



## **D-E Communications - Critical Issues Series**

### **Minorities in Engineering & Related Fields – Diversity Analysis of Students Earning Bachelor’s Degrees**

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**EXECUTIVE SUMMARY:** The racial/ethnic makeup of students earning bachelor’s degrees was examined (specifically focusing on historically underrepresented minorities – “UR Minorities” – Blacks, Hispanics, and Native Americans) to address a critical, “bottom-line” question – how relatively racially/ethnically diverse are the graduating baccalaureate classes in Engineering and five closely-related fields of study (namely: Chemistry, Physics, Math & Statistics, Computer Science, and Engineering Technology) when compared to the diversity seen in the graduating baccalaureate class of all Science & Engineering (S&E) fields combined?

Through this assessment – which involved examining both the most recent data set available (for 2004), as well as historical data (covering 1977-2004) – three of the six fields evaluated (namely: Physics, Math & Statistics, and Engineering) were identified as significant laggards in 2004 (as well as historically) in achieving racial/ethnic diversity in their graduating baccalaureate classes on a par with that seen considering S&E as a whole. For both Physics and Math & Statistics, substantial under-representation is seen for all three UR minority groups considered, while for Engineering, substantial under-representation is seen for both Blacks and Native Americans, with such under-representation generally extending throughout the various sub-disciplines of Engineering

This report seeks to serve as a “call to action” to colleges/universities, relevant professional societies, and other appropriate entities to undertake and/or support new or additional efforts/initiatives specifically focused on increasing racial/ethnic diversity levels in the graduating baccalaureate classes of Physics, Math & Statistics, and Engineering nationwide, with an ultimate goal put forth of achieving diversity levels on a par with corresponding “average” levels seen for S&E as a whole (which for 2004 was: 8.4% Black; 7.3% Hispanic; 0.71% Native American). Based on the data evaluated in this study, increases on the order of 50-100% in the number of graduating baccalaureate-earners in those fields that are “minorities of concern” (Blacks, Hispanics and Native Americans for Physics and Math & Statistics; Blacks and Native Americans for Engineering) will be needed to achieve such a goal.

## **1. Introduction**

In examining the issue of minorities in Science and Engineering (S&E) and associated diversity issues, there are many possible points of view and corresponding data analyses that can be conducted in various attempts to assess the situation. The analysis reported herein examines the racial/ethnic makeup of students earning bachelor’s degrees (specifically focusing on historically underrepresented minorities – “UR Minorities” – Blacks, Hispanics, and “Native Americans” [American Indians and Alaskan Natives]) to address a critical, “bottom-line” question: How racially/ethnically diverse are the graduating baccalaureate classes in Engineering and five closely-related fields (namely: Chemistry, Physics, Math & Statistics, Computer Science, and Engineering Technology) when compared to the diversity seen in the graduating baccalaureate class of all S&E fields combined?

The rationale for conducting this specific comparative analysis is based on the following two considerations:

- Awarded bachelor’s degrees define the ultimate success of efforts aimed at increasing the diversity of the scientific and engineering professions, given that a bachelor’s degree represents the entry-level educational requirement for both professions.
- By conducting comparisons specifically versus S&E as a whole (as opposed to oft-used comparisons to general population demographics), a particularly useful “yardstick” is employed to measure the diversity achieved within S&E, one enabling identification of leading and lagging fields within S&E.

Through this assessment – which involved examining both the most recent data set available (see Section 2), as well as historical data (see Section 3) – three of the six fields evaluated (namely, Physics, Math & Statistics, and Engineering) were identified as significantly lagging in achieving racial/ethnic diversity levels on a par with that seen for S&E as a whole. As such, a “call to action” is put forth (see Section 5), calling upon pertinent parties to undertake and/or support new and additional efforts/initiatives specifically aimed at increasing UR Minority diversity levels in Physics, Math & Statistics, and Engineering undergraduate programs, with the ultimate goal put forth of achieving diversity levels amongst baccalaureate-earners on a par with the corresponding “average” levels seen for S&E as a whole.

## **2. Data Sources**

All data on the racial/ethnic makeup of students earning bachelor’s degrees was obtained from the National Science Foundation’s (NSF) WebCASPAR database (located online at <http://webcaspar.nsf.gov>), which contains a large body of statistical data resources regarding science and engineering education at U.S. academic institutions. The specific data set accessed for this effort was the U.S. Department of Education’s National Center for Education Statistics’ (NCES) “IPEDS Completions Survey By Race – Degrees/Awards Conferred (NSF population of institutions).” Both the latest data set available (for 2004) and time series data (covering 1977-2004) were utilized in the analysis conducted. Raw data was downloaded from the database as Excel spreadsheets and then processed in Excel to obtain percentage breakdowns by race/ethnicity, with this derived percentage data used as the basis for the comparative analysis performed in this study.

The NCES data set used includes the following nine academic disciplines under “Science & Engineering”: Engineering, Physical Sciences, Geosciences, Math & Computer Science, Life Sciences, Psychology, Social Sciences, Science & Engineering Technologies, and Interdisciplinary/Other Sciences. For purposes of this analysis, the convention employed by the NSF in its ["Science and Engineering Indicators" report series](#) is used in defining what is considered a “science or engineering discipline.” Under the NSF convention, the following disciplines are not considered a “science or engineering discipline”: 1) Medical Sciences, 2) “Other Life Sciences” (defined as being “Life Sciences other than Agricultural, Biological or Medical Sciences”; principally consists of Nursing), 3) Science and Engineering Technologies, and 4) Interdisciplinary/Other Sciences.

## **3. Analysis of Latest (2004) Data on the Racial/Ethnic Makeup of Students Earning Bachelor’s Degrees**

Tables 1 provides a breakdown of earned bachelor’s degrees in the US by race/ethnicity for 2004 (the latest year for which a complete data set is available), listing both raw numbers and corresponding percentages. The table includes breakdowns considering All Academic Disciplines (i.e., college-wide) and All S&E Disciplines (consisting of the disciplines previously detailed in Section 2), as well as for Engineering (including by sub-discipline) and the five closely-related fields of interest – Chemistry, Physics, Math & Statistics, Computer Science, and Engineering Technology.

To aid in the comparative analysis conducted, Relative Representation Levels (RRLs) and associated Representation Gaps (RGs) for 2004 – presented in Table 2 – were calculated using the data given in Table 1 for Engineering (including by sub-discipline) and the five closely-related fields of interest. RRLs represent a simple quantitative means to directly compare racial/ethnic diversity levels seen in the baccalaureate graduating class of a particular S&E field to that seen considering S&E as a whole. More specifically, for a given year, an RRL is the ratio – expressed as a percentage – of the percentage of baccalaureates awarded in a particular field of interest (e.g., Engineering) that are earned by a particular UR minority group to the percentage of baccalaureates awarded in S&E as a whole (i.e., considering all S&E disciplines) that are earned by that same UR minority group (see Table 2 for a sample calculation). RRLs are interpreted as follows:

- **RRL at or above 100%** (occurs when the UR minority group percentage for the specific field is equal to or greater than the corresponding percentage for S&E as a whole): The particular UR minority group examined is relatively well-represented as baccalaureate-earners in the specific S&E field considered as compared to S&E as a whole.
- **RRL below 100%** (occurs when the UR minority group percentage for the specific field is less than the corresponding percentage for S&E as a whole): The particular UR minority group examined is relatively underrepresented as baccalaureate-earners in the specific S&E field considered compared to S&E as a whole, with the exact amount of under-representation being (100-RRL) percent (reflecting the “percentage deficit” of UR Minority baccalaureate-earners in the examined S&E field – the percentage by which the field falls short in terms of the number of UR Minority baccalaureate-earners needed to achieve an RRL of 100% in a given year). Viewed from a different perspective, this shortfall can also be quantified in terms of the percentage increase in the number of UR Minority baccalaureate-earners that would have been needed to achieve an RRL of 100% in a given year, calculated as  $[(100-RRL)/RRL] \times 100$  and referred to herein as the “Representation Gap” (RG). Calculated RG values seen in 2004 for the fields considered are provided in Table 2.

## **Discussion of Results**

Examining Table 1 first, the following is noted with respect to UR Minorities in 2004:

- The percentage of baccalaureates in S&E awarded to UR Minorities-Combined is just slightly below the corresponding percentage seen considering all academic disciplines (i.e., college-wide) – 16.4% versus 16.9%.
- For each specific UR minority group, the percentage of baccalaureates in S&E awarded to that group is nearly the same as the corresponding percentage seen considering all academic disciplines (i.e., college-wide) – 8.4% versus 8.7% for Blacks, 7.3% versus 7.5% for Hispanics, and 0.71% versus 0.70% for Native Americans.
- The percentage of baccalaureates awarded to UR Minorities-Combined considering Engineering and the five closely-related fields collectively is significantly less than the corresponding percentage seen for S&E as a whole – 14.7% versus 16.4%.
- For each specific UR minority group, the percentage of baccalaureates awarded to that group considering Engineering and the five closely-related fields collectively is significantly less than the corresponding percentage seen for S&E as a whole – 7.5% versus 8.4% for Blacks, 6.5% versus 7.3% for Hispanics, and 0.65% versus 0.71% for Native Americans.

- The percentage of baccalaureates earned by UR minority groups is seen to vary widely when looking specifically at Engineering and the five closely related fields – for Blacks, ranging from 4.0% (in Physics) to 10.3% (in Computer Science); for Hispanics, ranging from 4.5% (in Physics) to 7.7% (in Engineering Technology); for Native Americans, ranging from 0.43% (in Math & Statistics) to 1.28% (in Engineering Technology); and for UR Minorities-Combined, ranging from 9.0% (in Physics) to 19.2% (in Engineering Technology). Similar variations are noted when examining the data for the sub-disciplines of Engineering – for Blacks, ranging from 3.4% (in Civil Engineering) to 6.5% (in Electrical Engineering); for Hispanics, ranging from 6.0% (in Chemical Engineering) to 8.9% (in Civil Engineering); for Native Americans, ranging from 0.41% (in Electrical Engineering) to 0.68% (in Civil Engineering); and for UR Minorities-Combined, ranging from 10.5% (in Mechanical Engineering) to 14.2% (in Electrical Engineering).

Taken as a whole, the results indicate that in 2004, the racial/ethnic diversity of baccalaureate-earners in S&E as a whole roughly matched that seen college-wide (i.e., considering all academic disciplines). On the other hand, when considered collectively, the racial/ethnic diversity of baccalaureate-earners in Engineering and the five closely-related fields in 2004 was significantly less than that seen for S&E as a whole. Finally, when looking at the individual academic fields considered (as well as at Engineering’s sub-disciplines), a wide range of results was seen for 2004, something further examined in Table 2 using calculated RRL values.

Turning next to the aforementioned Table 2, the following is noted for 2004:

- Blacks are relatively well-represented as baccalaureate-earners in Computer Science and Engineering Technology (with RRLs of 123% and 121%, respectively), while being slightly underrepresented in Chemistry (96% RRL) and substantially underrepresented in Physics, Math & Statistics, and Engineering (47%, 68% and 59% RRL, respectively). Within Engineering, Blacks are substantially underrepresented in each sub-discipline considered, as well as in the “All Other Engineering Fields” category, recording RRLs that ranged from 40% (in Civil Engineering) to 77% (in Electrical Engineering).
- Hispanics are relatively well-represented as baccalaureate-earners in Engineering Technology (with an RRL of 106%), while being slightly underrepresented in Chemistry, Computer Science, and Engineering (96%, 84% and 94% RRL, respectively) and substantially underrepresented in Physics and Math & Statistics (61% and 67% RRL, respectively). Within Engineering, Hispanics are relatively well-represented in Civil Engineering (122% RRL), while being slightly under-represented in Chemical, Electrical and Mechanical Engineering (83%, 99% and 89% RRL, respectively).
- Native Americans are relatively well-represented in both Computer Science and Engineering Technology (with RRLs of 103% and 181%, respectively), while being substantially underrepresented in each of the four remaining fields evaluated – Chemistry, Physics, Math & Statistics, and Engineering (with RRLs of 76%, 68%, 61% and 73%, respectively). Within Engineering, Native Americans slightly underrepresented in Civil Engineering (96% RRL), while being substantially underrepresented in Chemical, Electrical and Mechanical Engineering (79%, 58% and 72% RRL, respectively), as well as in the “All Other Engineering Fields” category (78% RRL).

Overall, the RRL results for 2004 indicate that, of the fields examined, Engineering Technology clearly is the leader in achieving racial/ethnic diversity in its graduating baccalaureate class – it was the only field considered to record RRL values above 100% for each UR minority group considered. At the other end of the spectrum, both Physics and Math & Statistics clearly were relative laggards in achieving such diversity – Physics recorded the lowest RRLs seen for both Blacks and Hispanics (at 47% and 61%, respectively) and the second lowest RRL seen for Native Americans (68%), while Math & Statistics recorded the third lowest RRL seen for Blacks (68%), the second lowest RRL seen for Hispanics (67%) and the lowest RRL seen for Native Americans (61%). These specific RRLs noted for Physics and Math & Statistics translate to RG values on the order of 50-100% (see Table 2) – meaning that substantial increases (on the order of 50-100%) in the number of corresponding UR Minority baccalaureate-earners in Physics and Math & Statistics would have been needed to raise the corresponding RRLs for these fields to 100% for 2004.

As for Engineering, the results seen for its sub-disciplines in 2004 followed the general pattern seen for Engineering as a whole, namely: Hispanics being slightly under-represented as baccalaureate-earners (94% RRL overall), while both Blacks and Native Americans are substantially underrepresented (59% and 73% RRL overall, respectively).

Finally, a notable result for 2004 is that while both Blacks and Native Americans were relatively strongly represented as baccalaureate-earners in Engineering Technology (with RRLs of 121% and 181%, respectively), they both were substantially underrepresented in Engineering (with RRLs of 59% and 73%, respectively). Two possible explanations for this apparent dichotomy are that:

- 1) Students in these minority groups tend to prefer the more applied nature of Engineering Technology over the more theoretical nature of Engineering and/or
- 2) The enhanced academic background required and the more academically rigorous nature of Engineering are particularly significant obstacles to students in these specific minority groups, resulting in relatively fewer such students academically qualifying to study Engineering and/or being able to successfully complete their Engineering studies as compared to Engineering Technology.

#### **4. Time Series Analysis of Data on the Racial/Ethnic Makeup of Students Earning Bachelor’s Degrees**

The time series analysis conducted in this study sought to examine changes in the racial/ethnic makeup of students earning bachelor’s degrees over time to identify patterns and trends, as well as to place the previously-discussed results seen for 2004 into historical perspective. For this analysis, five sets of graphs were generated (Note: Due to data availability issues, the exact time frame covered by each set of graphs varies as specified below):

- **Figures 1-A/1-B/1-C** graphing the percentage of baccalaureates earned by each UR minority group from 1985 through 2004 at three collective levels: “All Academic Disciplines” (i.e., college-wide), “All S&E Disciplines” (as previously defined in Section 2), and “Engineering and Closely-Related Fields” (covering the five closely-related fields of interest).
- **Figures 2-A/2-B/2-C** graphing the percentage of baccalaureates earned by each UR minority group from 1977 through 2004 in each field of interest: Engineering, Engineering Technology, Chemistry, Physics, Math & Statistics, and Computer Science. For reference, the corresponding percentage considering “All S&E Disciplines” is graphed as well.
- **Figures 3-A/3-B/3-C** graphing Relative Representation Levels for each UR minority group from 1977 through 2004 for each of the fields of interest: Engineering, Engineering Technology, Chemistry, Physics, Math & Statistics and Computer Science.
- **Figures 4-A/4-B/4-C** graphing the percentage of baccalaureates earned by each UR minority group from 1995 through 2004 in each of the four major sub-disciplines of Engineering, as well as for the “All Other Engineering Fields” category. For reference, the corresponding percentages separately considering both “All S&E Disciplines” and “All of Engineering” are graphed as well.
- **Figures 5-A/5-B/5-C** graphing Relative Representation Levels for each UR minority group from 1995 through 2004 for each of the four major sub-disciplines of Engineering, as well as for “All Other Engineering Fields.” For reference, the corresponding RRL considering “All of Engineering” is graphed as well.

Additionally, Table 3-A provides a summary of Relative Representation Levels seen for each UR minority group over time for the fields of interest (Engineering, Engineering Technology, Chemistry, Physics, Math & Statistics, and Computer Science), while Table 3-B provides the same information for each of the sub-disciplines of Engineering, as well as for “All Other Engineering Fields.”

#### **Discussion of Results**

##### **Examination At Three Collective Levels Over 1985-2004 (Figures 1-A through 1-C):**

The figures indicate that the key findings noted previously for 2004 hold historically as well, in that:

- The racial/ethnic diversity of baccalaureate-earners in S&E (considered as a whole) roughly equals that seen college-wide (i.e., considering all academic disciplines).
- There is a significant gap seen persisting over time in terms of the racial/ethnic diversity of baccalaureate-earners in Engineering and the five closely-related fields (as collectively considered) when contrasted with that seen for S&E as a whole. This gap has persisted despite the significant gains seen in the percentage of baccalaureates earned by UR Minorities that occurred during the 1990s.

Thus, while substantial strides have been made in increasing the representation of UR Minorities as baccalaureate-earners in Engineering and the five closely-related fields – with the corresponding percentage of UR Minorities-Combined in the six fields collectively having risen from 7.0% in 1985 to 14.7% in 2004 – there still remains a historically-persistent “minority gap” when it comes to Engineering and the five closely-related fields collectively considered compared to S&E as a whole.

##### **Examination Of Engineering And The Closely-Related Fields Considered Over 1977-2004 (Figures 2-A/2-B/2-C and 3-A/3-B/3-C and Table 3-A):**

Looking first at Figures 2-A/2-B/2-C, the graphs show that the percentage of baccalaureates earned by UR Minorities significantly increased during the 1990s for each individual S&E field examined, as well as for S&E as a whole.

However, when examining corresponding Relative Representation Levels graphed over time (Figures 3-A/3-B/3-C), it is seen that, despite the significant increases in absolute numbers, RRLs for the six S&E fields considered stayed fairly constant during the 1990s. Thus, the “relative diversity” seen for these fields (i.e., when compared to S&E as a whole) has generally not significantly changed over time. This observation is further borne out through an examination of Table 3-A, which shows that, in general, the RRLs calculated for 2004 are fairly close to their corresponding historical averages.

This finding of historically-steady RRLs carries a highly significant implication, namely that intensive and focused efforts will likely be required to raise racial/ethnic diversity levels in the lagging fields identified (i.e., Physics, Math & Statistics and Engineering) to corresponding levels achieved in S&E as a whole (i.e., to achieve RRLs of 100% for the fields in the future).

Finally, it was determined that the key findings noted previously for 2004 hold historically as well, in that:

- Of the fields examined, Engineering Technology is clearly the leader in achieving racial/ethnic diversity in its graduating baccalaureate class – it was the only field to record historically-averaged RRLs near or above 100% for each UR minority group considered (117% for Blacks, 94% for Hispanics, and 122% for Native Americans).
- At the other end of the spectrum, Physics is the clear laggard in achieving such diversity – it recorded the lowest historically-averaged RRL seen for both Blacks and Hispanics (56% each) and the second lowest RRL for Native Americans (72%). Math & Statistics also has been a laggard historically when it comes to Hispanic and Native American baccalaureate earners (with historically-averaged RRLs of 71% and 77%, respectively), while Engineering has been a laggard historically with respect to Black and Native American baccalaureate earners (with historically-averaged RRLs of 60% and 71%, respectively).
- The disparity noted for both Blacks and Native Americans regarding Engineering Technology versus Engineering – namely, strong representation of these groups as baccalaureate-earners in Engineering Technology, with weak representation in Engineering – is seen to have historically been the case as well: Historically-averaged RRLs for Engineering Technology are 117% for Blacks and 122% for Native Americans, while for Engineering, the historical averages are just 60% for Blacks and 71% for Native Americans.

#### Examination Of Engineering’s Sub-Disciplines Over 1995-2004 (Figures 4-A/4-B/4-C and 5-A/5-B/5-C and Table 3-B):

Focusing on the RRLs seen over time (Figures 5-A/5-B/5-C and Table 3-B), it is observed that, compared to S&E as a whole, as baccalaureate-earners:

- Blacks historically have been (and continued to be in 2004) underrepresented throughout Engineering’s sub-disciplines, particularly in Civil and Mechanical Engineering.
- Hispanics historically have been (and continued to be in 2004) relatively well-represented throughout Engineering’s sub-disciplines, except for in Chemical Engineering, where they historically have been (and continued to be in 2004) relatively underrepresented.
- Native Americans historically have been (and continued to be in 2004) underrepresented throughout Engineering’s sub-disciplines, except for Civil Engineering, where they historically have been (and continued to be in 2004) relatively well-represented.

### **5. Conclusions/Recommendations**

Since the mid-1980s, substantial strides have been made in increasing the racial/ethnic diversity of baccalaureate graduating classes in S&E. Overall, the percentage of baccalaureates in S&E earned by UR Minorities increased from 8.9% in 1985 to 16.4% in 2004, while when collectively considering Engineering and the five closely-related fields examined as a whole, the corresponding percentage increased from 7.0% to 14.7% over the same time period.

However, while these significant advances have been made, substantial room for improvement exists within S&E. Through this study, Physics, Math & Statistics and Engineering were identified as significant laggards in 2004 (as well as historically) in achieving racial/ethnic diversity in their baccalaureate-earners on a par with that seen considering S&E as a whole. For both Physics and Math & Statistics, substantial under-representation is seen for all three UR minority groups considered, while for Engineering, substantial under-representation is seen for both Blacks and Native Americans, with such under-representation generally seen extending throughout the various sub-disciplines of Engineering.

Given that these areas of relative weakness within S&E are seen to be historically persistent, it is likely that focused, intensive efforts/initiatives will be required to raise racial/ethnic diversity levels in the baccalaureate graduating classes of Physics, Math & Statistics and Engineering to more closely match that seen for S&E as a whole. It is therefore intended that this report serve as a “call to action” to colleges/universities, relevant professional societies, and other appropriate entities to undertake and/or support such efforts – both new and existing – on a nationwide basis, with an ultimate goal put forth of achieving diversity levels amongst baccalaureate-earners on a par with corresponding “average” levels seen for S&E as a whole (which for 2004 was: 8.4% Black; 7.3% Hispanic; 0.71% Native American). Based on the data evaluated in this study, increases on the order of 50-100% in the number of graduating baccalaureate-earners in those fields that are “minorities of concern” (Blacks, Hispanics and Native Americans for both Physics and Math & Statistics; Blacks and Native Americans for Engineering) will be needed to achieve such a goal.

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**TABLES**

**Table 1: Earned Bachelor's Degrees By Race/Ethnicity For 2004\***  
(corresponding percentages shown in parentheses)

Academic Discipline/Field	All	White (non-Hispanic)	Asian/ Pacific Islander	Black	Hispanic	Native American	Foreign Students	Other/ Unknown	All UR**** Minorities
All Academic Disciplines	1,407,009	962,887 (68.4%)	86,030 (6.1%)	122,618 (8.7%)	105,165 (7.5%)	9,914 (0.70%)	44,175 (3.1%)	76,220 (5.4%)	237,697 (16.9%)
All Science & Eng Disciplines**	454,978	296,026 (65.1%)	41,090 (9.0%)	38,328 (8.4%)	33,290 (7.3%)	3,216 (0.71%)	18,606 (4.1%)	24,422 (5.4%)	74,834 (16.4%)
Eng & Closely Related Fields***	164,415	101,539 (61.8%)	18,145 (11.0%)	12,391 (7.5%)	10,689 (6.5%)	1,071 (0.65%)	11,135 (6.8%)	9,445 (5.7%)	24,151 (14.7%)
Chemistry	9,305	6,153 (66.1%)	960 (10.3%)	756 (8.1%)	651 (7.0%)	50 (0.54%)	350 (3.8%)	385 (4.1%)	1,457 (15.7%)
Physics	4,156	3,128 (75.3%)	223 (5.4%)	166 (4.0%)	187 (4.5%)	20 (0.48%)	189 (4.5%)	243 (5.8%)	373 (9.0%)
Math & Statistics	13,755	9,639 (70.1%)	1,244 (9.0%)	784 (5.7%)	676 (4.9%)	59 (0.43%)	682 (5.0%)	671 (4.9%)	1,519 (11.0%)
Computer Science	57,405	30,357 (52.9%)	7,462 (13.0%)	5,934 (10.3%)	3,535 (6.2%)	416 (0.72%)	4,861 (8.5%)	4,840 (8.4%)	9,885 (17.2%)
Engineering Technology	15,119	10,405 (68.8%)	631 (4.2%)	1,539 (10.2%)	1,170 (7.7%)	193 (1.28%)	506 (3.3%)	675 (4.5%)	2,902 (19.2%)
Engineering	64,675	41,857 (64.7%)	7,625 (11.8%)	3,212 (5.0%)	4,470 (6.9%)	333 (0.51%)	4,547 (7.0%)	2,631 (4.1%)	8,015 (12.4%)
Chemical Engineering	5,185	3,483 (67.2%)	527 (10.2%)	303 (5.8%)	313 (6.0%)	29 (0.56%)	368 (7.1%)	162 (3.1%)	645 (12.4%)
Civil Engineering	9,399	7,011 (74.6%)	493 (5.2%)	320 (3.4%)	836 (8.9%)	64 (0.68%)	315 (3.4%)	360 (3.8%)	1,220 (13.0%)
Electrical Engineering	21,342	10,934 (51.2%)	4,083 (19.1%)	1,393 (6.5%)	1,551 (7.3%)	88 (0.41%)	2,273 (10.7%)	1,020 (4.8%)	3,032 (14.2%)
Mechanical Engineering	14,368	10,756 (74.9%)	928 (6.5%)	504 (3.5%)	935 (6.5%)	73 (0.51%)	614 (4.3%)	558 (3.9%)	1,512 (10.5%)
All Other Eng Fields	14,381	9,673 (67.3%)	1,594 (11.1%)	692 (4.8%)	835 (5.8%)	79 (0.55%)	977 (6.8%)	531 (3.7%)	1,606 (11.2%)

\* - Source: U.S. Dept. of Education's National Center for Education Statistics' (NCES) survey, "IPEDS Completions Survey By Race – Degrees/Awards Conferred (NSF population of institutions)," with survey data obtained from the National Science Foundation's WebCASPAR database (online at <http://webcaspar.nsf.gov>).

\*\* - For purposes of this analysis, the convention employed by the National Science Foundation (NSF) in its "[Science and Engineering Indicators](#)" report series is used in defining what is considered a "science or engineering discipline" – see Section 2 of text for details.

\*\*\* - Consists of: Chemistry, Physics, Math & Statistics, Computer Science, Engineering Technology, and Engineering.

\*\*\*\*. UR = Historically Under-Represented Minorities (Black, Hispanic and "Native American" [American Indian and Alaskan Native])

**Table 2: Relative Representation Levels (RRLs) And Associated Representation Gaps (RGs) Of Historically Underrepresented Minorities For Engineering And Five Closely-Related Fields In 2004**

Academic Field	Relative Representation Levels (RRLs)*			Representation Gaps (RGs)**		
	Black	Hispanic	Native American	Black	Hispanic	Native American
Chemistry	96%	96%	76%	4%	4%	32%
Physics	47%	61%	68%	113%	64%	47%
Math & Statistics	68%	67%	61%	47%	49%	64%
Computer Science	123%	84%	103%	NA***	19%	NA
Engineering Technology	121%	106%	181%	NA	NA	NA
Engineering	59%	94%	73%	69%	6%	37%
Chemical Engineering	69%	83%	79%	45%	20%	27%
Civil Engineering	40%	122%	96%	150%	NA	4%
Electrical Engineering	77%	99%	58%	30%	1%	72%
Mechanical Engineering	42%	89%	72%	138%	12%	39%
All Other Eng Fields	57%	79%	78%	75%	27%	28%

\* - An RRL is the ratio – expressed as a percentage – of the percentage of baccalaureates awarded in a particular field of interest (e.g., Engineering) that are earned by a particular UR minority group to the percentage of baccalaureates awarded in S&E as a whole (i.e., considering all S&E disciplines) that are earned by that same UR minority group. RRLs are interpreted as follows:

- **RRL at or above 100%** (occurs when the UR minority group percentage for the specific field is equal to or greater than the corresponding percentage for S&E as a whole): The particular UR minority group examined is relatively well-represented as baccalaureate-earners in the specific S&E field considered as compared to S&E as a whole.
- **RRL below 100%** (occurs when the UR minority group percentage for the specific field is less than the corresponding percentage for S&E as a whole): The particular UR minority group examined is relatively underrepresented as baccalaureate-earners in the specific S&E field considered compared to S&E as a whole, with the exact amount of underrepresentation being (100-RRL) percent (reflecting the “percentage deficit” of UR Minority baccalaureate-earners in the examined S&E field – the percentage by which the field falls short in terms of the number of UR Minority baccalaureate-earners needed to achieve an RRL of 100% in a given year).

\*\* - An RG is the percentage increase in the number of corresponding UR Minority baccalaureate-earners that would have been needed to achieve an RRL of 100% in a given year, calculated as  $[(100-RRL) / RRL] \times 100$ .

\*\*\* NA – Not Applicable (no Representation Gap seen – the corresponding RRL is 100% or greater).

**Example Calculation – RRL and RG for Blacks in Engineering in 2004:** From Table 1, the percentage of baccalaureates in Engineering earned by Blacks is 5.0%, and the percentage of baccalaureates in all S&E disciplines earned by Blacks is 8.4%. Therefore, the corresponding RRL is  $(5.0\% / 8.4\%) \times 100 = 59\%$ , the “percentage deficit” seen is  $(100\% - 59\%) = 41\%$ , and the RG is  $[(100-59) / 59] \times 100 = 69\%$ .

**Table 3-A: Relative Representation Levels (RRLs)\* Of Historically Underrepresented Minorities Seen Over Time For Engineering And Five Closely-Related Fields** (see corresponding Figures 3-A/3-B/3-C)

	Engineering			Eng Technology			Chemistry			Physics			Math & Statistics			Computer Science		
	Avg.	Range		Avg.	Range		Avg.	Range		Avg.	Range		Avg.	Range		Avg.	Range	
Race/Ethnicity	2004	1977-04	2004	1985-04	2004	1995-04	2004	1995-04	2004	1995-04	2004	1977-04	2004	1977-04	2004	1977-04	2004	1977-04
Black	59%	48-65%	121%	117%	106-127%	96%	100%	96-104%	47%	56%	45-66%	68%	94%	68-104%	123%	127%	92-154%	
Hispanic	94%	72-105%	106%	94%	73-111%	96%	95%	86-99%	61%	56%	48-62%	67%	71%	54-79%	84%	87%	62-111%	
Native American	73%	60-84%	181%	122%	98-181%	76%	90%	68-116%	68%	72%	54-102%	61%	77%	45-97%	103%	72%	35-103%	

\* - See Table 1 for a further discussion of Relative Representation Levels, as well as a sample calculation.

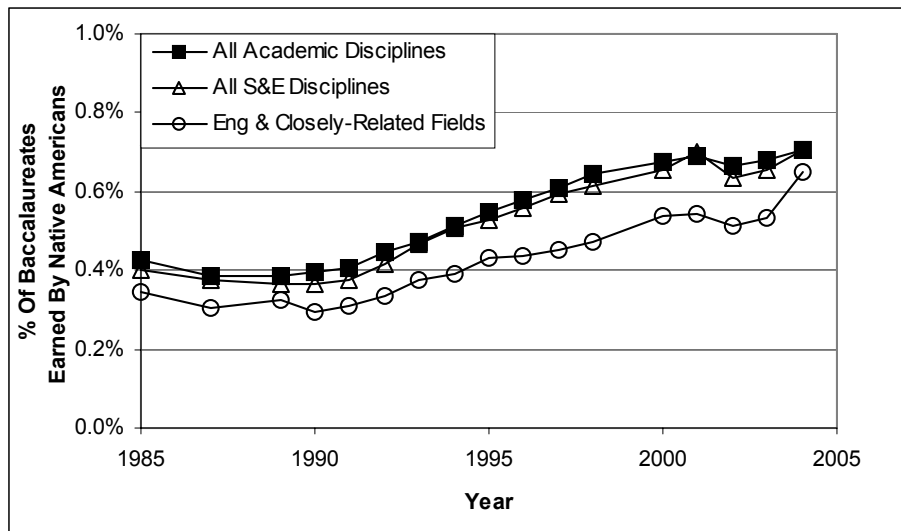
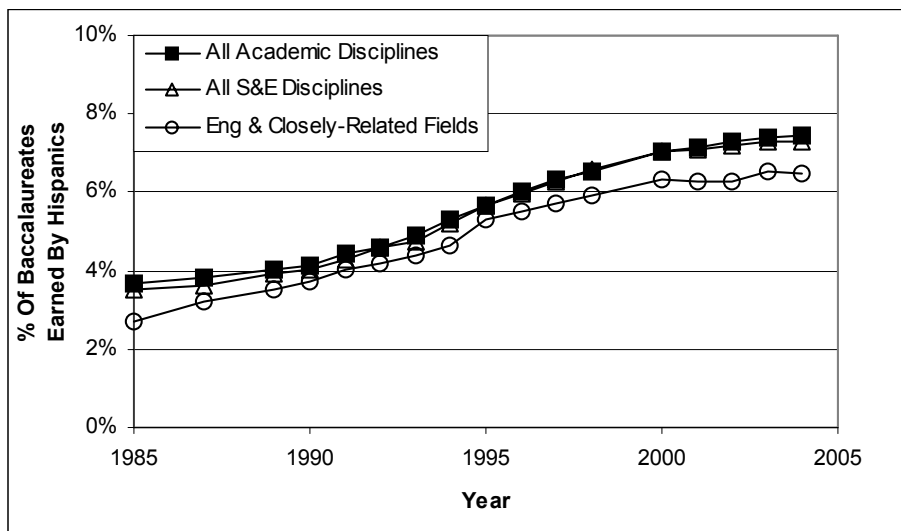
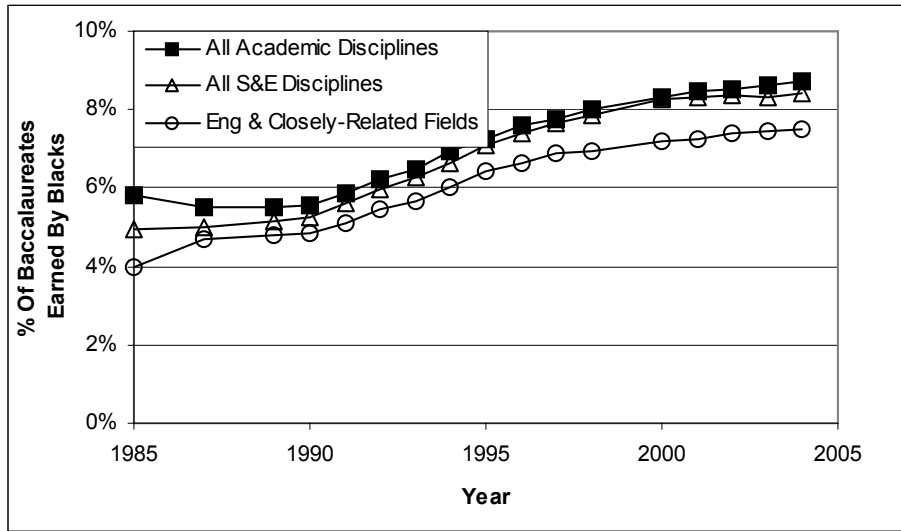
**Table 3-B: Relative Representation Levels (RRLs)\* Of Historically Underrepresented Minorities Seen Over Time For Engineering's Sub-Disciplines** (see corresponding Figures 5-A/5-B/5-C)

	Chemical Eng			Civil Eng			Electrical Eng			Mechanical Eng			All Other Eng Fields		
	Avg.	Range		Avg.	Range		Avg.	Range		Avg.	Range		Avg.	Range	
Race/Ethnicity	2004	1995-04	2004	1995-04	2004	1995-04	2004	1995-04	2004	1995-04	2004	1995-04	2004	1995-04	1995-04
Black	69%	70%	67-75%	40%	37-51%	77%	78%	69-85%	42%	51%	40-61%	57%	59%	55-62%	
Hispanic	83%	85%	79-96%	122%	103-122%	99%	103%	94-111%	89%	94%	85-98%	79%	91%	79-111%	
Native American	79%	84%	70-103%	96%	88-134%	58%	57%	44-73%	72%	64%	55-72%	78%	72%	50-90%	

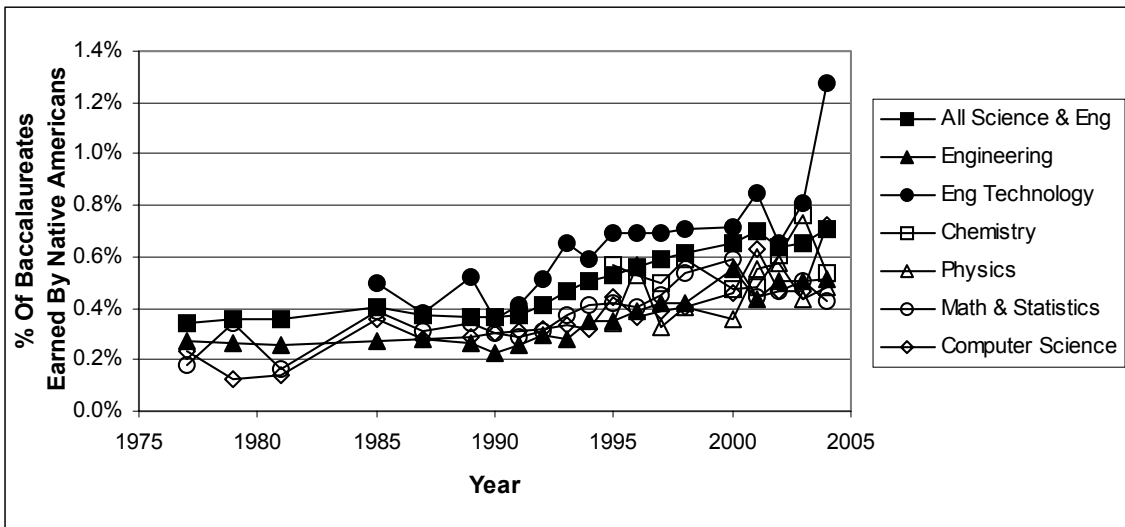
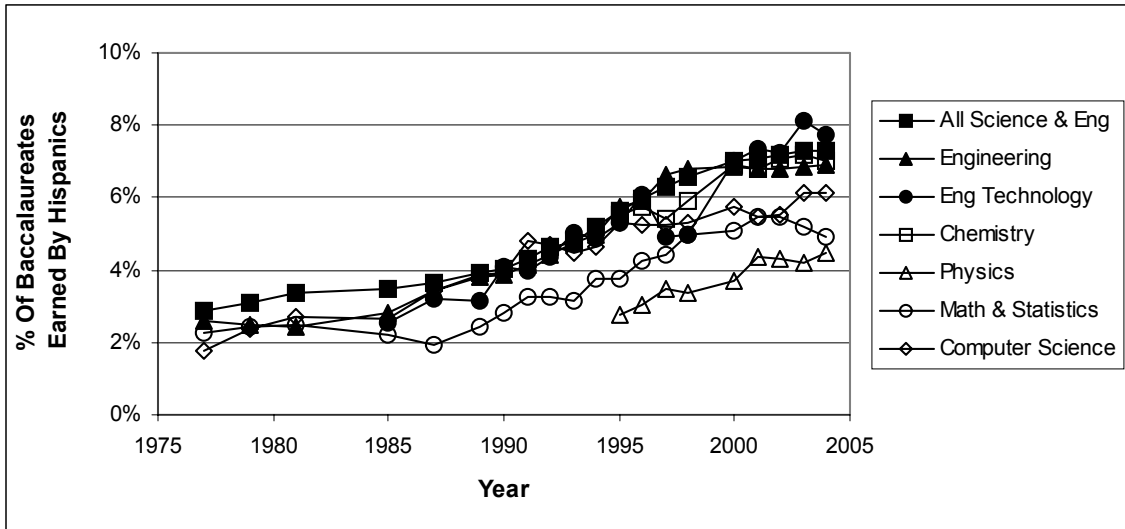
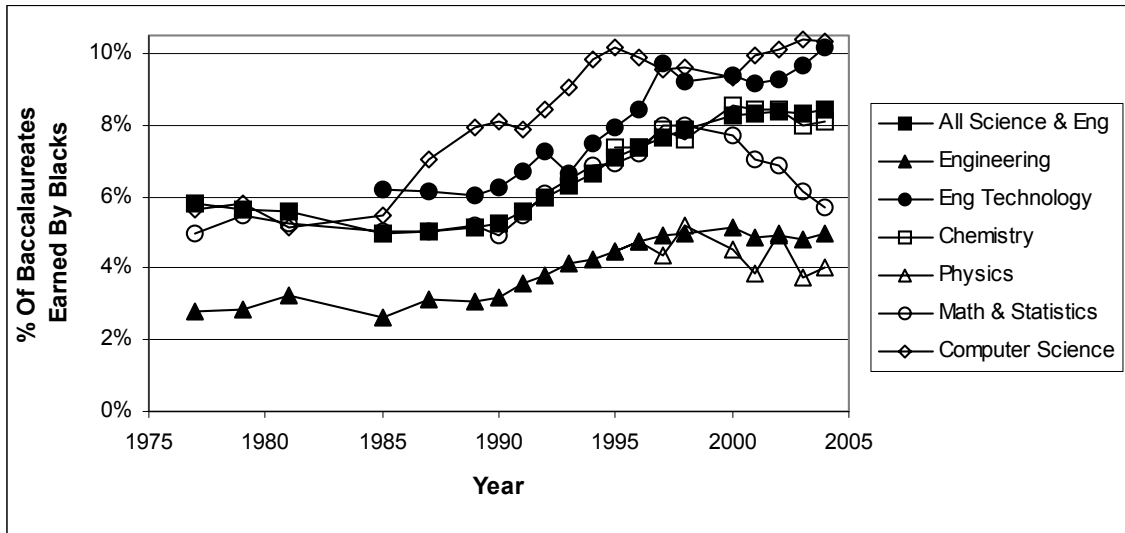
\* - See Table 1 for a further discussion of Relative Representation Levels, as well as a sample calculation.

**FIGURES**

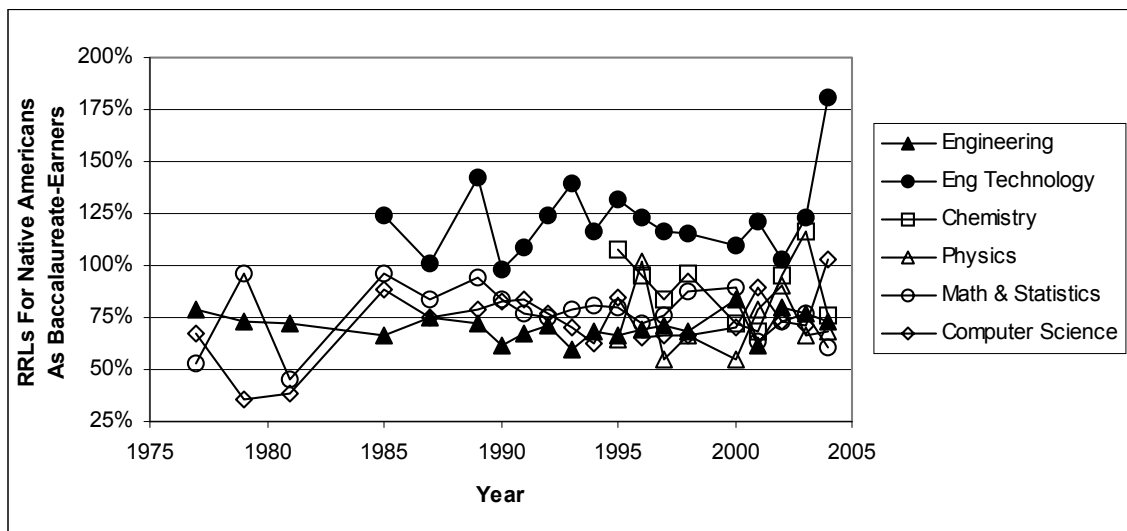
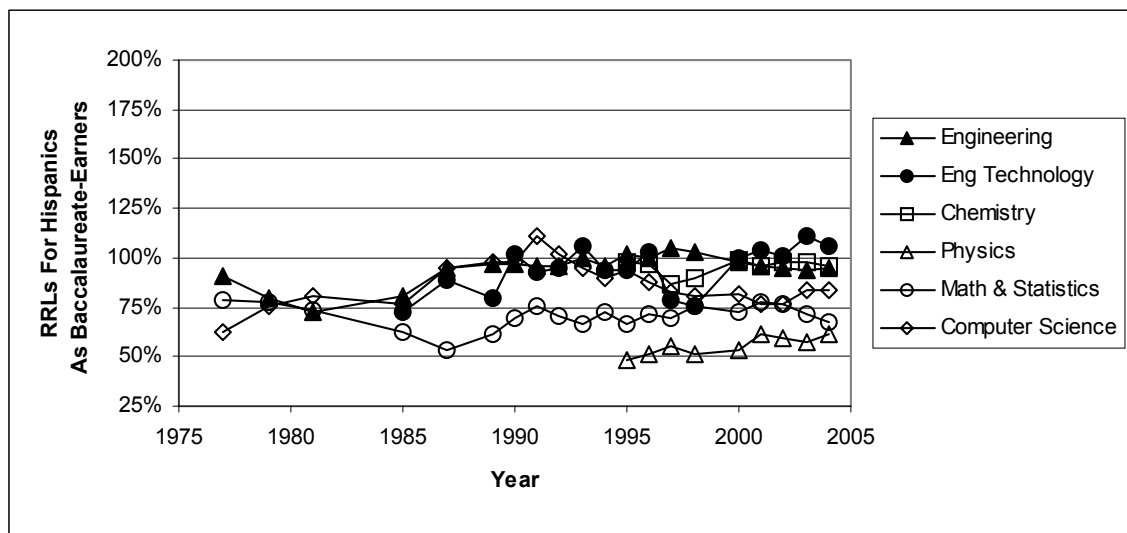
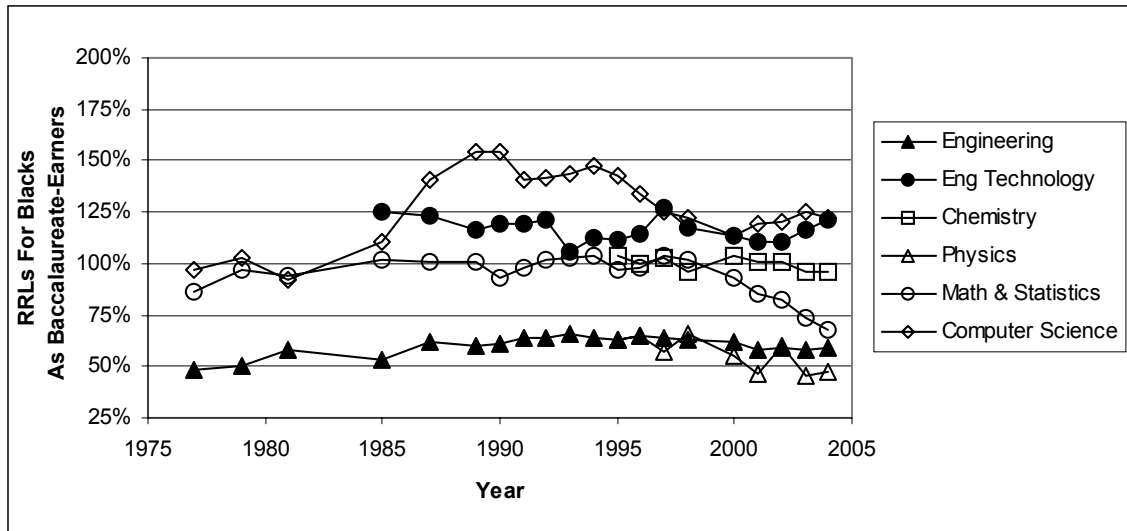
**Figures 1-A/1-B/1-C: Percentage Of Baccalaureates Earned By Historically Underrepresented Minorities At Three Collective Levels – 1985-2004**



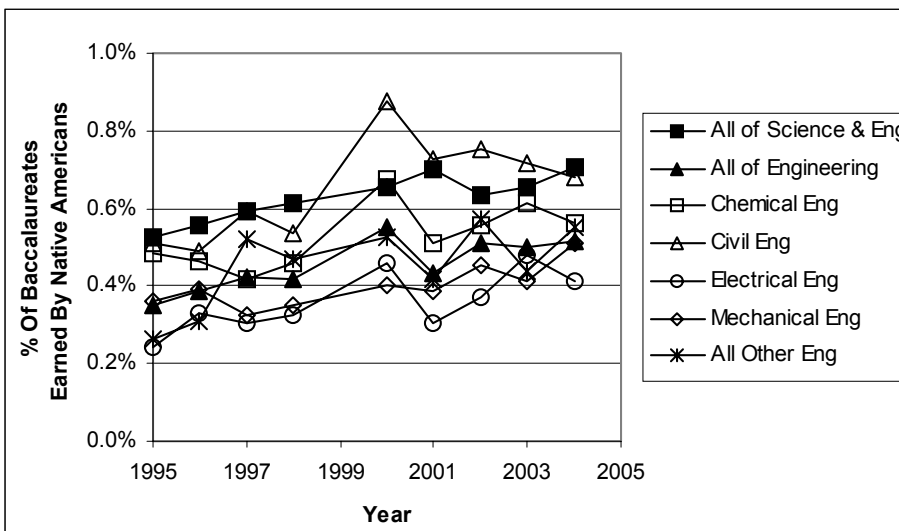
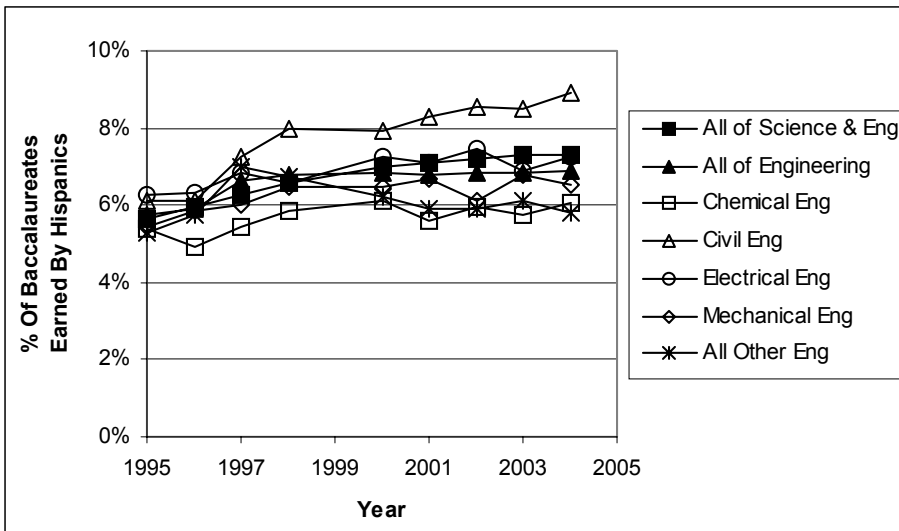
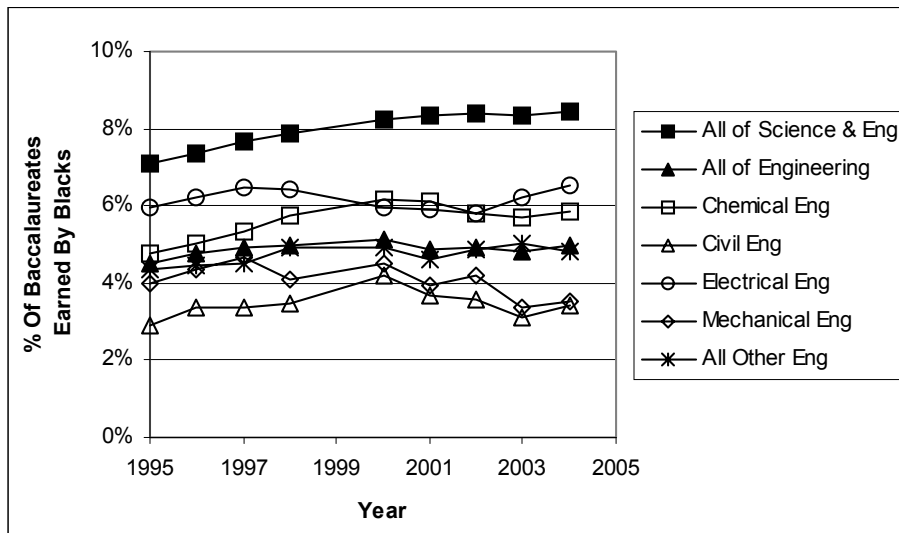
**Figure 2-A/2-B/2-C: Percentage Of Baccalaureates Earned By Historically Underrepresented Minorities In Engineering And Five Closely-Related Fields - 1977-2004**



**Figure 3-A/3-B/3-C: Relative Representation Levels (RRLs) For Historically Underrepresented Minorities In Engineering And Five Closely-Related Fields - 1977-2004**



**Figure 4-A/4-B/4-C: Percentage Of Baccalaureates Earned By Historically Underrepresented (UR) Minorities In Engineering And Its Sub-Disciplines - 1995-2004**



**Figure 5-A/5-B/5-C: Relative Representation Levels (RRLs) For Historically Underrepresented Minorities In Engineering And Its Sub-Disciplines - 1995-2004**

