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ABSTRACT

This paper discusses changes related to students that will occur during the next two decades and how they will affect science teacher's considerations of what and how to teach biology. Statistical data are presented for racial/ethnic groups. Some variables influencing the choice of a biology career are reviewed. Hands-on activities, inquiry, and appreciation for the values and methods of science are recommended for biology teaching. Lists 13 references. (YP)

Look Who Coming To School!

CHANGING DEMOGRAPHICS:

IMPLICATION FOR SCIENCE EDUCATION

by

Betty M. Vetter

Occasional Paper 89-0

Commission on Professionals in Science and Technology
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Adapted from a

Presentation to the

Biological Sciences Curriculum Study Group

Colorado Springs, Colorado

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LOOK WHO'S COMING TO SCHOOL!

Changing Demographics: Implications for Science Education

Betty M. Vetter

Presentation to the Biological Sciences Curriculum Study Group

Colorado Springs, Colorado, November 12, 1988

Many of you may have been in Washington DC last month for a conference on putting life back into the high school life sciences courses. I won't offer you any advice about how to teach high school biology, or what to teach. Instead, I am concerned with **who** your students will be over the next two decades, and how that affects your considerations of what and how to teach biology. One goal would be to provide all of them with some appreciation, if not much understanding of the biosciences, and to insure that enough of them will be interested in the subject to prepare for a career in the life sciences.

How many is enough? I have to deal with this question regularly, not just for biologists, but for all kinds of scientists and engineers, and of course, I can never be sure of the answer because there are so many unknowns in the equation. What will be the state of the economy? Will we be at war? How will Congress decide to spend our tax money? What will influence young people choosing careers? And what developments may occur in the life sciences over the next few years which would change all of the other demand projections? I can't answer any of these. What I can tell you is something about what the school and college age population probably will look like a decade from now, because that future is already here.

The first thing we know, of course, is about how many children there will be. Biology is generally taught in the 9th grade, to young people who are about 15 years old. Today's 15 year olds were born in 1973, and the number of people in this age group is starting to bottom out this year, and will be moving up again in 1991 (fig. 1). I would like first at the ninth graders of 1996. Born in 1981, they are seven years old now, and they will be college freshmen in the year 2000. The question is whether they will be ready for college. We still have time to do something to assure that they will - not much time, but some.

What do we know about these youngsters who are our freshman class of 2000 - that will allow us to project the future? We know that one in four of them is living below the federally established poverty line - the largest percentage of youth in poverty in 25 years; also the largest proportion in any advanced country. We know that one in eight of them has physical or emotional handicaps. About one in 12 still does not speak much English - and that proportion may be even higher - the estimate is shaky. We know that more than half of them will live at least for a time in a one parent home before they reach college age. Almost one third of them are black, Hispanic, Asian or Indian. Only one third of them are white, non-Hispanic boys. This is the talent pool for our 9th grade biology class in 1996, and from which we must select our college freshman class of 2000. When we recognize that we're not very good at educating poor children, black children, and Hispanic children - we recognize that we'd better learn how, because that's who's coming to school.

U.S. 18-YEAR OLDS

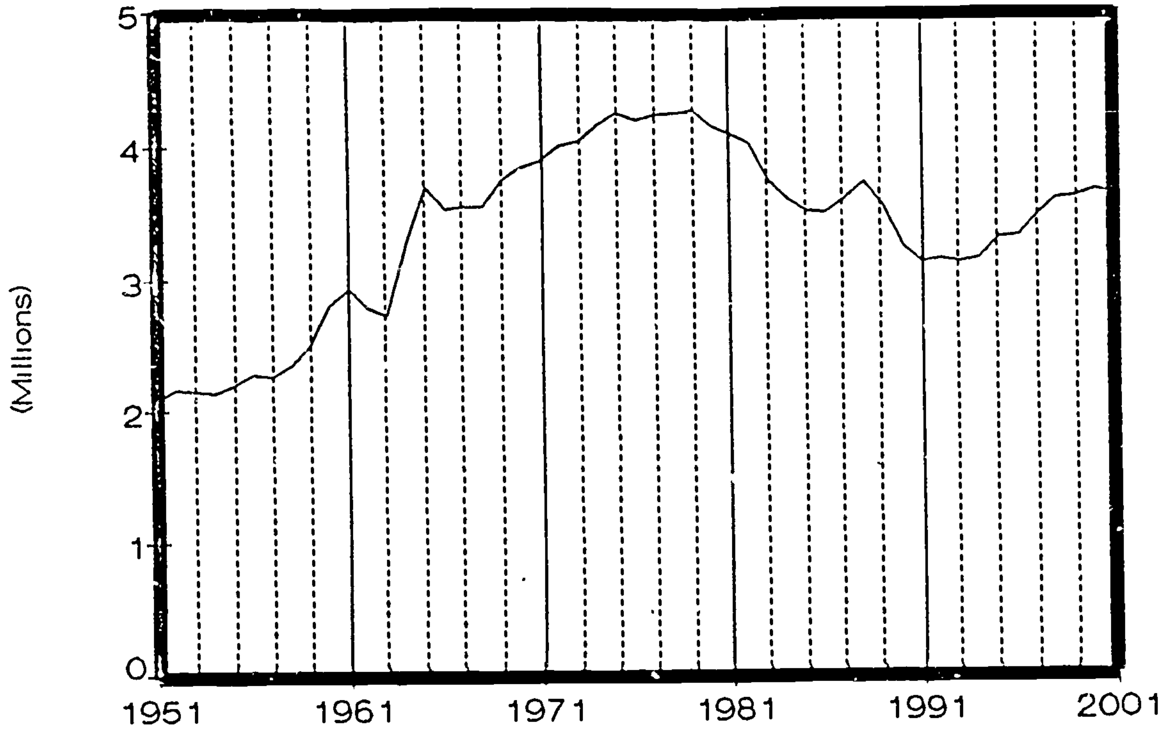
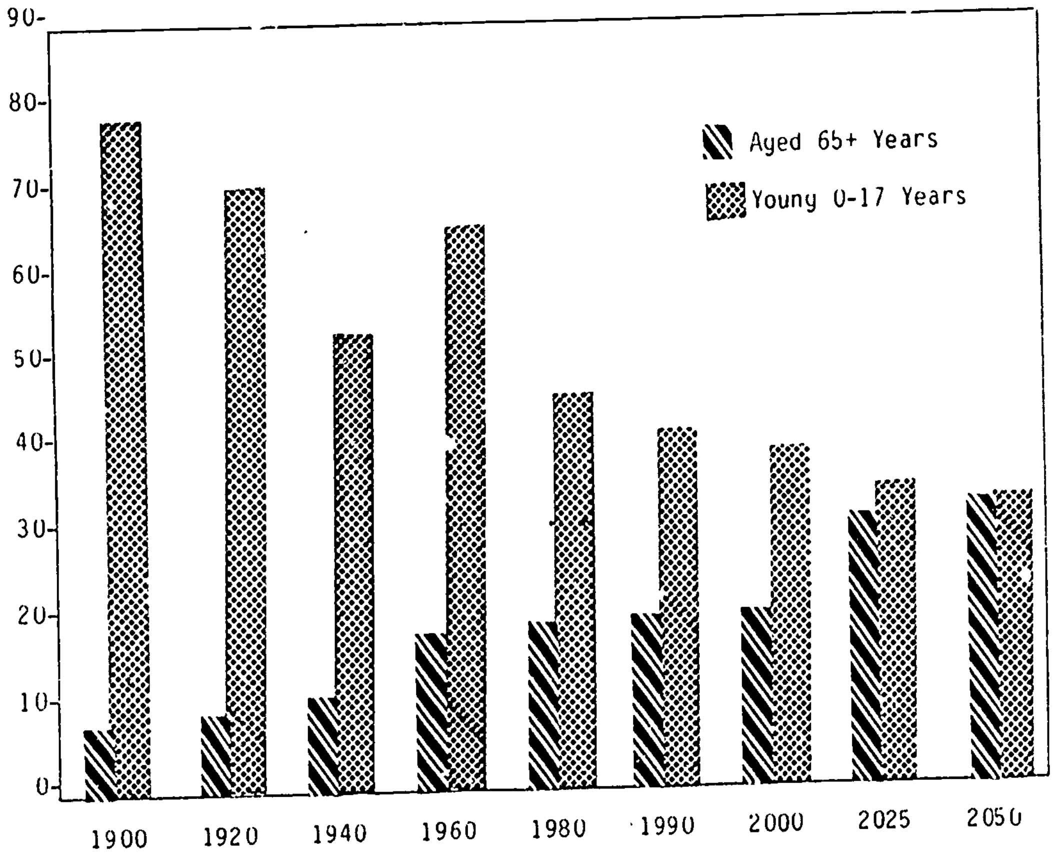


fig. 1

AGED AND YOUNG SUPPORT RATIOS, 1900-2050

Number in Age Range per 1000 Persons Aged 18-64



Source: U.S. Dept. of Health and Human Services, 1984

fig. 2

If we don't move now to get this group of children ready for college in 2000, the effort will be even harder later because of the rapid aging of our population. People over 85 make up the fastest growing group of Americans. When we have more elderly and fewer children to support, the ratios go through astonishing shifts (fig. 2). In 1900, the U.S. had eight children per one elderly person. Today the rate is closer to two to one, and the time is not too far distant when it will be one to one.

An educational system with 8 children per elderly person compared to one with two children per elderly person makes a big difference in how tax revenues are spent. Grandparents compete with their great-grandchildren for intergenerational transfer payments from taxes. The money that used to go entirely to schools increasingly must be split between programs for children and programs for the elderly. And of course, older people vote.

The rapidity of change toward minority dominance in our school population can be seen in a number of ways. For example, we can compare our college age population for the year 2000 with our present population (fig. 3). In 1986, we were 75.5% white, non Hispanic (Anglo), 11.7% black, 7.2% Hispanic, 1.9% Asian, 0.7% American Indian, and 3.0% foreign citizens. Our elementary school population, however, was less white and more black, Hispanic, and Asian, and these trends will continue very rapidly over the next decade.

Already, minorities constitute the majority of school enrollments in the nation's 25 largest cities. Differential birth rates and immigration accelerate this change. California schools opened this fall for the first time with a majority of their students being members of minority groups. (We need new words to describe minority majorities!) Texas will have a minority majority school population by next fall, joining Hawaii, New Mexico and Mississippi which already have turned this corner.

One way to see our high school sophomores in 1995 is to look at births in the United States 8 years ago - the last year for which we have all kinds of detail. Among the 3,612,258 babies born in the U.S. in 1980, 72% were Anglo, 16.3% were black, 2.3% were Asian, less than one percent were American Indian, and 8.5% were Hispanic (fig. 4). Most of these children are now in third grade. One of them is my grandson, so I watch this group closely.

Birth rates for U.S. mothers in 1980 varied significantly within these populations (fig. 5). The number of births per 1000 women aged 14-44 was 14.2 for Anglo women, 26.5 for black women, 13 for Asian women and 23.5 for Hispanic women. The national birth rate in that year was 16.4.

Ignoring the effects of immigration, if we project these 1980 birth rates out for a decade, we find that only 64.5% of the babies born in 1990 would be Anglo, while 22% would be black, 1% American Indian, 10.5% Hispanic and 2% Asian (fig. 4).

If we carry the projection out for a second decade, to the year 2000, we find that only 55.9% of the babies born to U.S. mothers would be Anglo, 28.8% would be black, 1.1% American Indian, 12.6% Hispanic and 1.6% Asian. Because of immigration, both legal and illegal, Hispanics are growing much

PERCENT MINORITIES IN THE U.S.

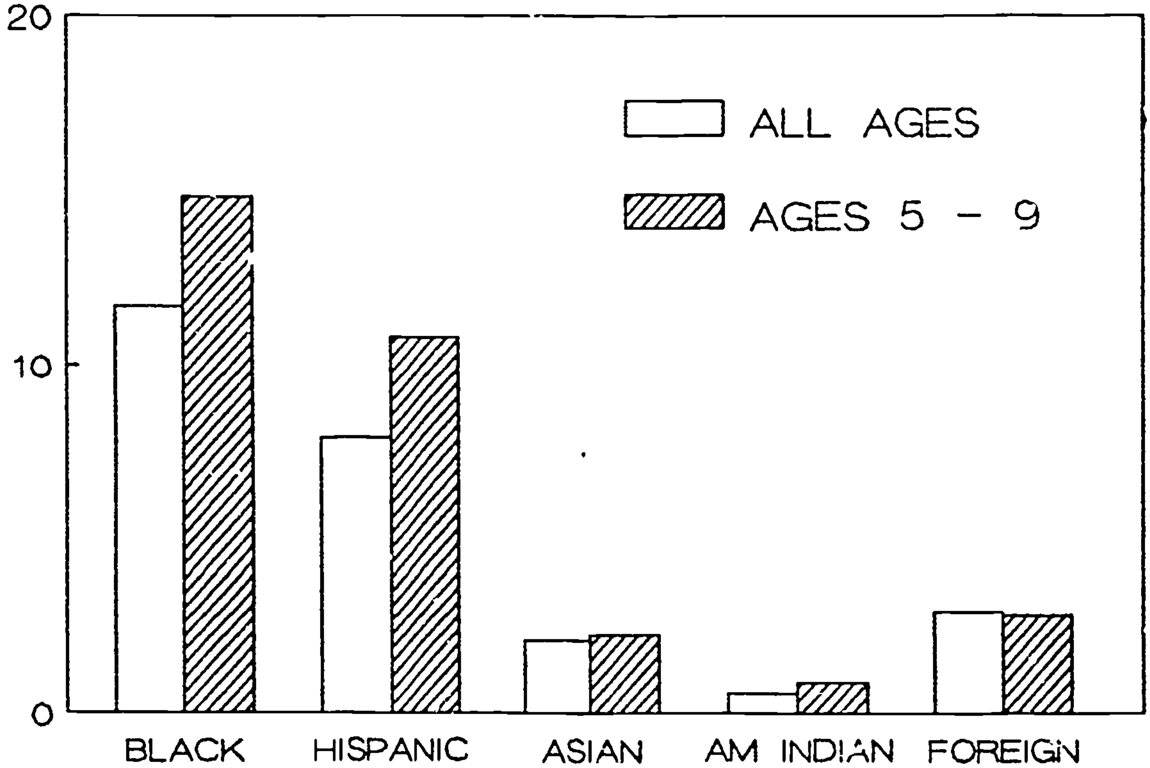


fig. 3

PERCENT OF U.S. BIRTHS BY RACIAL/ETHNIC GROUP

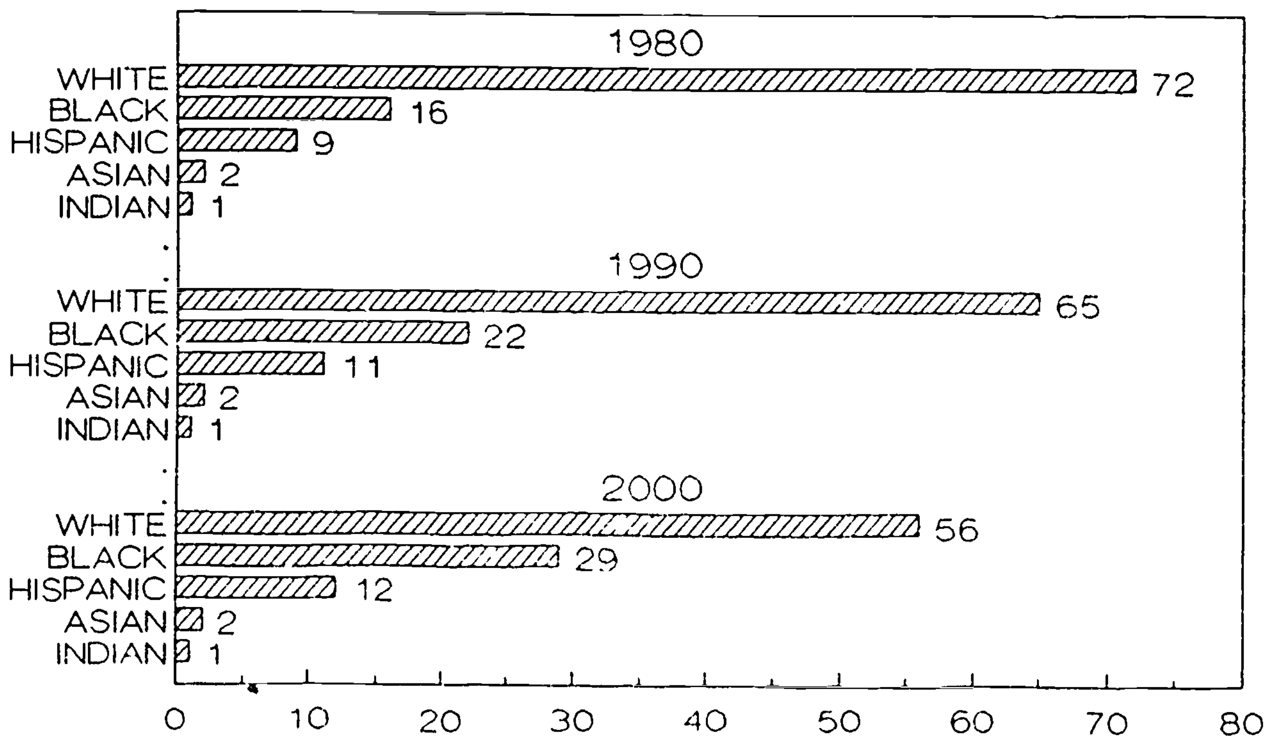


fig. 4

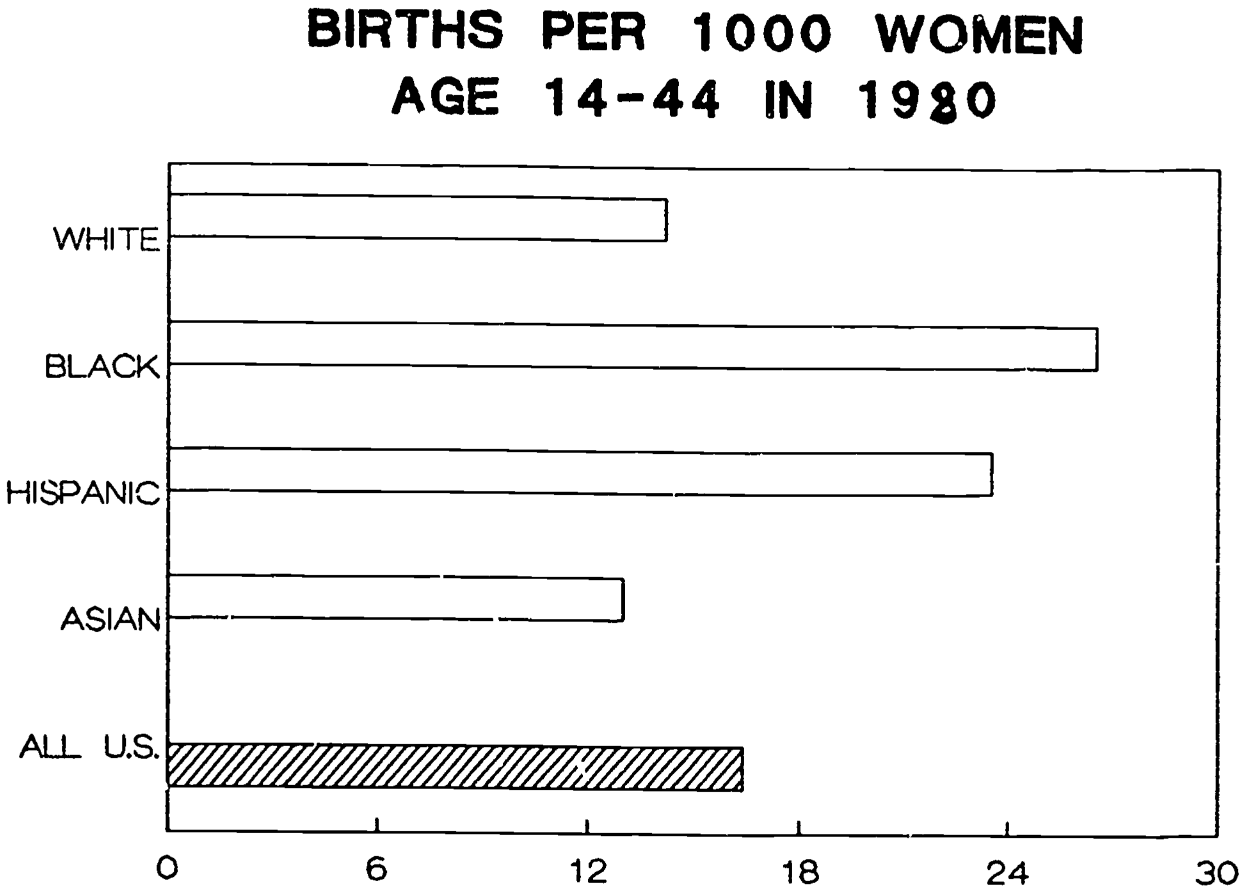

BIRTHS PER 1000 WOMEN
AGE 14-44 IN 1980
WHITE
BLACK
HISPANIC
ASIAN
ALL U.S.
0
6
12
18
24
30

fig. 5

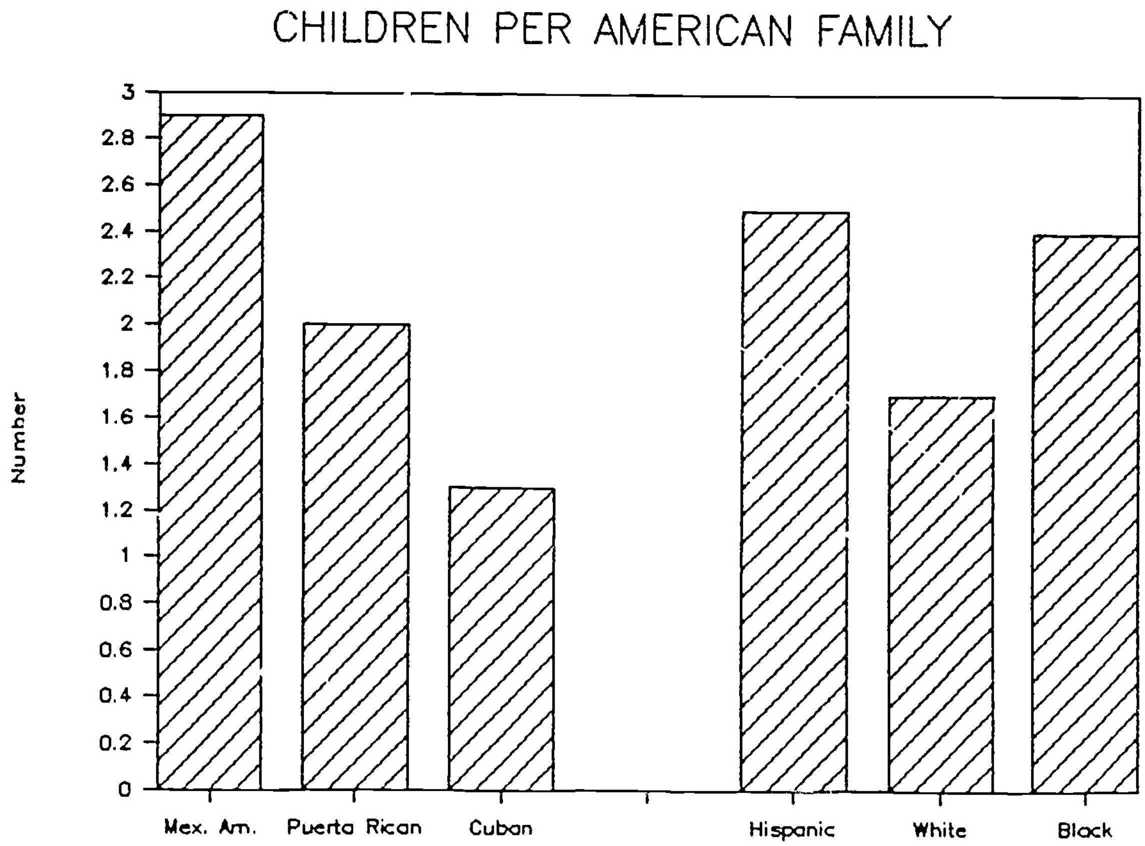

CHILDREN PER AMERICAN FAMILY
Number
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Mex. Am.
Puerto Rican
Cuban
Hispanic
White
Black

fig. 6

faster than this, and the number of Hispanic births is expected to exceed the number of black births even by 1990.

The Census Bureau says there are now 14.6 million Hispanics in the U.S. population and 26.5 million blacks. By 2020, there will be 44 million blacks and 47 million Hispanics, because the Hispanic group is growing both by births and immigration. Hispanic fertility is high - averaging 2.5 children per family. But there is really no such thing as a "Hispanic Fertility Rate," because within the Hispanic population, Mexican American families average 2.9 children per family - the same rate as the white rate after World War II that produced our famous baby boom generation, of which some of you are members.

Puerto Rican families in the U.S. average 2.0 children per family, and Cuban American families only 1.3 children- a rate lower even than the present 1.7 rate of Anglo families in the U.S. So the Hispanic populations represent both the top and bottom of the fertility change (fig. 6). Neither the white nor the Cuban populations in the U.S. are producing enough children to replace themselves - that takes 2.1 children per woman.

Perhaps we should try to control fertility rates. China has its famous (or infamous) one-child policy, and punishes couples who have more. West Germany is doing everything possible to increase its fertility rate, including the offer of a Mercedes to couples that have a fourth child. Which incentive works best? The answer is that neither one works at all! Governments have been totally unable to regulate or control fertility rates.

Our school population in 1982 - that is our 5-17 year olds - was about one fourth minority, with blacks predominating. By 1988, our school population is almost 30% minority, and by 2020, the most conservate projection of the Census Bureau says our school population will be about half white, one fifth black, one fourth Hispanic and 4% other - again, mostly Asian (fig. 7).

The point of showing you these projections - both mine and the Census Bureau's -is to demonstrate how essential it is that we increase educational opportunities and encouragement for our minority youngsters, because if we follow the patterns of the past two decades, losing most of the potential minority talent, there won't be enough non-minority talent - and particularly white male talent, to fill our needs. There is far more than a moral issue of fairness at stake. Our survival as a world leader is involved.

But what can we do now to maximize the future utilization of talent in our nation? I think we find one major clue when we look at the most striking feature of the 1980 crop of babies. That is the wide variation among their mothers in both their own age, and their educational level.

Among all 1980 Anglo mothers, 15.6% had completed four or more years of college. Among black mothers, the proportion was 6.3%. For Asian mothers, however, the proportion of college graduates is 30.2%! (fig. 8). This sheds considerable light on the achievement levels of Asian students. This particular statistic is not available for the Hispanic mothers, but we can infer from other data that the proportion who were college graduates is very small indeed.

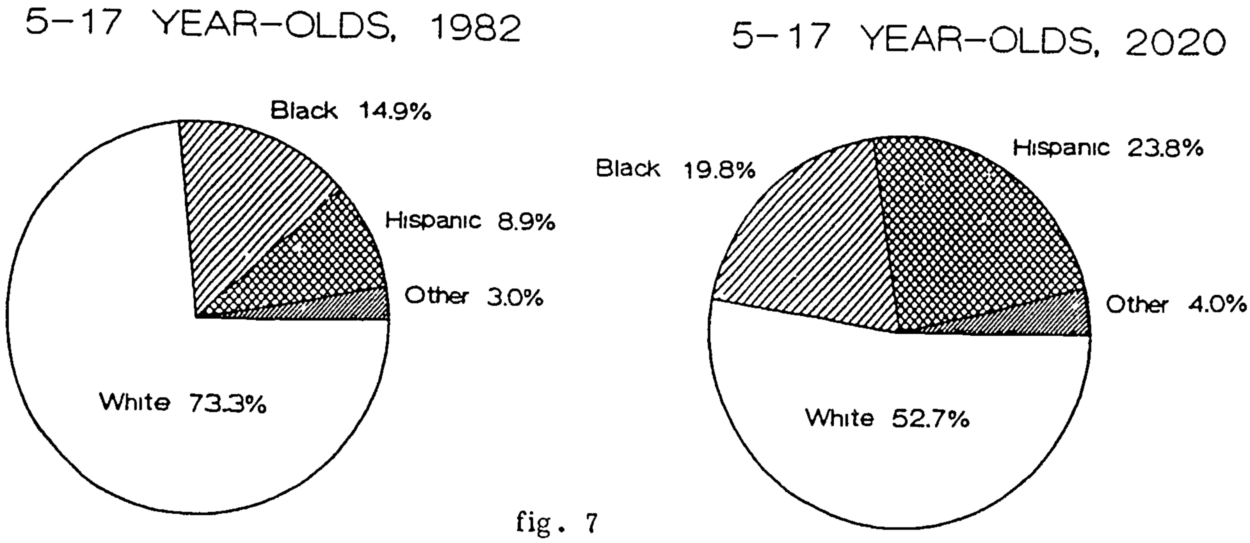


fig. 7

Source: Census Bureau

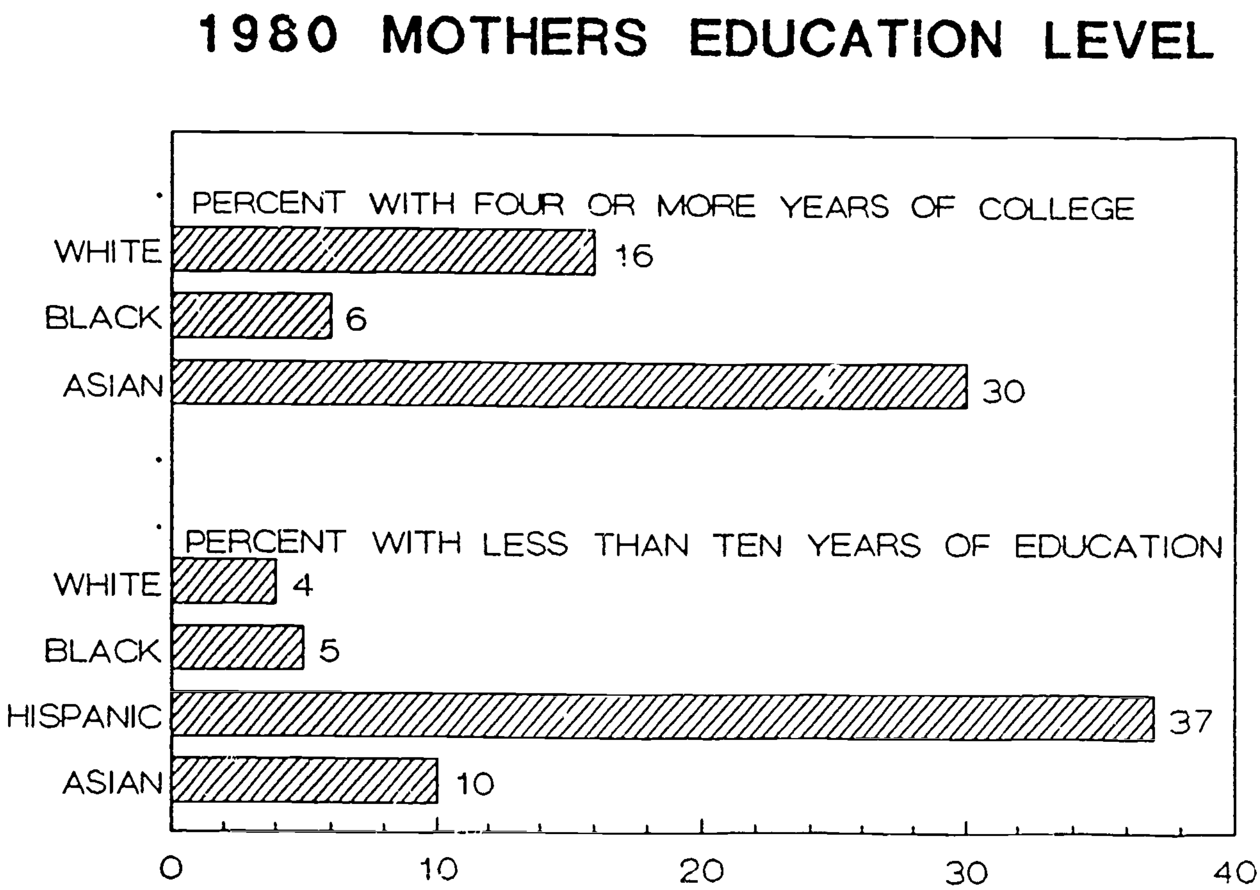


fig. 8

Source: Census Bureau

Looking at educational attainment from the other end, we see that 4.0% of the white mothers, 5.0% of the black, 10.0% of the Asian and an astonishing 37.1% of the Hispanic mothers had completed fewer than ten years of education (fig. 8). The high proportion of Asian mothers with very little education appears to be due predominately to the influx of refugees from southeast Asia in that year.

A highly related statistic shows that the percentage of 1980 births to mothers under the age of 20 was 13.5% for white women, 26.5% for black women, 39.0% for Hispanic women, but only 6.0% for Asian women (fig. 9).

To compound the rapidity of increase in Hispanic births, Hispanic women in the U.S. are much younger than white women. The median ages of the two groups in 1980 were 22 for Hispanic women, 25 for black women, and 31 for Anglo women (fig. 10). Guess which group will have more children over the next decade or so!

It is not idle speculation that the **mother's** educational level (and her age as it relates to a delay in childbirth for educational pursuit) is a dominant factor in the child's abilities and attainment. An earlier study carried out in 1980 by the National Opinion Research Center (NORC) of the University of Chicago identified a nationally representative sample of nearly 12,000 16 to 23 year old men and women, and administered to this "National Youth Sample" the Armed Forces Qualification Test (AFQT) which consists of four subtests of aptitudes, and serves as a general measure of trainability and the primary criterion of enlistment eligibility for the armed forces. The Youth Sample was appropriately representative of the racial, ethnic, sex and socio-economic mix of that age group in the nation as a whole.

As could have been predicted, youth from higher socio-economic groups scored higher than those from lower socio-economic groups. White youths did generally better than black or Hispanic youths; suburban better than inner city, etc. Students with more education scored higher than those with less, and youths from some parts of the country (i.e. New England and the West North Central region) scored far higher than those from the three southern regions. But the startling finding of the study was that the strongest single predictor of both the AFQT score and reading ability was the **mother's** educational level.

The differences in percentile scores, based on the educational level of mothers are substantial. Youth whose mothers had completed 8th grade or less averaged AFQT percentile scores of 29. The average for youth whose mothers stopped at grades 9 through 11 was 38. If the mother completed high school, the average score was 54. With some college for the mother, the youth averaged 63. Youth whose mothers were college graduates or more averaged 71 on the percentile score (fig. 11).

Another ongoing longitudinal study of a thousand youngsters in six southern states, examining career aspirations and expectations at various age levels and then comparing them to later attainment, has found that the best single predictor of women's success in attaining the jobs they aspired to is their mother's educational level.

PERCENT OF 1980 MOTHERS UNDER AGE 20

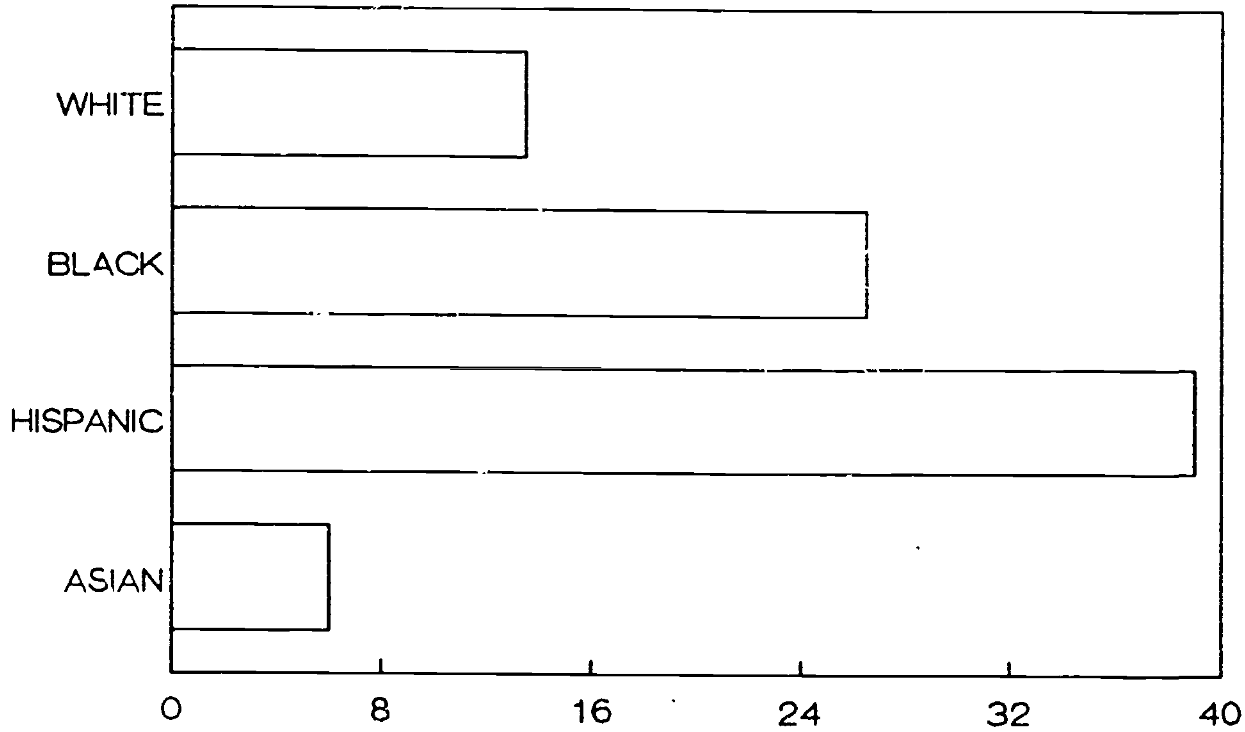


fig. 9

MEDIAN AGE OF HISPANIC, BLACK & WHITE POPULATION

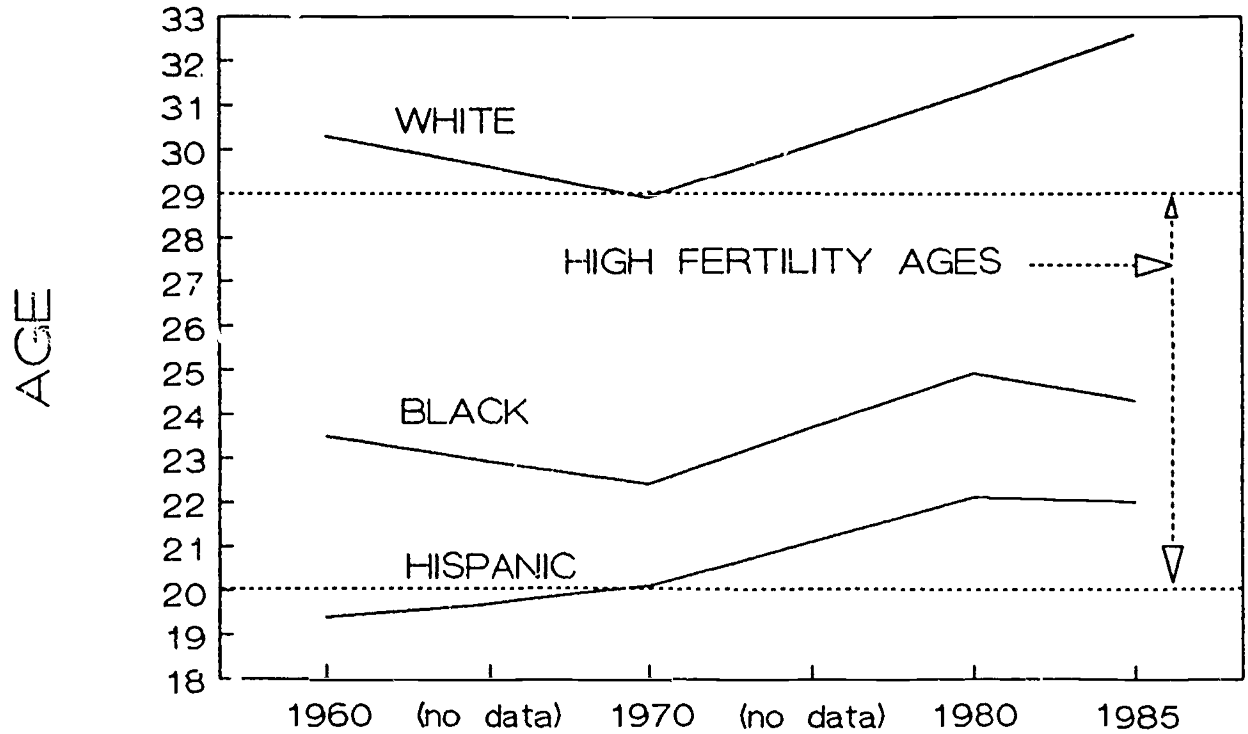
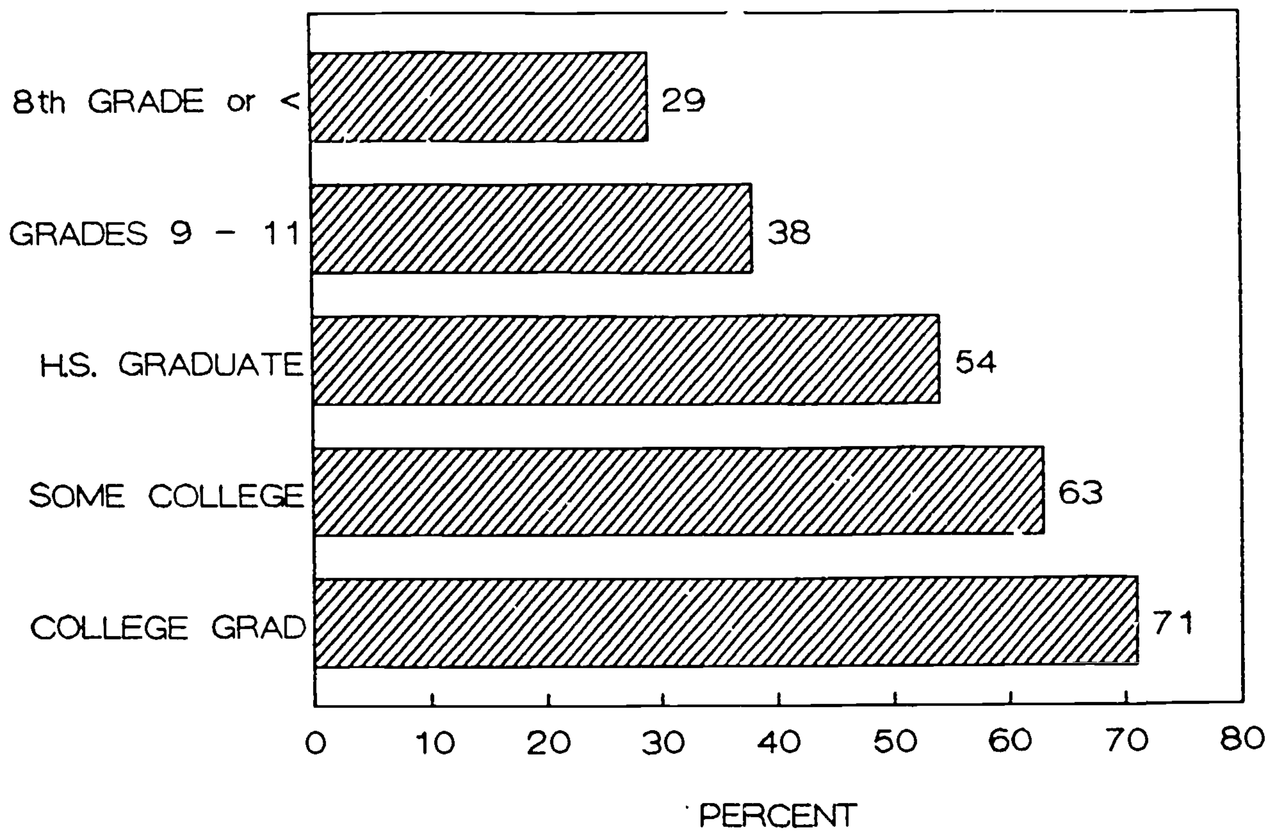


fig. 10

Sources: Aso. Nat. Pro Personas Mayores & Census Bureau

YOUTH PERCENTILE SCORE BY MOTHER'S EDUCATION LEVEL



Source: NORC

fig. 11

% US MINORITIES IN VARIOUS POPULATION GROUPS (1985-85)

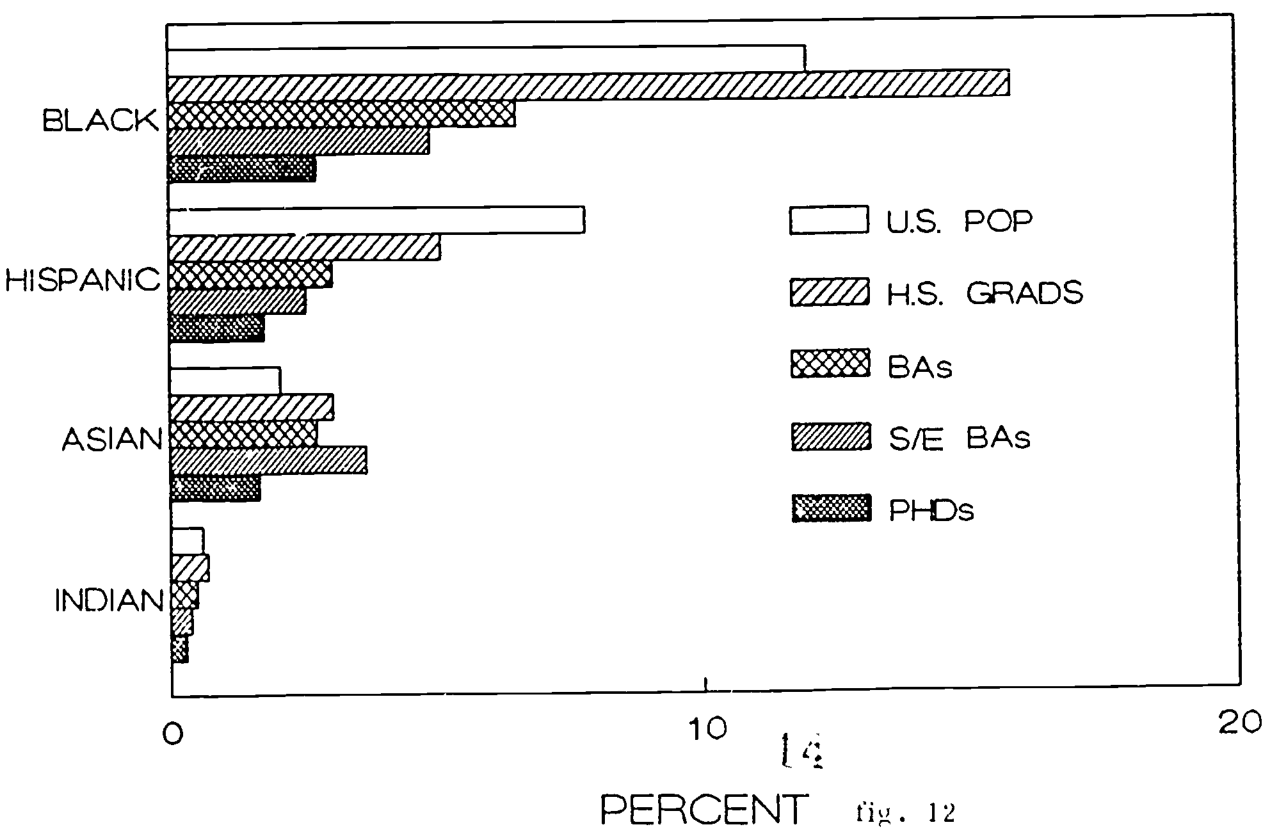


fig. 12

TABLE 1

HIGH SCHOOL RETENTION, 1984

TOP TEN		BOTTOM TEN	
Minnesota	96.0%	Kentucky	69.6%
North Dakota	89.7	California	69.3
Iowa	87.9	Texas	69.2
South Dakota	87.6	Florida	67.4
Nebraska	86.3	South Carolina	66.3
Utah	85.8	New York	66.0
Montana	84.8	Georgia	65.6
Wisconsin	84.5	Mississippi	64.4
Kansas	84.2	Alabama	62.4
Hawaii	83.5	Louisiana	58.1

(Penn. = 12th Ohio = 14th New Jersey = 17th)

TABLE 2

HEAD START: RESULTS, FALL 1984
(Cohort Now 19 Years Old)

	Head Start	Control
Percent Employed	59%	32%
High School Graduates	67%	49%
Enrolled in College	38%	21%
Function Competence	61%	38%
Been Arrested	31%	51%
On Welfare	18%	32%

Source: High/Scope Foundation, Michigan, 9/84

There appears to me to be little doubt that a policy which encourages and provides for the highest possible level of education for girls and women, preferably before they have children, might be the single most significant measure that could be taken to improve opportunities for minorities, as well as for majority youth.

We can see why this matters when we look where we are now. At each successively higher level of educational attainment, we find a smaller proportion of each minority group. Blacks, who are about 12% of the population, graduate from high school in higher proportions than the average, but earn only 6.5% of the bachelor's degrees, 5.8% of the master's degrees and 3.4% of the Ph.D. awards. For Hispanics, the situation is similar, except that we lose half of them even before High School graduation. The dropoff for American Indians is not quite so great, and Asians appear to increase their proportions at higher degree levels, although much of that increase may be due to recent immigration (fig. 12).

The first stage of progress, of course, is high school retention - how many children do we graduate. Harold Hodgkinson, well known educator and speaker, provides a list of the top and bottom ten states in high school retention in 1984, and points out commonalities in each set (Table 1). Among the top ten, other than Hawaii, all are northern. They are rural, and more Anglo than others. They lack large urban centers with big poverty concentrations. They are not highly industrialized. Most important, they are cold. Hodgkinson says that John Calvin wouldn't have written a word if he had lived in Hawaii! It is impossible to think of people engaging in protestant-like behavior such as studying hard in the evenings, in warm climates.

In the bottom ten, we find states with big cities and established poverty centers, high minority populations, and except for New York, warm climates. But it is not high minority populations that make the difference - it is the increase in poverty. Pennsylvania, Ohio and New Jersey actually represent a minor miracle because they do so well. But Texas, Florida, New York and California - all large, sophisticated states with big budgets for education - are in the bottom ten.

Non graduates are very different from people who graduate from high school. They know so little about almost anything that they can be swayed to believe any demogogue who comes along. They believe in signs and omens - not in science. They make it possible to support 30,000 astrologers, and only 3000 astronomers in this country. Their votes are for sale to any persuasive speaker - whether truth or falsehood is spoken. Their lives are so circumscribed by ignorance that they are easy targets for the drug pusher who offers nirvana through cocaine crack.

One fourth of the U.S. population drops out of high school, but eighty percent of all prisoners in U.S. jails are high school dropouts. Each costs us taxpayers about $24,000 per year,and of course, provides no revenue in the form of employment taxes.

A college student enrolled in a state college or university costs the state an average $3,500 per year, or $14,000 for a bachelor's degree. Four years in prison costs six times as much, and the prisoner, unlike the student, is not being prepared during those years to get a job and start paying taxes. Even Harvard costs less than prison! We simply can't afford the price of **not** educating our children.

Even small amounts of educational difference make a significant difference in the outcome. Among 19 year olds in 1984 who had participated in Head Start, 31% had been arrested compared with 51% of a control group without Head Start. The Head Start group was far ahead of the control group in high school graduation, employment, and college going (Table 2). Education pays. It is the alternatives that are costly. **In 1988, only 18% of eligible children are served** by **Head Start**, due to inadequate funding. We spent $2.4 billion on the care and education of preschoolers last year, including significant amounts to preserve the lives of addicted infants who will always be well below normal in intelligence. We spent $8.7 billion on one year of space research; $38 billion on military research, development and testing; and we spend $20 billion per year on prisons. We taxpayers spent almost $40 million on the recent mud-slinging process called a Presidential election campaign, not including private donations. The president wants a line item veto. As a taxpayer, so do I!

The current administration excuses its education priorities by saying that a rising tide raises all boats. But increasing prosperity for some during the past eight years has not helped the large underclass without a high school diploma - they weren't even **on** the boat!

Robert Park points out that American students are increasingly unwilling to endure the rigors of a science education. They dabble in new age mysticism, ascribing supernatural powers to crystals but disdaining crystallography. Many who enroll in Astronomy 101 do so believing it will enable them to construct their own horoscope. Fundamentalists, with some help from the present administration, seek to purge the great unifying principle of biology from our textbooks. Thus, American students trail every civilized country in the industrialized world in science and math literacy by 12th grade, ranking 13th out of 13 countries in biology (Table 3).

The new NAEP Assessment of Science, **The Science Report Card,** says that approximately one million third and fourth graders have not yet developed any understanding of science principals or rudimentary knowledge of plants and animals. Among 17 year olds, who should have taken high school biology, only 80% can apply basic scientific information, only 41% can analyze simple scientific procedures and data, and only 7.5% can integrate specialized scientific information, such as in figure 13. Girls do less well than boys; minorities rank well below white students. Most damaging of all as I see it is that the gap in achievement in science between boys and girls at age 13 has **widened** since the first assessment in 1969. The only encouraging news is that the gap in achievement between white and minority students has lessened slightly.

College Freshmen, turned off by something, are moving away from majors in science, in computer science or in engineering (fig. 14). The biosciences attract a substantially smaller proportion of freshmen now than in 1975. Why is biology less interesting to college-going students today than it was a decade ago?

TABLE 3

Rank Order of Countries for Achievement at Each Level

	10 yr olds Grade 4/5	14 yr. olds Grade 8/9	Grade 12/13 Science Students		
			Biology	Chemistry	Physics
Australia	9	10	9	6	8
Canada (Eng)	6	4	11	12	11
England	12	11	2	2	2
Finland	3	5	7	13	12
Hong Kong	13	16	5	1	1
Hungary	5	1	3	5	3
Italy	7	11	12	10	13
Japan	1	2	10	4	4
Korea	1	7	-	-	-
Netherlands	-	3	-	-	-
Norway	10	9	6	8	6
Philippines	15	17	-	-	-
Poland	11	7	4	7	7
Singapore	13	14	1	3	5
Sweden	4	6	8	9	10
Thailand	-	14	-	-	-
U.S.A.	8	14	13	11	9
Total no. of countries	15	17	13	13	13

Recombinant DNA research has produced a variety of organisms with big economic potential. For which of the following reasons are concerned citizens hesitant to permit the use of these organisms outside of the laboratory?

- ○ Production of such organisms will involve the production of hazardous by-products.
- ○ Most scientific research is perceived to be dangerous.
- ○ The organisms could die outside of a laboratory environment
- ● The introduction of organisms new to the Earth could upset the ecological balance

Source: Science Report Card, 1988, NAEP

fig. 13

Part of the answer might be in the fact that starting salaries in the biological sciences are substantially below those in all other science fields, as well as the various business fields (fig. 15). There also is a wide discrepancy in starting salaries at the baccalaureate level between men and women with new bachelor's degrees in the biological sciences - a difference of about $1,000/year to start, and of course, a difference which will grow with time in the workplace, and which exceeds the difference in most other fields. However, it is not salary alone that determines student choice, or we would not see the falling interest in engineering and in computer sciences, where starting salaries remain high.

Freshmen are opting for majors in business rather than in any science or engineering field. Interest in education also has turned up again after a long drop (fig. 16). However, most education majors probably are not planning to teach high school biology - or they would major in biology with an option for a teaching credential.

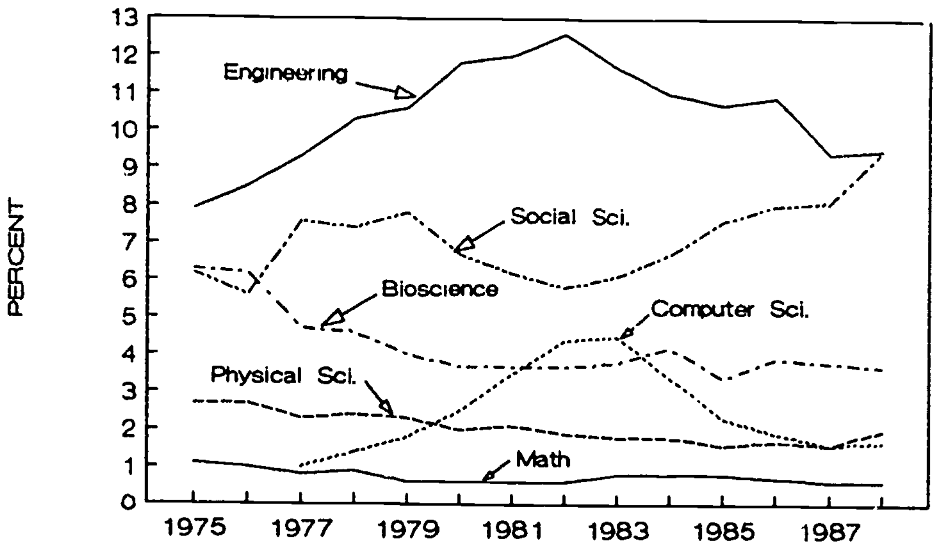
What will happen to the supply of baccalaureate graduates in the science and engineering fields? Because we are dealing with a smaller age group, and with a smaller proportion of that age group planning to major in one of these fields, the drop in baccalaureate graduates in science or engineering will be substantial even by 1990 according to a forecast of the National Science Foundation shown in figure 17. In the life sciences, that will not matter for a while, because we have a sufficient current supply of life scientists, on through the doctorate level, to fill the available jobs for faculty and other researchers.

However, as that demand grows through the next two decades, there may be too small a base of American baccalaureate graduates to populate our graduate schools, replace our aging faculties, and man our research laboratories. In 1987, only 8,000 U.S. citizens earned a PhD from an American university in any natural science or engineering field. Figure 18, a projection of demand for PhDs from the National Science Foundation, indicates the need for 18,000 new PhD graduates by 2004. Where are they to come from?

Your problem is more immediate. How do you maintain interest among 15 year olds - old enough to drop out by next year. Old enough (but not mature enough) to become parents. Accustomed to adventure, excitement, television, instant gratification. For many, perhaps for most, biology is the last science course they will ever take. Their feeling about what science is, the method by which it seeks answers, and even its potential for good or ill may be fixed for life by their high school biology class. It may be the only formal source of information for them about the natural world, about their bodies, and how they work.

Surely you don't still give them long lists of names and categories to memorize, and a foul-smelling frog to disect! That is why I hated biology. I saw no relevance to me or to my life. How could I have been so dumb, or my teacher so stuffy? Biology is related to the most fearsome problems, the most exciting mysteries, the most hopeful activities of anything we can imagine.

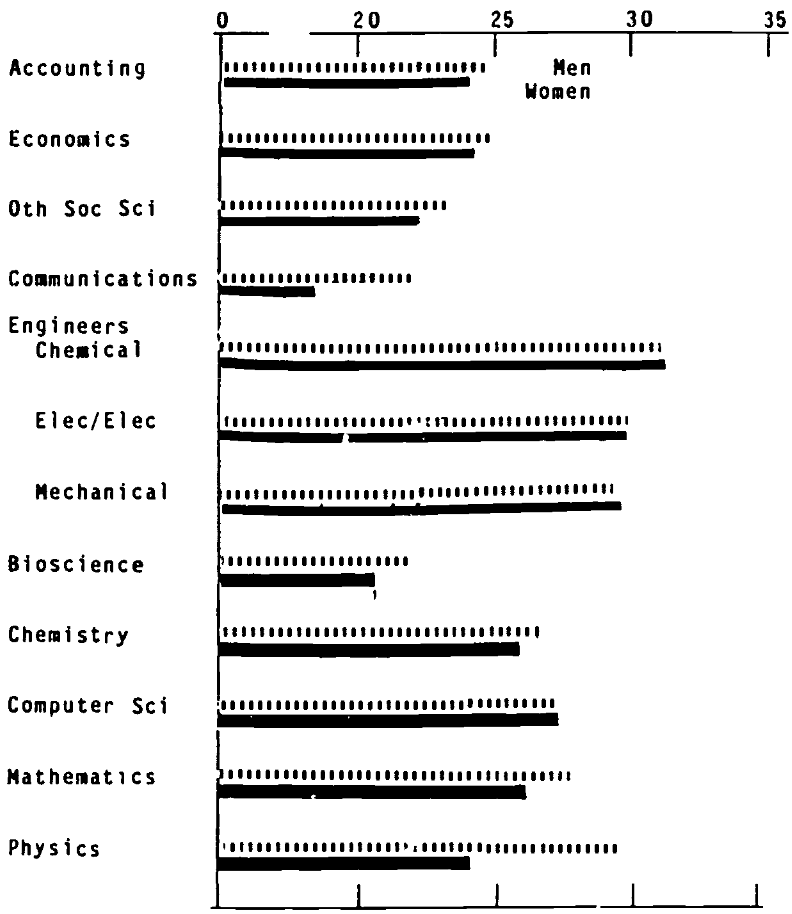
FRESHMAN PLANS FOR S/E MAJORS 1975 -1988



Source: Cooperative Institutional Research Program

fig. 14

STARTING SALARIES, 1988 BA/BS GRADUATES



Source: College Placement Council

fig. 15

CHANGING FRESHMAN MAJORS, 1973 - 1987

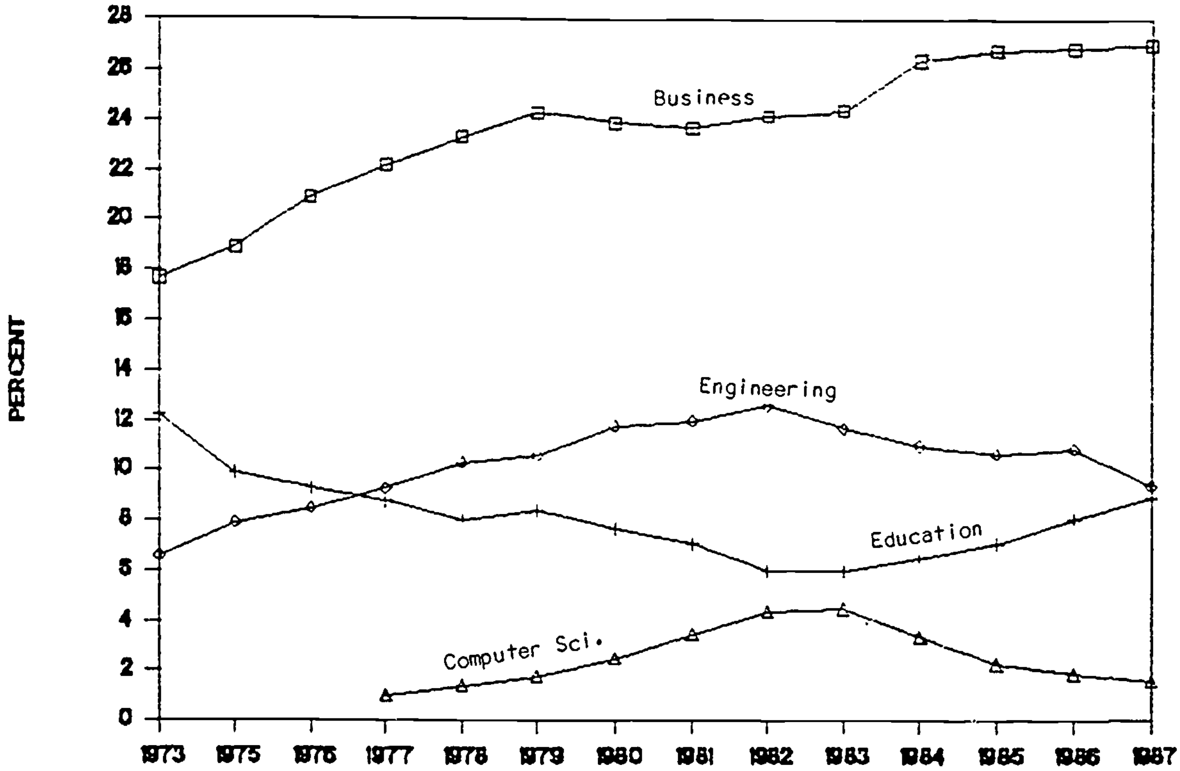


fig. 16

NS&E BS Production

[Showing Expected Effects of Freshman Intentions]

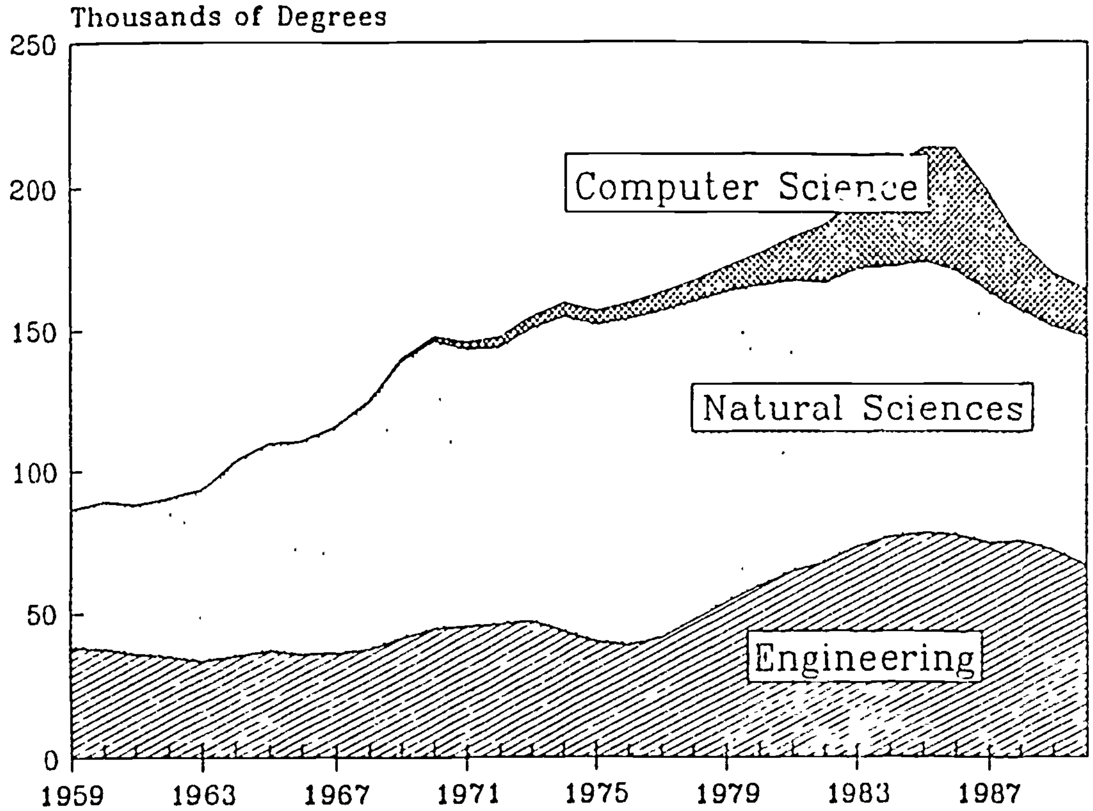


fig. 17

Source: NSF

Available PhD Positions for Natural Scientists and Engineers

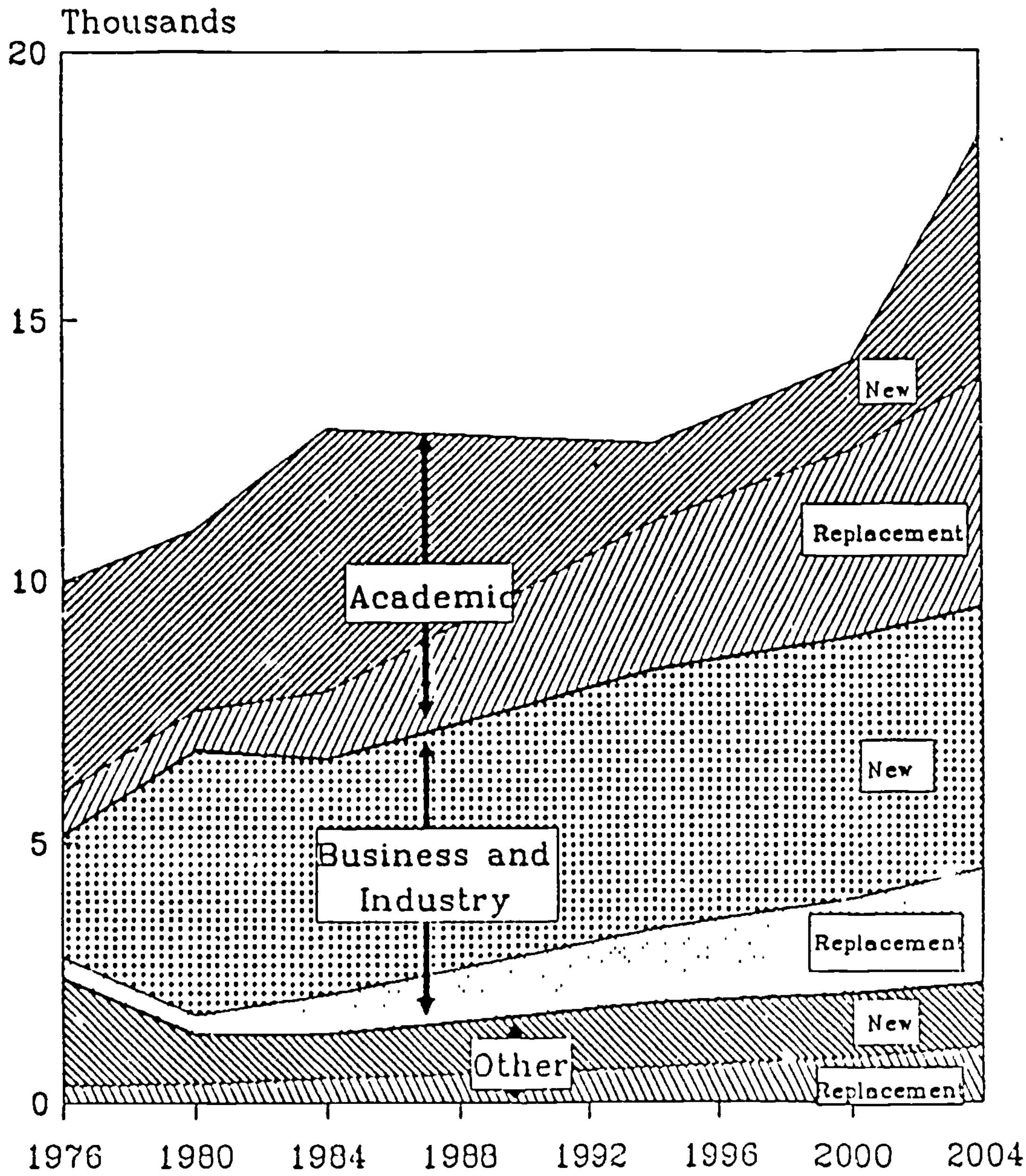


fig. 18

Our earth is beginning to suffocate under a blanket of carbon dioxide. Our sky rains acid on dying forests and lakes. The ocean has started to regurgitate the filth of civilization back onto its beaches, and a hole has appeared in the ozone layer. The irreplaceable rain forests of the Amazon, vital to us all, are being burned off at an almost unbelievable rate.

At the same time, developments in the life sciences such as gene splicing hold promise beyond comprehension for most of us. How could students **not** be interested if they understood anything at all of these terrible dangers and marvelous potentialities and the relationships between them?

My suggestions are simple. Let the curriculum include a lot of hands on work, but don't insist that it smell bad. Let it teach appreciation for the wonderful detective work of science in general and bioscience in particular. Let it show students the promise of eliminating sickle cell and Tay Sachs, along with the threat of AIDS, and why it is so difficult to find the solution to that deadly puzzle. It is not necessary that high school students become "science literate", in high school biology class. What is necessary is that they learn some appreciation for the values and methods, the puzzles and triumphs, the marvels and mysteries of life on our earth. Most of all, let them understand the relevance of all these things to themselves.

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of the COMMISSION ON PROFESSIONALS IN SCIENCE AND TECHNOLOGY

SCIENTIFIC, ENGINEERING, TECHNICAL MANPOWER COMMENTS, periodical, 10 issues/year. Free to CPST members. Non-members: $65/one-year; 2 yrs./$125; 3 yrs./$185.

A monthly digest of current developments affecting the recruitment, training and utilization of scientist, engineers and technologist. Special sections provide information on supply and demand, salaries, women and minorities, 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, Seventh Edition, December 1987. Members - $75; Non-members - $85.

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SALARIES OF SCIENTISTS, ENGINEERS AND TECHNICIANS, A Summary of Salary Surveys, Thirteenth Edition, October 1987. Members - $35; Non-members - $45.

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THE TECHNOLOGICAL MARKETPLACE - Supply and Demand for Scientists and Engineers, May 1985. Member - $20; Non-Member - $25.

This 54-page report, which includes over 50 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 and experienced graduates, including assessment of the increasing participation of women and foreign nationals in degree output. Surveys projecting supply/demand imbalances over the next decade are examined and compared. [The 1982 edition is available for $10.]

continued on next page ...

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SCIENTIFIC MANPOWER - 1987 AND BEYOND, January 1987. Members $15, Non-Members $20.

Proceedings of a Symposium examining the effect of today's federal and corporate budgets on tomorrow's science and engineering manpower.

THE INTERNATIONAL FLOW OF SCIENTIFIC TALENT: Data, Policies and Issues, September 1985. Members - $12.50, Non-Members - $15.

The Scientific and Engineering Manpower Commissions, meeting at the National Academy of Sciences, explored the increasing participation of foreign nationals in this country's educational institutions and workforce. Tables and charts supplement the text.

OPPORTUNITIES IN SCIENCE AND ENGINEERING - A Chartbook Presentation, Second Edition, November 1984. Members - $12.50, Non-Members - $15.

This 96 page presentation includes information on the present supply of men and women scientists and engineers, detailing such characteristics as their educational preparation, their labor force participation and employment opportunities, and their starting and advanced salary levels. The future supply of and demand for scientists and engineers is examined by field under different scenarios for various periods in the future. Each page of text is accompanied by a full page chart outlining some of the statistical information included. The charts are suitable for reproduction.

GUIDE TO DATA ON SCIENTISTS AND ENGINEERS, April 1984, free to libraries.

This 275 page reference book consists of three indexes to science and engineering manpower data published by 49 organizations concerned with some phase of science or engineering manpower. The Bibliographic Index describes each publishing organization, outlines the manpower surveys it conducts, and lists detail of data tables in each of its publications covering 1973-1983. A Field Index and year of Data Index are quick guides for any data characteristic, which reference back to the Bibliographic Index.

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