AGEP Alliances for Graduate Education and the Professoriate

Info Brief V

Changes in the Annual Number of PhDs Awarded to Underrepresented Minorities in STEM at AGEP Institutions

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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 (URM) [1] receiving PhDs in science, technology, engineering, and mathematics (STEM). (See program description at bottom of page[2]). Analyses of data collected on PhDs awarded from 57 AGEP institutions representing 20 Alliances indicate that the AGEP Program is achieving the goal of increasing the annual number of PhDs awarded to URM in STEM.

Number and Percent of PhDs Awarded to URM in STEM at AGEP Institutions in 2006/07

In 2006/07, 689 PhDs were awarded to URM at 57 AGEP institutions. Of the 689 PhDs awarded to URM in STEM fields at 57 AGEP institutions in 2006/07:

- 424 or 61.5% were in Natural Sciences & Engineering (NS&E).
- 160 or 23.2% were in Other Social Sciences.
- 57 or 8.3% were in Psychology.
- 21 or 3.0% were in Sociology.
- 13 or 1.9% were in Political Science.
- 8 or 1.2% were in Interdisciplinary Sciences.
- 6 or 0.9% were in Economics *(Table 1).*

Of the 424 PhDs awarded to URM in NS&E at 57 AGEP institutions in 2006/07:

- 176 or 41.5% were in Biological/Agricultural Sciences.
- 112 or 26.4% were in Engineering.

[1]URM students are African Americans, Hispanic Americans, and Native Americans who are U.S. citizens or permanent residents.

[2]**Program 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.

- 72 or 17.0% were in Chemistry.
- 43 or 10.1% were in Other Physical Sciences.
- 15 or 3.5% were in Mathematics.
- 10 or 2.4% were in Earth, Atmospheric, and Ocean Sciences.
- 10 or 2.4% were in Computer Sciences.
- 8 or 1.9% were in Computer Engineering *(Table 1).*

About Changes in the Annual Number of PhDs Awarded to URM at AGEP Institutions from 2000/01 to 2006/07

An analysis of the number of PhDs awarded to URM from 2000/01 to 2006/07 at 57 AGEP institutions from 20 Alliances indicated that the annual number of PhDs awarded to URM in STEM fields increased from 602 to 689. Thus, in the past six years the annual number of PhDs awarded to URM in STEM fields at the 57 AGEP institutions increased by 14.5% or 87. During this same period, the annual number of PhDs awarded to URM at the 57 AGEP institutions in the Natural Sciences and Engineering (NS&E) increased from 309 to 424. Thus, in the past six years the annual number of PhDs awarded to URM at the 57 AGEP institutions in NS&E increased by 37.2% or 115 *(Table 1).*

The annual number of PhDs awarded to URM in 2006/07 at 57 AGEP institutions increased in nine fields and were mostly due to increases in the fields of Biological/Agricultural Sciences and Engineering. By fields, the annual number of PhDs awarded to URM between 2000/01 and 2006/07 increased from:

- 124 to 176 in the Biological/Agricultural Sciences (an increase of 52).
- 84 to 112 in Engineering (an increase of 28).
- 26 to 43 in the Other Physical Sciences (including astronomy and physics) (an increase of 17).
- 60 to 72 in Chemistry (an increase of 12).
- 3 to 10 in Earth, Atmospherics, and Ocean Sciences (an increase of 7).
- 3 to 10 in Computer Sciences (an increase of 7).
- 6 to 8 in Computer Engineering (an increase of 2).
- 4 to 6 in Economics (an increase of 2).
- 3 to 8 in Interdisciplinary Sciences (an increase of 5).

There was no increase in the annual number of PhDs awarded to URM in Mathematics at AGEP institutions from 2000/01 to 2006/07 and during this same time period there were declines in the annual number of PhDs awarded to URM in Psychology, Political Sciences, Sociology, and Other Social Sciences *(Table 1 and Figure 2).*

Almost 40% (39.1% or 34 of the 87) of the increases in the annual number of PhDs awarded to URM in STEM between 2000/01 and 2006/07 at all AGEP institutions are due to increases at the nine University of California (UC) campuses. The nine UC campuses account for most of the increase in the annual number of PhDs awarded to URM in Chemistry (83.3%) and nearly three-quarters of the increase in the annual number of PhDs awarded to URM in Engineering (71.4%) at all AGEP institutions between 2000/01 and 2006/07 *(Table 3).*

Comparison of Percent Change in the Annual Number of PhDs Awarded to URM and All Other U.S. Citizens and Permanent Residents

From 2000/01 to 2006/07, the percent change in the annual number of PhDs awarded at the 57 AGEP institutions was higher for URM than for all other U.S. citizens and permanent residents[3] in NS&E (37.2% vs 13.8%) and in all STEM fields (14.5% vs 6.4%). Within fields, the percent change in the annual number of PhDs awarded at AGEP institutions was much higher for URM than for all other U.S. citizens and permanent residents in Earth, Atmospheric, and Ocean Sciences (233.3% vs 42.4%), Computer Sciences (233.3% vs 44.0%) and Interdisciplinary Sciences (166.7% vs -7.1%) and higher in Economics (50.0% vs -27.5%), and Other Physical Sciences (65.4% vs 5.8%), Biological and Agricultural Sciences (41.9% vs 11.0%) and Engineering (33.3% vs 20.9%) *(Figure 1 and Table 4).*

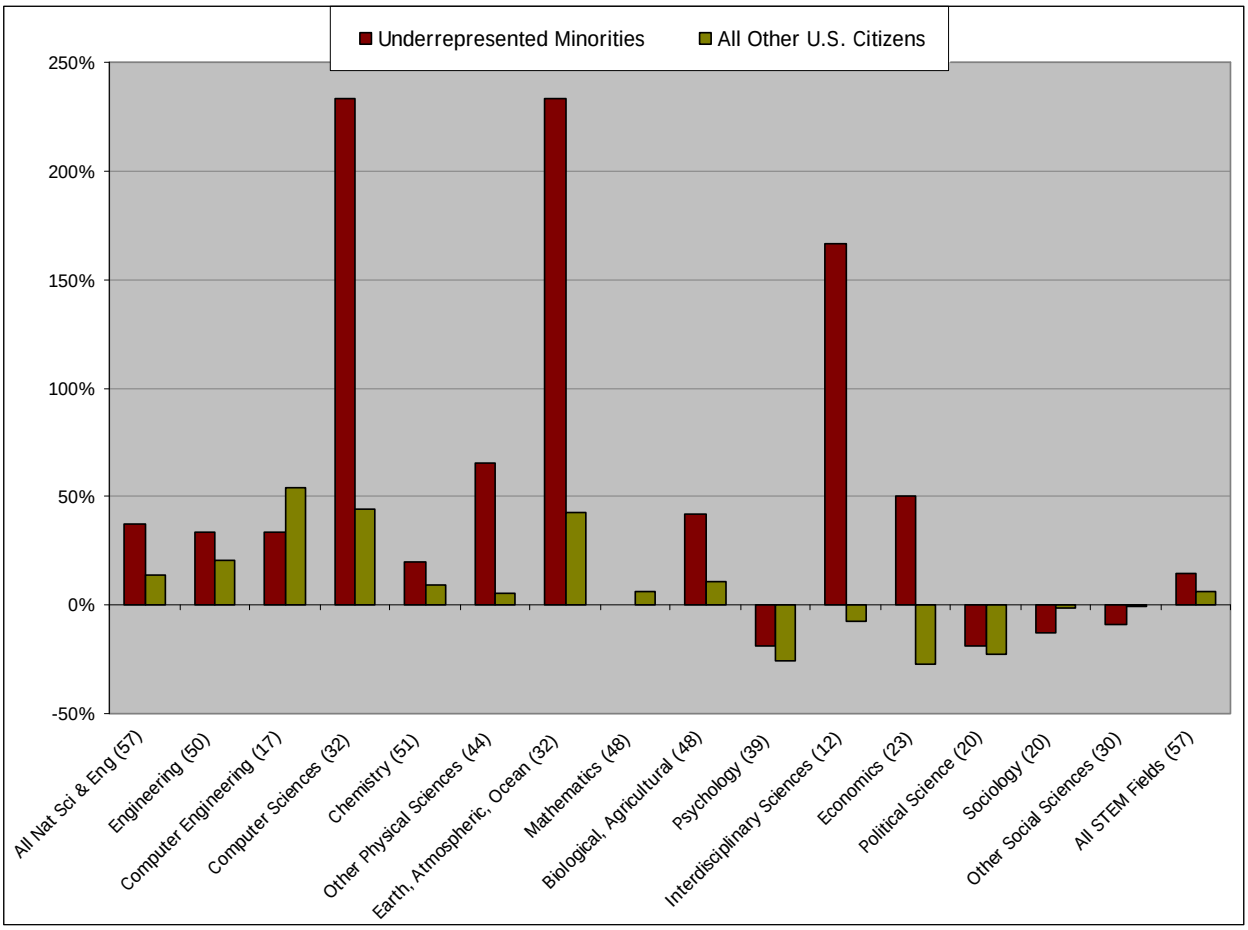
As indicated in Table 5, the percent change in the annual number of PhDs awarded at the nine UC campuses from 2000/01 to 2006/07 was higher for URM than for other U.S. citizens and permanent residents in NS&E (54.9% vs 20.4%) and in all STEM fields (24.1% vs 15.2%). In NS&E fields, the percent change in the annual number of PhDs awarded at the nine UC campuses from

[3]All other U.S. students are U.S. citizens or permanent residents who are not African Americans, Hispanic Americans, and Native Americans.

2000/01 to 2006/07 was much higher for URM as compared to all other U.S. students in the Engineering (111.1% vs 29.0%), Other Physical Sciences (70.6% vs 9.9%), Chemistry (83.3% vs 28.2%) and higher in Biological,Agricultural Sciences (29.5% vs 19.0%); and lower in Mathematics (0.0% vs 47.3%).

Figure 1: Percent Change in Annual Number of PhDs Awarded to URM and All Other U.S. Citizens and Permanent Residents by Broad STEM Categories at AGEP Institutions from (2000/01-2002/03) to 2006/07

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



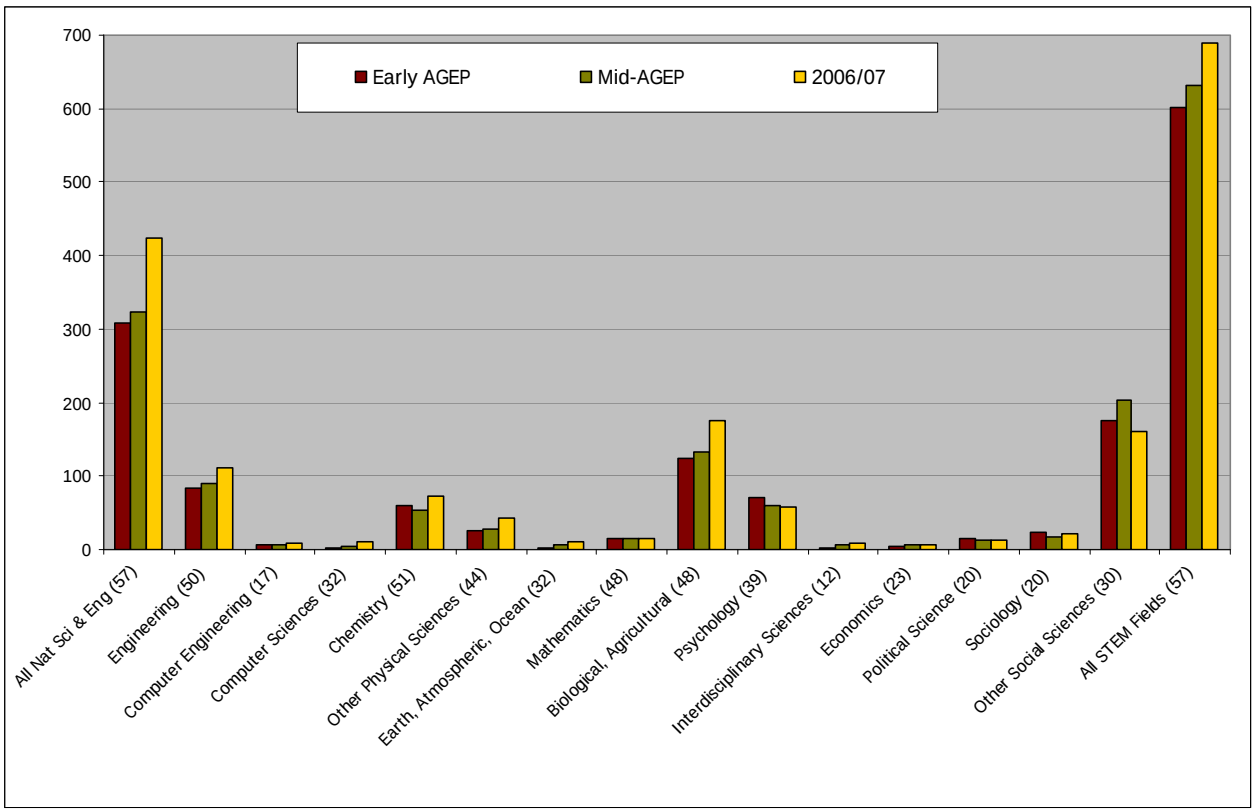
(Numbers for this figure are in Table 4.)

Underrepresented Minorities (URM) 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.

Figure 2: Changes in the Annual Number of PhDs Awarded to URM by Broad STEM Categories at AGEP Institutions for Early AGEP Years (2000/01-2002/03), Mid-AGEP Years (2003/04 to 2005/06), and 2006/07

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



(Numbers for this figure are in Table 1.)

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

Table 1 – Number and Percent Change in the Annual Number of PhDs Awarded to URM* in STEM from 2000/01 to 2006/07 at AGEP Institutions, including the nine campuses of the University of California*

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

PhD Recipients Underrepresented Minorities (all)	Early AGEP Years 2000/01 to 2002/03	Mid-AGEP Years 2003/04 to 2005/06	Year 2006/07	Early AGEP to 2006/07 Change	Early AGEP to 2006/07 Percent Change
All Natural Sciences & Engineering (57)	309	324	424	115	37.2%
Engineering (50)	84	90	112	28	33.3%
Computer Engineering (17)	6	7	8	2	33.3%
Computer Sciences (32)	3	5	10	7	233.3%
Chemistry (51)	60	53	72	12	20.0%
Other Physical Sciences (44)	26	28	43	17	65.4%
Earth, Atmospheric, Ocean (32)	3	6	10	7	233.3%
Mathematics (48)	15	16	15	0	0.0%
Biological, Agricultural (48)	124	133	176	52	41.9%
Psychology (39)	70	60	57	-13	-18.6%
Interdisciplinary Sciences (12)	3	7	8	5	166.7%
Economics (23)	4	6	6	2	50.0%
Political Science (20)	16	13	13	-3	-18.8%
Sociology (20)	24	18	21	-3	-12.5%
Other Social Sciences (30)	176	204	160	-16	-9.1%
All STEM Fields (57)	602	632	689	87	14.5%

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

*The University of California System (UC) reported they entered their data for Chemistry students twice, once under Chemistry and once under Other Physical Sciences. For that reason, data for UC Chemistry students are not included in Natural Science and STEM totals, nor are the UC Chemistry data used in the computation of the percent of change due to UC.

Table 2 – Number and Percent Change in the Annual Number of PhDs Awarded to URM in STEM from 2000/01 to 2006/07 at Nine Campuses of the University of California*

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

PhD Recipients Underrepresented Minorities UC only	Early AGEP Years 2000/01 to 2002/03	Mid-AGEP Years 2003/04 to 2005/06	Year 2006/07	Early AGEP to 2006/07 Change	Early AGEP to 2006/07 Percent Change
All Natural Sciences & Engineering (9)	82	82	127	45	54.9%
Engineering (9)	18	14	38	20	111.1%
Computer Engineering					
Computer Sciences					
Chemistry (9)	12	14	22	10	83.3%
Other Physical Sciences (9)	17	19	29	12	70.6%
Earth, Atmospheric, Ocean					
Mathematics (9)	3	5	3	0	0.0%
Biological, Agricultural (9)	44	44	57	13	29.5%
Psychology (9)	15	16	12	-3	-20.0%
Interdisciplinary Sciences					
Economics					
Political Science					
Sociology					
Other Social Sciences (9)	44	43	36	-8	-18.2%
All STEM Fields (9)	141	141	175	34	24.1%

* Some data cells do not contain information because UC did not report data in all categories. Also, the UC system reported they entered their data for Chemistry students twice, once under Chemistry and once under Other Physical Sciences. For that reason, data for UC Chemistry students are not included in Natural Sciences & Engineering and STEM totals, nor are the UC Chemistry data used in the computation of the percent of change due to UC.

Table 3 – Percent Change in Annual Number of PhDs Awarded to URM at AGEP Institutions due to the Nine Campuses of the University of California* from 2000/01 to 2006/07

URM PhD Recipients in Broad STEM Categories	Number Early AGEP to 2006/07- Change at UC	Percent Early AGEP to 2006/07- Change at UC	Number Early AGEP to 2006/07 change to All AGEP Institutions	Percent Early AGEP to 2006/07 Change to All AGEP Institutions	Percent Early AGEP to 2006/07 Change Due to UC
All Natural Sciences & Engineering	43	54.9%	115	37.2%	39.1%
Engineering	20	111.1%	28	33.3%	71.4%
Computer Engineering			2	33.3%	
Computer Sciences			7	233.3%	
Chemistry	10	83.3%	12	20.0%	83.3%
Other Physical Sciences	12	70.6%	17	65.4%	70.6%
Earth, Atmospheric, Ocean			7	233.3%	
Mathematics	0	0.0%	0	0.0%	
Biological, Agricultural	13	29.5%	53	41.9%	25.0%
Psychology	-3	-20.0%	-13	-18.6%	23.1%
Interdisciplinary Sciences			5	166.7%	
Economics			2	50.0%	
Political Science			-3	-18.8%	
Sociology			-3	-12.5%	
Other Social Sciences	-8	-18.2%	-16	-9.1%	50.0%
All STEM Fields	34	24.1%	87	14.5%	39.1%

* Some data cells do not contain information because UC did not report data in all categories. Also, the UC system reported they entered their data for Chemistry students twice, once under Chemistry and once under Other Physical Sciences. For that reason, data for UC Chemistry students are not included in Natural Sciences & Engineering and STEM totals, nor are the UC Chemistry data used in the computation of the percent of change due to UC.

Table 4 – Number and Percent Change in the Annual Number of PhDs Awarded in STEM to All Other U.S. Citizens or Permanent Residents and Percent Change in Annual Number of PhDs Awarded to URM at AGEP Institutions from 2000/01 to 2006/07*

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

PhD Recipients Other US (All)	Early AGEP Years 2000/01 to 2002/03	Mid-AGEP Years 2003/04 to 2005/06	Year 2006/07	Early AGEP to 2006/07 Change	Early AGEP to 2006/07 Percent Change All Other U.S. Students	Early AGEP to 2006/07 Percent Change URM
All Natural Sciences & Engineering (57)	3,460	3,492	3,937	477	13.8%	37.2%
Engineering (50)	928	951	1,122	194	20.9%	33.3%
Computer Engineering (17)	37	46	57	20	54.1%	33.3%
Computer Sciences (32)	75	78	108	33	44.0%	233.3%
Chemistry (51)	494	485	539	45	9.1%	20.0%
Other Physical Sciences (44)	431	422	456	25	5.8%	65.4%
Earth, Atmospheric, Ocean (32)	99	87	141	42	42.4%	233.3%
Mathematics (48)	175	183	186	11	6.3%	0.0%
Biological, Agricultural (48)	1,377	1,404	1,528	151	11.0%	41.9%
Psychology (39)	436	361	324	-112	-25.7%	-18.6%
Interdisciplinary Sciences (12)	28	30	26	-2	-7.1%	166.7%
Economics (23)	69	59	50	-19	-27.5%	50.0%
Political Science (20)	92	84	71	-21	-22.8%	-18.8%
Sociology (20)	64	63	63	-1	-1.6%	-12.5%
Other Social Sciences (30)	769	769	762	-7	-0.9%	-9.1%
All STEM Fields (57)	4,918	4,858	5,233	315	6.4%	14.5%

* Some data cells do not contain information because UC did not report data in all categories. Also, the UC system reported they entered their data for Chemistry students twice, once under Chemistry and once under Other Physical Sciences. For that reason, data for UC Chemistry students are not included in Natural Sciences & Engineering and STEM totals, nor are the UC Chemistry data used in the computation of the percent of change due to UC.

Other U.S. citizens and permanent residents does not include African Americans, Hispanic Americans, and Native Americans.

Table 5 – Number and Percent Change in Annual Number of PhDs Awarded to All Other U.S. Citizens or Permanent Residents & Percent Change in Annual Number of PhDs Awarded to URM at the Nine Campuses of the University of California from 2000/01 to 2006/07*

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

PhD Recipients Other US UC only	Early AGEP Years 2000/01 to 2002/03	Mid-AGEP Years 2003/04 to 2005/06	Year 2006/07	Early AGEP to 2006/07 Change	Early AGEP to 2006/07 Percent Change All Other U.S. Students	Early AGEP to 2006/07 Percent Change URM
All Natural Sciences & Engineering (9)	1,115	1,170	1,342	227	20.4%	54.9%
Engineering (9)	255	282	329	74	29.0%	111.1%
Computer Engineering						
Computer Sciences						
Chemistry (9)	156	164	200	44	28.2%	83.3%
Other Physical Sciences (9)	283	292	311	28	9.9%	70.6%
Earth, Atmospheric, Ocean						
Mathematics (9)	55	68	81	26	47.3%	0.0%
Biological, Agricultural (9)	522	528	621	99	19.0%	29.5%
Psychology (9)	88	95	94	6	6.8%	-20.0%
Interdisciplinary Sciences						
Economics						
Political Science						
Sociology						
Other Social Sciences (9)	286	292	280	-6	-2.1%	-18.2%
All STEM Fields (9)	1,489	1,557	1,716	227	15.2%	24.1%

* Some data cells do not contain information because UC did not report data in all categories. Also, the UC system reported they entered their data for Chemistry students twice, once under Chemistry and once under Other Physical Sciences. For that reason, data for UC Chemistry students are not included in Natural Sciences & Engineering and STEM totals, nor are the UC Chemistry data used in the computation of the percent of change due to UC.

Other U.S. citizens and permanent residents does not include African Americans, Hispanic Americans, and Native Americans.

About Data Collection and Analysis of the Annual Number of STEM PhDs Awarded to URM at AGEP Institutions (2000/01 to 2006/07)

To examine changes in the annual number of STEM PhDs awarded to URM from 2000/01 to 2006/07, data was collected from 57 AGEP institutions representing 20 Alliances. Between July 2007 and February 2008, the 57 institutions submitted data on URM 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:

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

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