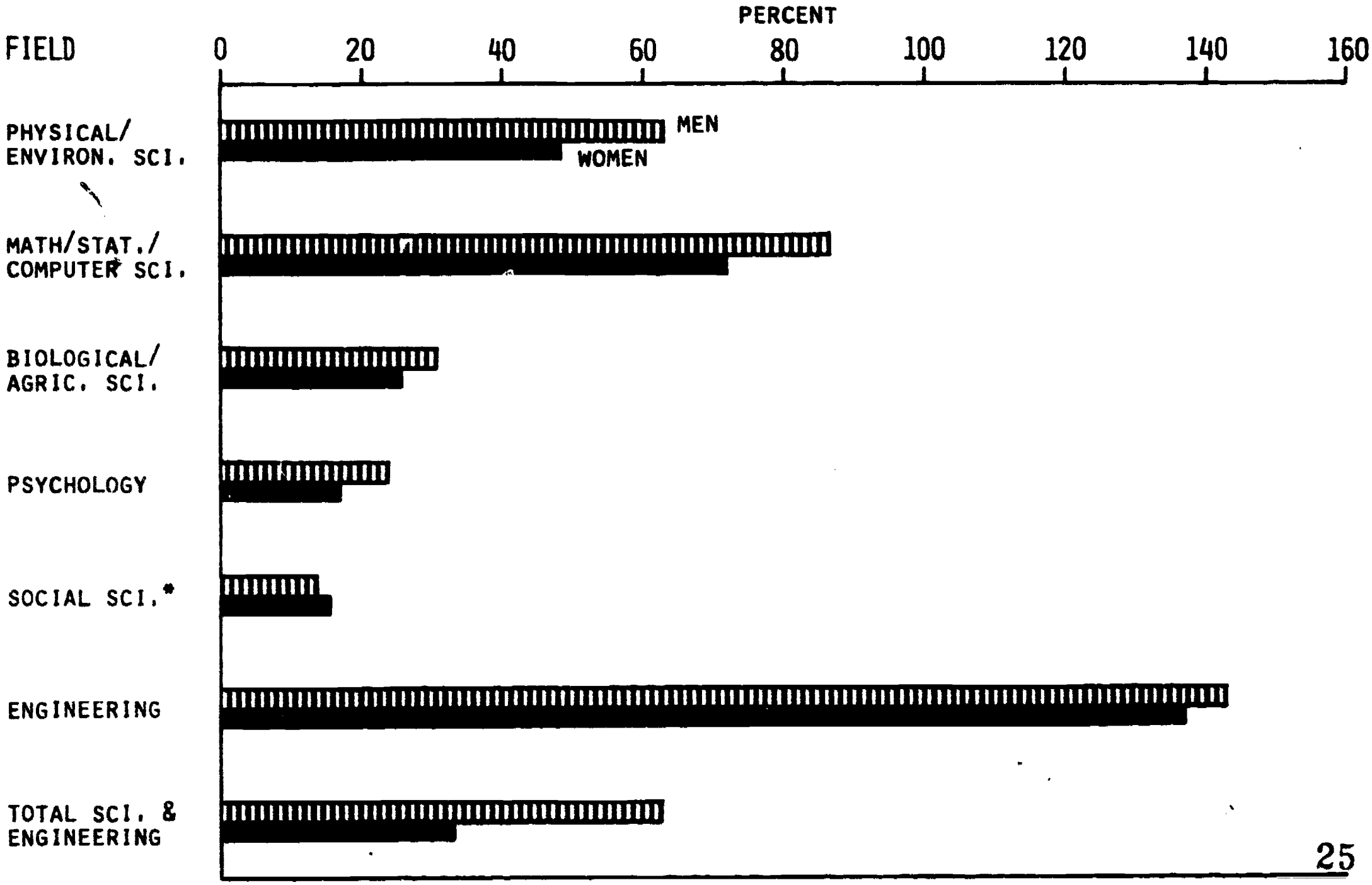
SOURCE: NATIONAL SCIENCE FOUNDATION

ALTHOUGH WOMEN ARE NOW EARNING A SUBSTANTIAL PROPORTION OF S/E DEGREES, EVEN IN THE LEAST TRADITIONAL FIELDS, THEY ARE A MUCH SMALLER FRACTION OF THE S/E LABOR FORCE THAN THEIR PRESENT PROPORTION OF NEW GRADUATES.

IN 1982, THEIR PROPORTION IN THE LABOR FORCE RANGED FROM 45% OF MATHEMATICAL SCIENTISTS AND 41% OF PSYCHOLOGISTS TO 3.5% OF ENGINEERS, AVERAGING 13.1% ACROSS ALL S/E FIELDS.

Data Source: Appendix Table 4

SCIENTISTS AND ENGINEERS IN 1982 AS A PERCENT OF S/E BACHELOR'S DEGREES AWARDED 1948-1981



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24 *ANTHROPOLOGY, SOCIOLOGY, ECONOMICS AND POLITICAL SCIENCE

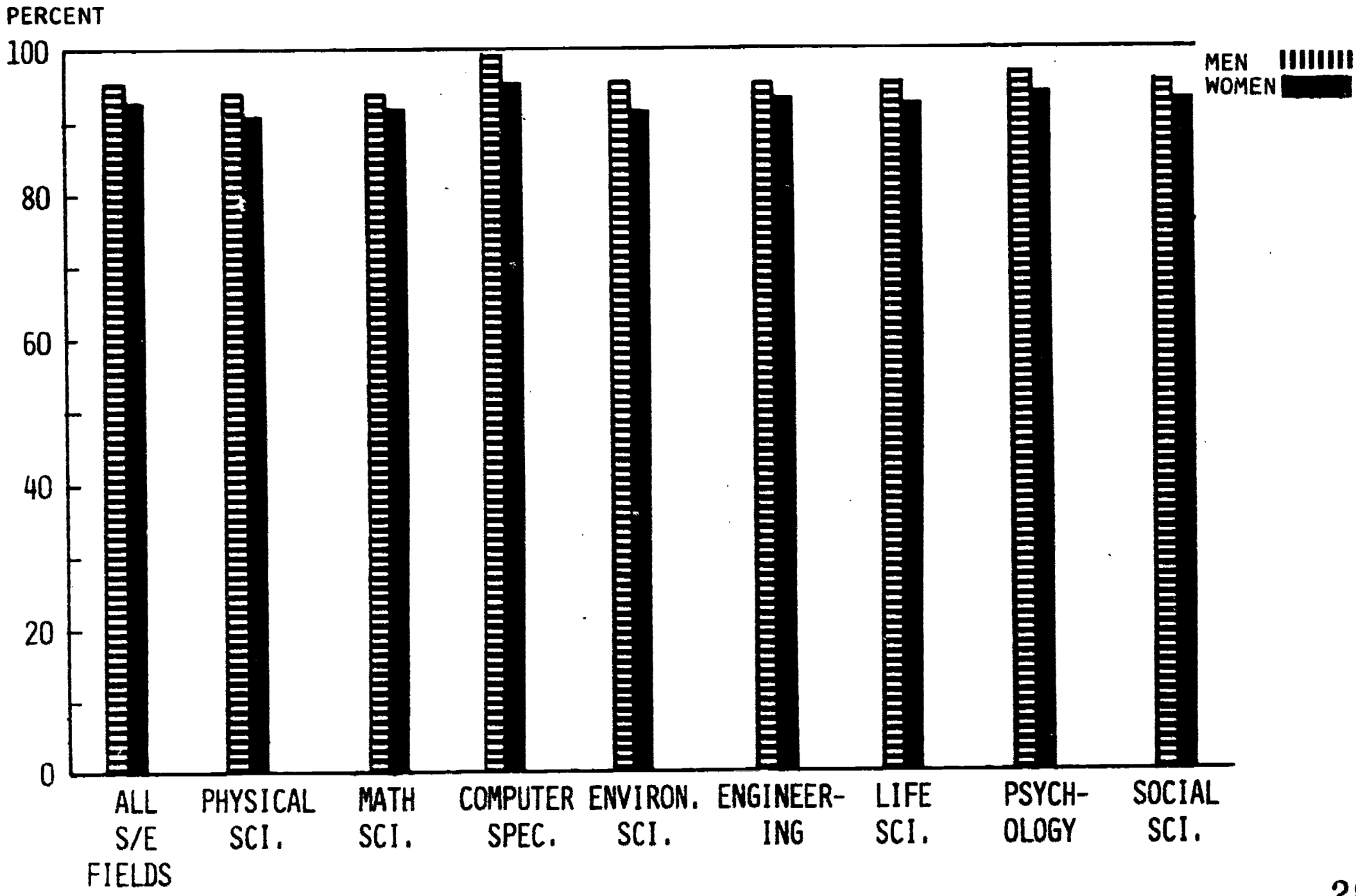
SOURCE: NATIONAL CENTER FOR EDUCATION STATISTICS AND NATIONAL SCIENCE FOUNDATION

THIS DIFFERENCE IN WOMEN'S PROPORTION OF DEGREES AND THEIR PROPORTION OF THE LABOR FORCE IS LARGELY ATTRIBUTABLE TO THE RELATIVELY SMALLER PROPORTIONS OF WOMEN WHO GRADUATED IN THE FIFTIES AND SIXTIES THAN IN THE SEVENTIES.

WOMEN ALSO ARE SOMEWHAT LESS LIKELY TO REMAIN IN THE S/E LABOR FORCE AFTER OBTAINING A BACHELOR'S DEGREE IN ONE OF THESE FIELDS THAN ARE MEN. FOR EXAMPLE, WOMEN EARNED ALMOST 23% OF ALL BACHELOR'S DEGREES AWARDED IN SCIENCE AND ENGINEERING FROM 1948 THROUGH 1981, BUT THE 1982 LABOR FORCE INCLUDES ONLY 48% AS MANY WOMEN AS THERE WERE WOMEN WHO EARNED BACHELOR'S DEGREES DURING THOSE THREE AND A HALF DECADES; WHILE IT INCLUDES ALMOST 64% OF THE MEN WHO EARNED DEGREES IN THESE FIELDS. THERE IS WIDE VARIATION AMONG FIELDS, WITH MORE MEN AND WOMEN IN ENGINEERING HAVING ENTERED EMPLOYMENT THAN EARNED DEGREES IN ENGINEERING, COMPARED WITH LESS THAN 15% OF EITHER SEX WHOSE BACHELOR'S DEGREES WERE IN THE SOCIAL SCIENCES HAVING ENTERED THESE FIELDS.

Data Source: Appendix Table 5

LABOR FORCE PARTICIPATION RATES OF SCIENTISTS AND ENGINEERS, 1982



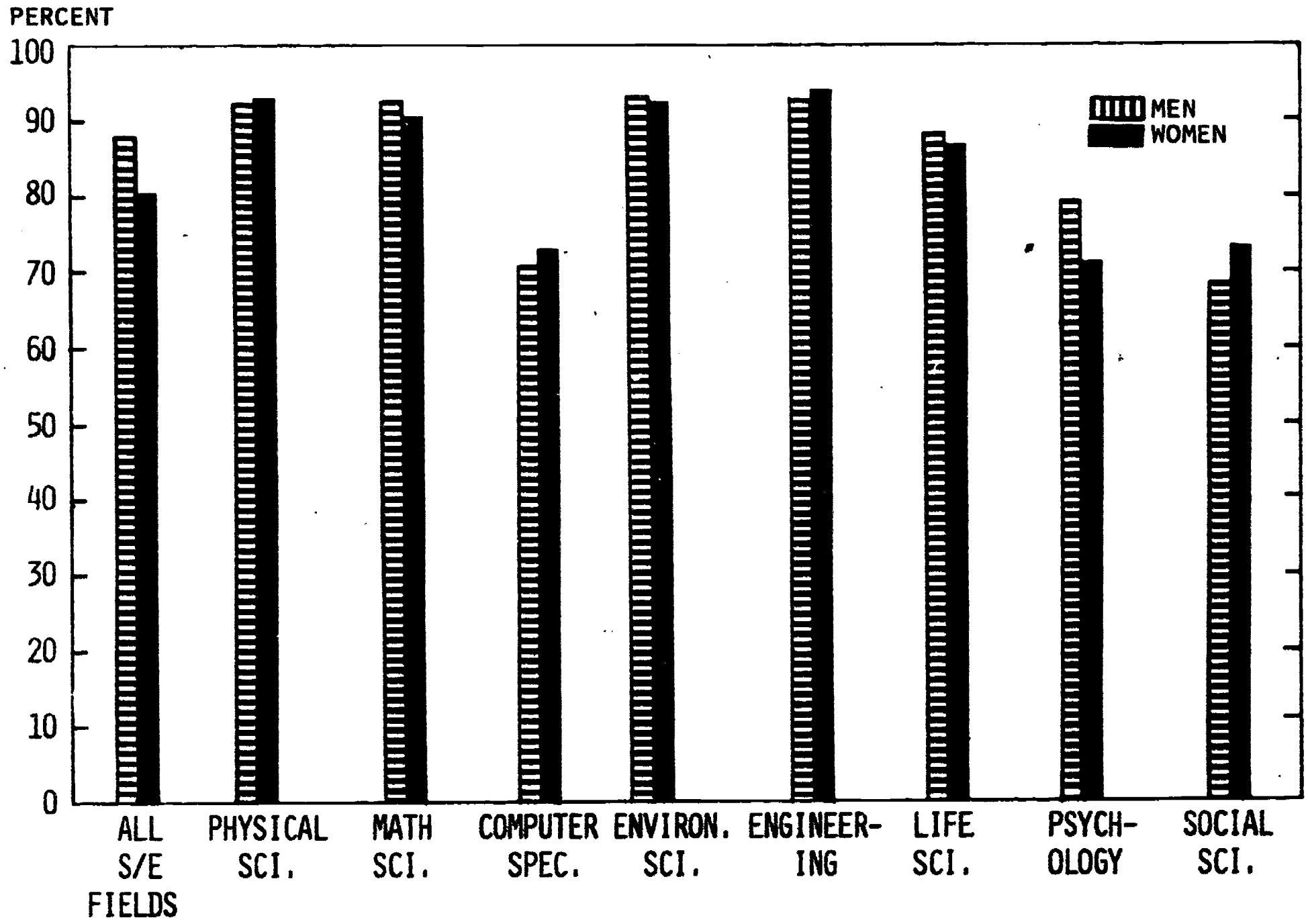
SOURCE: NATIONAL SCIENCE FOUNDATION

ANOTHER REASON THAT WOMEN ARE A SMALLER PROPORTION OF THE S/E LABOR FORCE THAN OF THE S/E DEGREE RECIPIENTS IS THAT THEY ARE STILL SLIGHTLY LESS LIKELY THAN MEN TO BE IN THE LABOR FORCE -- THAT IS, ACTUALLY WORKING OR LOOKING FOR WORK.

AMONG SCIENTISTS AND ENGINEERS IDENTIFIED BY THE NATIONAL SCIENCE FOUNDATION IN 1982, FIVE PERCENT OF MEN AND SEVEN PERCENT OF WOMEN WERE OUT OF THE LABOR FORCE, SOME BECAUSE OF RETIREMENT, OTHERS FOR DIFFERENT REASONS. THE DIFFERENCES ARE SMALL, BUT EXTEND ACROSS ALL FIELDS.

Data Source: Appendix Table 6

S/E UTILIZATION RATES OF SCIENTISTS AND ENGINEERS, 1982



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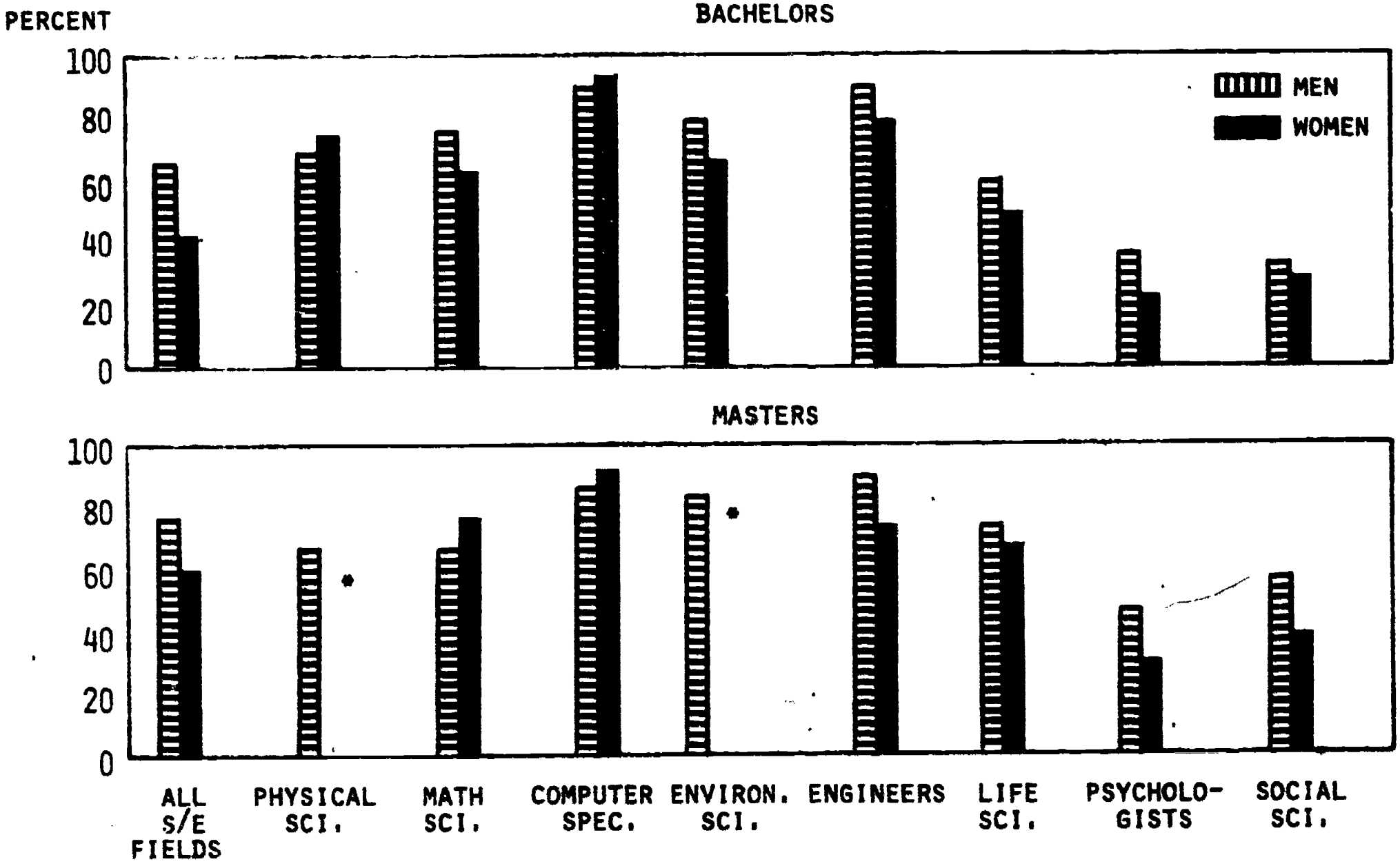
SOURCE: NATIONAL SCIENCE FOUNDATION

EVEN AMONG THOSE WHO ARE IN THE LABOR FORCE, MEN ARE SOMEWHAT MORE LIKELY THAN WOMEN TO FIND JOBS IN SCIENCE AND ENGINEERING. IN 1982, 88% OF MEN BUT ONLY 80% OF WOMEN SCIENTISTS AND ENGINEERS WERE EMPLOYED IN THESE AREAS. THIS DIFFERENCE IS LARGELY RELATED TO FIELD OF SPECIALTY, WITH COMPUTER SPECIALISTS, PSYCHOLOGISTS AND SOCIAL SCIENTISTS LESS LIKELY TO BE WORKING IN SCIENCE AND ENGINEERING THAN ENGINEERS, PHYSICAL SCIENTISTS, ENVIRONMENTAL SCIENTISTS OR LIFE SCIENTISTS. THE LARGEST DIFFERENCE BETWEEN MEN AND WOMEN IS IN THE SOCIAL SCIENCES, WHERE WOMEN HAVE HIGHER UTILIZATION RATES, AND IN PSYCHOLOGY WHERE THEIR RATES ARE LOWER THAN MEN'S.

THE LOWER S/E UTILIZATION RATES OF COMPUTER SPECIALISTS MAY BE ATTRIBUTABLE TO THE WIDE NEED FOR COMPUTER EXPERTISE IN AREAS OUTSIDE OF SCIENCE AND ENGINEERING.

Data Source: Appendix Table 6

S/E UTILIZATION RATES FOR RECENT GRADUATES, 1982



* RATES NOT COMPUTED FOR GROUPS WITH FEWER THAN 1500 IN THE LABOR FORCE

SOURCE: NATIONAL SCIENCE FOUNDATION (NSF 84-318)

THERE IS A LARGER DIFFERENCE BETWEEN THE SEXES IN S/E UTILIZATION RATES FOR THEIR FIRST JOBS - THAT IS, WHETHER THE FIRST JOB IS IN A SCIENCE OR ENGINEERING FIELD. FOR EXAMPLE, AMONG 1980 AND 1981 BACHELOR'S AND MASTER'S GRADUATES IN SCIENCE AND ENGINEERING WHO WERE SURVEYED IN 1982, HIGHER PROPORTIONS OF EMPLOYED MEN THAN OF EMPLOYED WOMEN WERE WORKING IN SCIENCE OR ENGINEERING, AS HAS BEEN TRUE IN EACH OF THE SURVEYS OF RECENT GRADUATES UNDERTAKEN SINCE 1976.

IN 1982, THE S/E UTILIZATION RATE FOR RECENT WOMEN BACHELOR'S GRADUATES WAS 46% COMPARED TO 68% FOR MEN. IN PART, THIS REFLECTS THE HIGHER PROPORTION OF ENGINEERS AMONG MALE GRADUATES AND OF SOCIAL AND BEHAVIORAL SCIENCE GRADUATES AMONG WOMEN. HOWEVER, THE DIFFERENTIAL EXISTS IN EVERY FIELD EXCEPT PHYSICAL AND COMPUTER SCIENCES.

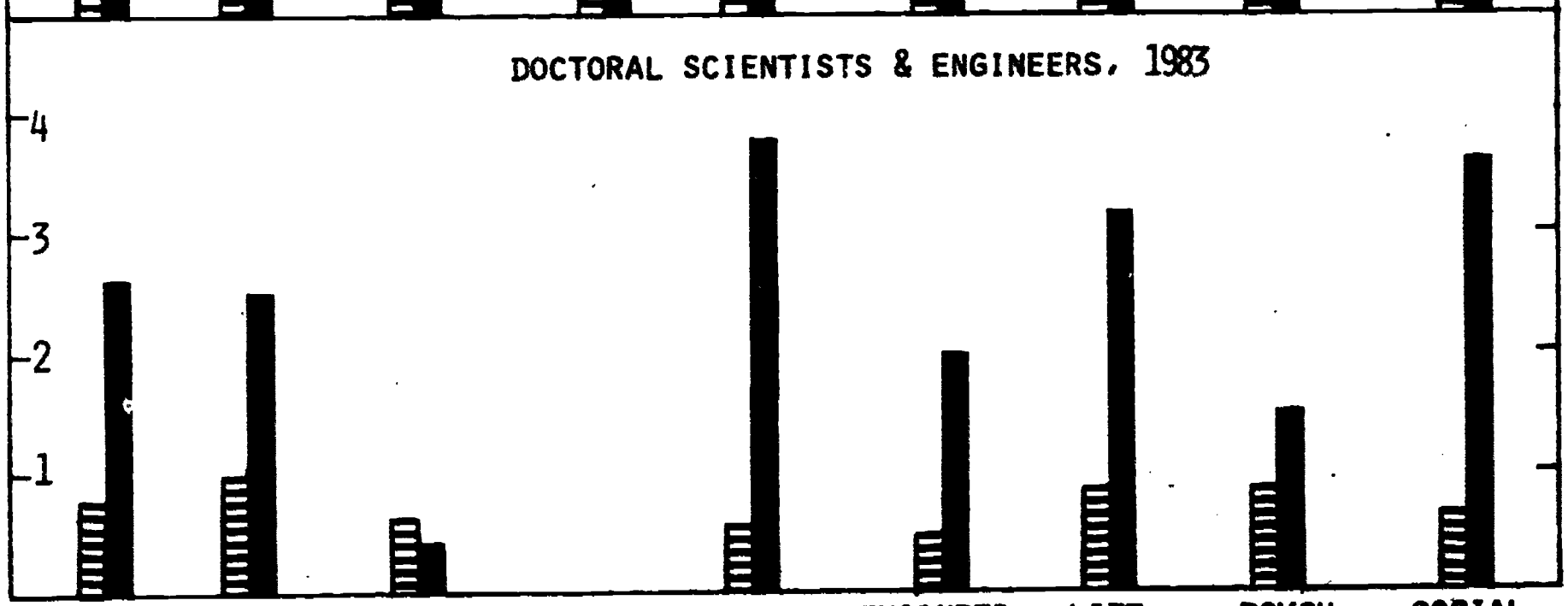
AT THE MASTER'S LEVEL, S/E UTILIZATION RATES ARE HIGHER FOR BOTH SEXES, BUT THE SEX DIFFERENTIAL IS MORE PRONOUNCED, PARTICULARLY AMONG SOCIAL AND BEHAVIORAL SCIENTISTS AND ENGINEERS.

Data Source: Appendix Table 7

UNEMPLOYMENT RATES

ALL SCIENTISTS & ENGINEERS, 1982

DOCTORAL SCIENTISTS & ENGINEERS, 1983



SOURCES: NATIONAL SCIENCE FOUNDATION AND NATIONAL RESEARCH COUNCIL

WOMEN SCIENTISTS AND ENGINEERS ALSO ARE MORE LIKELY THAN MEN TO BE UNEMPLOYED AND SEEKING WORK. THE UNEMPLOYMENT RATES FOR WOMEN ARE HIGHER THAN FOR MEN IN ALMOST EVERY FIELD, AT EVERY DEGREE LEVEL, AND AT EVERY LEVEL OF EXPERIENCE.

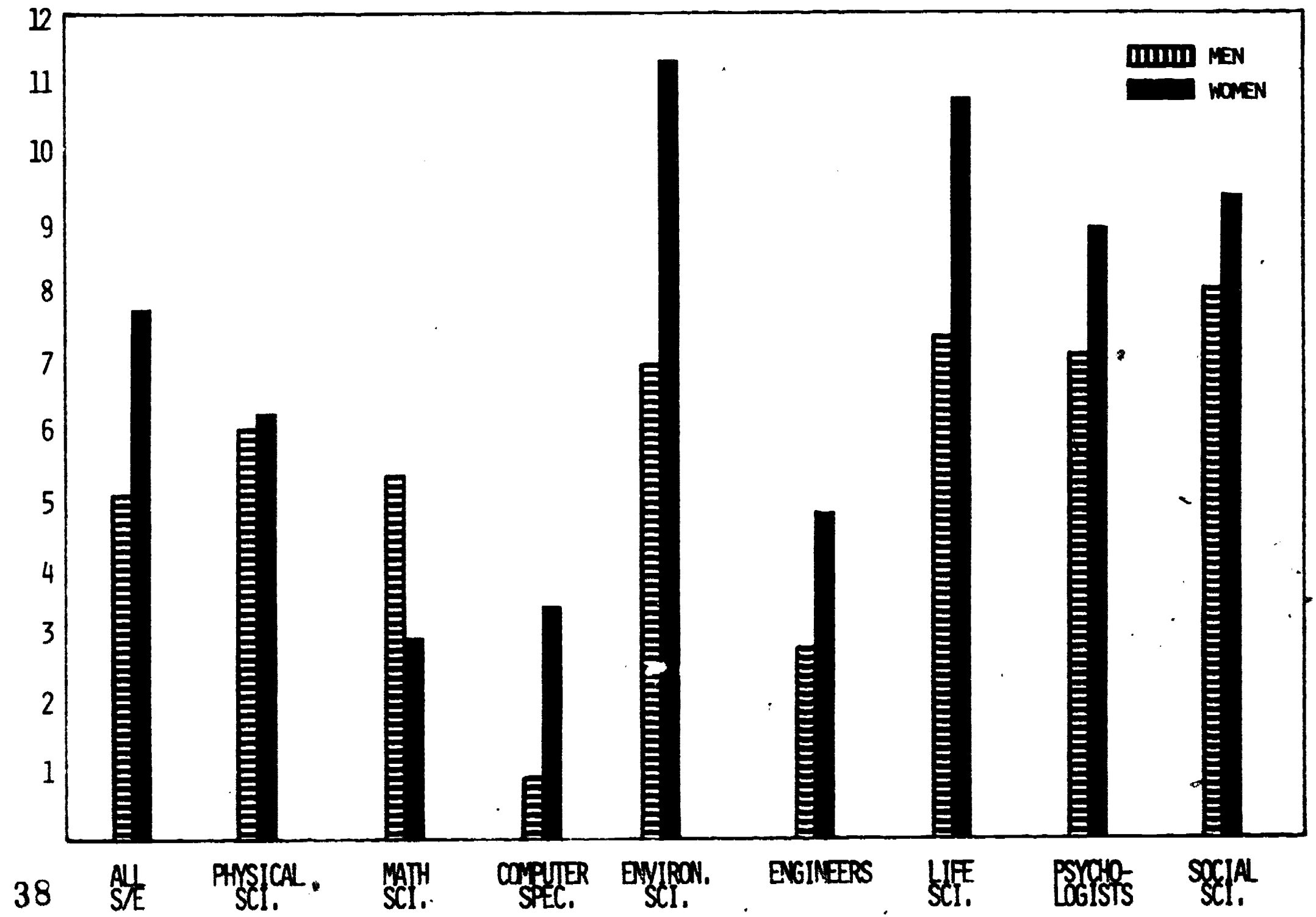
ALTHOUGH THE UNEMPLOYMENT RATE FOR SCIENTISTS AND ENGINEERS IN 1982 WAS ONLY 2.3%, THE UNEMPLOYMENT RATE FOR WOMEN IN THIS GROUP WAS TWICE AS HIGH AS FOR MEN. DOCTORAL WOMEN SCIENTISTS AND ENGINEERS WERE THREE TIMES AS LIKELY AS MEN TO BE INVOLUNTARILY UNEMPLOYED IN 1983, BUT THE TOTAL UNEMPLOYMENT RATE FOR THIS GROUP IS ONLY ONE PERCENT.

IN 1982, WOMEN WERE 13.4% OF ALL SCIENTISTS AND ENGINEERS IN THE LABOR FORCE, BUT 25.3% OF ALL THOSE WHO WERE UNEMPLOYED AND SEEKING EMPLOYMENT. AT THE DOCTORAL LEVEL IN 1983, WOMEN WERE 13% OF THE LABOR FORCE AND 34% OF THOSE WHO WERE UNEMPLOYED AND SEEKING WORK.

THERE IS ALSO VARIATION BY FIELD. AMONG ALL SCIENTISTS AND ENGINEERS, WITHOUT REGARD TO SEX, SOCIAL SCIENTISTS AND PSYCHOLOGISTS HAVE THE HIGHEST UNEMPLOYMENT RATES. WITHIN THE DOCTORAL POPULATION, LIFE SCIENTISTS AND PSYCHOLOGISTS HAVE HIGHER UNEMPLOYMENT RATES THAN ENGINEERS OR MATH AND COMPUTER SPECIALISTS.

Data Source: Appendix Tables 6 and 8

UNEMPLOYMENT RATES OF RECENT S/E BACCALAUREATES, 1982



SOURCE: NATIONAL SCIENCE FOUNDATION (NSF 84-318)

AGAIN, THE GREATER DIFFICULTY EXPERIENCED BY WOMEN SCIENTISTS AND ENGINEERS IN COMPARISON WITH MEN IN FINDING EMPLOYMENT OFTEN BEGINS WITH THE FIRST JOB.

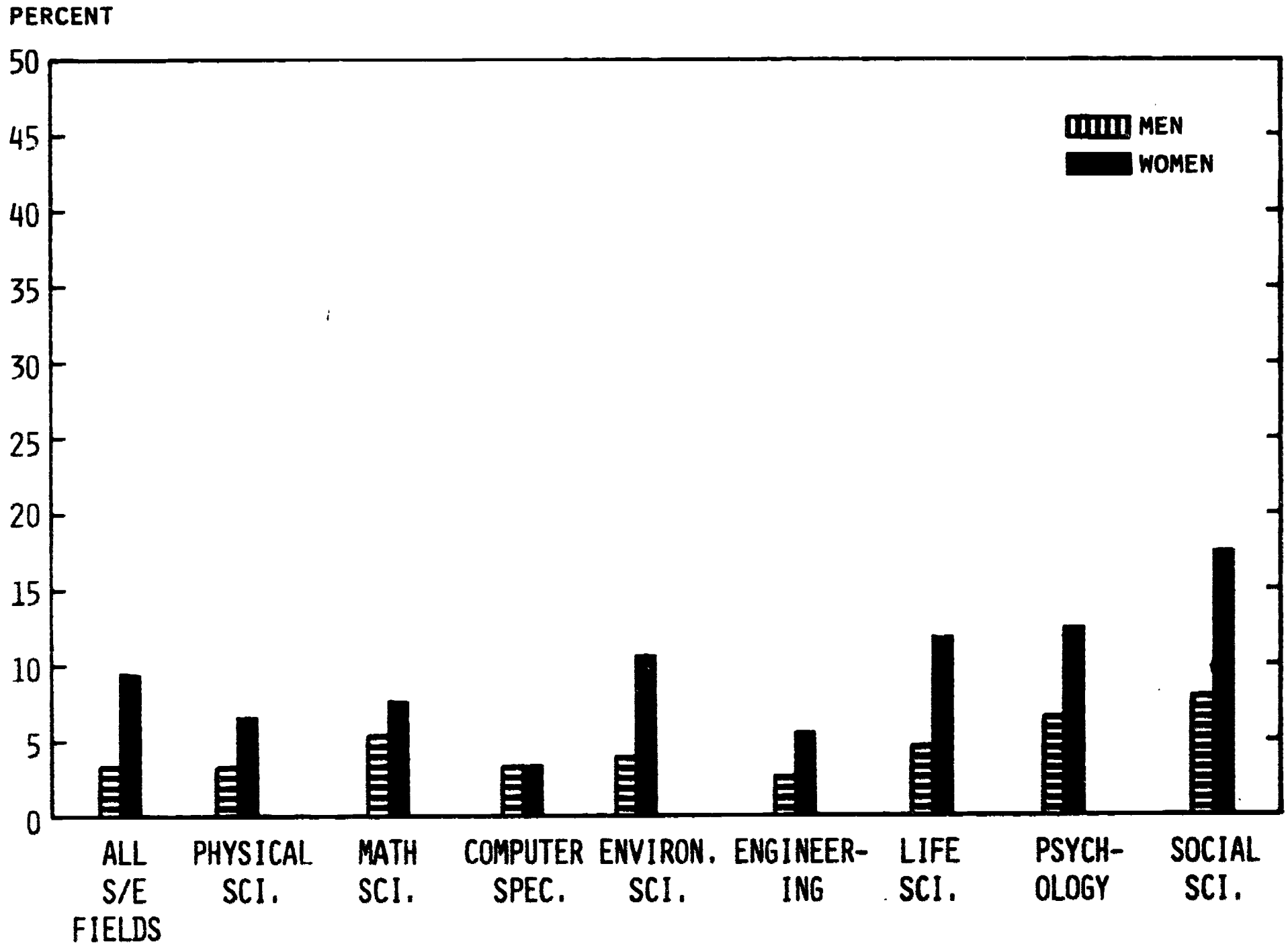
IN 1982, UNEMPLOYMENT RATES FOR RECENT BACHELOR'S GRADUATES WERE AT VERY HIGH LEVELS, HISTORICALLY. AMONG GRADUATES ONE AND TWO YEARS OUT OF SCHOOL, 7.7% OF THE WOMEN AND 5.1% OF THE MEN WITH BACHELOR'S DEGREES IN SCIENCE OR ENGINEERING WERE UNEMPLOYED AND SEEKING JOBS.

EXCEPT IN MATHEMATICAL SCIENCES, THE UNEMPLOYMENT RATES ARE HIGHER IN EVERY FIELD FOR WOMEN THAN FOR MEN WITH RECENT BACHELOR'S DEGREES.

AT THE MASTER'S LEVEL, THE OVERALL UNEMPLOYMENT RATES ARE 2.3% FOR MEN AND 7.3% FOR WOMEN, AND THE HIGHER RATES FOR WOMEN ARE UNIVERSAL ACROSS ALL FIELDS. GENERALLY, THE HIGHER THE UNEMPLOYMENT RATE FOR MEN, THE LARGER THE GAP BETWEEN MEN AND WOMEN IN UNEMPLOYMENT RATES.

Data Source: Appendix Table 7

UNDER-UTILIZATION RATES OF SCIENTISTS AND ENGINEERS, 1982



SOURCE: NATIONAL SCIENCE FOUNDATION

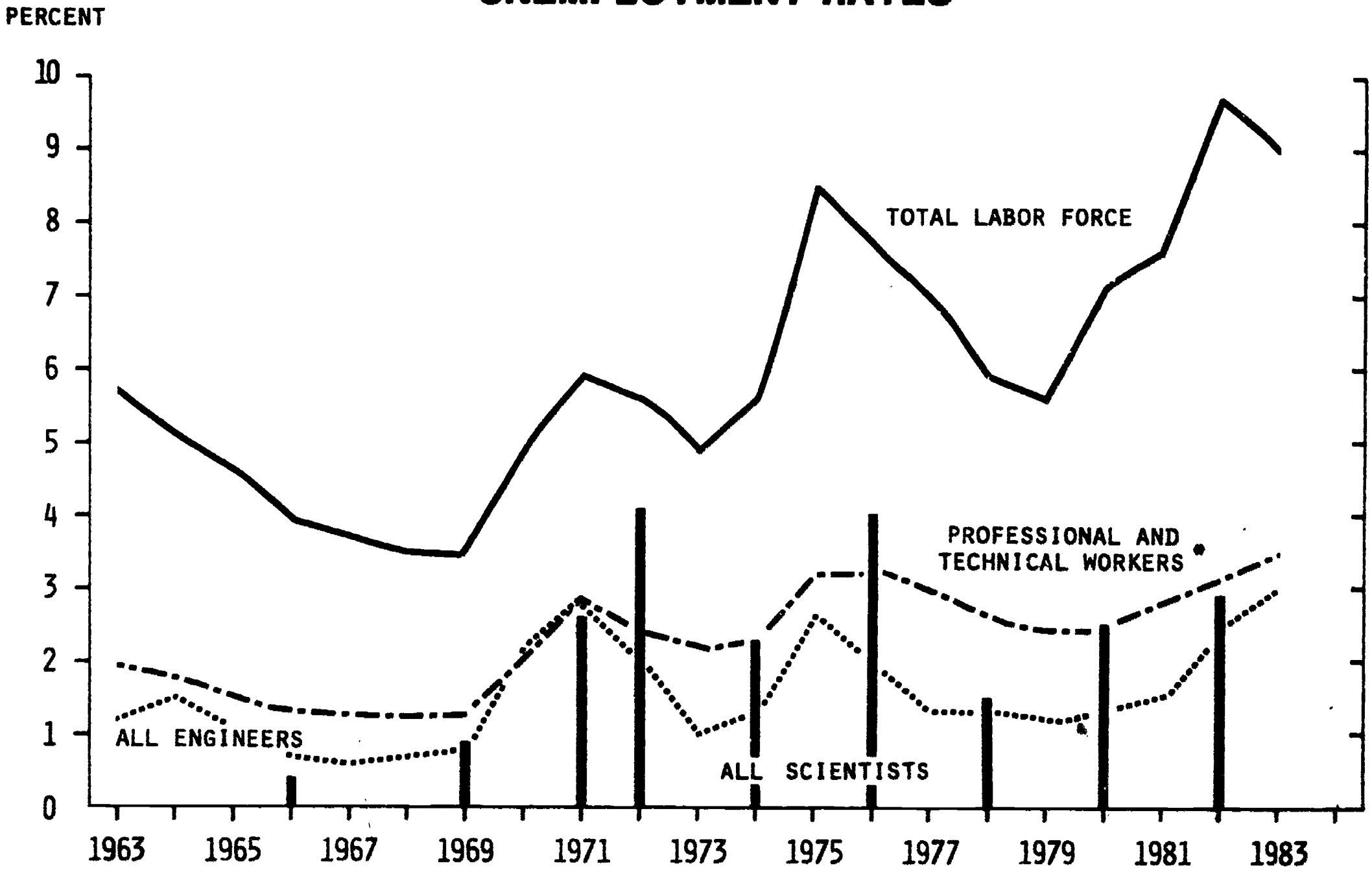
IF WE ADD TOGETHER THE NUMBERS OF MEN AND WOMEN SCIENTISTS AND ENGINEERS IN THE LABOR FORCE WHO ARE UNEMPLOYED AND SEEKING WORK, PLUS THOSE WHO ARE WORKING ONLY PART TIME BUT ARE SEEKING FULL TIME EMPLOYMENT; AND THOSE WHO ARE IN JOBS OUTSIDE OF SCIENCE AND ENGINEERING BECAUSE THEY COULD NOT FIND EMPLOYMENT IN SCIENCE AND ENGINEERING, WE HAVE A MEASURE OF THE UNDER-UTILIZATION RATE OF THIS POPULATION.

AGAIN, WE FIND THAT THE RATE IS MUCH HIGHER FOR WOMEN THAN FOR MEN, WITH 9.4% OF ALL WOMEN SCIENTISTS AND ENGINEERS IN THIS CATEGORY COMPARED WITH 3.3% OF MEN. FIELD DIFFERENCES ACCOUNT FOR SOME OF THE SEX DIFFERENCE, BUT ONLY AMONG COMPUTER SCIENTISTS DOES THE UNDERUTILIZATION RATE EQUALIZE. THE SEX DIFFERENTIAL IS GENERALLY HIGHEST IN FIELDS WITH HIGHER UNEMPLOYMENT RATES.

UNEMPLOYMENT AND UNDEREMPLOYMENT RATES ARE ONE MEASURE OF SUPPLY VS. DEMAND. WHERE UNEMPLOYMENT RATES ARE LOW, SUPPLY GENERALLY IS EQUAL TO OR LESS THAN DEMAND.

Data Source: Appendix Table 6

UNEMPLOYMENT RATES



* BEGINNING IN 1982, THIS UNEMPLOYMENT RATE IS FOR PERSONS WITH 4 OR MORE YEARS OF COLLEGE

SOURCES: BUREAU OF LABOR STATISTICS, NATIONAL SCIENCE FOUNDATION, NATIONAL RESEARCH COUNCIL

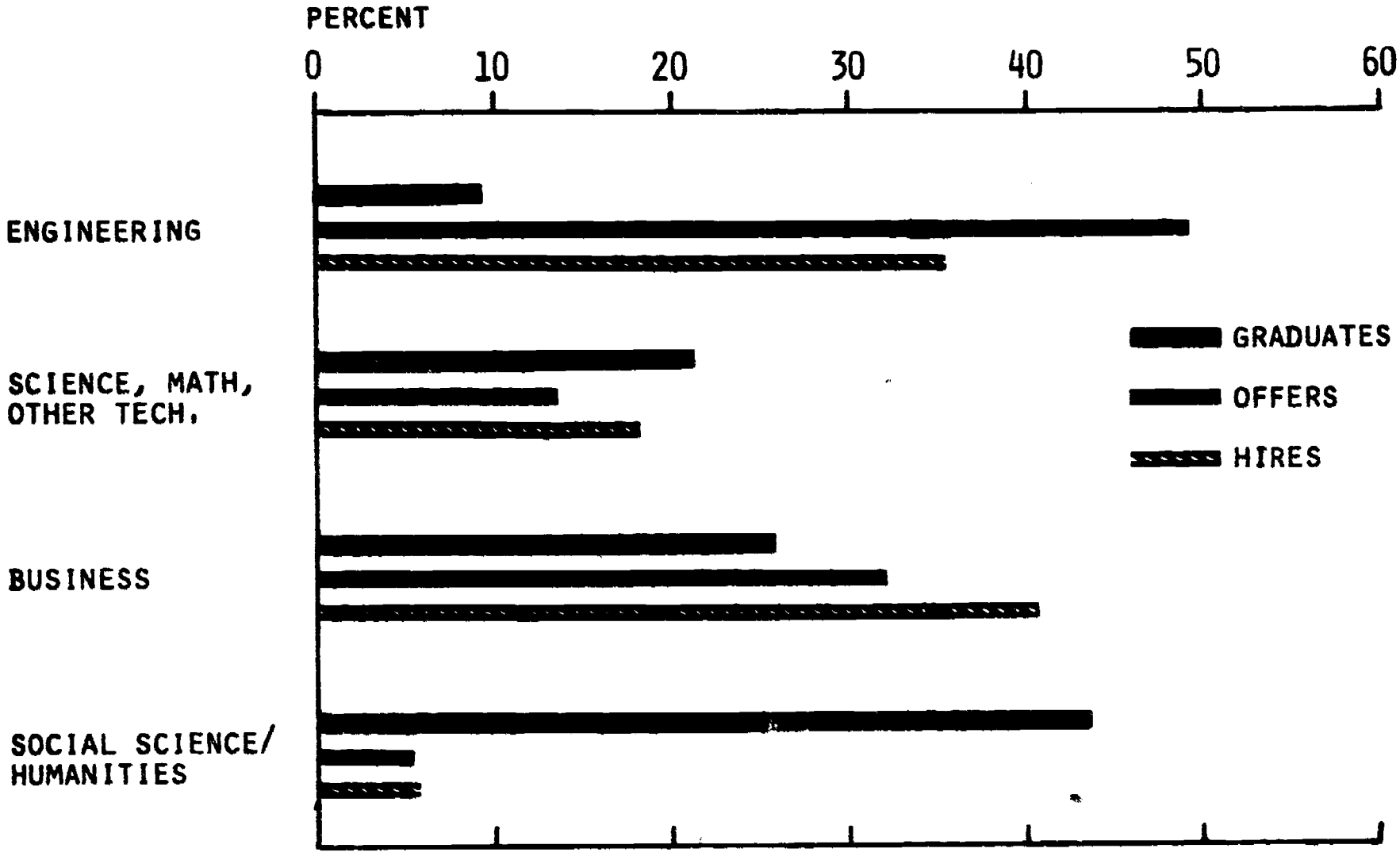
DESPITE THIS APPARENT DISADVANTAGE FOR WOMEN IN SCIENCE, HOWEVER, IT IS IMPORTANT TO EMPHASIZE THAT THE DATA GAPS BETWEEN MEN AND WOMEN SCIENTISTS AND ENGINEERS HAVE LESSENED CONSIDERABLY OVER THE PAST TWO YEARS. IT IS ALSO IMPORTANT TO RECOGNIZE THAT SCIENTISTS AND ENGINEERS HAVE LOWER UNEMPLOYMENT RATES THAN OTHER SEGMENTS OF THE U.S. LABOR FORCE.

IN 1982, THE UNEMPLOYMENT RATE FOR SCIENTISTS WAS 2.9%, AND FOR ENGINEERS, 2.4% COMPARED WITH 9.7% FOR THE GENERAL POPULATION AND 3.5% FOR ALL COLLEGE GRADUATES.

IN 1983, ONLY ONE PERCENT OF DOCTORAL SCIENTISTS AND ENGINEERS WERE UNEMPLOYED AND SEEKING WORK, IN CONTRAST TO NINE PERCENT OF THE TOTAL U.S. LABOR FORCE AND 1.7% OF DOCTORATES IN THE HUMANITIES.

Data Source: Appendix Table 9

CURRICULUM DISTRIBUTION OF ALL DEGREE RECIPIENTS,* NON-TEACHING JOB OFFERS AND HIRES



* EXCLUSIVE OF EDUCATION

SOURCE: NCES, EARNED DEGREES; CPC SALARY SURVEY, JULY 1984 AND CPC RECRUITING '85

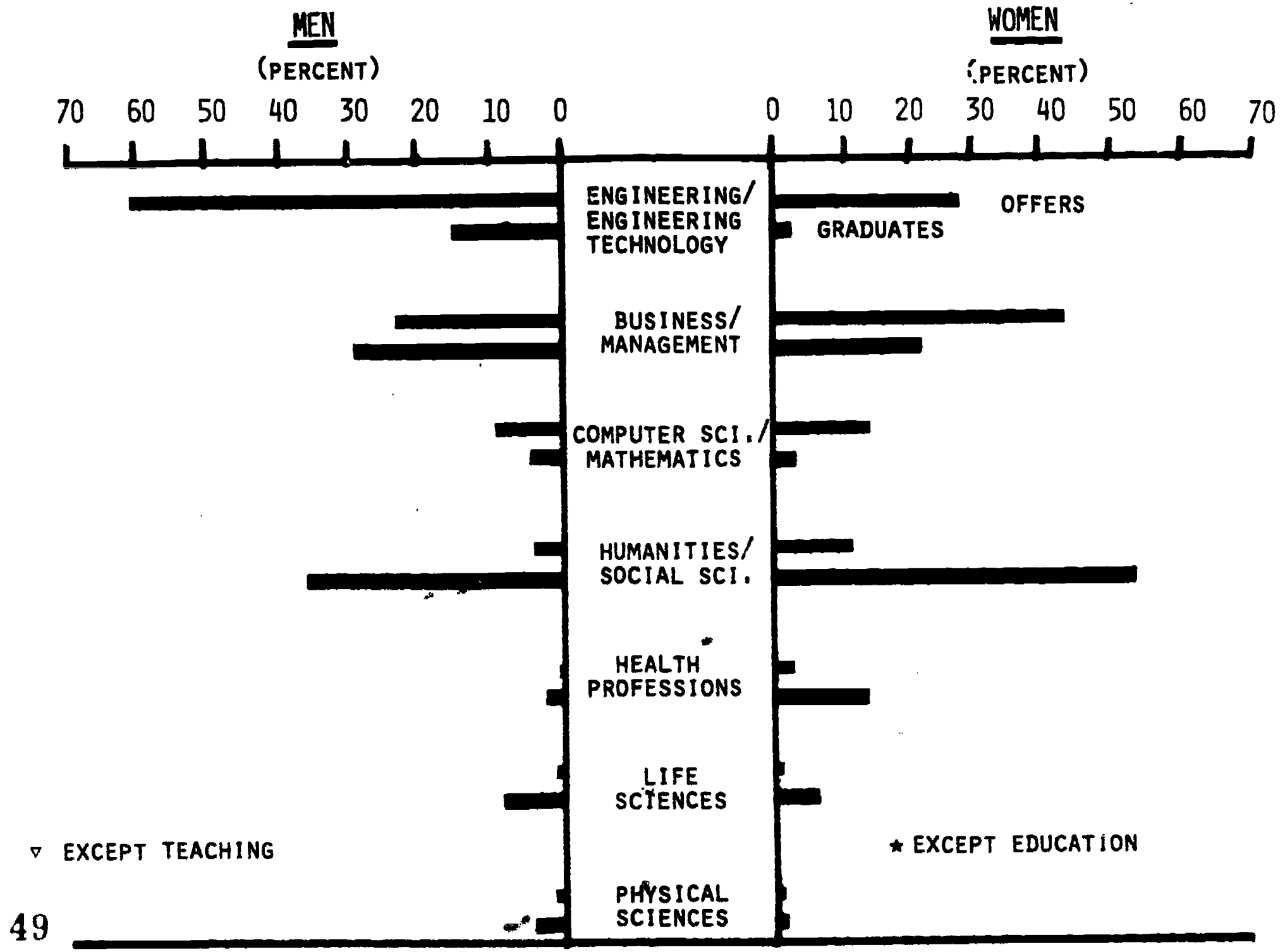
WE CAN SEE SOME OF THE RELATIONSHIP BETWEEN HIGHER UNEMPLOYMENT FIELDS AND RELATIVE DEMAND BY COMPARING THE PROPORTION OF GRADUATES WHO EARN DEGREES IN THESE FIELDS WITH THE PROPORTION OF JOB OFFERS (INCLUDING MULTIPLE OFFERS) AND HIRES OF NEW GRADUATES IN THE SAME FIELDS. DEGREES, OFFERS AND JOBS IN TEACHING ARE OMITTED. BECAUSE OF THE VARIATION IN PROFESSIONAL DEGREE LEVEL IN DIFFERENT FIELDS, ALL THREE DEGREE LEVELS ARE FIRST COMBINED.

IN 1983-84, ALMOST HALF (49.1%) OF ALL OFFERS RECORDED BY PARTICIPATING PLACEMENT OFFICES IN THE COLLEGE PLACEMENT COUNCIL'S ANNUAL SALARY SURVEY AND ABOUT 35 PERCENT OF ALL HIRES OF NEW GRADUATES BY SOME 400 EMPLOYERS PARTICIPATING IN ANOTHER CPC SURVEY WERE ENGINEERING MAJORS, WHO MADE UP ONLY NINE PERCENT OF ALL 1982 GRADUATES EXCLUSIVE OF THOSE IN EDUCATION.

IN THE SCIENCES AND MATH GROUP, PROPORTIONS OF GRADUATES AND HIRES ARE SIMILAR; WHILE GRADUATES IN THE SOCIAL SCIENCES, HUMANITIES AND OTHER NON-TECHNICAL AREAS FAR EXCEED THEIR PROPORTION OF JOB OFFERS OR HIRES BY THESE EMPLOYERS. ON THE OTHER HAND, INEXPERIENCED BUSINESS GRADUATES ARE PROPORTIONALLY BETTER REPRESENTED AMONG HIRES THAN AMONG GRADUATES. THESE GROUPINGS, OF COURSE, MASK WIDE VARIATIONS BETWEEN INDIVIDUAL FIELDS AND AT DIFFERENT DEGREE LEVELS.

Data Source: Appendix Table 10

PERCENT OF BACHELOR'S OFFERS▽ AND GRADUATES★



▽ EXCEPT TEACHING

★ EXCEPT EDUCATION

49 50

SOURCE: NCES, EARNED DEGREES, 1982, AND CPC SALARY SURVEY, JULY, 1984

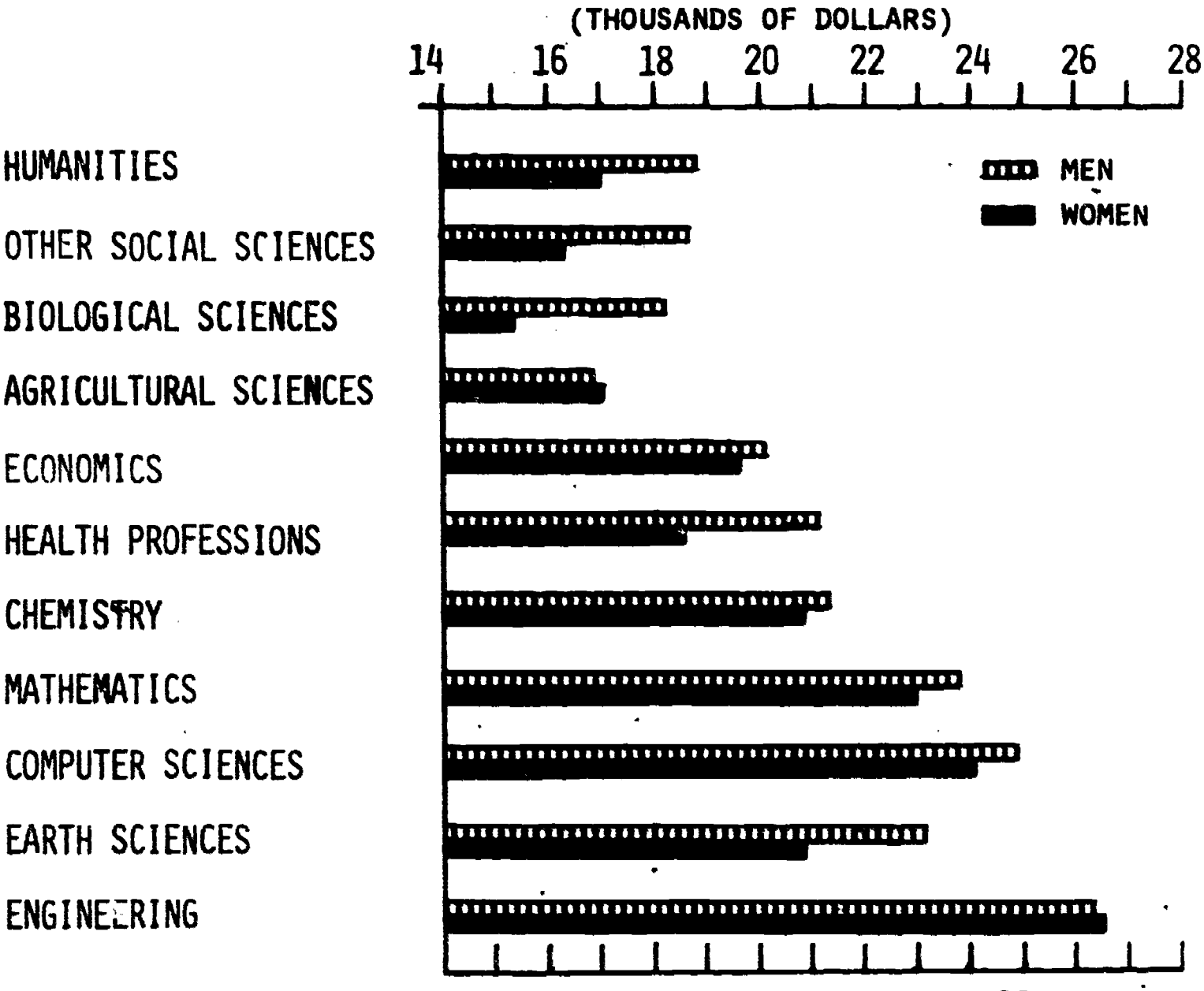
LOOKING ONLY AT BACHELOR'S GRADUATES, WE SEE THE WIDE VARIETY AMONG FIELDS AS WELL AS DIFFERENCES BETWEEN MEN AND WOMEN.

FORTY THREE PERCENT OF REPORTED OFFERS THAT WERE MADE TO WOMEN GRADUATES IN 1984 WERE TO BUSINESS MAJORS, COMPARED WITH 24 PERCENT OF OFFERS MADE TO MEN. SIXTY ONE PERCENT OF THE OFFERS MADE TO MEN AND TWENTY NINE PERCENT OF THOSE MADE TO WOMEN WERE TO GRADUATES IN SOME FIELD OF ENGINEERING OR ENGINEERING TECHNOLOGY. HIGHER PROPORTIONS OF OFFERS IN A FIELD MIGHT INDICATE EITHER THAT LARGE NUMBERS OF JOBS ARE AVAILABLE, OR, BECAUSE THE NUMBER INCLUDES MULTIPLE OFFERS, THAT SEVERAL OFFERS MUST BE MADE IN ORDER TO FILL ONE POSITION.

WHEN COMPARED ALSO WITH THE PROPORTION OF DEGREE AWARDS EARNED IN THESE FIELDS BY EACH SEX IN 1982, IT APPEARS THAT BOTH MEN AND WOMEN HAVE EXCELLENT OPPORTUNITIES RELATIVE TO THEIR PROPORTION OF GRADUATES IN ENGINEERING OR COMPUTER SCIENCE/MATHEMATICS, WHILE THE PROPORTIONS OF GRADUATES AND OFFERS ARE REASONABLY SIMILAR IN THE PHYSICAL SCIENCES. THERE ARE PROPORTIONALLY MORE GRADUATES THAN JOB OFFERS IN THE LIFE SCIENCES, AND THE SOCIAL SCIENCES/HUMANITIES GROUPING INDICATES A FAR HIGHER PROPORTION OF GRADUATES THAN OFFERS. THIS BROAD GROUPING, OF COURSE, MASKS INDIVIDUAL FIELD DIFFERENCES.

Data Source: Appendix Table 11

BEGINNING OFFERS TO BACHELOR'S GRADUATES, 1984



SOURCE: COLLEGE PLACEMENT COUNCIL SALARY SURVEY, JULY 1984

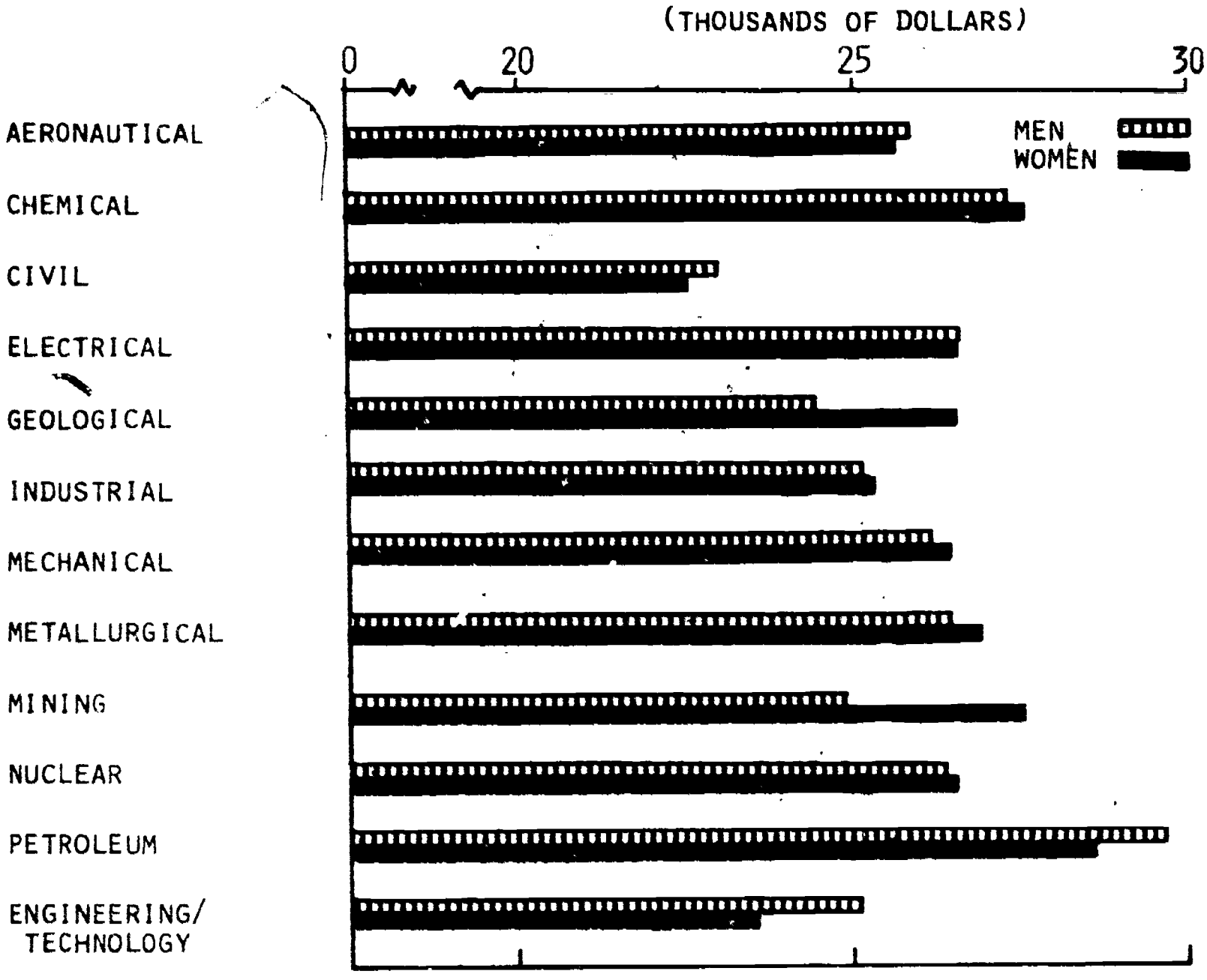
ANOTHER INDICATER OF SUPPLY VS. DEMAND IN ONE FIELD RELATIVE TO ANOTHER IS STARTING SALARY LEVELS. AVERAGE BEGINNING OFFERS TO 1984 GRADUATES AT THE BACHELOR'S LEVEL RANGED FROM $16,824 FOR GRADUATES IN THE BIOLOGICAL SCIENCES TO $26,276 OVERALL FOR GRADUATES IN ENGINEERING OR ENGINEERING TECHNOLOGY.

WOMEN IN HIGHER SALARIED FIELDS SUCH AS ENGINEERING, COMPUTER SCIENCE OR CHEMISTRY ARE OFFERED ABOUT THE SAME STARTING SALARIES AS MEN. HOWEVER, WHERE DEMAND IS LOW RELATIVE TO SUPPLY, AS INDICATED BY STARTING SALARIES IN THE BIOLOGICAL SCIENCES, THE HUMANITIES, AND SOCIAL SCIENCES OTHER THAN ECONOMICS, OFFERS TO WOMEN ARE WELL BELOW OFFERS TO MEN.

AVAILABLE DATA ON MINORITY WOMEN IN REGARD TO SALARIES AND JOB OPPORTUNITIES SHOW THEM TO FALL CONSISTENTLY WITHIN THE SAME PATTERNS OF DISADVANTGAGE AND ADVANTAGE AS MAJORITY WOMEN, WHILE MINORITY MEN ARE BELOW BUT MUCH CLOSER TO THE PATTERNS OF MAJORITY MEN.

Data Source:- Appendix Table 12

AVERAGE ANNUAL SALARY OFFERS TO BACHELOR'S GRADUATES IN ENGINEERING, 1984

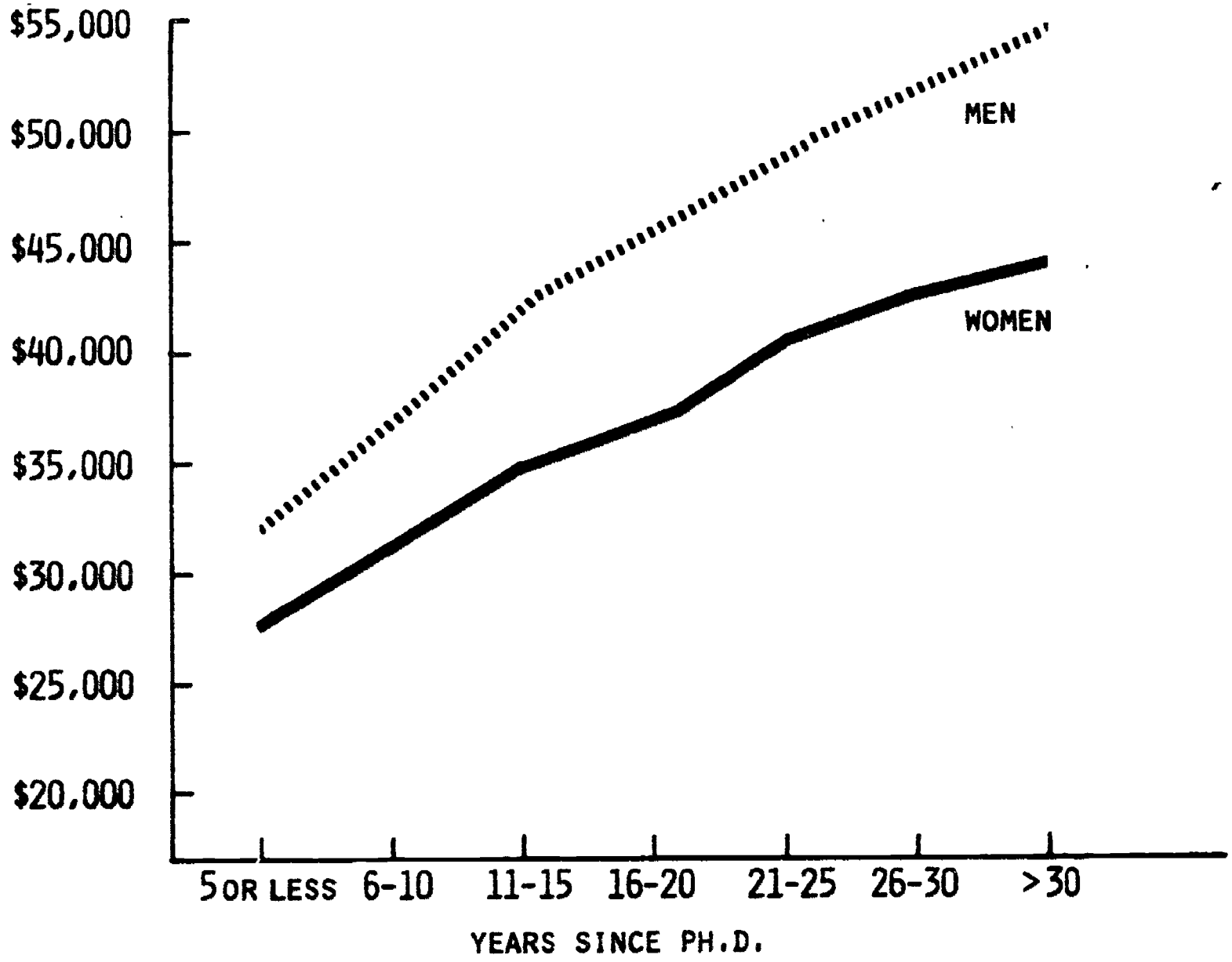


SOURCE: COLLEGE PLACEMENT COUNCIL SALARY SURVEY, JULY 1984

WITHIN THE GENERAL CATEGORY OF ENGINEERING, STARTING SALARIES VARY FROM $22,765 FOR CIVIL ENGINEERING GRADUATES TO $29,570 FOR GRADUATES IN PETROLEUM ENGINEERING, INDICATING SOME PERCEIVED DIFFERENCES IN THE BALANCE BETWEEN SUPPLY OF NEW GRADUATES AND DEMAND FOR THEIR SERVICES. IN THE CASE OF PETROLEUM ENGINEERS, THE VARIANCE ALSO REFLECTS PAST IMBALANCES, WHEN STARTING SALARIES WERE EVEN HIGHER THAN IN 1984. HOWEVER, THE RELATIVE STARTING SALARIES OF MEN AND WOMEN REMAIN CLOSE IN ALL OF THE ENGINEERING SUBFIELDS, WITH OFFERS TO WOMEN SLIGHTLY EXCEEDING THOSE TO MEN IN SEVERAL DISCIPLINES.

Data Source: Appendix Table 12

SALARIES OF FULL-TIME PH.D. SCIENTISTS AND ENGINEERS, 1983

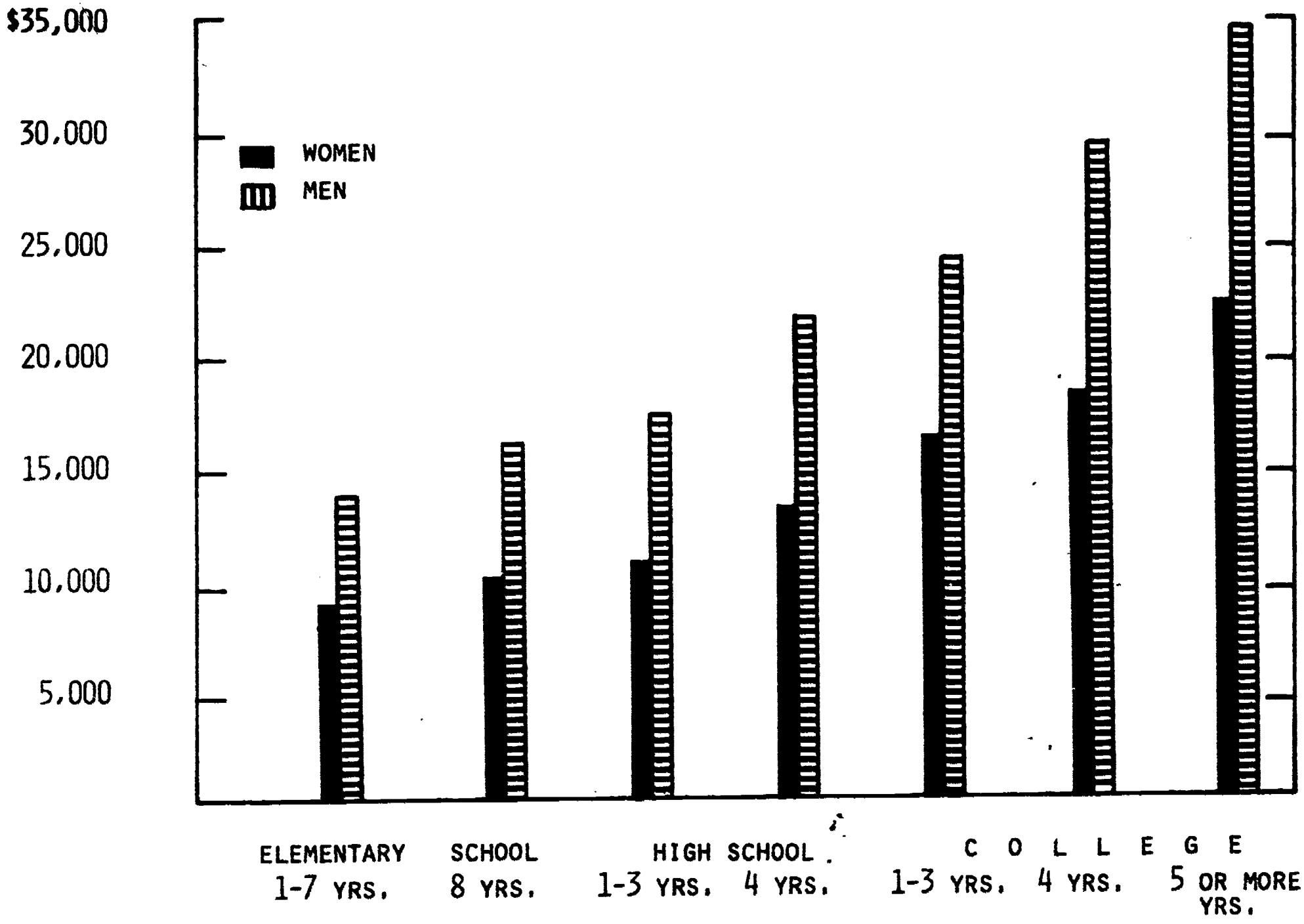


SOURCE: NATIONAL RESEARCH COUNCIL

THE DIFFERENTIAL BETWEEN THE STARTING SALARIES OF MEN AND WOMEN WIDENS WITH AGE, AND IS GREATER AT THE DOCTORAL LEVEL THAN AT THE BACHELOR'S LEVEL. THIS IS TRUE ACROSS ALL FIELDS OF SCIENCE AND ENGINEERING. IT IS ALSO TRUE IN THE HUMANITIES.

Data Source: Appendix Table 13

MEDIAN INCOME OF FULL-TIME, YEAR-ROUND WORKERS,* 1983



* AGE 25 OR OLDER

SOURCE: BUREAU OF THE CENSUS

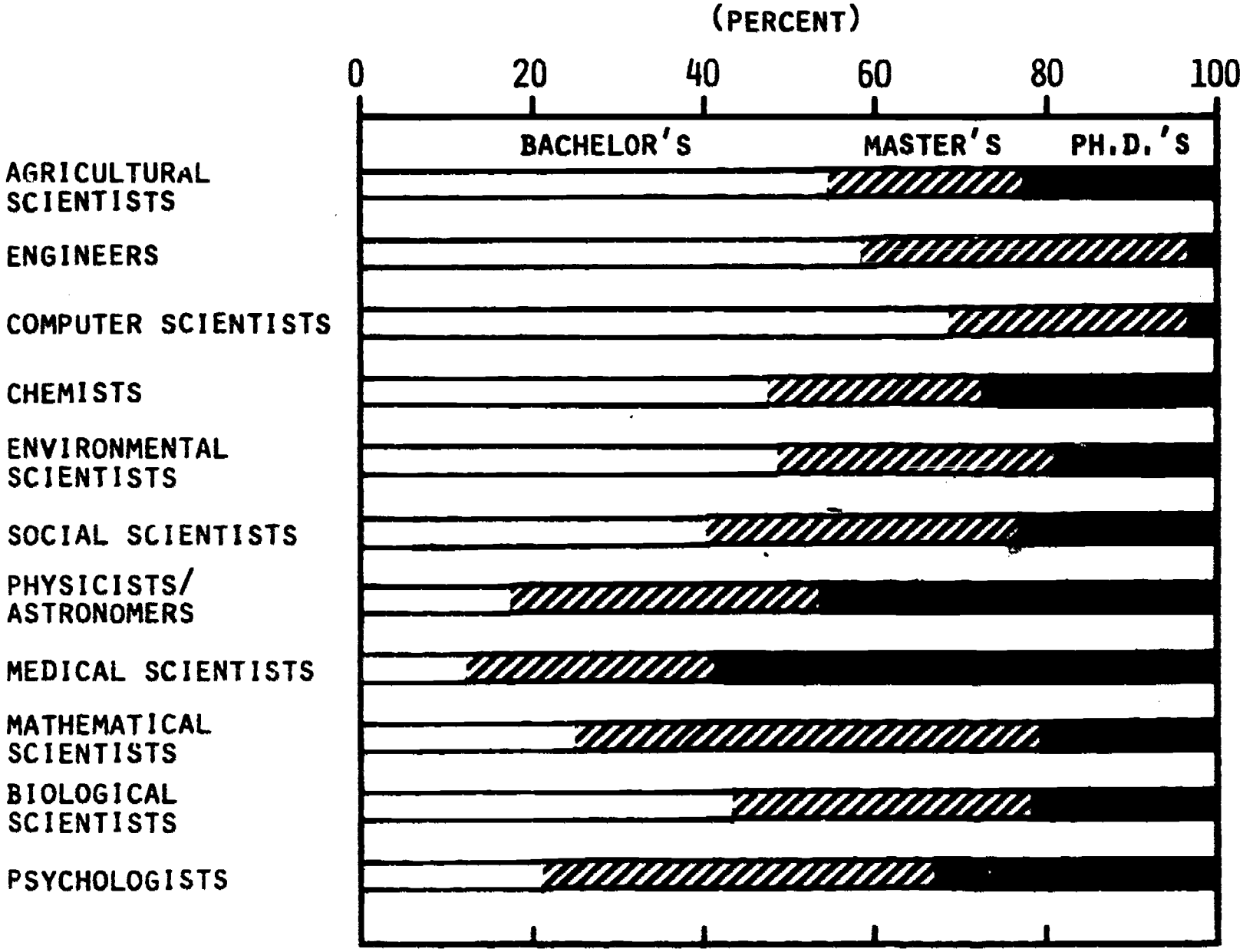
HOWEVER, THE SALARY DIFFERENTIAL IS FAR MORE PRONOUNCED OUTSIDE OF SCIENCE AND ENGINEERING, REGARDLESS OF FIELD OR EDUCATIONAL LEVEL.

AMONG ALL FULL TIME YEAR-ROUND WORKERS, WOMEN STILL EARN ONLY 61 CENTS FOR EVERY DOLLAR EARNED BY MEN. HIGHER LEVELS OF EDUCATION INCREASE SALARY FOR BOTH SEXES, BUT EVEN IN 1983 WOMEN WITH FIVE OR MORE YEARS OF COLLEGE CONTINUE TO EARN ABOUT THE SAME AMOUNT AS MEN WHO ARE JUST HIGH SCHOOL GRADUATES.

MUCH OF THIS DIFFERENTIAL RESULTS FROM THE FACT THAT OCCUPATIONS TRADITIONALLY DOMINATED BY WOMEN ARE LOW-PAYING OCCUPATIONS. SEVERAL STATES HAVE PASSED OR ARE CONSIDERING LEGISLATION TO REQUIRE EQUAL PAY FOR WORK OF EQUAL VALUE AND RESPONSIBILITY. SUCH LAWS WILL TEND TO LESSEN THE EARNINGS GAP BETWEEN THE SEXES. THAT GAP ALSO WILL LESSEN AS MORE WOMEN MOVE INTO HIGHER PAYING FIELDS AND ACTIVITIES, WHERE THEIR PARTICIPATION HAS BEEN LOW OR NON-EXISTENT. ALTHOUGH THERE ARE STILL SOME BARRIERS TO EQUALITY FOR WOMEN IN SCIENCE, OPPORTUNITIES THERE ARE MUCH BETTER THAN IN MANY OTHER FIELDS.

Data Source: Appendix Table 14

HIGHEST DEGREE LEVEL OF SCIENTISTS AND ENGINEERS IN 1982



SOURCE: NATIONAL SCIENCE FOUNDATION

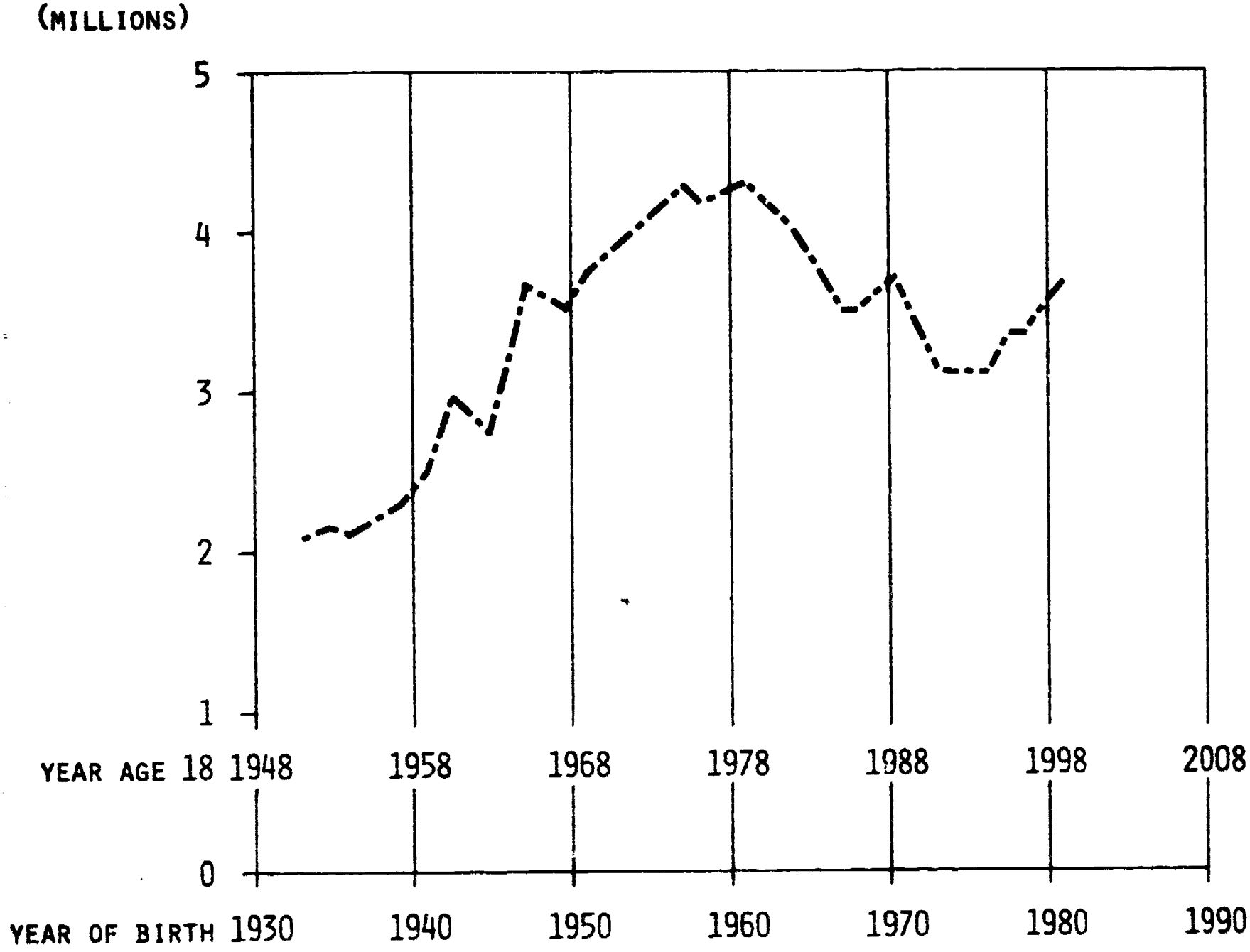
SALARIES AND UNEMPLOYMENT RATES DIFFER FROM ONE FIELD TO ANOTHER. THE EDUCATIONAL REQUIREMENTS FOR PROFESSIONAL ENTRY ALSO ARE DIFFERENT, SO THAT INDIVIDUALS SEEKING CAREERS IN SOME FIELDS NEED TO PLAN ON A LONGER PERIOD OF FORMAL TRAINING THAN WILL BE TRUE IN OTHERS.

IN GENERAL, COMPUTER SCIENTISTS, ENGINEERS AND AGRICULTURAL SCIENTISTS ENTER PROFESSIONAL EMPLOYMENT AT THE END OF A BACHELOR'S DEGREE, AND MORE THAN HALF THE PROFESSIONALS IN THESE FIELDS IN 1982 HAD NO GRADUATE DEGREES. SOME CHEMISTS AND GEOLOGISTS ALSO ENTER THE WORK FORCE AT THAT LEVEL, BUT A MASTER'S DEGREE IS THE PREFERRED ENTRY LEVEL FOR THESE FIELDS BY MOST INDUSTRIAL EMPLOYERS. AT THE OTHER END OF THE SCALE, MEDICAL SCIENTISTS, PHYSICISTS AND PSYCHOLOGISTS NEED AT LEAST A MASTER'S AND PREFERABLY A DOCTORAL DEGREE.

ALTHOUGH THE 1982 LABOR FORCE INCLUDES MANY INDIVIDUALS WITH ONLY A BACHELOR'S DEGREE, RISING REQUIREMENTS FOR HIGHER EDUCATIONAL LEVELS PLUS AN ADEQUATE SUPPLY OF PERSONS WITH GRADUATE DEGREES SEEKING TO ENTER THE LABOR FORCE DURING THE 1980S WILL RAISE THE GENERAL EDUCATIONAL LEVEL OF THESE PROFESSIONALS BY 1995.

Data Source: Appendix Table 15

BIRTHS IN THE UNITED STATES



SOURCE: NATIONAL CENTER FOR HEALTH STATISTICS

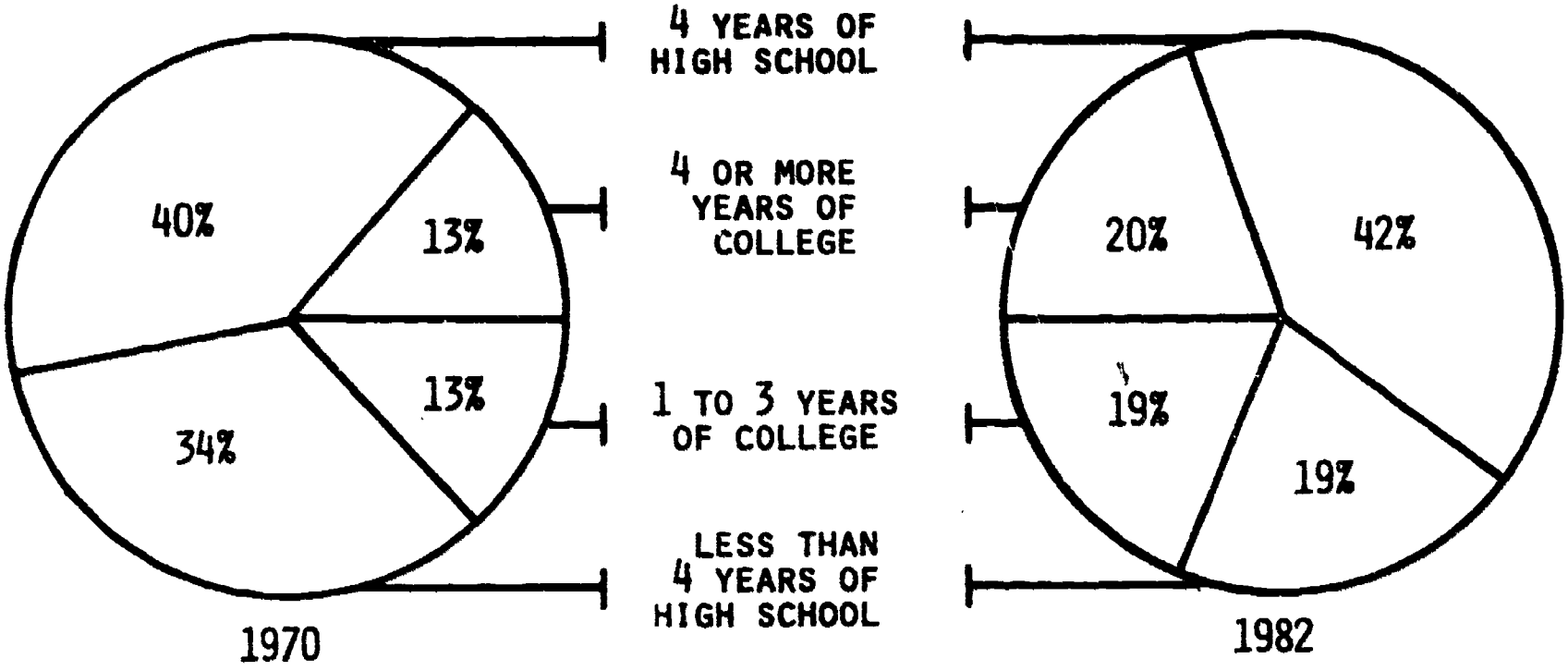
OTHER THINGS ALSO WILL CHANGE OVER THE NEXT DECADE. THE NUMBER OF 18-YEAR-OLDS WILL DECLINE 26 PERCENT BY 1992 FROM THE 1979 PEAK, BEFORE STARTING UP AGAIN, AND THE NUMBER OF COLLEGE GRADUATES ALSO WILL DECLINE THROUGH THE REST OF THE CENTURY IF THERE IS NO SIGNIFICANT CHANGE IN THE PROPORTION OF STUDENTS ENTERING AND COMPLETING COLLEGE AFTER HIGH SCHOOL; AND IF THE PROPORTION OF OLDER STUDENTS IN COLLEGE CONTINUES TO LEVEL OFF.

IN EITHER CASE, IF AVAILABLE JOBS CONTINUE TO INCREASE AT ABOUT THE SAME RATE AS ADDITIONAL GRADUATES ARE PREPARED TO SEEK THEM, SOME FIELDS WILL REMAIN HIGHLY COMPETITIVE, WHILE OTHERS WILL EXPERIENCE A SHORTAGE OF WORKERS.

Data Source: Appendix Table 16

EDUCATIONAL LEVEL OF THE LABOR FORCE

PERCENT DISTRIBUTION OF LABOR FORCE AGE 18 TO 64



SOURCE: BUREAU OF LABOR STATISTICS

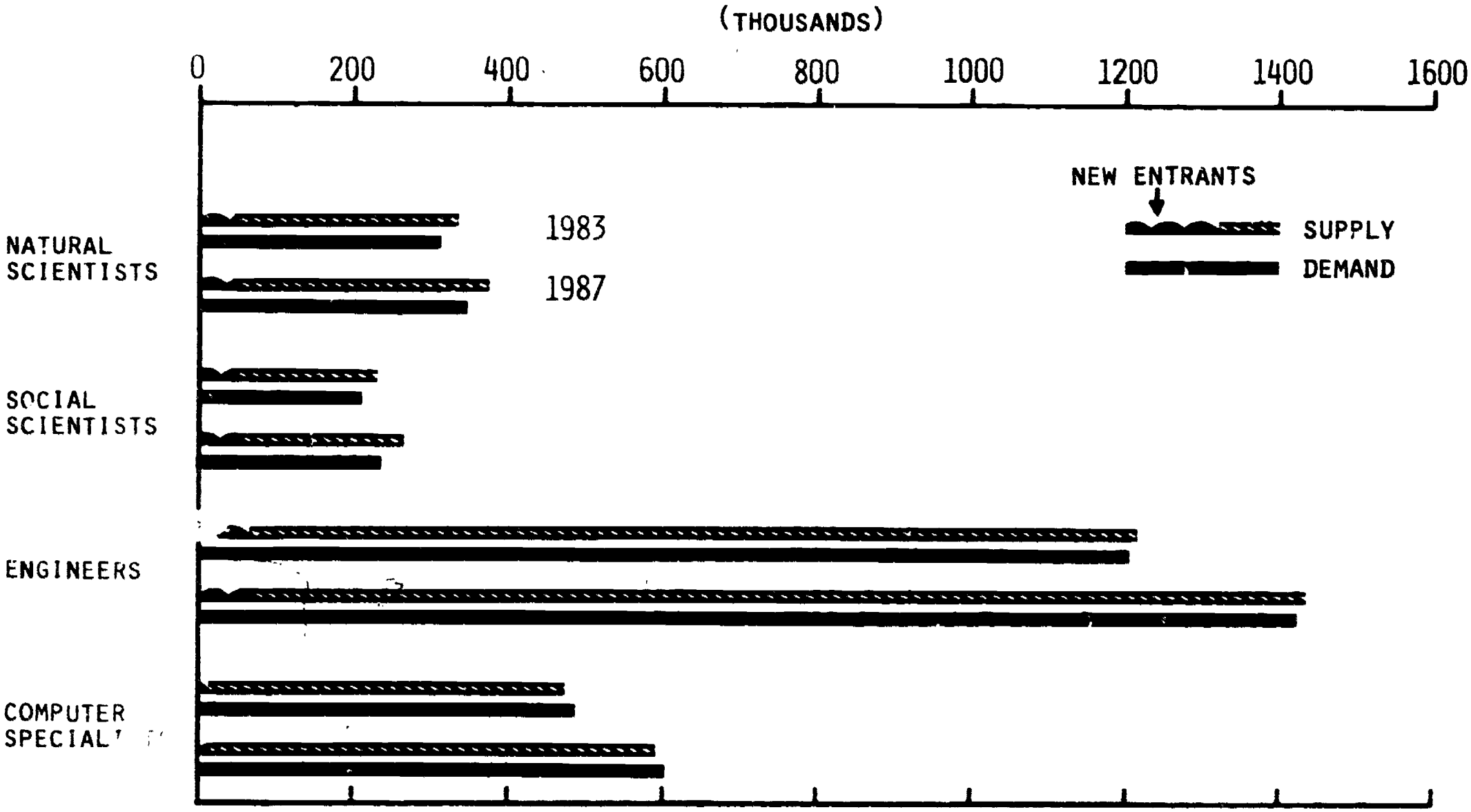
HOW WELL WILL THE SMALLER PROJECTED SUPPLY OF NEW GRADUATES MATCH WITH PROJECTED JOB OPPORTUNITIES FOR THEM?

NOBODY CAN BE SURE, OF COURSE, ABOUT THE FUTURE, BUT A NUMBER OF FORECASTS HAVE BEEN MADE BY GOVERNMENT AGENCIES AND OTHERS WHICH INDICATE THAT THERE WILL BE NO SHORTAGE OF COLLEGE EDUCATED WORKERS IN GENERAL.

BETWEEN 1970 AND 1982, EMPLOYMENT OF COLLEGE GRADUATES MORE THAN DOUBLED, AND THE PROPORTION OF WORKERS WITH COLLEGE BACKGROUNDS INCREASED FROM 26% TO 39% OF ALL WORKERS. BUT THE PROPORTION OF COLLEGE GRADUATES EMPLOYED IN PROFESSIONAL, TECHNICAL AND MANAGERIAL OCCUPATIONS DECLINED BECAUSE THESE OCCUPATIONS DID NOT EXPAND RAPIDLY ENOUGH TO ABSORB THE GROWING SUPPLY OF NEW GRADUATES. CONSEQUENTLY, ONE OF EVERY FIVE GRADUATES WHO ENTERED THE LABOR MARKET BETWEEN 1970 AND 1982 TOOK JOBS NOT USUALLY REQUIRING A DEGREE. THIS OVERSUPPLY OF GRADUATES IS LIKELY TO CONTINUE THROUGH 1995.

Data Source: Bureau of Labor Statistics: Occupational Projections and Training Data, 1984 Edition, Bulletin 2206, May 1984

SUPPLY AND DEMAND FOR SCIENTISTS AND ENGINEERS, 1983 AND 1987



SOURCE: NATIONAL SCIENCE FOUNDATION

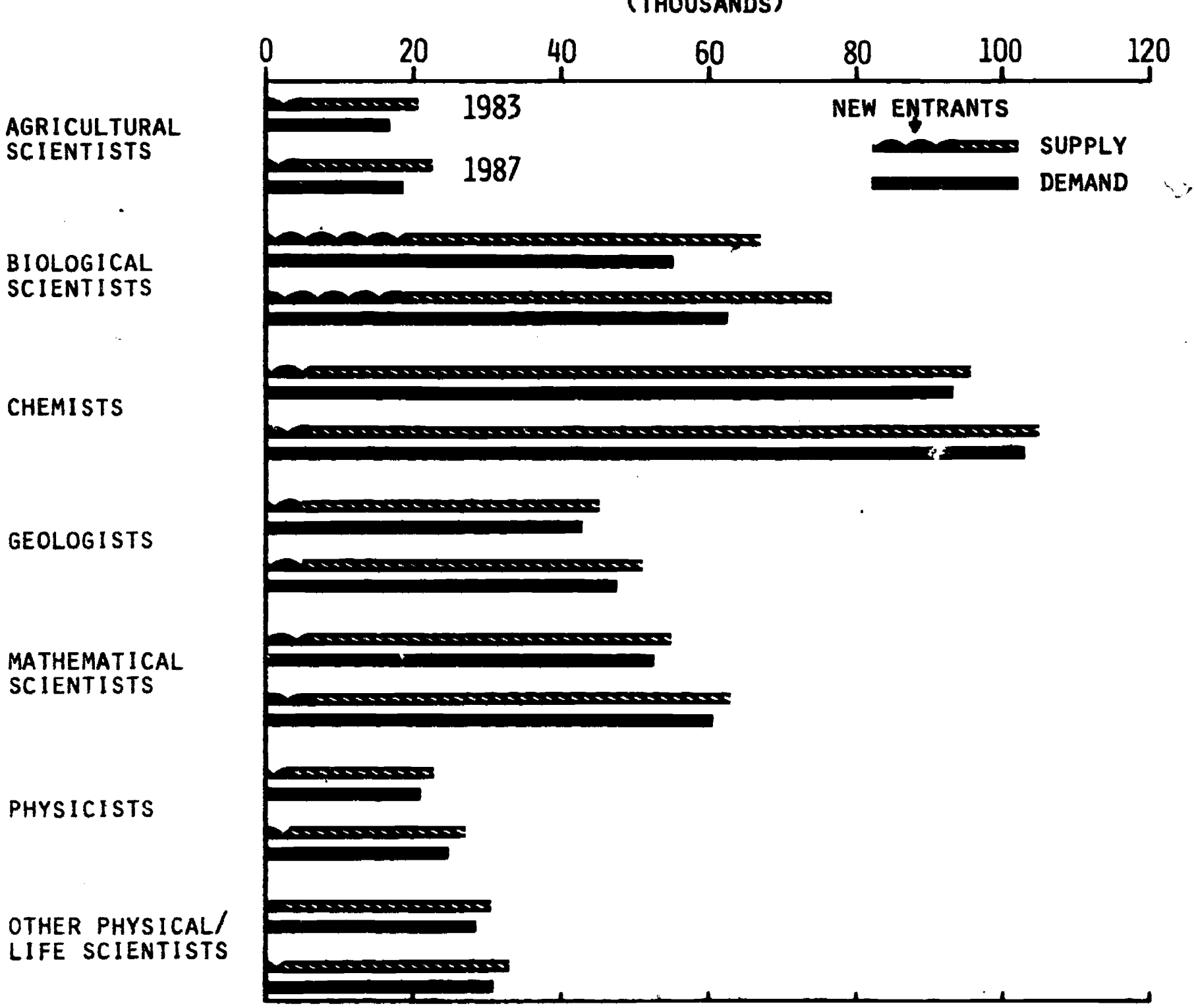
HOWEVER, THE EXCESS GRADUATES ARE NOT EVENLY DISTRIBUTED ACROSS ALL FIELDS. IN SOME SCIENCE AND IN ENGINEERING AREAS, GRADUATES ARE EXPECTED TO BE IN APPROXIMATE BALANCE WITH THE JOB OPENINGS AVAILABLE. IN OTHERS, TOO FEW GRADUATES ARE EXPECTED TO MEET NEEDS; WHILE IN STILL OTHERS, AN OVERSUPPLY OF GRADUATES IS ANTICIPATED.

THE NATIONAL SCIENCE FOUNDATION HAS PROVIDED A COMPARISON OF SUPPLY AND DEMAND IN SCIENCE AND ENGINEERING IN 1983 AND AGAIN IN 1987, BASED ON FOUR DIFFERENT SCENARIOS WHICH ASSUME HIGH OR LOW DEFENSE EXPENDITURES, AND HIGH OR LOW ECONOMIC GROWTH. THIS CHART ASSUMES OPTIMISTIC ECONOMIC GROWTH AND CONTINUED STRONG EMPHASIS ON DEFENSE. LIKE THE OTHER PROJECTIONS, THIS ONE INDICATES A SHORTAGE OF COMPUTER SPECIALISTS AND A SLIGHT SURPLUS OF NATURAL SCIENTISTS, SOCIAL SCIENTISTS AND ENGINEERS.

IT IS IMPORTANT TO NOTE THAT IN THESE PROJECTIONS, NEITHER THE JOB OPENINGS NOR THE NUMBER OF EXPECTED GRADUATES IS DIFFERENTIATED BY DEGREE LEVEL. AS HAS BEEN NOTED, SOME FIELDS REQUIRE HIGHER DEGREES FOR PROFESSIONAL ENTRY THAN DO OTHERS, SO THAT MANY GRADUATES WITH ONLY A BACHELOR'S DEGREE WILL NOT ENTER THESE FIELDS. FURTHER, NOT ALL NEW OPENINGS WILL BE FILLED BY NEW GRADUATES. JOB MOBILITY ACROSS FIELDS OCCURS ALL THE TIME AS INDIVIDUALS ARE PULLED OUT OF ONE SPECIALTY AND INTO ANOTHER BY CHANGING INTERESTS OR GOOD EMPLOYMENT OPPORTUNITIES; OR ARE PUSHED OUT BY LACK OF OPPORTUNITIES.

Data Source: Appendix Table 17

SUPPLY AND DEMAND FOR NATURAL SCIENTISTS, 1983 AND 1987



SOURCE: NATIONAL SCIENCE FOUNDATION

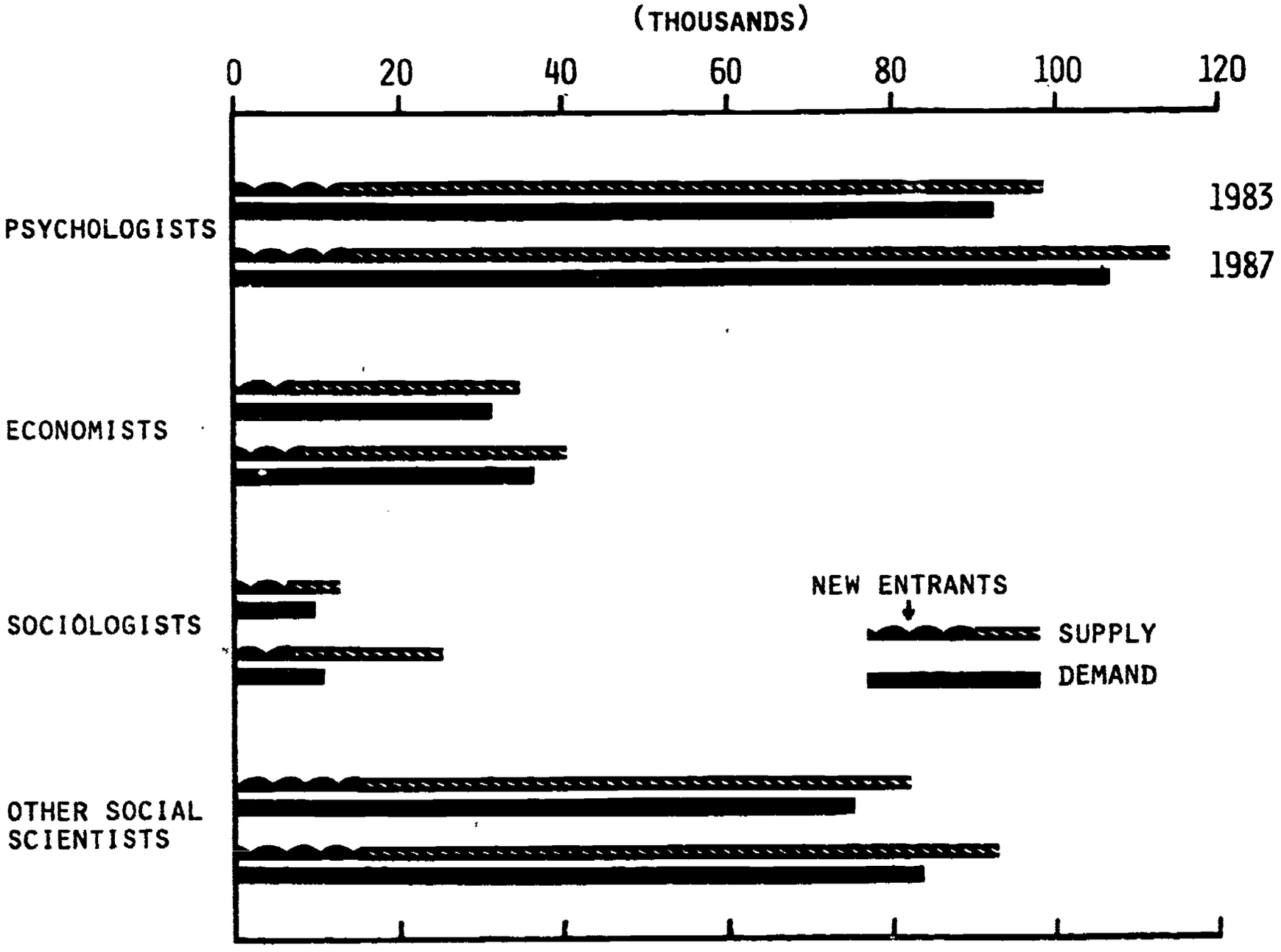
GROUPING INTO LARGER FIELDS MASKS MUCH OF THE DETAIL THAT IS NEEDED TO EXAMINE NEAR-RANGE CAREER OPPORTUNITIES MORE CAREFULLY IN LIGHT OF THESE TWO SNAPSHOTS IN TIME. FOR EXAMPLE, WE SEE CONSIDERABLE DIFFERENCE BETWEEN THE LIFE AND PHYSICAL SCIENCES.

THE COMBINED AGRICULTURAL AND BIOLOGICAL SCIENCES SHOW A SUPPLY SURPLUS OF ABOUT 14,000 PERSONS IN 1983, GROWING TO 17,600 OR 18% OF THAT 98,500 LABOR FORCE IN 1987.

IN THE PHYSICAL SCIENCES, SUPPLY AND DEMAND FOR CHEMISTS ARE APPROXIMATELY IN BALANCE IN BOTH YEARS. THESE PROJECTIONS INDICATE SMALL SURPLUSES OF MATHEMATICAL SCIENTISTS (ABOUT FOUR PERCENT OF THE LABOR FORCE IN BOTH YEARS), GEOLOGISTS (SEVEN PERCENT) AND PHYSICISTS (EIGHT PERCENT). ALL PHYSICAL SCIENCE AND MATH FIELDS TOGETHER SHOW A SURPLUS OF ONLY 9,000 PERSONS IN 1983 OR FOUR PERCENT OF THE TOTAL 220,000 LABOR FORCE IN THOSE FIELDS. IN 1987, THE SURPLUS IS 10,300, STILL ONLY FOUR PERCENT OF THE WORK FORCE.

Data Source: Appendix Table 17

SUPPLY AND DEMAND FOR SOCIAL AND BEHAVIORAL SCIENTISTS, 1983 AND 1987



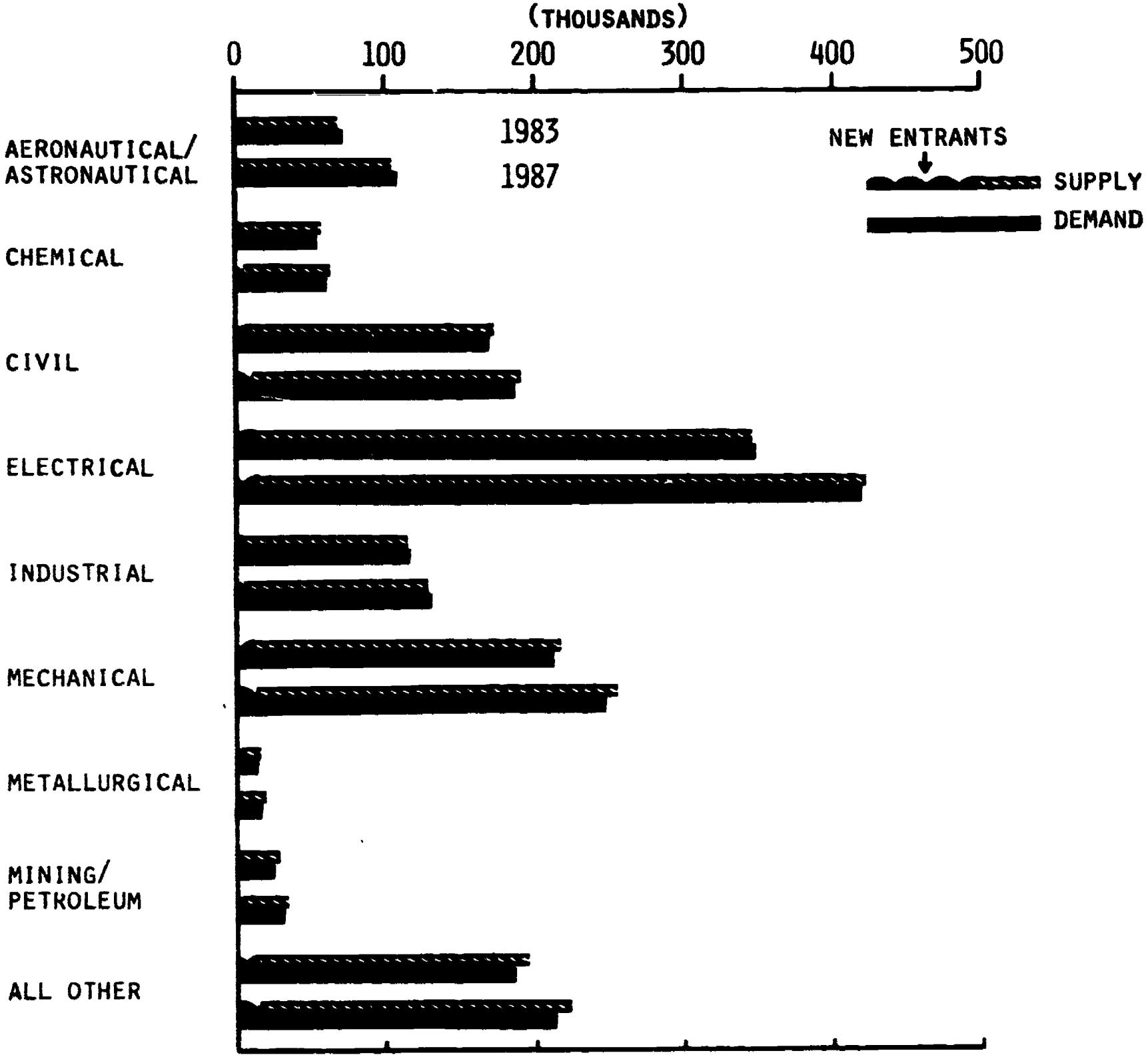
SOURCE: NATIONAL SCIENCE FOUNDATION

IN THE SOCIAL AND BEHAVIORAL SCIENCES, THE SURPLUSES ARE LARGER IN BOTH YEARS - 18,600 IN 1983, RISING TO 25,300 OR ALMOST TEN PERCENT OF THE LABOR FORCE IN 1987.

PSYCHOLOGISTS ARE ONLY ABOUT SIX PERCENT OVER DEMAND LEVELS, BUT ONE FOURTH OF SOCIOLOGISTS ARE IN THE SURPLUS CATEGORY IN 1983, RISING TO ONE THIRD OF THE TOTAL BY 1987. SINCE THESE DATA ARE BASED ON A SUPPLY MODEL WHICH ALREADY HAS TAKEN INTO ACCOUNT THE NET OUTWARD MOBILITY OF MANY WHO HAVE TRAINING IN THESE FIELDS, SUBSTANTIAL SURPLUSES SEEM APPARENT.

Data Source: Appendix Table 17

SUPPLY AND DEMAND FOR ENGINEERS, 1983 AND 1987



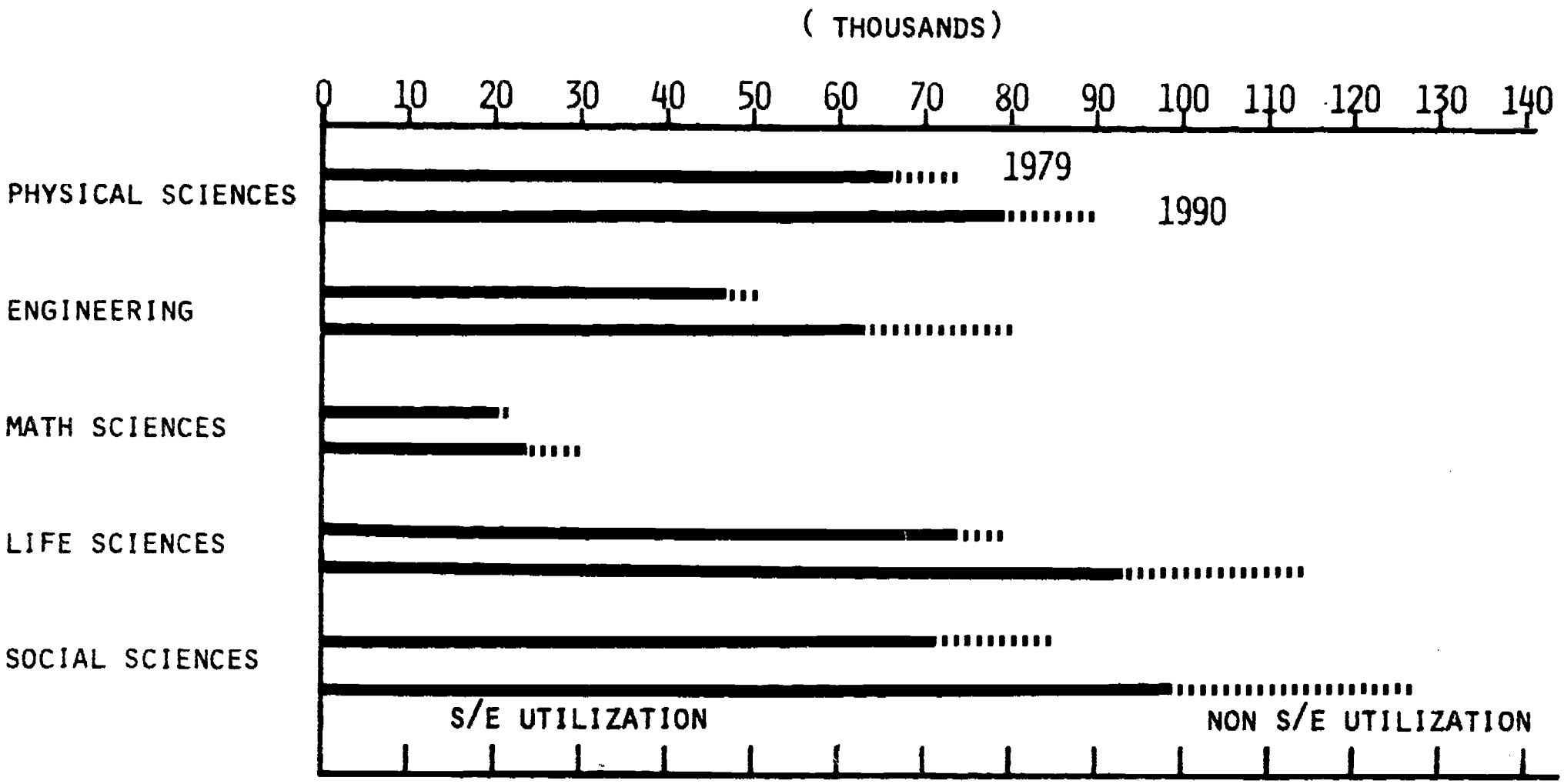
SOURCE: NATIONAL SCIENCE FOUNDATION

ENGINEERING SHOWS BOTH SMALL SURPLUSES AND SOME SHORTAGES IN VARIOUS ENGINEERING DISCIPLINES. BY 1987, THESE PROJECTIONS INDICATE A FOUR PERCENT SHORTAGE OF AERONAUTICAL ENGINEERS, AND A SLIGHT SHORTAGE OF INDUSTRIAL ENGINEERS, BUT THE SHORTAGE OF ELECTRICAL/ELECTRONIC ENGINEERS STILL PRESENT IN 1983 WILL HAVE DISAPPEARED AS THAT FIELD MOVES INTO BALANCE.

FOR CHEMICAL AND PETROLEUM ENGINEERS, WHO WERE IN SHORT SUPPLY THROUGH 1981, THE PROJECTIONS INDICATE SMALL SURPLUSES BY 1987. OF COURSE, A NEW OIL CRISIS COULD TURN THIS PROJECTION AROUND, INCREASING DEMAND FOR THESE SPECIALTIES BEYOND THE EXPECTED SUPPLY.

Data Source: Appendix Table 17

S/E UTILIZATION OF DOCTORAL LABOR FORCE IN 1979 AND 1990



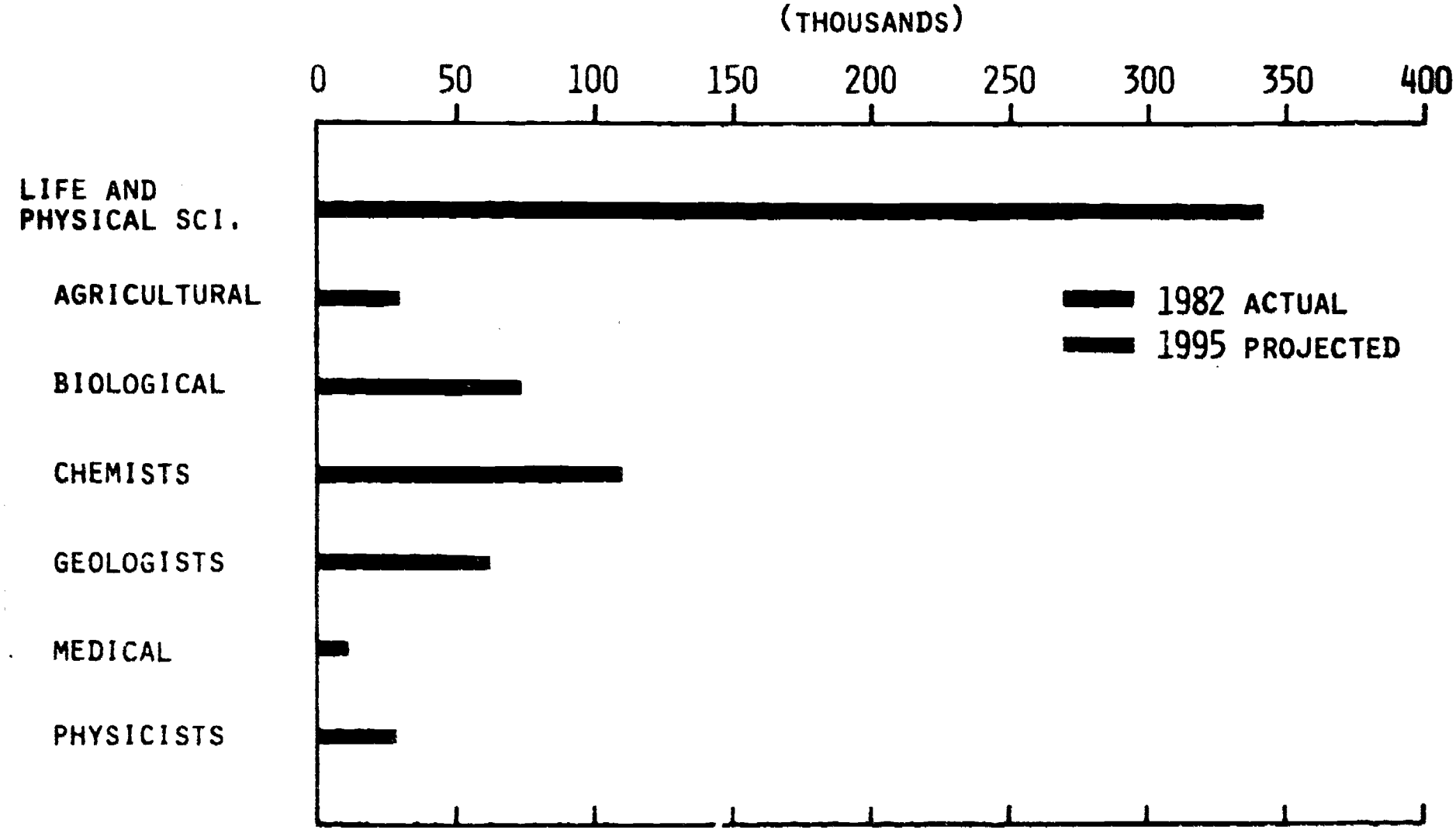
SOURCE: NATIONAL SCIENCE FOUNDATION

ANOTHER STUDY PREPARED BY THE NATIONAL SCIENCE FOUNDATION AND THE DEPARTMENT OF EDUCATION COMPARED PROJECTED JOB OPENINGS FOR GRADUATES WITH EXPECTED DEGREES FOR THE TOTAL PERIOD 1978 TO 1990. THESE PROJECTIONS DO NOT INDICATE A SHORTAGE OF GRADUATES AT ANY DEGREE LEVEL EXCEPT FOR B.S. INDUSTRIAL ENGINEERS.

AT THE DOCTORAL LEVEL, THE STUDY ESTIMATED THAT BY 1990, SOME 80,000 PH.D.'S OR 18% OF ALL DOCTORAL SCIENTISTS AND ENGINEERS, WILL BE UTILIZED OUTSIDE OF SCIENCE AND ENGINEERING. THE GROUP WHICH CANNOT BE UTILIZED IN SCIENCE AND ENGINEERING WILL INCLUDE 26,000 SOCIAL SCIENTISTS, 20,000 LIFE SCIENTISTS, 17,000 ENGINEERS, 10,000 PHYSICAL SCIENTISTS AND 7,000 MATHEMATICAL SCIENTISTS. THESE NUMBERS COMPARE WITH 28,000 DOCTORAL SCIENTISTS AND ENGINEERS (9% OF THE TOTAL) WHO WERE UTILIZED OUTSIDE OF SCIENCE AND ENGINEERING IN 1979 .

Data Source: Appendix Tables 18 and 19

EMPLOYMENT IN LIFE AND PHYSICAL SCIENCE OCCUPATIONS, 1982 AND 1995



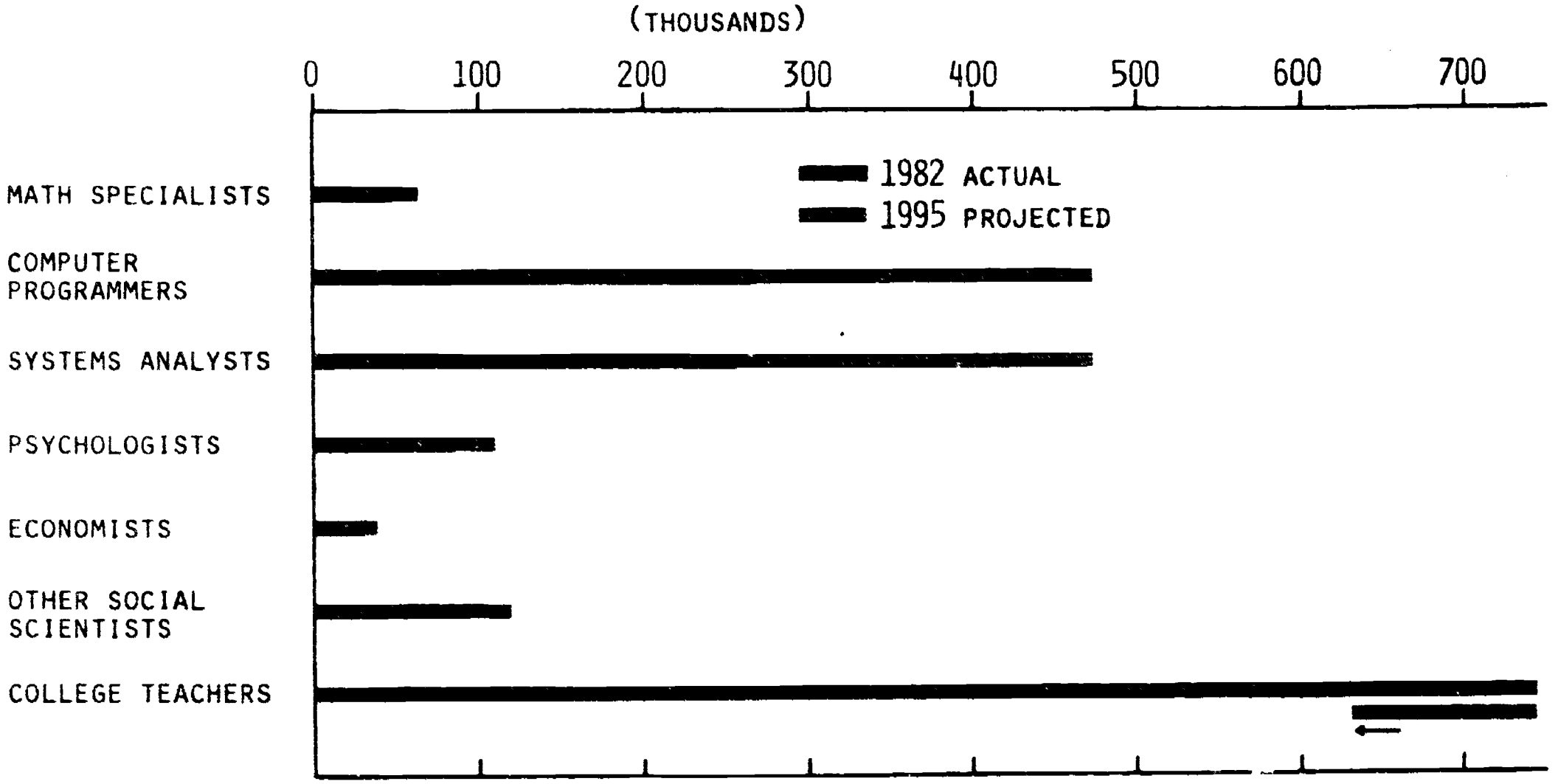
SOURCE: BUREAU OF LABOR STATISTICS

ANOTHER STUDY BY THE BUREAU OF LABOR STATISTICS PROJECTS A 30% TO 35% INCREASE IN THE EMPLOYMENT OF PROFESSIONAL, TECHNICAL AND RELATED WORKERS BETWEEN 1982 AND 1995, DEPENDING ON ECONOMIC AND PRODUCTIVITY INCREASES. TOTAL EMPLOYMENT INCREASES FOR ALL OCCUPATIONS DURING THAT PERIOD ARE ONLY 23% TO 28%, INDICATING THAT GROWTH WILL BE MORE RAPID IN THE [illegible]OFESSIONAL AND TECHNICAL AREAS THAN IN MANY OTHER OCCUPATI[illegible]

THE EMPLOYMENT OF LIFE AND PHYSICAL SCIENTISTS WILL GROW ABOUT 26% IN THOSE 13 YEARS, BUT THE NUMBER OF AGRICULTURAL SCIENTISTS EMPLOYED WILL INCREASE ONLY 18% COMPARED WITH A 36% INCREASE ANTICIPATED FOR THE BIOLOGICAL SCIENCES, 37% FOR PHYSICISTS, AND A MORE MODERATE 22% - 24% FOR CHEMISTS AND GEOLOGISTS. ALTHOUGH A 32% INCREASE IS ANTICIPATED FOR MEDICAL SCIENTISTS, THE SMALLER BASE MEANS AN INCREASE OF ONLY ABOUT 3,300 MEDICAL RESEARCHERS DURING THOSE YEARS.

Data Source: Appendix Table 20

EMPLOYMENT IN SELECTED OCCUPATIONS, 1982 AND 1995



SOURCE: BUREAU OF LABOR STATISTICS

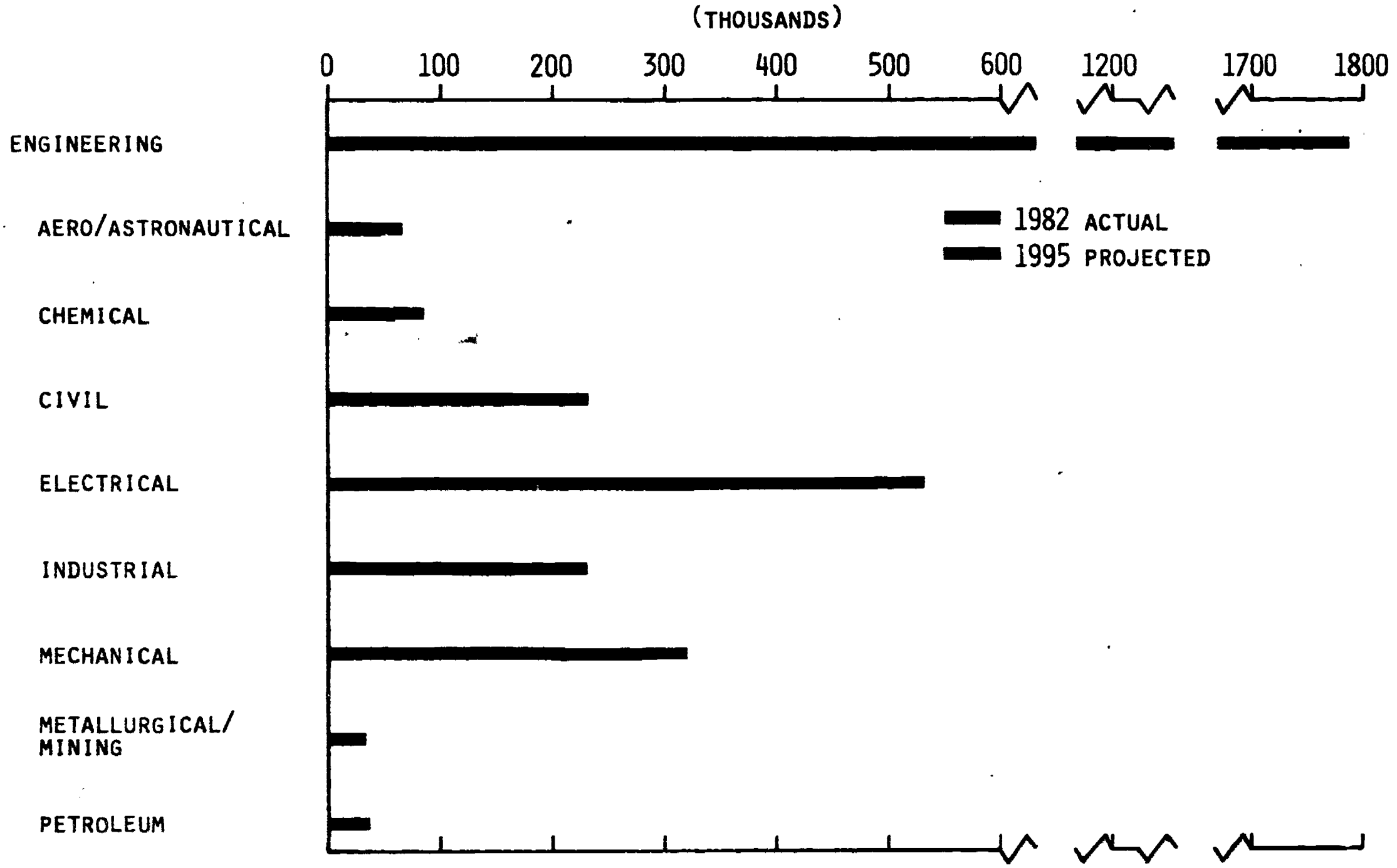
GROWTH IN THE NUMBER OF MATHEMATICAL SPECIALISTS (MATHEMATICIANS, ACTUARIES AND STATISTICIANS) IS PROJECTED AT 14,700, OR ABOUT 29% WHILE THE NUMBER OF COMPUTER PROGRAMMERS IS EXPECTED TO RISE 77%, FROM 266,000 IN 1982 TO 465,000 IN 1995. EMPLOYMENT OF SYSTEMS ANALYSTS WILL INCREASE ABOUT 85%, RISING FROM A SIMILAR 1982 BASE.

AMONG SOCIAL SCIENTISTS, TOTAL GROWTH WILL BE ABOUT 30%, WITH EMPLOYMENT OF PSYCHOLOGISTS RISING 33% COMPARED WITH A 25% INCREASE IN EMPLOYMENT OF SOCIOLOGISTS, AND 27% FOR ECONOMISTS. THE TOTAL EMPLOYMENT INCREASE FOR SOCIAL AND BEHAVIORAL SCIENCES IS ONLY 61,000, AVERAGING 4,700 PER YEAR. SINCE DEGREE PRODUCTION AT THE DOCTORATE LEVEL HAS BEEN AVERAGING 6,000 PER YEAR, THERE WOULD APPEAR TO BE FEW PROFESSIONAL OPPORTUNITIES IN THESE AREAS FOR THOSE AT LOWER DEGREE LEVELS.

THE NUMBER OF COLLEGE TEACHERS WILL FALL 15%, FOR A DROP OF 111,500 TEACHERS IN 15 YEARS. THE NUMBER OF OPENINGS FOR NEW FACULTY WILL GENERALLY BE RESTRICTED TO REPLACEMENTS FOR PRESENT FACULTY MEMBERS WHO DIE, RETIRE, OR TRANSFER OUT OF TEACHING.

Data Source: Appendix Table 20

EMPLOYMENT IN ENGINEERING OCCUPATIONS, 1982 AND 1995



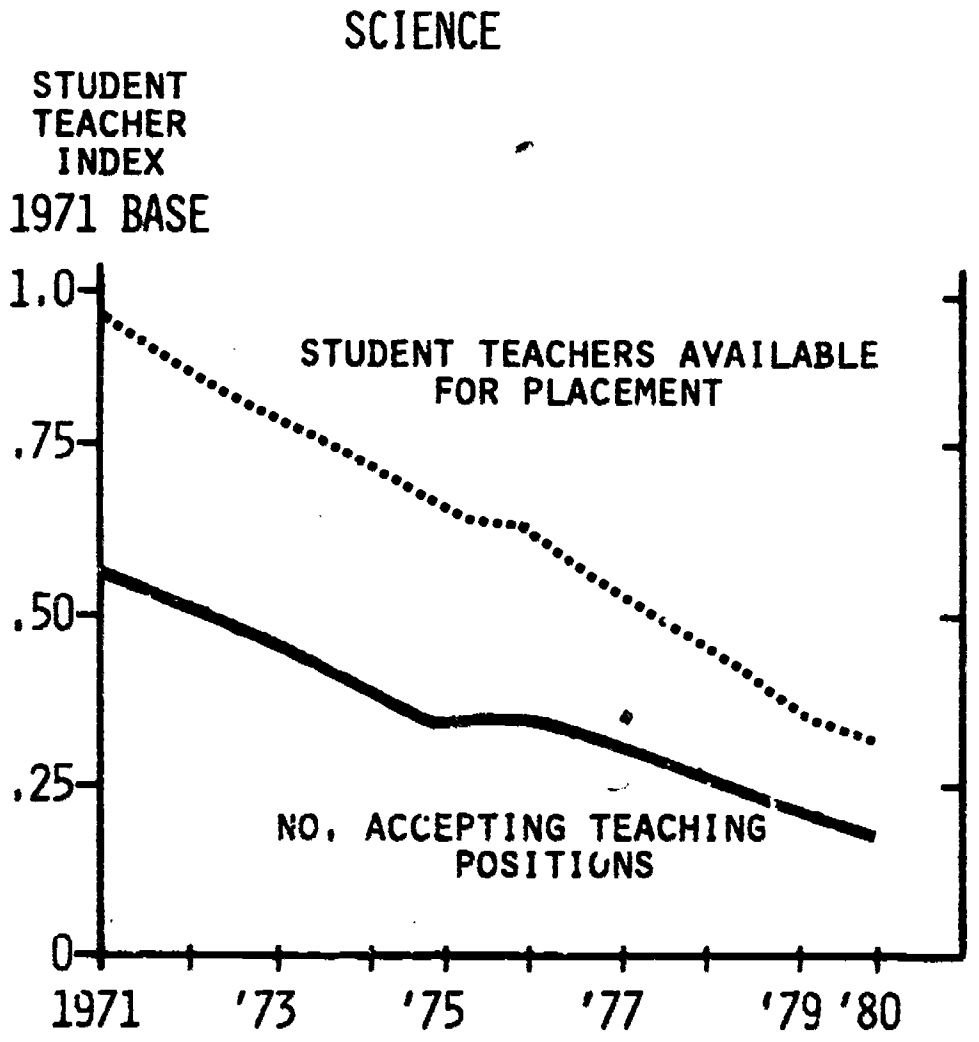
SOURCE: BUREAU OF LABOR STATISTICS

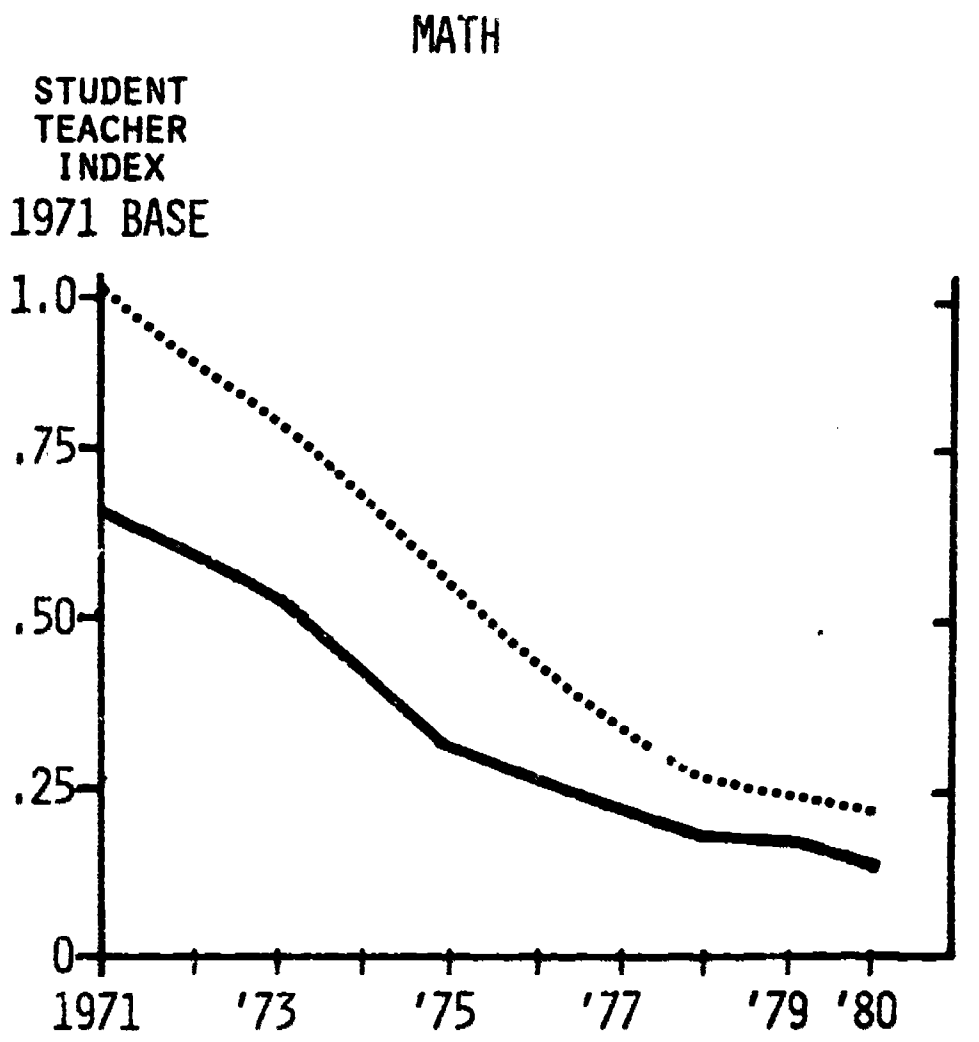
ENGINEERING EMPLOYMENT IS EXPECTED TO INCREASE BY ALMOST 584,000 PERSONS, OR 45,000 PER YEAR, FOR AN OVERALL GROWTH OF 48.5%. WITH THE ADDITIONAL JOB OPPORTUNITIES PROVIDED BY RETIREMENT, DEATH AND TRANSFER OUT OF ENGINEERING, EMPLOYMENT OPPORTUNITIES AND GRADUATES SHOULD BE ABOUT IN BALANCE. IN 1983, 72,500 BACHELOR'S DEGREES WERE AWARDED IN ENGINEERING FIELDS.

HOWEVER, ANTICIPATED EMPLOYMENT INCREASES IN SOME ENGINEERING FIELDS ARE FAR LARGER THAN IN OTHERS. THE GROWTH IN ELECTRICAL/ELECTRONIC ENGINEERING IS 65.3% OVER THIS PERIOD, AVERAGING 7,700 NEW JOBS EACH YEAR. EMPLOYMENT OF PETROLEUM ENGINEERS IS EXPECTED TO INCREASE ONLY 22% DURING THIS PERIOD, OR A MERE 400 PER YEAR.

Data Source: Appendix Table 20

STUDENT TEACHER SUPPLY INDEX





SOURCE: NATIONAL SCIENCE TEACHERS ASSOCIATION 1982

ONE AREA IN SERIOUS NEED OF MORE GRADUATES IS SCIENCE OR MATHEMATICS TEACHING AT THE ELEMENTARY AND SECONDARY LEVELS.

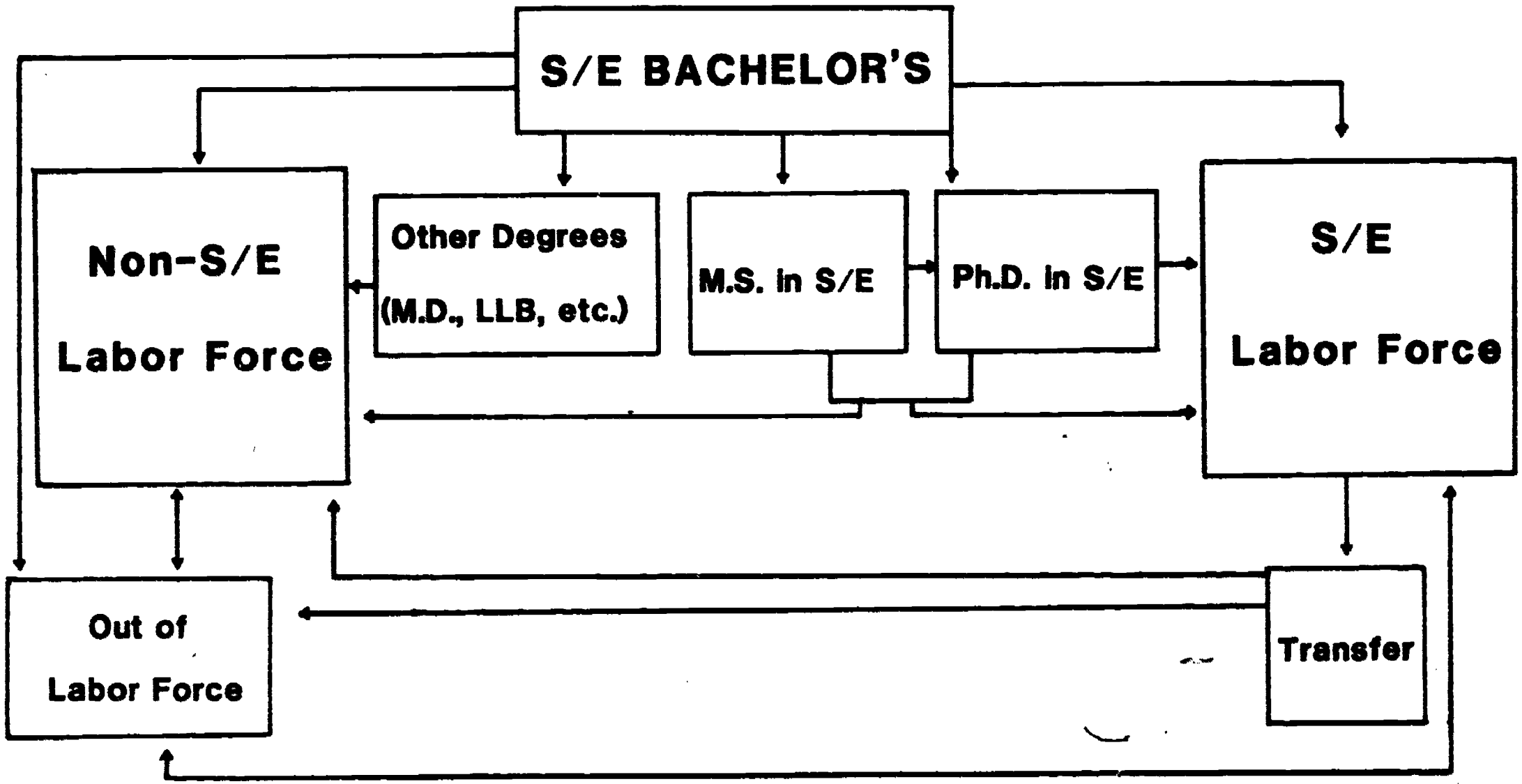
SINCE 1971, THERE HAS BEEN A 77% DECLINE IN THE NUMBER OF MATH TEACHERS AND A 65% DECLINE IN THE NUMBER OF SCIENCE TEACHERS PREPARED TO TEACH IN SECONDARY SCHOOLS. THE FRACTION OF THOSE TEACHERS WHO ACTUALLY ENTER TEACHING ALSO HAS DROPPED, SO THAT THE TOTAL EFFECT IS A 68% REDUCTION IN NEWLY EMPLOYED SCIENCE TEACHERS AND AN 80% DROP IN MATH TEACHERS SINCE 1971.

MANY QUALIFIED TEACHERS ALREADY IN THE SCHOOL SYSTEM ARE LEAVING FOR NON-TEACHING JOBS, SO THAT THE NET LOSS OF TEACHERS HAS REQUIRED SCHOOLS TO UTILIZE TEACHERS WHO ARE NEITHER CERTIFIED NOR QUALIFIED TO TEACH IN THESE FIELDS.

IN RESPONSE TO THE MANY RECENT REPORTS OF DEFICIENCIES IN PRE-COLLEGE SCIENCE AND MATH EDUCATION, SEVERAL STATES HAVE INCREASED COURSE REQUIREMENTS IN MATH AND SCIENCE, BUT THE SHORTAGE OF QUALIFIED TEACHERS REMAINS.

AMONG NEWLY EMPLOYED SCIENCE AND MATH TEACHERS IN 1982, MORE THAN HALF WERE UNQUALIFIED TO TEACH IN THOSE FIELDS. IN 1984, ABOUT FIVE PERCENT OF ALL HIGH SCHOOL TEACHERS WHOSE PRINCIPAL TEACHING ASSIGNMENTS WERE IN SCIENCE AND MATH WERE NOT CERTIFIED TO TEACH THESE SUBJECTS.

Data Source: National Science Teachers Association Survey of college and university placement officers conducted by J. A. Shymansky of the University of Iowa, 1982; and National Center for Education Statistics, preliminary data from 1984 survey of teacher demand and shortage


S/E BACHELOR'S
Non-S/E
Labor Force
Other Degrees
(M.D., LLB, etc.)
M.S. in S/E
Ph.D. in S/E
S/E
Labor Force
Out of
Labor Force
Transfer

EXCEPT FOR PRE-COLLEGE MATH AND SCIENCE TEACHERS, PRESENT PROJECTIONS OF SUPPLY AND DEMAND INDICATE THAT THE NUMBER OF STUDENTS GRADUATING IN MOST S/E FIELDS PROBABLY WILL BE SUFFICIENT TO FILL AVAILABLE JOB OPENINGS CREATED BOTH BY GROWTH IN EMPLOYMENT AND REPLACEMENT OF THOSE IN THE PRESENT LABOR FORCE WHO DIE, RETIRE, OR TRANSFER TO OTHER PROFESSIONS. IN MOST INSTANCES, PROJECTIONS INDICATE A LARGER SUPPLY THAN CAN BE UTLIZED IN SCIENCE AND ENGINEERING EMPLOYMENT. HOWEVER, NO SIGNIFICANT INCREASE IN UNEMPLOYMENT FOR SCIENCE AND ENGINEERING GRADUATES IS ANTICIPATED.

DIRECT EMPLOYMENT FOR ALL GRADUATES IN OCCUPATIONS CLOSELY RELATED TO THEIR COLLEGE MAJORS IS NOT NECESSARILY DESIRABLE, NOR DOES IT NECESSARILY REPRESENT OPTIMUM UTILIZATION OF EDUCATION EITHER FOR THE INDIVIDUAL OR THE NATION. IN ORDER TO MAINTAIN TECHNOLOGICAL COMPETITIVENESS WITH OTHER NATIONS OF THE WORLD, THE U.S. MUST HAVE PERSONS INVOLVED IN THE DECISION MAKING AND MANAGERIAL PROCESSES OF BOTH GOVERNMENT AND INDUSTRY WHO ARE TRAINED IN SCIENCE AND ENGINEERING.

A BACHELOR'S DEGREE IN SCIENCE OR ENGINEERING CONTINUES TO BE AN EXCELLENT STEPPING STONE TO CAREERS IN MEDICINE, LAW, BUSINESS AND OTHER OCCUPATIONS.

NEEDS + MONEY = DEMAND

in	from	for
Energy	Government	Scientists
Environment	Industry	Engineers
Cities	Foundations	
Transportation		
Health		
Defense		
Teaching		

MANY OPPORTUNITIES IN SCIENCE AND ENGINEERING WILL DEPEND ON DECISIONS MADE BY THE FEDERAL GOVERNMENT INCLUDING THE MIX IN APPROPRIATIONS FOR ACTIVITIES UTILIZING LARGE NUMBERS OF PERSONS WITH TECHNOLOGICAL TRAINING. THESE DECISIONS WILL AFFECT THE TOTAL DEMAND FOR SCIENTISTS AND ENGINEERS, AS WELL AS THE M OF FIELDS IN GREATEST DEMAND.

THE DIFFERENCE BETWEEN DEMAND AND NEED IS MONEY. NO MATTER HOW MANY SCIENTISTS AND ENGINEERS MAY BE NEEDED TO ACCOMPLISH NATIONAL OBJECTIVES, NONE CAN BE HIRED WITHOUT MONEY TO PAY FOR THEIR SERVICES.

THE NATION'S NEEDS FOR TECHNOLOGICALLY TRAINED EXPERTS WILL NOT HAVE DIMINISHED OVER THE COMING DECADE. WE WILL STILL BE TRYING TO PRODUCE ADEQUATE, CLEAN ENERGY, KEEP OUR ENVIRONMENT HABITABLE, ERASE URBAN BLIGHT, CREATE ADEQUATE TRANSPORTATION SYSTEMS, TEACH OUR CHILDREN AND PROVIDE HEALTH CARE, WHILE MAINTAINING OUR NATIONAL DEFENSE. THE STATE OF THE ECONOMY AND THE REORDERING OF PRIORITIES WILL ENABLE US TO CONVERT AT LEAST SOME OF THESE NEEDS INTO DEMAND.

WE CANNOT ALWAYS FORECAST THE PRIORITIES THAT WILL DETERMINE THESE GOVERNMENTAL DECISIONS. NEITHER CAN WE PREDICT THAT UNEXPECTED DISCOVERY OR HAPPENING THAT WILL CHANGE THE FORECAST, ALTHOUGH WE CAN BE QUITE CERTAIN THAT SOMETHING UNEXPECTED WILL OCCUR. SO IT IS IMPORTANT TO KEEP WATCH OVER NATIONAL DEVELOPMENTS AND TECHNOLOGICAL/ECONOMIC ADVANCES AS WELL AS TO KEEP A BROAD INTEREST IN ANY CHOSEN CAREER SPECIALTY.

KNOWLEDGE ⟶ INFORMED CHOICE

of

Employment Opportunities

Salaries

Education Requirements

etc.

AS WE HAVE SEEN, OPPORTUNITIES FOR WOMEN IN MOST AREAS ARE NOT YET QUITE AS GOOD AS FOR MEN - BUT CHANGES ARE OCCURRING, AND FIELDS THAT APPEAR TO OFFER GOOD PROSPECTS FOR EMPLOYMENT ALSO ARE THOSE IN WHICH THE TRADITIONAL BARRIERS ARE LESSENING.

NO ONE SHOULD CHOOSE A MAJOR FIELD OF STUDY OR A CAREER SOLELY ON THE BASIS OF THE PRESENT OR PROJECTED JOB MARKET IN THAT FIELD. THERE IS ALWAYS A DEMAND FOR OUTSTANDING PEOPLE IN EVERY FIELD. BUT TRUE CHOICE IS AVAILABLE ONLY TO THOSE WHO UNDERSTAND THE COMPONENTS AND THE ALTERNATIVES OF THE DECISION. AN UNDERSTANDING OF POTENTIAL EMPLOYMENT OPPORTUNITIES IS ONE COMPONENT OF INFORMED CHOICE.

ANOTHER IS THE RECOGNITION THAT SITUATIONS CHANGE IN WAYS THAT CANNOT ALWAYS BE FORESEEN IN ADVANCE. CAREER PATTERNS TYPICALLY WILL CHANGE SEVERAL TIMES OVER A LIFETIME, AND SO IT IS IMPORTANT TO MAINTAIN AS WIDE AN INTEREST AS POSSIBLE IN ANY AREA CHOSEN. A GOOD EDUCATION IN SCIENCE OR ENGINEERING WILL BE ESPECIALLY HELPFUL IN PREPARING STUDENTS FOR WHATEVER CHANGES THEY MAY CHOOSE OR MAY BE REQUIRED TO MAKE, WHETHER THEY FIND CAREERS IN SCIENCE OR ENGINEERING OR IN SOME OTHER AREA, BECAUSE THE WORLD OF WORK, REGARDLESS OF JOB SPHERE OR LEVEL, WILL CONTINUE TO BECOME MORE TECHNOLOGICALLY SOPHISTICATED.

TABLE 1

S/E PH.D.'S AWARDED BY DECADE 1920's - 1980's

	1920's	1930's	1940's	1950's	1960's	1970's	1980's*
Math & Physical Sciences	3,271	6,687	8,202	18,745	34,307	48,852	16,994
Engineering	228	833	1,439	5,765	19,042	31,479	10,431
Life Sciences	2,370	5,081	5,822	14,459	26,461	43,123	21,891
Social Sciences	1,898	3,550	4,001	13,692	25,120	52,294	25,063
Total S/E	7,767	16,151	19,464	52,661	104,930	175,748	74,379
NUMBER OF S/E PH.D.'S AWARDED TO WOMEN							
Math & Physical Sciences	247	442	406	685	1,577	4,047	2,197
Engineering	2	6	7	20	77	541	437
Life Sciences	378	765	738	1,318	3,078	7,446	6,044
Social Sciences	325	562	580	1,510	3,604	12,634	9,151
Total S/E	952	1,775	1,731	3,533	8,336	24,667	17,829

*Through 1983

Source: National Research Council, Doctorate Records File

TABLE 2

SCIENCE AND ENGINEERING DOCTORAL DEGREES, 1965-1983

Year	Total S/E	Physical Sciences[1]	Engineering	Math Sciences[2]	Life Sciences	Social Sciences[3]
	TOTAL DEGREES AWARDED					
1965	10,477	2,869	2,073	685	2,539	2,315
1966	11,456	3,058	2,299	769	2,712	2,618
1967	12,982	3,502	2,603	830	2,967	3,080
1968	14,411	3,667	2,847	970	3,501	3,426
1969	15,949	3,910	3,249	1,064	3,796	3,930
1970	17,731	4,400	3,432	1,222	4,163	4,514
1971	18,880	4,494	3,495	1,236	4,533	5,122
1972	18,940	4,226	3,475	1,281	4,505	5,453
1973	18,948	4,016	3,338	1,222	4,574	5,798
1974	18,316	3,696	3,144	1,196	4,407	5,873
1975	18,352	3,611	2,959	1,149	4,540	6,093
1976	17,872	3,442	2,791	1,003	4,480	6,156
1977	17,373	3,410	2,641	959	4,266	6,097
1978	17,956	3,234	2,423	959	4,887	6,453
1979	18,247	3,321	2,494	977	5,076	6,379
1980	18,171	3,151	2,479	963	5,325	6,253
1981	18,662	3,208	2,528	960	5,461	6,505
1982	18,747	3,348	2,644	940	5,565	6,250
1983	18,799	3,438	2,780	986	5,540	6,055
	DEGREES AWARDED TO WOMEN					
1965	744	127	7	50	263	297
1966	911	132	8	48	326	397
1967	1,086	161	9	48	401	467
1968	1,295	185	12	47	483	568
1969	1,472	205	10	56	537	664
1970	1,626	243	15	77	538	753
1971	1,929	244	16	96	656	917
1972	2,101	269	21	96	680	1,035
1973	2,446	257	45	119	795	1,230
1974	2,590	260	34	115	784	1,397
1975	2,838	284	50	110	863	1,531
1976	2,986	296	53	113	870	1,654
1977	3,103	303	74	128	845	1,753
1978	3,526	309	53	131	1,082	1,951
1979	3,854	351	63	145	1,190	2,105
1980	4,099	386	90	116	1,342	2,165
1981	4,359	364	99	138	1,443	2,315
1982	4,533	458	124	116	1,542	2,291
1983	4,838	468	124	149	1,717	2,380

[1] Includes Environmental Science
[2] Includes Computer Science
[3] Includes Psychology

SOURCE: National Research Council, Doctorate Records File

TABLE 3

SCIENCE AND ENGINEERING BACHELOR'S DEGREES, 1965-1982

Year	Total S/E	Physical Sciences[1]	Engineering	Math Sciences[2]	Life Sciences	Social Sciences[3]
	ALL BACHELOR'S DEGREES					
1965	164,936	17,916	36,795	19,668	34,842	55,715
1966	173,471	17,186	35,815	20,182	36,864	63,424
1967	187,849	17,794	36,188	21,530	39,408	72,929
1968	212,173	19,442	37,614	24,084	43,260	87,774
1969	244,519	21,591	41,553	28,263	48,713	104,399
1970	264,122	21,551	44,772	29,109	52,129	116,561
1971	271,176	21,549	45,387	27,306	51,461	125,473
1972	281,228	20,887	46,003	27,350	53,484	133,604
1973	295,391	20,809	46,989	27,528	49,486	140,579
1974	305,062	21,287	43,530	26,570	68,226	145,449
1975	294,920	20,896	40,065	23,385	72,710	137,864
1976	292,174	21,559	39,114	21,749	77,301	132,451
1977	288,543	22,628	41,581	20,729	78,472	125,143
1978	288,167	23,175	47,411	19,925	77,138	120,518
1979	288,625	23,363	53,720	20,670	75,085	115,787
1980	291,983	23,661	59,340	22,686	71,617	114,779
1981*	291,590	23,952	63,673	26,199	66,832	110,934
1982	298,847	24,052	67,400	31,866	63,884	111,645
	DEGREES AWARDED TO WOMEN					
1965	36,213	2,532	139	6,453	8,277	18,812
1966	39,482	2,333	146	6,702	8,464	21,837
1967	44,002	2,402	184	7,334	8,948	25,134
1968	53,463	2,674	211	8,841	10,091	31,646
1969	63,196	2,952	313	10,348	11,308	38,275
1970	68,878	2,969	338	10,516	11,875	43,180
1971	72,996	3,014	3656	9,818	11,803	47,996
1972	77,671	3,148	501	9,784	12,694	51,544
1973	83,839	3,121	580	9,985	14,570	55,583
1974	91,793	3,536	706	9,719	17,836	59,996
1975	93,342	3,838	860	8,656	29,811	59,177
1976	95,597	4,139	1,443	7,678	23,789	58,584
1977	97,453	4,551	2,086	7,488	25,609	57,719
1978	100,060	4,987	3,497	7,110	26,954	57,512
1979	102,292	5,287	4,919	7,421	27,548	57,117
1980	105,974	5,651	6,014	8,247	27,596	58,466
1981*	106,842	5,888	7,083	9,655	26,786	57,430
1982	111,541	6,186	8,299	12,055	26,282	58,719

[1] Includes Environmental Science

[2] Includes Computer Science

[3] Includes Psychology

*Beginning with 1981 NCES data are for 50 states and D.C. only. Prior years include territories and protectorates.

SOURCE: Series of Earned Degrees Conferred, 1965-1982, National Center for Education Statistics, using National Science Foundation field definitions.

TABLE 4

SCIENTISTS AND ENGINEERS BY FIELD, SEX AND EMPLOYMENT STATUS, 1982

FIELD	TOTAL			LABOR FORCE			UNEMPLOYED/SEEKING		
	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN
All Fields	3,588,000	3,098,800	489,700	3,405,700	2,949,100	456,600	77,200	57,700	19,500
Physical Scientists	248,700	218,000	30,700	231,400	203,600	27,800	6,300	4,900	1,400
Mathematical Scientist	49,200	26,300	22,900	45,700	24,700	21,000	1,100	500	600
Computer Specialists	395,800	284,200	111,600	386,600	281,100	105,500	4,300	3,000	1,300
Environmental Scientists	93,900	81,800	12,100	88,400	77,300	11,100	2,700	2,000	700
Engineers	1,980,500	1,908,600	71,900	1,876,400	1,809,000	67,400	36,800	33,900	3,000
Life Scientists	380,200	292,300	87,900	359,900	278,500	81,400	9,000	4,900	4,100
Psychologists	156,000	90,800	65,200	148,900	87,700	61,100	4,600	2,400	2,200
Social Scientists	284,100	196,800	87,300	268,300	187,100	81,300	12,300	6,200	6,100

Note: Detail may not add to totals because of rounding.

SOURCE: National Science Foundation, Women and Minorities in Science and Engineering, NSF 84-300

TABLE 5

NUMBER OF BACHELOR'S DEGREES GRANTED, 1948-1981, COMPARED WITH 1982 POPULATION OF SCIENTISTS AND ENGINEERS, BY FIELD AND SEX

FIELD	BACHELOR'S DEGREES, 1948-1981				SCIENTISTS & ENGINEERS, 1982				S/E's In 1982 as a % of B.S. Degrees Granted 1948-1981	
	Total	Men	Women	% W	Total	Men	Women	% W	Men	Women
Physical/Environmental Sciences	558,357	469,523	88,834	15.9	342,600	299,800	42,800	12.5	63.8	48.2
Math/Statistical/Computer Science	545,184	358,157	187,027	34.3	445,000	310,500	134,500	30.2	86.7	71.9
Biological/Agricultural Science	1,287,186	944,653	342,533	26.6	380,200	292,300	87,900	23.1	30.9	25.7
Psychology	776,244	387,535	388,709	50.1	156,000	90,800	65,200	41.8	23.4	16.8
Social Sciences*	1,982,432	1,427,279	555,153	28.0	284,100	196,800	87,300	30.7	13.8	15.7
Engineering	1,370,534	1,339,152	52,488	3.8	1,980,500	1,908,600	71,900	3.6	142.5	137.0
Total Science & Engineering	**6,532,788**	**4,933,760**	**1,492,095**	**22.8**	**3,588,000**	**3,098,800**	**489,700**	**13.6**	**62.8**	**32.8**

*Anthropology, Sociology, Economics and Political Science

SOURCE: National Center for Education Statistics, Series of Earned Degrees Conferred, 1948-1981; and National Science Foundation, Women and Minorities in Science and Engineering.

TABLE 6

1982 RATES OF LABOR FORCE PARTICIPATION, UNEMPLOYMENT, S/E EMPLOYMENT, UNDER-EMPLOYMENT AND UNDER-UTILIZATION BY FIELD, SEX AND RACIAL/ETHNIC GROUP

FIELD	WHITE		BLACK		ASIAN		NAT. AMERICAN		HISPANIC		TOTAL	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
TOTAL SCIENTISTS/ENGINEERS												
Participation[1]	95.0	92.8	97.7	97.3	96.8	93.9	95.0	98.4	96.8	92.6	95.2	93.1
Unemployment[2]	1.9	4.0	3.8	5.9	3.1	4.0	0.9	3.4	1.8	5.8	2.0	4.3
S/E Employment[3]	88.2	79.9	85.4	78.8	90.8	86.8	81.6	85.3	84.1	79.6	88.2	80.2
Under-employment[4]	1.3	5.4	1.9	5.7	1.3	4.4	2.4	15.3	2.8	6.8	1.4	5.4
Under-utilization[5]	3.2	9.2	5.7	11.3	4.4	8.2	3.3	18.1	4.6	12.2	3.3	9.4
PHYSICAL SCIENTISTS												
Participation	93.6	89.6	90.3	95.9	93.7	92.5	*	*	88.7	*	93.4	90.4
Unemployment	2.3	4.1	4.7	7.7	2.9	12.6	*	*	6.8	*	2.4	5.2
S/E Employment	92.3	92.4	82.9	88.9	84.6	91.2	*	*	82.5	*	91.8	92.0
Under-employment	1.0	1.9	*	*	*	1.1	*	*	3.6	*	1.0	1.6
Under-utilization	3.3	5.9	4.7	7.7	2.9	13.6	*	*	10.2	*	3.4	6.7
MATH SCIENTISTS												
Participation	93.9	91.2	*	96.2	93.0	90.6	*	*	*	*	93.9	91.9
Unemployment	2.1	3.4	*	6.5	1.9	0.6	*	*	*	*	2.0	2.9
S/E Employment	92.4	90.3	*	91.5	85.6	90.7	*	*	*	*	92.0	88.0
Under-employment	2.3	3.1	*	4.2	21.6	9.7	*	*	*	*	5.6	5.0
Under-utilization	4.4	6.3	*	10.5	23.1	10.2	*	*	*	*	5.5	7.7
COMPUTER SPECIALISTS												
Participation	98.9	94.3	99.5	97.1	99.4	97.8	*	*	100.0	93.0	98.9	94.5
Unemployment	1.0	1.2	0.8	0.9	1.6	2.4	*	*	*	*	1.1	1.3
S/E Employment	70.6	72.1	70.7	68.6	81.0	72.2	*	*	72.9	83.1	70.9	72.0
Under-employment	2.2	1.7	1.6	5.2	3.0	2.5	*	*	*	*	3.2	3.2
Under-utilization	3.2	2.9	2.3	6.1	4.5	4.9	*	*	*	*	3.2	3.2
ENVIRONMENTAL SCIENTISTS												
Participation	94.5	90.9	*	*	96.0	*	*	*	*	*	94.6	91.1
Unemployment	3.1	2.6	*	*	2.0	1.8	*	*	*	*	3.0	2.6
S/E Employment	94.1	93.2	*	*	97.8	*	*	*	*	*	94.2	93.2
Under-employment	1.2	4.8	*	*	2.1	*	*	*	*	*	1.3	4.8
Under-utilization	3.8	10.8	*	*	3.8	*	*	*	*	*	3.8	10.7
LIFE SCIENTISTS												
Participation	95.3	92.3	96.4	96.4	93.9	97.2	*	*	93.3	94.3	95.3	92.6
Unemployment	1.8	5.1	1.2	4.9	2.0	2.6	*	*	2.7	7.7	1.7	5.1
S/E Employment	88.4	86.9	92.1	88.4	84.2	80.0	*	*	76.3	83.8	88.4	86.4
Under-employment	2.9	6.7	1.8	5.4	4.4	15.0	*	*	5.7	14.4	2.9	7.2
Under-utilization	4.6	11.4	3.0	10.1	6.3	15.3	*	*	8.2	21.0	4.6	11.9
PSYCHOLOGISTS												
Participation	96.8	93.6	98.0	99.4	*	*	*	*	*	100.0	96.6	93.8
Unemployment	2.5	3.7	12.4	1.1	*	*	*	*	*	0.6	2.8	3.6
S/E Employment	79.3	71.5	55.1	54.6	*	*	*	*	*	61.8	78.4	70.8
Under-employment	3.4	8.8	7.0	14.9	*	*	*	*		9.8	4.0	9.1
Under-utilization	5.7	12.2	18.5	15.8	*	*	*	*	*	10.4	6.7	12.3
SOCIAL SCIENTISTS												
Participation	95.0	91.9	98.5	99.2	94.2	96.3	*	*	98.4	90.2	95.1	93.1
Unemployment	3.0	7.1	4.3	8.6	9.6	3.6	*	*	1.5	11.2	3.3	7.5
S/E Employment	68.4	71.6	65.7	73.5	73.5	92.3	*	*	61.6	73.3	68.4	73.3
Under-employment	4.8	11.6	6.6	10.3	2.0	3.7	*	*	6.2	9.1	4.8	10.7
Under-utilization	7.7	17.9	10.6	18.0	11.4	7.1	*	*	7.6	19.3	8.0	17.4
ENGINEERS												
Participation	94.9	93.7	98.4	95.9	97.5	91.9	96.4	*	97.9	91.1	94.8	93.7
Unemployment	1.8	3.8	4.0	7.1	2.9	5.9	0.5	*	1.7	6.2	1.9	4.4
S/E Employment	92.7	93.4	92.7	89.6	93.7	96.9	86.1	*	90.4	95.5	92.7	93.3
Under-employment	0.6	1.0	0.8	0.9	0.6	0.2	*	*	1.7	2.3	0.6	1.0
Under-utilization	2.3	4.8	4.8	7.9	3.5	6.1	0.5	*	3.3	8.4	2.4	5.4

[1] Ratio of those employed plus unemployed but seeking, to the total population.

[2] Ratio of those unemployed but seeking to total labor force.

[3] Ratio of those holding jobs in science or engineering to total employed graduates in S/E.

[4] Ratio of those working part time but seeking full time or those in non-S/E job who prefer S/E to total employment.

[5] Proportion of the labor force that is total of unemployed but seeking plus working part time but seeking full time, plus those involuntarily in non-S/E employment.

* Too few cases to estimate

SOURCE: National Science Foundation, Women and Minorities in Science and Engineering, January 1984

TABLE 7

RATES OF LABOR FORCE PARTICIPATION, SCIENCE AND ENGINEERING UTILIZATION AND UNEMPLOYMENT AMONG RECENT SCIENCE AND ENGINEERING DEGREE RECIPIENTS, BY FIELD, SEX AND DEGREE LEVEL, 1982

FIELD AND DEGREE LEVEL	LABOR FORCE PARTICIPATION RATES		SCIENCE AND ENGINEERING UTILIZATION RATES		UNEMPLOYMENT RATES	
	MEN	WOMEN	MEN	WOMEN	MEN	WOMEN
B A C H E L O R ' S						
All Fields	97.0	92.2	64.5	42.4	5.1	7.7
Physical Scientists	95.7	93.6	69.8	74.9	5.9	6.2
Mathematical Scientists	95.8	94.5	71.2	63.5	5.3	2.9
Computer Specialists	99.7	96.4	87.9	92.7	0.8	3.4
Environmental Scientists	95.2	95.1	77.0	65.8	6.9	11.3
Engineers	98.4	97.5	85.9	84.0	2.8	4.7
Life Scientists	95.3	90.5	58.3	49.1	5.6	10.3
Psychologists	97.5	91.2	30.7	20.2	8.9	5.8
Social Scientists	95.8	92.1	34.6	27.1	7.9	9.3
M A S T E R ' S						
All Fields	97.6	95.2	75.8	59.0	2.3	7.3
Physical Scientists	96.2	*	66.4	*	1.2	*
Mathematical Scientists	96.9	96.6	66.9	76.0	2.9	6.5
Computer Specialists	99.6	97.4	84.0	91.6	0.4	1.4
Environmental Scientists	97.2	*	83.0	*	6.5	*
Engineers	98.2	95.0	86.0	76.7	2.1	2.2
Life Scientists	95.7	96.4	74.2	67.4	2.8	1.9
Psychologists	98.4	98.7	49.4	34.6	1.7	15.2
Social Scientists	97.2	91.1	56.1	36.9	3.6	12.6

* Too few cases to estimate

SOURCE: National Science Foundation, Characteristics of Recent Science/Engineering Graduates, 1982, NSF 84-318

TABLE 8

DOCTORAL SCIENTISTS AND ENGINEERS BY FIELD, SEX AND EMPLOYMENT STATUS, 1983

FIELD OF Ph.D.	TOTAL			LABOR FORCE			LABOR FORCE PARTICIPATION RATES			UNEMPLOYMENT RATES		
	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL	MEN	WOMEN
All Fields	387,300	334,600	52,700	365,400	317,000	48,400	94.3	94.7	91.8	1.0	0.8	2.6
Math	19,600	17,900	1,700	18,700	17,100	1,600	95.4	95.5	94.1	0.6	0.6	0.4
Computer Sciences	2,600	2,400	200	2,500	2,300	200	96.1	95.8	100.0			
Physics/Astronomy	30,300	29,300	1,00	29,100	28,200	900	96.0	96.2	90.0	0.7	0.7	1.7
Chemistry	50,000	46,100	3,900	46,600	43,000	3,600	93.2	93.3	92.3	1.2	1.1	2.7
Earth/Environ. Sci.	12,900	12,100	800	12,300	11,600	700	95.3	95.9	87.5	0.8	0.6	3.8
Engineering	57,500	56,800	700	55,600	55,000	700	96.7	96.8	100.0	0.5	0.5	2.0
Agriculture Sciences	18,900	18,000	900	17,400	16,600	700	92.1	92.2	77.8	0.8	0.7	4.5
Medical Sciences	14,700	11,400	3,300	13,800	10,700	3,100	93.9	93.9	93.9	0.8	0.7	1.2
Biological Sciences	69,500	55,600	13,900	64,000	51,700	12,400	92.1	93.0	89.2	1.5	1.0	3.6
Psychology	51,300	36,000	15,300	48,800	34,500	14,300	95.1	95.8	93.5	1.1	0.9	1.5
Social Sciences	60,000	49,000	11,000	56,500	46,400	10,200	94.2	94.7	92.7	1.2	0.6	3.6

SOURCE: National Research Council, Science, Engineering and Humanities Doctorates in the U.S., 1983 Profile, 1984

TABLE 9

UNEMPLOYMENT RATES

YEAR	Total U.S.	Prof. & Technical Workers	Doctoral Scientists	Doctoral Engineers	All Scientists	All Engineers	College Graduates
1963	5.7	1.9				1.2	
1964	5.1	1.8				1.5	
1965	4.6	1.5				1.1	
1966	3.9	1.3			0.4	0.7	
1967	3.7	1.3				0.6	
1968	3.5	1.2	0.5			0.7	
1969	3.5	1.3	0.5		0.9	0.8	
1970	4.9	2.0	0.9			2.2	1.3
1971	5.9	2.9	1.4	1.9	2.6	2.9	
1972	5.6	2.4			4.1	2.0	
1973	4.9	2.2	1.2	0.8		1.0	
1974	5.6	2.3		0.9	2.3	1.3	
1975	8.5	3.2	1.0	0.7		2.6	
1976	7.7	3.2			4.0	2.0	
1977	7.0	3.0	1.3	0.7		1.3	
1978	5.9	2.6			1.5	1.3	
1979	5.6	2.4	1.0	0.5		1.2	
1980	7.1	2.5			2.5	1.3	
1981	7.6	2.8	0.9	0.1		1.4	
1982	9.7	3.2*			2.9	1.9	3.1
1983	9.0		3.5	0.5			3.5

* To September

Source: Bureau of Labor Statistics; National Science Foundation, National Research Council

TABLE 10

DISTRIBUTION OF COLLEGE GRADUATES, NON-TEACHING JOB OFFERS AND HIRES, BY CURRICULUM GROUP

FIELD	BACHELOR'S			MASTER'S			PH.D'S			ALL LEVELS		
	Degrees[5] 1981-82	Hires[6] 1983-84	Offers[7] 1983-84	Degrees[5] 1981-82	Hires[6] 1983-84	Offers[7] 1983-84	Degrees[5] 1981-82	Hires[6] 1983-84	Offers[7] 1983-84	Degrees[5] 1981-82	Hires[6] 1983-84	Offers[7] 83-84
	PERCENTAGES											
Engineering[1]	9.4	36.7	51.8	8.9	26.7	30.3	10.5	38.0	46.6	9.3	35.4	49.1
Science/Math/Other Tech.[2]	21.4	17.4	13.1	18.0	17.1	12.0	39.8	55.9	53.4	21.2	18.1	13.6
Business[3]	25.3	39.7	29.2	30.3	53.2	55.4	3.4	2.1	-	25.8	40.8	32.0
Social Sci./Humanities[4]	43.9	6.3	5.9	42.8	3.0	2.3	46.2	4.0	-	43.7	5.8	5.4
	NUMBERS											
Engineering[1]	80,005	18,776	21,950	17,939	2,271	1,826	2,636	487	360	100,580	21,534	24,136
Science/Math/Other Tech.[2]	182,239	8,877	5,550	36,500	1,453	725	9,965	715	413	228,704	11,045	6,688
Business[3]	215,817	20,276	12,385	61,428	4,519	3,346	857	27	-	278,102	24,822	15,731
Social Sci./Humanities[4]	373,874	3,201	2,508	86,575	255	137	11,573	51	-	472,022	3,507	2,645
TOTAL	851,935	51,130	42,393	202,442	8,498	6,034	25,031	1,280	773	1,079,408	60,908	49,200

[1] Includes engineering technologies
[2] Includes computer sciences and health (medical) professions
[3] Includes accounting, marketing, business management, finance, etc.
[4] Includes liberal arts, humanities, social sciences, home economics, and other non-technical fields
[5] Exclusive of degrees in education
[6] Actual hires by 399 employers in business, industry, government, and non-profit and educational institutions, except for teaching positions
[7] To inexperienced graduates, reported by 87 placement offices at 162 colleges and universities

Source: National Center for Education Statistics, Earned Degrees Conferred, 1981-82 and College Placement Council, Recruiting '85 (October 1984) and Salary Survey: A study of 1983-84 Beginning Offers, July 1984

NOTE: The surveys utilized for this table are very different in scope. Degree data from the NCES Survey of Earned Degrees reports on total degree awards, exclusive of degrees in education. The CPC Salary Survey reports number of offers (not acceptances) reported by 187 participating placement offices, excluding teaching offers but including multiple offers. Recruiting '85 reports actual hires by 399 employers, exclusive of teaching positions. The number of hires reported reflects only the sample size. The proportion of hires in each of these broad fields is an indicator of relative demand for the various fields

TABLE 11

PERCENT OF BACHELOR'S OFFERS AND PERCENT OF BACHELOR'S GRADUATES* BY FIELD AND SEX

FIELD	% of 1984 Bachelor's Offers			% of 1982 Bachelor's Graduates*		
	Total	Men	Women	Total	Men	Women
Business & Management	29.2	23.7	43.0	25.3	29.2	21.0
Engineering	49.8	58.5	28.2	7.9	13.1	2.0
Engineering Technologies	2.0	2.6	0.4	1.5	2.7	0.2
Agricultural Sciences	0.8	0.9	0.5	2.5	3.2	1.6
Biological Sciences	0.3	0.2	0.5	4.9	5.1	4.7
Health Professions	0.8	0.1	2.6	7.5	2.3	13.3
Chemistry	0.5	0.4	0.6	1.3	1.7	0.9
Other Physical/ Earth Sciences	0.5	0.7	0.3	1.5	2.3	0.7
Computer Sciences	8.9	7.9	11.3	2.4	2.9	1.7
Mathematics	1.3	0.9	2.1	1.4	1.4	1.2
Humanities & Social Sciences	5.9	4.1	10.5	43.9	36.1	52.8

*Excluding Education

Source: College Placement Council, Salary Survey, July, 1984 and National Center for Education Statistics, Earned Degrees, 1982

TABLE 12

AVERAGE ANNUAL SALARY OFFERS TO BACHELOR'S DEGREE CANDIDATES, 1984

FIELD	TOTAL	MEN	WOMEN
Accounting	$19,524	$19,560	$19,488
Business/Management	18,660	18,792	18,444
Marketing	17,820	18,288	17,220
Humanities	17,724	18,768	17,016
Economics	19,980	20,148	19,716
Other Social Sciences	17,424	18,780	16,224
Engineering	26,276	26,252	26,430
Aeronautical	25,836	25,896	25,380
Chemical	27,420	27,312	27,624
Civil/Construction/Sanitary/Transportation	22,764	22,800	22,524
Electrical/Computer	26,556	26,556	26,604
Geological	24,492	24,324	26,580
Industrial	25,224	25,152	25,356
Mechanical	26,280	26,256	26,460
Metallurgical/Ceramic and Metallurgy	26,556	26,400	26,904
Mining	24,876	24,816	27,600
Nuclear and Engineering Physics	26,388	26,352	26,544
Petroleum	29,568	29,652	28,680
Engineering Technology	24,936	25,020	23,580
Agricultural Sciences	17,016	16,992	17,076
Biological Sciences	16,824	18,168	15,384
Chemistry	21,072	21,240	20,796
Computer Sciences	24,552	24,828	24,060
Health Professions	18,912	21,084	18,660
Mathematics	23,400	23,760	22,992
Other Physical/Earth Sciences	22,800	23,148	20,832

Source: College Placement Council, Salary Survey, Formal Report No. 3, July, 1984

TABLE 13

MEDIAN ANNUAL SALARIES* OF DOCTORAL SCIENTISTS AND ENGINEERS BY YEARS SINCE PH.D, FIELD AND SEX, 1983

Sex & Years Since Ph.D.	FIELD OF DOCTORATE											
	All Fields	Math	Comp. Sci.	Phys./ Astrn.	Chem.	Earth/ Envir.	Engr.	Agric.	Med.	Biol.	Psych.	Social Sci.
	(In Thousands of Dollars)											
TOTAL	$40.2	$37.8	$42.1	$43.9	$42.8	$40.6	$46.5	$37.4	$40.2	$36.7	$39.8	$36.0
5 or less	30.9	27.8	38.4	36.7	35.1	32.1	37.6	28.5	31.8	26.7	28.0	27.5
6-10	36.1	34.5	45.2	38.8	38.7	36.8	44.2	34.6	37.5	31.9	32.7	32.5
11-15	41.1	37.5	49.5	43.2	42.5	44.4	48.6	38.9	42.9	37.2	39.0	37.8
16-20	44.9	41.4		45.2	45.8	46.9	51.5	42.6	50.3	41.7	40.5	42.7
21-25	48.5	48.0		49.6	48.8	51.9	55.1	43.7	52.4	45.9	45.6	45.8
26-30	50.9	50.7		57.1	50.9	52.9	59.1	46.9	54.4	48.2	49.5	48.8
Over 30	53.4	56.2		55.1	52.9	54.5	58.2	50.5	55.7	52.6	51.5	50.6
MALE, TOTAL	40.9	38.4	42.3	44.1	43.7	40.8	46.7	38.0	42.5	38.1	37.3	36.7
5 or less	32.1	27.6	38.0	36.8	35.3	32.1	37.7	28.7	33.0	27.1	28.7	28.0
6-10	36.7	35.0	45.3	38.8	39.1	36.9	44.2	34.7	38.9	33.2	33.8	32.8
11-15	42.0	37.8	49.7	43.3	43.0	44.6	48.6	39.0	44.5	38.0	39.9	38.2
16-20	45.2	41.6		45.3	46.5	47.8	51.5	42.6	50.6	42.7	40.6	43.9
21-25	48.9	48.6		49.7	50.1	52.0	55.1	43.8	55.2	46.8	46.1	46.1
26-30	51.6	51.2		57.3	51.8	53.3	59.1	47.0	55.4	49.3	50.0	49.0
Over 30	54.2	56.6		55.2	53.8	55.5	58.2	50.5	55.9	53.8	52.1	51.3
FEMALE, TOTAL	31.8	33.5	41.1	38.1	35.0	35.6	39.7	29.2	33.0	30.7	30.8	31.0
5 or less	27.6	29.4	39.8	34.3	33.7	32.6	36.3	27.5	30.0	25.2	26.2	26.7
6-10	31.1	32.3	45.1	38.1	35.4	35.1	43.5	30.6	34.3	29.6	30.6	31.6
11-15	34.9	35.8		38.2	34.6	35.7	45.0	33.7	36.6	33.6	34.7	35.9
16-20	36.9	36.2		40.8	34.0	42.0			45.5	34.6	39.7	37.0
21-25	40.3	37.1		41.0	38.4				40.6	40.7	41.6	42.4
26-30	42.6				36.8					43.2	43.0	40.1
Over 30	44.0				42.3					42.4	45.5	46.1

*Median salaries were computed only for Ph.D.s employed full-time, excluding those in the U.S. military. Academic salaries were multiplied by 11/9 to adjust for a full-time scale. Medians were not calculated for cells with less than 20 cases reporting salary.

TABLE 14

MEDIAN INCOME OF YEAR ROUND FULL-TIME WORKERS 25 YEARS OR OLDER, BY YEARS OF EDUCATION, 1983

	YEARS OF EDUCATION						
	Elementary		High School		College		
	< 8	8	1-3	4	1-3	4	5 or more
Men	$14,093	$16,438	$17,685	$21,823	$24,613	$29,892	$34,643
Women	9,385	10,337	11,131	13,787	16,536	18,452	22,877

Source: U.S. Department of Commerce, Bureau of Census, Money Income and Poverty Status of Families and Persons in the U.S. 1983, (Advance data from Current Population Surveys, P-60, No. 145, August 19, 1984)

TABLE 15

HIGHEST DEGREE LEVEL OF SCIENTISTS AND ENGINEERS BY FIELD AND SEX IN 1982

FIELD	TOTAL			MEN			WOMEN		
	Ph.D.	Master's	Bachelor's	Ph.D.	Master's	Bachelor's	Ph.D.	Master's	Bachelor's
All Fields	10.8%	26.3%	52.4%	10.7%	25.2%	52.5%	11.5%	34.0%	51.9%
Chemists	27.7	23.8	48.0	28.7	24.1	46.6	19.8	21.5	57.6
Physicists/Astronomers	46.0	35.9	17.9	46.2	35.8	17.3	36.0	36.0	24.0
Math/Statisticians	20.3	53.0	25.2	27.2	47.4	27.4	5.5	65.2	26.9
Computer Specialists	3.8	27.8	68.4	3.8	29.4	65.9	0.8	23.3	75.5
Environ. Scientists	18.9	32.1	48.3	20.7	31.8	46.8	8.1	33.9	57.3
Engineers	3.2	21.0	58.1	3.3	21.0	57.9	2.1	20.8	64.3
Biologists	21.9	33.6	43.5	22.6	33.3	43.1	19.2	34.7	45.4
Agric. Scientists	22.1	22.2	54.3	25.4	23.1	49.8	9.0	17.5	77.5
Medical Scientists	58.3	18.6	12.2	58.7	19.6	9.8	57.1	15.7	18.6
Psychologists	32.8	45.2	21.5	39.3	42.1	18.3	23.1	49.8	26.4
Social Scientists	22.8	33.8	42.0	26.6	31.1	40.5	13.4	40.7	45.8

NOTES: Where columns do not add to 100%, remainder is "other and no degree."

Graduate degree representation is highest in the sciences, and lowest in engineering. Since 62.5% of the men but only 15.0% of the women are engineers, the proportion of all women scientists and engineers with graduate degrees is higher than the proportion of men. By individual fields, men have more doctorates than women, while the proportion with master's degrees is similar in most fields.

SOURCE: National Science Foundation, U.S. Scientists & Engineers, 1982

TABLE 16

LIVE BIRTHS IN THE U.S. BY SEX: 1933-1981

YEAR	TOTAL	MALE	FEMALE
1933	2,081,232	1,068,871	1,012,361
1934	2,167,636	1,112,703	1,054,933
1935	2,155,105	1,105,489	1,049,616
1936	2,144,790	1,099,465	1,045,325
1937	2,203,337	1,130,641	1,072,696
1938	2,286,962	1,172,541	1,114,421
1939	2,265,558	1,162,600	1,102,988
1940	2,360,399	1,211,684	1,148,715
1941	2,513,427	1,289,734	1,223,693
1942	2,808,996	1,444,365	1,364,631
1943	2,936,860	1,508,959	1,427,901
1944	2,794,800	1,435,301	1,359,499
1945	2,735,456	1,404,587	1,330,869
1946	3,288,672	1,691,220	1,597,452
1947	3,699,940	1,899,876	1,800,064
1948	3,535,068	1,813,852	1,721,216
1949	3,559,529	1,826,352	1,733,177
1950	3,554,149	1,823,555	1,730,594
1951	3,750,850	1,923,020	1,827,830
1952	3,846,986	1,971,262	1,875,724
1953	3,902,120	2,001,798	1,900,322
1954	4,017,362	2,059,068	1,958,294
1955	4,047,295	2,073,719	1,973,576
1956	4,163,090	2,133,588	2,029,502
1957	4,254,784	2,179,960	2,074,824
1958	4,203,812	2,152,546	2,051,266
1959	4,244,796	2,173,638	2,071,158
1960	4,257,850	2,179,708	2,078,142
1961	4,268,326	2,186,274	2,082,052
1962	4,167,362	2,132,466	2,034,896
1963	4,098,020	2,101,632	1,996,388
1964	4,027,490	2,060,162	1,967,328
1965	3,760,358	1,927,054	1,833,304
1966	3,606,274	1,845,862	1,760,412
1967	3,520,959	1,803,388	1,717,571
1968	3,501,564	1,796,326	1,705,238
1969	3,600,206	1,846,572	1,753,634
1970	3,731,386	1,915,378	1,816,008
1971	3,555,970	1,822,910	1,733,060
1972	3,258,411	1,669,927	1,588,484
1973	3,136,965	1,608,326	1,528,639
1974	3,159,958	1,622,114	1,537,844
1975	3,144,198	1,613,135	1,531,063
1976	3,167,788	1,624,436	1,543,352
1977	3,326,632	1,705,916	1,620,716
1978	3,333,279	1,709,394	1,623,885
1979	3,494,398	1,791,267	1,703,131
1980	3,612,258	1,852,616	1,759,642
1981	3,629,238	1,860,272	1,768,966

SOURCE: National Center for Health Statistics

TABLE 18

COMPARISONS OF PROJECTED JOB OPENINGS WITH PROJECTED DEGREES IN SCIENCE AND ENGINEERING 1978-1990

FIELD	Job Openings, 1978-1990 (in thousands): Senario				Graduates, 1978-1990 (in thousands): Level	
	Baseline Assumptions	Accelerated Defense Spending	Synthetic Fuels Program	Balanced Federal Budget	Bachelor's Degrees	Master's Degrees
Life and Physical Scientists						
Agricultural	16	16	16	16	193	34
Atmospheric	5	5	5	5	5	4
Biological	38	38	38	37	637	78
Chemical	63	64	64	63	178	26
Geological	22	22	23	22	67	18
Marine	2	2	2	2	10	3
Physics and Astronomy	11	11	11	11	45	19
Total	157	159	157	156	1,135	182
Mathematical Sciences						
Mathematicians	3	3	3	3	102	27
Statisticians	19	19	19	19	3	5
Total	22	22	22	22	105	32
Computer Professionals						
Programmers	300	302	300	299	NA	NA
Systems Analysts	221	223	221	221		
Other	28	29	28	28		
Total	549	553	550	547	110	47
Social Scientists						
Psychologists	76	76	76	75	490	111
Other[1]	100	102	101	99	628	58
Total	176	178	177	175	1,117	170
Engineers						
Aeronautical	24	35	24	24	28	NA
Chemical	22	22	22	21	92	
Civil	95	95	95	94	134	
Electrical	121	128	121	120	172	
Industrial	94	98	94	93	48	
Mechanical	89	95	89	89	171	
Metallurgical	9	9	9	9	16	
Mining	7	7	7	7	11	
Petroleum	11	11	11	11	14	
Other	59	61	59	59	115	
Total	528	561	534[2]	525	928[3]	196
Total All Fields	1,432	1,473	1,439	1,424	3,395	626

[1]Includes economists, political scientists and sociologists.
[2]Includes 4,000 engineers who are not distributed by field.
[3]Includes 128,000 engineering technology degrees not distributed by field.

NOTE: Estimates of openings do not include academic employment. Detail may not add to totals because of rounding.

SOURCES: National Science Foundation, Bureau of Labor Statistics and National Center for Education Statistics.

TABLE 19

FULL-TIME SCIENCE AND ENGINEERING DOCTORAL LABOR FORCE BY FIELD 1979 ACTUAL AND 1990 PROJECTED
(in thousands)

	Physical Sciences	Engineering	Math Sciences	Life Sciences	Social Sciences	Total
Labor Force						
1979	73	49	21	79	83	306
1990	103	80	30	113	125	450
Science/Engineering Utilization						
1979	67	47	20	74	71	278
1990	93	63	23	93	99	370
Non-Science/Engineering Utilization						
1979	7	3	1	5	12	28
1990	10	17	7	20	26	80
Non-Science/Engineering Utilization as Percent of Labor Force						
1979	9	6	6	6	14	9
1990	10	21	23	18	21	18

Note: Detail may not add to totals because of rounding.

SOURCE: National Science Foundation

TABLE 17

SUPPLY/DEMAND BALANCE OF SCIENTISTS AND ENGINEERS BASED ON A NET-MOBILITY SUPPLY MODEL, 1983 AND 1987

OCCUPATION	1983				1987			
	TOTAL SUPPLY	NEW ENTRANTS	DEMAND	BALANCE AS PERCENT OF SUPPLY	TOTAL SUPPLY	NEW ENTRANTS	DEMAND	BALANCE AS PERCENT OF SUPPLY
	(In thousands)							
Total Scientists	**566.2**	**87.0**	**523.0**	**7.7**	**639.9**	**92.2**	**584.7**	**8.6**
Agricultural Scientists	20.8	5.3	17.6	15.4	22.2	5.0	18.4	17.1
Biologists	67.6	19.2	56.7	16.1	76.3	19.7	62.5	18.1
Chemists	95.5	6.1	93.9	1.7	104.6	6.4	102.8	1.7
Geologists	45.7	4.4	42.5	7.0	51.6	4.9	47.9	7.2
Mathematical Scientists	55.3	5.8	53.0	4.2	63.0	5.9	60.6	3.8
Physicists	23.6	2.9	21.7	8.1	26.6	3.1	24.2	9.0
Other Life & Physical Scientists	30.1	1.9	28.6	5.0	33.3	2.0	31.3	6.0
Social Scientists	227.6	41.4	209.0	8.2	262.3	45.2	237.0	9.6
Economists	34.7	7.5	31.4	9.5	40.7	8.2	36.2	11.1
Psychologists	98.4	12.9	92.7	5.8	113.6	14.3	106.2	6.5
Sociologists	12.5	6.1	9.6	23.2	25.2	7.3	10.7	29.6
Social, n.e.c.	82.0	14.9	75.3	8.2	92.8	15.4	83.9	9.6
Total Engineers	**1,217.2**	**64.0**	**1,207.6**	**0.8**	**1,437.3**	**66.8**	**1,423.1**	**1.0**
Aero/Astronautical	70.0	1.9	72.4	-3.4	104.8	2.2	109.2	-4.2
Chemical	58.0	5.5	55.4	4.5	64.2	5.4	60.9	5.1
Civil	171.6	10.2	171.5	0.1	190.1	10.2	188.9	0.6
Electrical/Electronic	347.9	14.0	348.9	-0.3	421.3	15.6	420.6	0.2
Industrial	114.2	4.0	114.9	-0.6	129.8	4.1	130.8	-0.8
Mechanical	217.9	11.4	214.3	1.7	253.4	11.7	248.2	2.1
Metallurgical	16.3	1.4	15.8	3.1	19.2	1.4	18.5	3.6
Mining/Petroleum	28.5	2.1	27.6	3.2	32.5	2.3	31.6	2.8
Engineers, n.e.c.	192.8	13.5	186.8	3.1	222.0	13.9	214.4	3.4
Computer Specialists*	**477.7**	**10.8**	**486.9**	**-1.9**	**592.8**	**13.5**	**603.8**	**-1.9**

* Includes both computer systems analysts and computer programmers

Note: This projection is based on the high-economic growth and high-defense expenditure scenario. Because of rounding, components may not correspond to totals.

Source: National Science Foundation, Projected Response of the Science, Engineering, and Technical Market to Defense and Nondefense Needs: 1982-87, NSF 84-304

TABLE 20

CIVILIAN EMPLOYMENT IN SELECTED S/E OCCUPATIONS WITH 5,000 WORKERS OR MORE, ACTUAL 1982 AND PROJECTED 1995

OCCUPATION	EMPLOYMENT (in thousands)				PERCENT CHANGE		
		1995			1982-1995		
	1982	Low Trend	Moderate Trend	High Trend	Low Trend	Mod. Trend	High Trend
TOTAL, ALL OCCUPATIONS	**101,510.1**	**124,846.0**	**127,109.8**	**129,902.1**	**23.0**	**25.2**	**28.0**
Professional, Technical & Related Workers	16,583.9	21,544.7	21,775.0	22,325.4	29.9	31.3	34.6
Engineers	1,204.3	1,787.0	1,788.4	1,830.6	48.4	48.5	52.0
Aero/Astronautic	43.8	65.2	61.6	62.4	48.8	40.6	42.4
Chemical	56.0	78.9	80.3	82.3	40.9	43.5	47.0
Civil	155.4	225.5	228.1	235.8	45.1	46.8	51.7
Electrical	319.5	530.5	528.2	540.3	66.0	65.3	69.1
Industrial	160.2	225.9	226.7	232.3	41.0	41.6	45.0
Mechanical	209.1	313.9	318.0	327.2	50.1	52.1	56.5
Metallurgical	14.0	20.5	20.7	21.0	46.1	47.5	50.2
Mining	5.7	6.9	7.0	7.1	21.2	22.4	24.7
Nuclear	6.3	9.4	9.3	9.7	50.5	47.9	53.9
Petroleum	26.1	31.2	31.8	30.2	19.4	21.7	15.7
Life & Physical Scientists	271.0	343.0	341.7	348.4	26.6	26.1	28.6
Agricultural	21.7	25.7	25.7	26.3	18.8	18.6	21.5
Biological	51.6	71.3	70.4	72.7	38.1	36.3	40.9
Chemists	88.8	107.0	108.3	110.9	20.5	22.0	24.9
Geologists	48.6	60.1	60.1	58.8	23.6	23.6	20.9
Medical	7.2	9.4	9.5	9.8	30.1	31.8	35.6
Physicists	18.8	26.4	25.7	26.6	40.2	36.6	41.0
Math Specialists	47.9	62.6	61.6	63.3	30.5	28.6	32.1
Actuaries	8.2	10.8	10.9	11.1	31.5	33.0	34.8
Mathematicians	10.6	14.1	13.5	14.0	33.1	28.1	32.3
Statisticians	20.1	26.1	25.8	26.6	29.5	28.3	32.0
Engineering & Science Technicians	1,243.3	1,648.6	1,660.8	1,704.6	32.6	33.6	37.1
Drafters	302.4	309.3	317.6	327.3	2.3	5.0	8.2
Electrical/Electronic	366.2	585.0	588.5	601.7	59.8	60.7	64.3
Industrial Engineering	27.4	35.9	35.4	36.6	30.9	28.9	33.4
Mechanical Engineering	47.8	72.0	72.4	74.0	50.8	51.6	54.8
Surveyors	43.6	61.3	62.4	64.3	40.5	43.1	47.3
Computer Specialists	520.8	934.8	942.8	960.0	79.5	81.0	84.3
Programmers	266.4	465.3	471.3	479.6	74.6	76.9	80.0
Systems Analysts	254.4	469.5	471.4	480.3	84.6	85.3	88.8
Social Scientists	209.6	266.8	266.7	273.2	29.8	29.7	32.9
Economists	30.0	38.7	38.0	39.1	28.9	26.6	30.4
Psychologists	82.5	109.3	109.9	112.4	32.5	33.2	36.2
College & University Teachers	744.0	619.4	632.5	646.2	-16.7	-15.0	-13.1
Graduate Assistants	139.8	121.6	124.2	126.9	-13.1	-11.2	- 9.3

: Bureau of Labor Statistics

BIBLIOGRAPHY OF DATA SOURCES

BUREAU OF THE CENSUS, WASHINGTON, DC 20233

MONEY, INCOME AND POVERTY STATUS OF FAMILIES AND PERSONS IN THE U.S.: 1983, ADVANCE DATA FROM THE 1983 CURRENT POPULATION SURVEYS, P-60, NO. 145, AUGUST 19, 1984

BUREAU OF LABOR STATISTICS, U.S. DEPARTMENT OF LABOR, WASHINGTON DC 20212

OCCUPATIONAL PROJECTIONS AND TRAINING DATA, 1984 EDITION, BULLETIN 2206, MAY, 1984
EMPLOYMENT AND EARNINGS, 1983, VOL. 31, NO. 1, JANUARY 1984
UNPUBLISHED DATA

THE COLLEGE PLACEMENT COUNCIL, INC. P.O. BOX 2263, 62 HIGHLAND AVENUE, BETHLEHEM, PA 18017

RECRUITING 83, OCTOBER 1982
CPC SALARY SURVEY, A STUDY OF 1983-84 BEGINNING OFFERS, FORMAL REPORT NO. 3, JULY 1984

ENGINEERING MANPOWER COMMISSION OF THE AMERICAN ASSOCIATION OF ENGINEERING SOCIETIES, 345 EAST 47TH ST., NEW YORK, NY 10017

ENGINEERING AND TECHNOLOGY ENROLLMENTS, ANNUAL SERIES, 1967-1984
ENGINEERING AND TECHNOLOGY DEGREES, ANNUAL SERIES, 1969-1983

NATIONAL ACADEMY OF SCIENCES/NATIONAL RESEARCH COUNCIL, 2101 CONSTITUTION AVE., NW, WASHINGTON DC 20418

DOCTORATES AWARDED 1920 TO 1971 BY SUBFIELD OF DOCTORATE, SEX AND DECADE, MARCH, 1973
SUMMARY REPORT, DOCTORATE RECIPIENTS FROM UNITED STATES UNIVERSITIES 1971 THROUGH 1983, 1972 THROUGH 1984
DOCTORAL SCIENTISTS AND ENGINEERS IN THE UNITED STATES, 1973 PROFILE, MARCH 1974, AND 1975 PROFILE, 1976
SCIENCE, ENGINEERING AND HUMANITIES DOCTORATES IN THE UNITED STATES, 1977 PROFILE, 1978; 1979 PROFILE, 1980, 1981 PROFILE, 1982 AND 1983 PROFILE, IN PRESS

NATIONAL CENTER FOR HEALTH STATISTICS, 3700 EAST-WEST HIGHWAY, HYATTSVILLE, MD 20782

UNPUBLISHED DATA

NATIONAL CENTER FOR EDUCATION STATISTICS, 400 MARYLAND AVENUE, SW, WASHINGTON DC. 20202

EARNED DEGREES CONFERRED, SERIES 1937-38 THROUGH 1981-82
1984 SURVEY OF TEACHER DEMAND AND SHORTAGE, PRELIMINARY DATA, UNPUBLISHED.

NATIONAL SCIENCE FOUNDATION, 1800 G ST. NW, WASHINGTON, DC 20550

CHARACTERISTICS OF DOCTORAL SCIENTISTS AND ENGINEERS IN THE UNITED STATES, 1979, (NSF 80-311), 1980
CHARACTERISTICS OF RECENT SCIENCE/ENGINEERING GRADUATES: 1982, DETAILED STATISTICAL TABLES, NSF 84-318
PROJECTED RESPONSE OF THE SCIENCE, ENGINEERING, AND TECHNICAL LABOR MARKET TO DEFENSE AND NONDEFENSE NEEDS: 1982-87, SPECIAL REPORT, NSF 84-304
U.S. SCIENTISTS AND ENGINEERS, 1980, DETAILED STATISTICAL TABLES, NSF 82-314, 1980
U.S. SCIENTISTS AND ENGINEERS, 1982, DETAILED STATISTICAL TABLES, IN PRESS
WOMEN AND MINORITIES IN SCIENCE AND ENGINEERING, NSF 84-300, JANUARY 1984

NATIONAL SCIENCE FOUNDATION AND THE DEPARTMENT OF EDUCATION, AVAILABLE FROM THE U.S. GOVERNMENT PRINTING OFFICE, WASHINGTON DC 20402

SCIENCE AND ENGINEERING EDUCATION FOR THE 1980s AND BEYOND, (NSF 80-78), OCTOBER 1980

NATIONAL SCIENCE TEACHERS ASSOCIATION, 1742 CONNECTICUT AVE., NW, WASHINGTON DC 20009

SURVEY OF COLLEGE AND UNIVERSITY PLACEMENT OFFICERS CONDUCTED BY J. A. SHYMANSKY, THE UNIVERSITY OF IOWA, 1982.

SCIENTIFIC MANPOWER COMMISSION, 1776 MASSACHUSETTS AVE., NW, WASHINGTON DC 20036

PROFESSIONAL WOMEN AND MINORITIES, A MANPOWER DATA RESOURCE SERVICE, FIFTH EDITION, AUGUST, 1984
SUPPLY AND DEMAND FOR SCIENTISTS AND ENGINEERS, JANUARY 1982
THE SCIENCE AND ENGINEERING TALENT POOL, PROCEEDINGS OF THE 1984 JOINT MEETING OF THE SCIENTIFIC MANPOWER COMMISSION AND THE ENGINEERING MANPOWER COMMISSION, SEPTEMBER, 1984

OTHER PUBLICATIONS OF THE SCIENTIFIC MANPOWER COMMISSION

SCIENTIFIC, ENGINEERING, TECHNICAL MANPOWER COMMENTS, periodical, 10 issues per year, 1 yr., $35; 2 yrs., $60; 3 yrs. $80.

A monthly digest of current developments affecting the recruitment, training and utilization of scientific, engineering and technical manpower. Special sections include current information on supply and demand, salaries, women and minorities in science, education, pending legislation, federal agency activities, and new publications of interest to producers and users of technical manpower.

PROFESSIONAL WOMEN AND MINORITIES, A Manpower Data Resource Service, Fifth Edition, Aug. 1984, $70

A comprehensive reference book of manpower data presented in approximately 400 tables and charts, with breakouts by sex and/or minority status, compiled from more than 200 sources. Data on enrollments, degrees, and general, academic and federal work force participation by field and subfield are supplemented with textual highlights; annotated recruitment resources for women and minority professionals,
by field; a comprehensive cross index; and an extensive bibliography.

SALARIES OF SCIENTISTS, ENGINEERS AND TECHNICIANS, A Summary of Salary Surveys, Eleventh Edition, November 1983, $30

A 196 page report presenting detailed information on starting and advanced salaries in industry, government and educational institutions with breakouts by field, highest degreee, sex, years since first degree, age group, category of employment, work activity, type of employer, geographic area, academic rank, Civil Service grade and grade distribution, and level of responsibility, with some comparative salary data in non-technical fields.

SUPPLY AND DEMAND FOR SCIENTISTS AND ENGINEERS, January 1982, $25.

This 50-page report, which includes 51 tables and charts, examines past, present and future imbalances in the supply of and demand for scientists and engineers. The supply is assessed by source and by field, and compared with current and short range demand for new graduates and for experienced scientists and engineers, including assessment of the increasing participation of women and foreign nationals in degree output. Surveys projecting future supply/demand imbalances are examined and compared.

THE SCIENCE AND ENGINEERING TALENT POOL, Proceedings of the 1984 Joint Meeting of the Scientific Manpower Commission and the Engineering Manpower Commission, May 15, 1984, $10

The 55 page report includes charts and text of several presentations about the sources for scientists, engineers and teachers over the coming decade; and opportunities for equal access for all students.