

AGEP Alliances for Graduate Education and the Professoriate **Info Brief VII**

The AGEP Program has led to Dramatic Increases in the Annual Number of URMs Receiving STEM PhDs from 2000/01 to 2007/08

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ADVANCING SCIENCE. SERVING SOCIETY

SUMMARY

One of the goals of the National Science Foundation (NSF) Alliances for Graduate Education and the Professoriate (AGEP) Program, which began in 1998, is to increase the number of underrepresented minorities (URMs)¹ receiving PhDs in science, technology, engineering, and mathematics. (See *program description below*.)² Analyses of PhD recipient data from 66 AGEP institutions from 21 Alliances indicate that the AGEP Program has dramatically increased the annual number of URMs receiving PhDs in STEM fields.

An analysis of URM PhD recipients' data from 2000/01 to 2007/08 for 66 AGEP institutions from 21 Alliances indicated that the average annual number of PhDs awarded to URMs in STEM increased from 623 to 834, an increase of 211 or 33.9%. During this same period, the average annual number of PhDs awarded to URM in Natural Sciences & Engineering (NS&E) increased from 382 to 573, an increase of 191 or 50.0% (*Table 1 and Figure 1*).

MORE ABOUT THE AGEP DATA

A. About the Average Annual Number and Percent of PhDs Awarded to URMs in STEM at 66 AGEP Institutions in 2006/07 and 2007/08

For 2006/07 and 2007/08, the average annual number of PhDs awarded to URMs in STEM fields at 66 AGEP institutions was 834. By broad STEM fields, the average annual number and percent of PhDs awarded to URMs at 66 AGEP institutions in 2006/07 and 2007/08 was:

¹URM students are African-Americans, Alaskan Natives, Native Americans, Hispanic Americans, and Native Pacific Islanders.

²Program Description: The goal of the National Science Foundation (NSF) Alliances for Graduate Education and the Professoriate (AGEP) Program is to increase the number of underrepresented minority students pursuing advanced study, obtaining doctoral degrees, and entering the professoriate in STEM disciplines (including Social Sciences). Alliances participating in this program are expected to engage in comprehensive institutional cultural changes that will lead to sustained increases in the conferral of STEM doctoral degrees, significantly exceeding historic levels of performance. Specific objectives of AGEP are: (1) to develop and implement innovative models for recruiting, mentoring, and advancing minority students in STEM doctoral programs, and (2) to develop effective strategies for identifying and supporting underrepresented minorities who want to pursue academic careers.

- 573 or 68.7% in NS&E.
- 104 or 12.5% in Other Social Sciences.
- 79 or 9.5% in Psychology.
- 34 or 4.1% in Sociology.
- 18 or 2.2% in Interdisciplinary Sciences.
- 14 or 1.7% in Political Science.
- 12 or 1.4% in Economics (*Table 1*).

Of the average annual number of 573 PhDs awarded to URMs in NS&E at 66 AGEP institutions in 2006/07 and 2007/08, the average annual number and percent of PhDs awarded to URMs was:

- 237 or 41.4% in Biological and Agricultural Sciences.
- 138 or 24.1% in Engineering.
- 95 or 16.6% in Chemistry.
- 44 or 7.7% in Other Physical Sciences.
- 22 or 3.8% in Mathematics.
- 15 or 2.6% in Computer Sciences.
- 14 or 2.4% in Earth, Atmospheric, and Ocean Sciences.
- 8 or 1.4% in Computer Engineering (*Table 1*).

B. About Changes in the Average Annual Number of PhDs Awarded in STEM to URMs at 66 AGEP Institutions from 2000/01 to 2007/08

An analysis of URM PhD recipients' data from 2000/01 to 2007/08 for 66 AGEP institutions from 21 Alliances indicated that the average annual number of PhDs awarded to URMs in STEM increased from 623 to 834, an increase of 211 or 33.9%. During this same period, the average annual number of PhDs awarded to URM in NS&E increased from 382 to 573, an increase of 191 or 50.0% (*Table 1 and Figure 1*).

The average annual number of URM PhD recipients at 66 AGEP institutions increased in 12 fields between 2000/01 and 2007/08 from:

- 152 to 237 in Biological and Agricultural Sciences (an increase of 85).
- 96 to 138 in Engineering (an increase of 42).
- 66 to 95 in Chemistry (an increase of 29).
- 82 to 104 in Other Social Sciences (an increase of 22).
- 30 to 44 in Other Physical Sciences (an increase of 14).
- 5 to 18 in Interdisciplinary Sciences (an increase of 13).

- 6 to 15 in Computer Sciences (an increase of 9).
- 7 to 14 in Earth, Atmospheric, and Ocean Sciences (an increase of 7).
- 7 to 12 in Economics (an increase of 5).
- 18 to 22 in Mathematics (an increase of 4).
- 78 to 79 in Psychology (an increase of 1).
- 7 to 8 in Computer Engineering (an increase of 1).

During this same seven-year period, there were decreases in the average annual number of URM PhDs awarded at AGEP institutions in Sociology and Political Science (*Table 1 and Figure 1*).

Almost a quarter (22.7% or 48 of the 211) of the increase in the average annual number of URM PhDs awarded at AGEP institutions between 2000/01 and 2007/08 was due to increases at nine University of California (UC) campuses (*Table 3*).

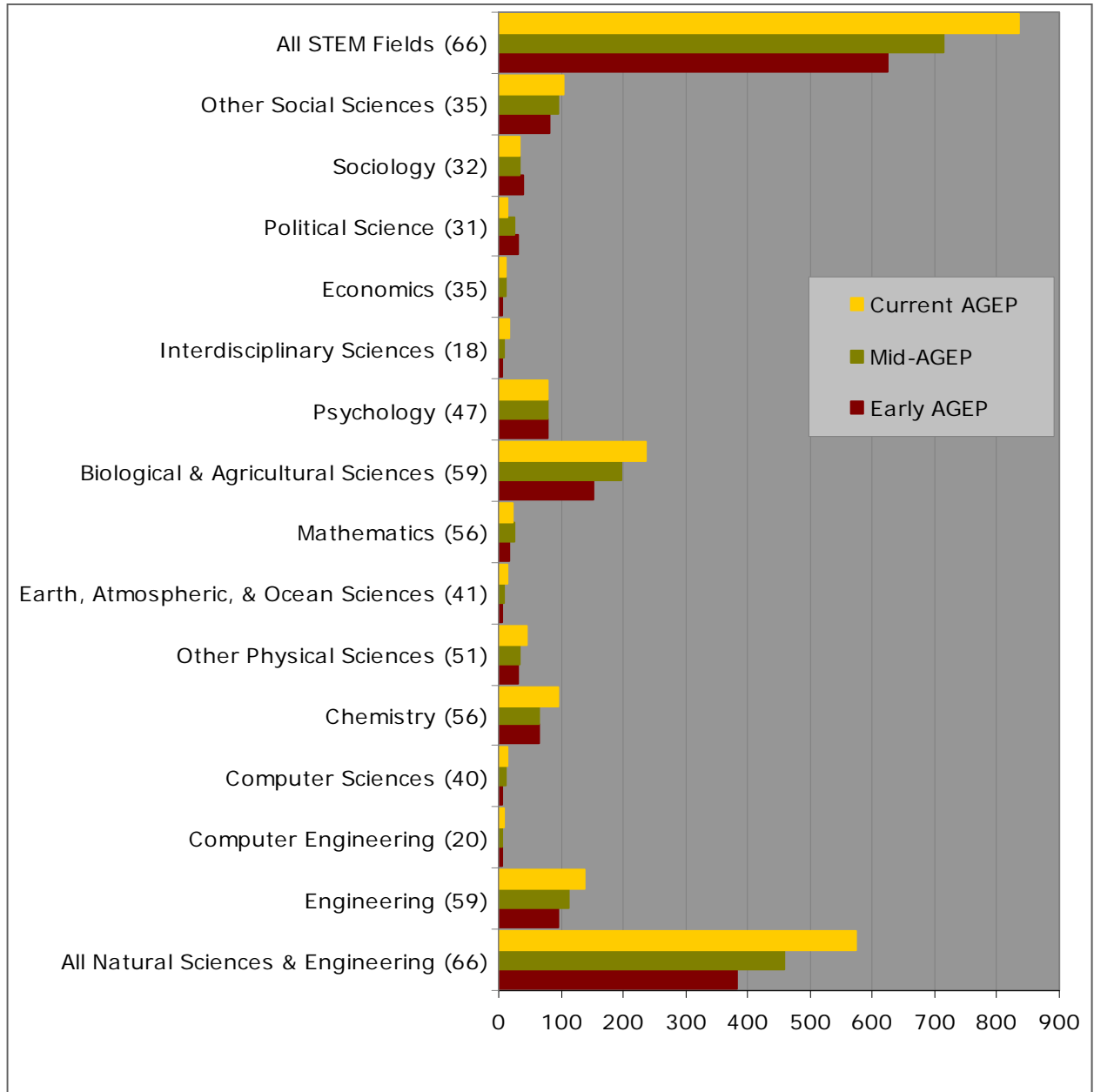
C. Comparison of Percent Change in the Average Annual Number of PhDs Awarded to URMs and All Other U.S. Citizens and Permanent Residents at 66 AGEP Institutions from 2000/01 to 2007/08

From 2000/01 to 2007/08, the percent change in the average annual number of PhDs awarded at the 66 AGEP institutions was much higher for URM than for all other U.S. citizens and permanent residents³ in NS&E (50.0% vs 31.0%) and in all STEM fields (33.9% vs 22.3%). The percent change in the average annual number of PhDs awarded was higher for URMs than for all other U.S. citizens and permanent residents in Interdisciplinary Sciences (260.0% vs 0.0%); Computer Sciences (150.0% vs 81.3%); Earth, Atmospheric, and Ocean Sciences (100.0% vs 19.2%); Economics (71.4% vs -1.0%); Biological and Agricultural Sciences (55.9% vs 38.3%); Other Physical Sciences (46.7% vs 17.3%); Chemistry (43.9% vs 3.4%); Engineering (43.8% vs 38.4%); Other Social Sciences (26.8% vs 5.9%); and Psychology (1.3% vs -7.2%) (*Figure 2 and Table 4*).

At nine UC campuses from 2000/01 to 2007/08, the percent change in the average annual number of PhD recipients was much higher for URMs than for all other U.S. citizens and permanent residents in NS&E (49.5% vs 25.2%) and in all STEM fields (31.6% vs 20.9%) (*Table 5*).

³All other U.S. citizens or permanent residents does not include African Americans, Hispanic Americans, and Native Americans.

Figure 1: Changes in the Average Annual Number of PhDs Awarded to Underrepresented Minorities* (URMs) by Broad STEM Categories at 66 AGEP Institutions for Early AGEP Years (2000/01 to 2002/03), Mid-AGEP Years (2003/04 to 2005/06), and Current AGEP Years (2006/07 to 2007/08)

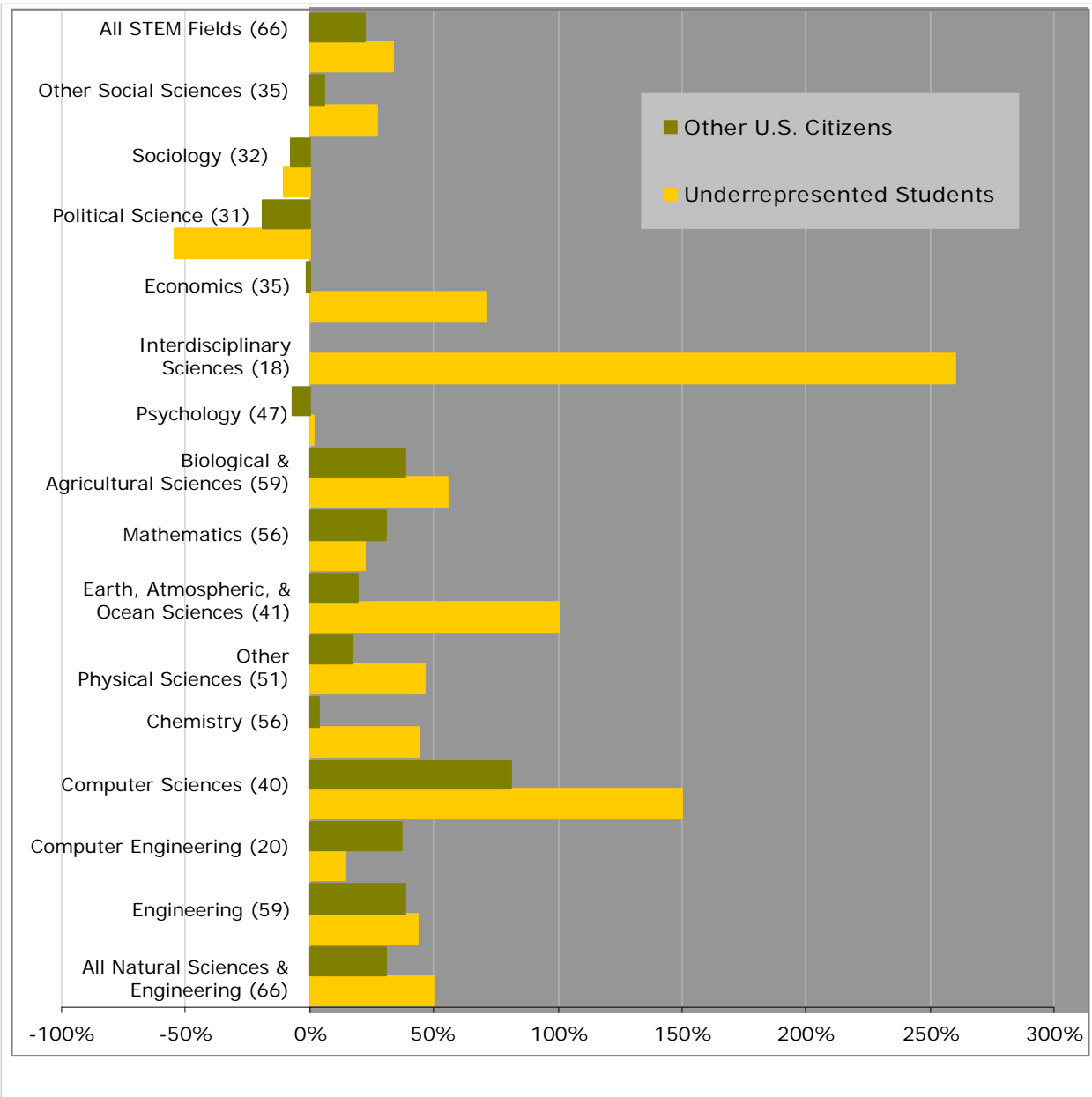


Numbers for this figure are in Table 1.

(The numbers in parentheses represent the number of institutions reporting data in the field.)

*Underrepresented Minorities (URMs) include African Americans, Hispanic Americans, and Native Americans.

Figure 2: Percent Change in the Average Annual Number of PhDs Awarded to Underrepresented Minorities* (URMs) and All Other U.S. Citizens and Permanent Residents by Broad STEM Categories at 66 AGEP Institutions from Early AGEP Years (2000/01 to 2002/03) to Current AGEP Years (2006/07 to 2007/08)**



Numbers for this Figure are in Table 4.

(The numbers in parentheses represent the number of institutions reporting data in the field.)

*Underrepresented Minorities (URMs) include African Americans, Hispanic Americans, and Native Americans.

**Other U.S. Citizens includes permanent residents and does not include African Americans, Hispanic Americans, and Native Americans.

Table 1 – Number and Percent Changes in the Average Annual Number of PhDs Awarded to Underrepresented Minorities* (URMs) in STEM from 2000/01 to 2007/08 at 66 AGEP Institutions, including Nine Campuses of the University of California (UC)

PhDs Awarded to URM	Average Annual Number for Early AGEP Years 2000/01 to 2002/03	Average Annual Number for Mid-AGEP Years 2003/04 to 2005/06	Average Annual Number for Current AGEP Years 2006/07 to 2007/08	Changes in the Average Annual Number for Early to Current AGEP Years	Percent Changes in the Average Annual Number of PhDs Awarded to URM for Early to Current AGEP Years
All Natural Sciences & Engineering (66)	382	458	573	191	50.0%
Engineering (59)	96	113	138	42	43.8%
Computer Engineering (20)	7	7	8	1	14.3%
Computer Sciences (40)	6	10	15	9	150.0%
Chemistry (56)	66	66	95	29	43.9%
Other Physical Sciences (51)	30	33	44	14	46.7%
Earth, Atmospheric and Ocean Sciences (41)	7	9	14	7	100.0%
Mathematics (56)	18	24	22	4	22.2%
Biological and Agricultural Sciences (59)	152	196	237	85	55.9%
Psychology (47)	78	79	79	1	1.3%
Interdisciplinary Sciences (18)	5	9	18	13	260.0%
Economics (35)	7	12	12	5	71.4%
Political Science (31)	31	25	14	-17	-54.8%
Sociology (32)	38	35	34	-4	-10.5%
Other Social Sciences (35)	82	95	104	22	26.8%
All STEM Fields (66)	623	713	834	211	33.9%

(The numbers in parentheses represent the number of institutions reporting data in the field.)

*Underrepresented Minorities (URMs) include African Americans, Hispanic Americans, and Native Americans.

Table 2 – Number and Percent Changes in the Average Annual Number of PhDs Awarded to Underrepresented Minorities* (URMs) in STEM from 2000/01 to 2007/08 at Nine Campuses of the University of California (UC).

PhDs Awarded to URMs at UC Only	Average Annual Number for Early AGEP Years 2000/01 to 2002/03	Average Annual Number for Mid-AGEP Years 2003/04 to 2005/06	Average Annual Number for Current AGEP Years 2006/07 to 2007/08	Changes in the Average Annual Number for Early to Current AGEP Years at UC	Percent Changes in the Average Annual Number of PhDs Awarded for Early to Current AGEP Years at UC
All Natural Sciences & Engineering (9)	91	93	136	45	49.5%
Engineering (9)	18	14	28	10	55.6%
Computer Engineering					
Computer Sciences (1)	0	0	0	0	
Chemistry (9)	12	14	20	8	66.7%
Other Physical Sciences (9)	15	18	26	11	73.3%
Earth, Atmospheric and Ocean Sciences (1)	0	0	0	0	
Mathematics (9)	3	5	3	0	0.0%
Biological and Agricultural Sciences (9)	43	42	59	16	37.2%
Psychology (8)	15	16	14	-1	-6.7%
Interdisciplinary Sciences					
Economics (1)	0	0	0	0	
Political Science (1)	0	2	2	2	
Sociology (1)	3	2	3	0	0.0%
Other Social Sciences (9)	43	41	45	2	4.7%
All STEM Fields (9)	152	154	200	48	31.6%

(The numbers in parentheses represent the number of institutions reporting data in the field.)

Note: Some data cells do not contain information because UC did not report data in all categories.

*Underrepresented Minorities (URMs) include African Americans, Hispanic Americans, and Native Americans.

Table 3 – Percent Changes in the Average Annual Number of PhDs Awarded to Underrepresented Minorities* (URMs) at AGEP Institutions due to Nine Campuses of the University of California from 2000/01 to 2007/08**

PhDs Awarded to URM	Changes in the Average Annual Number for Early to Current AGEP Years at UC***	Changes in the Average Annual Number for Early to Current AGEP Years at all 66 AGEP Institutions	Percent Increase in the Average Annual Number of PhDs Awarded to URM for Early to Current AGEP Years due to UC
All Natural Sciences & Engineering	45	191	23.6%
Engineering	10	42	23.8%
Computer Engineering		1	
Computer Sciences	0	9	0.0%
Chemistry	8	29	27.6%
Other Physical Sciences	11	14	78.6%
Earth, Atmospheric and Ocean Sciences	0	7	0.0%
Mathematics	0	4	0.0%
Biological and Agricultural Sciences	16	85	18.8%
Psychology	-1	1	****
Interdisciplinary Sciences		13	
Economics	0	5	****
Political Science	2	-17	
Sociology	0	-4	0.0%
Other Social Sciences	2	22	9.1%
All STEM Fields	48	211	22.7%

Note: Some data cells do not contain information because UC did not report data in all categories.

*Underrepresented Minorities (URMs) include African Americans, Hispanic Americans, and Native Americans.

**See Table 2 for more details about the changes in the average annual number of PhDs awarded to URMs at UC.

***See Table 1 for more details about the changes in the average annual number of PhDs awarded to URMs at the 66 AGEP institutions.

****Only positive percent increase is reported.

Table 4 – Number and Percent Changes in the Average Annual Number of PhDs Awarded to All Other U.S. Citizens and Permanent Residents in STEM at 66 AGEP Institutions and the Percent Changes in the Average Annual Number of PhDs Awarded to Underrepresented Minorities* (URMs) in STEM from 2000/01 to 2007/08

PhDs Awarded to All Other U.S. Citizens and Permanent Residents (not including URMs)	Average Annual Number for Early AGEP Years 2000/01 to 2002/03	Average Annual Number for Mid-AGEP Years 2003/04 to 2005/06	Average Annual Number for Current AGEP Years 2006/07 to 2007/08	Changes in the Average Annual Number for Early to Current AGEP Years	Percent Changes in the Average Annual Number of PhDs Awarded to All Other U.S. Citizens & Permanent Residents for Early to Current AGEP Years	Percent Changes in the Average Annual Number of PhDs Awarded to URMs for Early to Current AGEP Years
All Natural Sciences & Engineering (66)	4,165	4,790	5,456	1,291	31.0%	50.0%
Engineering (59)	1,062	1,227	1,470	408	38.4%	43.8%
Computer Engineering (20)	38	55	52	14	36.8%	14.3%
Computer Sciences (40)	96	144	174	78	81.3%	150.0%
Chemistry (56)	580	597	600	20	3.4%	43.9%
Other Physical Sciences (51)	479	492	562	83	17.3%	46.7%
Earth, Atmospheric and Ocean Sciences (41)	146	136	174	28	19.2%	100.0%
Mathematics (56)	208	254	272	64	30.8%	22.2%
Biological and Agricultural Sciences (59)	1,556	1,885	2,152	596	38.3%	55.9%
Psychology (47)	502	455	466	-36	-7.2%	1.3%
Interdisciplinary Sciences (18)	36	41	36	0	0.0%	260.0%
Economics (35)	101	90	100	-1	-1.0%	71.4%
Political Science (31)	136	121	110	-26	-19.1%	-54.8%
Sociology (32)	123	115	114	-9	-7.3%	-10.5%
Other Social Sciences (35)	557	587	590	33	5.9%	26.8%
All STEM Fields (66)	5,620	6,199	6,872	1,252	22.3%	33.9%

(The numbers in parentheses represent the number of institutions reporting data in the field.)

*Underrepresented Minorities (URMs) include African Americans, Hispanic Americans, and Native Americans.

Table 5 – Number and Percent Changes in the Average Annual Number of PhDs Awarded to All Other U.S. Citizens and Permanent Residents in STEM and the Percent Changes in the Average Annual Number of PhDs Awarded to Underrepresented Minorities* (URMs) in STEM at Nine Campuses of the University of California from 2000/01 to 2007/08

PhDs Awarded to All Other U.S. Citizens and Permanent Residents (not including URM's) at UC only	Average Annual Number for Early AGEP Years 2000/01 to 2002/03	Average Annual Number for Mid-AGEP Years 2003/04 to 2005/06	Average Annual Number for Current AGEP Years 2006/07 to 2007/08	Changes in the Average Annual Number for Early to Current AGEP Years	Percent Changes in the Average Annual Number of PhDs Awarded to All Other U.S. Citizens & Permanent Residents for Early to Current AGEP Years	Percent Changes in the Average Annual Number of PhDs Awarded to URM's for Early to Current AGEP Years
All Natural Sciences & Engineering (9)	1,254	1,299	1,570	316	25.2%	49.5%
Engineering (9)	245	271	354	109	44.5%	55.6%
Computer Engineering (1)						
Computer Sciences (1)	8	7	9	1	12.5%	
Chemistry (9)	156	164	188	32	20.5%	66.7%
Other Physical Sciences (9)	270	275	296	26	9.6%	73.3%
Earth, Atmospheric and Ocean Sciences (1)	7	6	10	3	42.9%	
Mathematics (9)	54	67	79	25	46.3%	0.0%
Biological and Agricultural Sciences (9)	514	509	634	120	23.3%	37.2%
Psychology (8)	88	95	104	16	18.2%	-6.7%
Interdisciplinary Sciences						
Economics (1)	4	4	4	0	0.0%	
Political Science (1)	13	8	6	-7	-53.8%	
Sociology (1)	11	6	8	-3	-27.3%	0.0%
Other Social Sciences (9)	263	282	282	19	7.2%	4.7%
All STEM Fields (9)	1,633	1,694	1,974	341	20.9%	31.6%

(The numbers in parentheses represent the number of institutions reporting data in the field.)

Note: Some data cells do not contain information because UC did not report data in all categories.

*Underrepresented Minorities (URMs) include African Americans, Hispanic Americans, and Native Americans.

D. About Data Collection and Analysis of the Average Annual Number of STEM PhDs Awarded to URMs at AGEP Institutions (2000/01 to 2007/08)

To examine changes in the annual number of STEM PhDs awarded to URMs from 2000/01 to 2007/08, data were collected from 66 AGEP institutions representing 21 Alliances. Between July 2008 and February 2009, the 66 institutions submitted data on URMs and other U.S. citizens and permanent residents for at least one category of STEM fields.

To reduce the volatility of the annual data, the data were grouped into three categories, and the average annual number was calculated for each of the three categories.

- Early AGEP Years (2000/01 to 2002/03);
- Mid-AGEP Years (2003/04 to 2005/06); and
- Current AGEP Years (2006/07 to 2007/08).

Also, data were collected and analyzed by race/ethnicity, gender, and citizenship for the following fields:

- (a) Biological & Agricultural Sciences
- (b) Chemistry
- (c) Computer Engineering
- (d) Computer Sciences
- (e) Earth, Atmospheric, and Ocean Sciences (including Geosciences, Environmental Sciences)
- (f) Economics
- (g) Engineering (including Electrical Engineering; excluding Computer Engineering)
- (h) Interdisciplinary Sciences
- (i) Mathematics (including Mathematical Statistics)
- (j) Other Physical Sciences (including Astronomy, Physics)
- (k) Other Social Sciences
- (l) Political Science
- (m) Psychology (excluding Clinical Psychology)
- (n) Sociology

The category NS&E includes Biological & Agricultural Science; Chemistry; Computer Engineering; Computer Sciences; Earth & Atmospheric Services; Engineering; Mathematics; and Other Physical Sciences.