

Physics Bachelor's Degrees: 2018

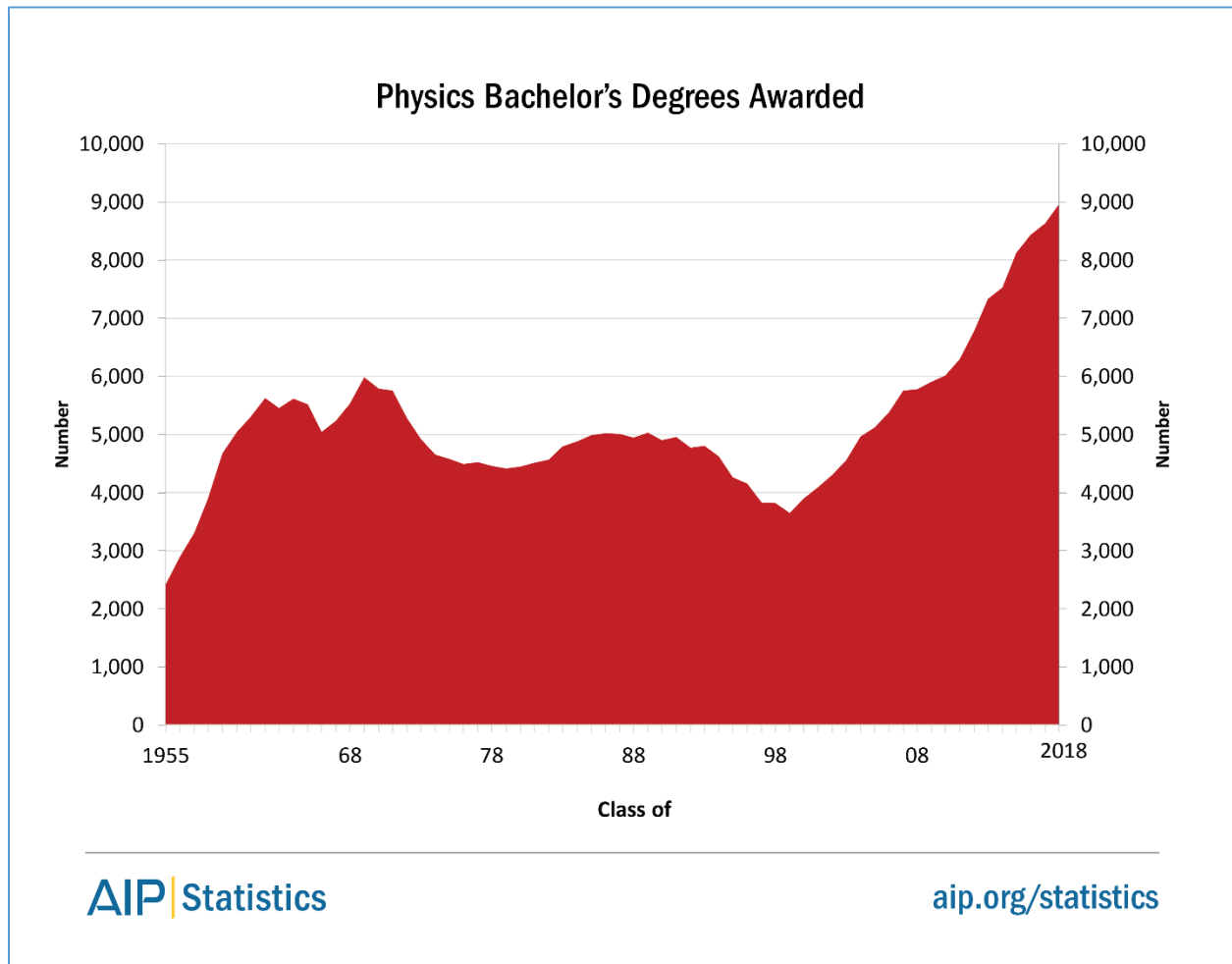
Results from the 2018 Survey of Enrollments and Degrees

Patrick J. Mulvey and Starr Nicholson

Degrees Conferred

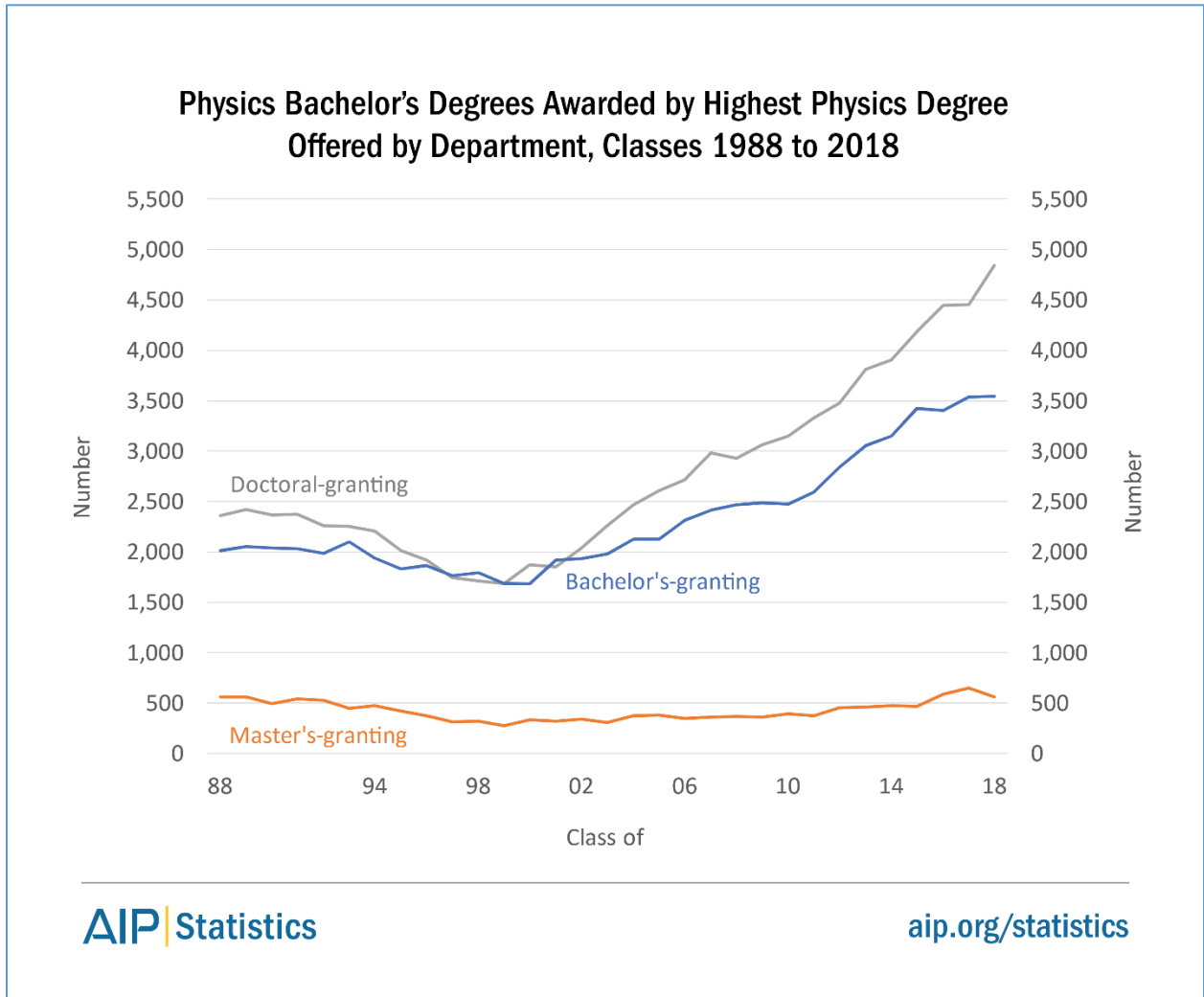
The two-decades long trend of increases in the number of physics bachelor's conferred at US physics departments continues with the class of 2018. The class of 2018 continues the two-decades-long trend of increases in the number of physics bachelor's degrees conferred at US physics departments. The 8,946 degrees conferred in the class of 2018 represents a 3.5% increase from the previous year and a 145% increase from the recent low in 1999 (see **Figure 1**).

Figure 1



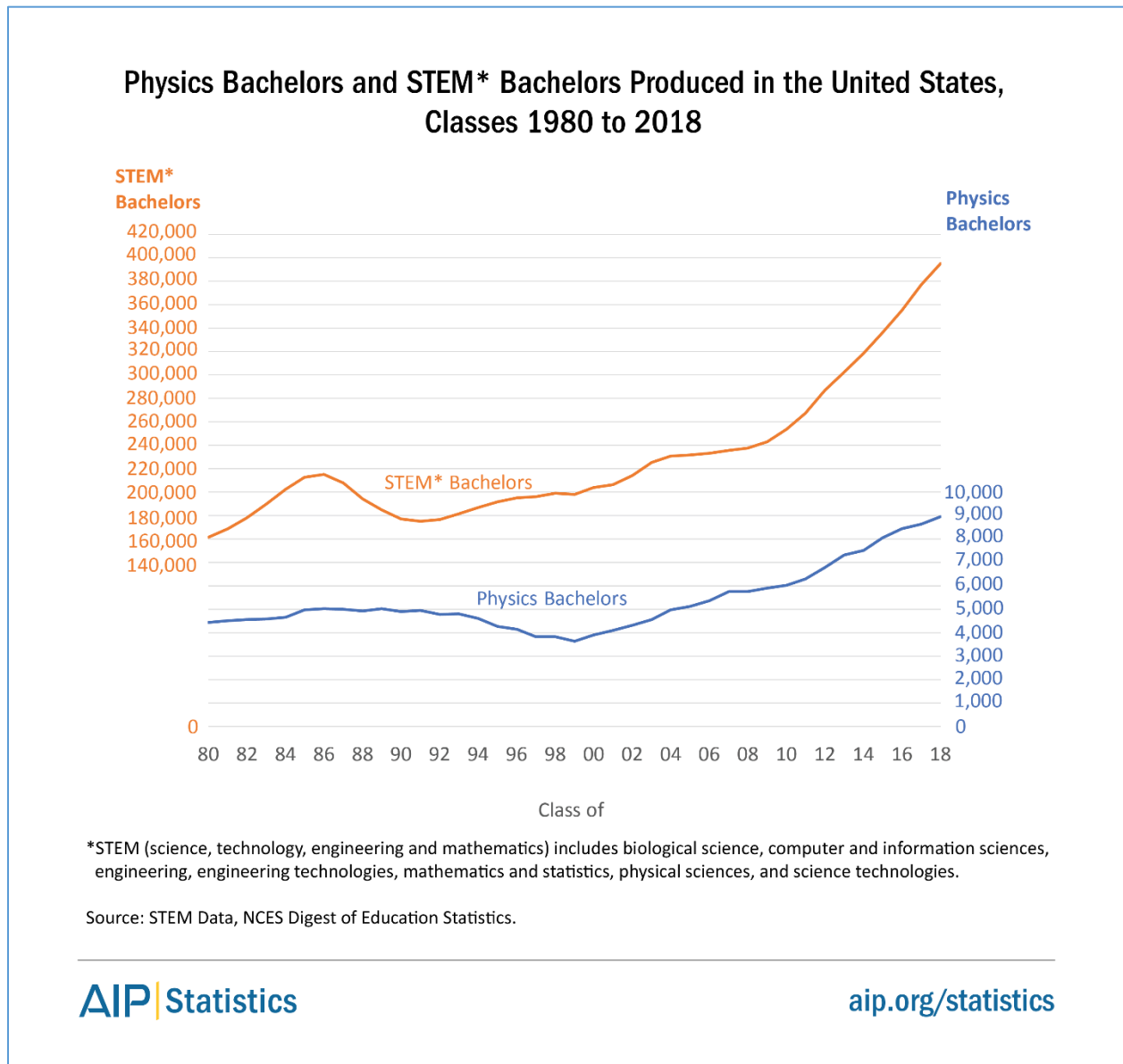
Increases in the number of bachelor's degrees conferred since 1999 have occurred at all department types (see **Figure 2**). The gains have been the greatest at doctoral-granting departments, which have seen an increase of 187%. Bachelor's- and master's-granting departments have seen increases of 111% and 105%, respectively.

Figure 2



The trend of increases in the number of degrees conferred has not been limited to only physics bachelors. STEM (science, technology, engineering, and mathematics) degrees have been increasing for an even longer period of time, since 1992 (see **Figure 3**). The number of physics degrees conferred since 1999 has increased 145%, while the overall number of STEM degrees has increased about 80% during the same time period. The total number of bachelor's degrees awarded across all subjects has also been on the rise and has increased an estimated 65% since 1999. Physics bachelor's degrees represented about 1.8% of STEM degrees in the 1998–99 academic year and have increased their representation to 2.3% in the class of 2018. Among all bachelor's degrees in the class of 1999, 0.3% were awarded in physics. For the class of 2018 this was 0.46%, a 50% increase.

Figure 3



Even though doctoral-granting physics departments comprise just a quarter of the degree-granting physics departments, they conferred 40% of the physics bachelor’s degrees in the class of 2018 (see **Table 1**). These departments on average conferred 25 degrees per department in the class of 2018, and they tend to be significantly larger, both in terms of students and faculty members, than the 503 bachelor’s-only departments, which averaged seven degrees per department.

The institutions with physics departments that conferred, on average, the most physics bachelor’s are listed in **Tables 2, 3, and 4**. These three tables separate the departments by the highest physics degree they offer. There were four PhD-granting with physics departments that averaged over 100 physics bachelor’s in the classes of 2016, 2017, and 2018 [1].

For an in-depth analysis of the number of bachelor’s degrees conferred by departments, including a comparison of number of bachelor’s conferred to number of faculty, see “Size of Undergraduate Physics and Astronomy Programs.” [1].

Table 1

Number and Size of Physics Bachelor’s Programs by Highest Degree the Department Offered, Class of 2018.

| Highest physics degree offered by department | Number of Depts. | Percent of Depts. | Physics Bachelor’s Degrees Conferred | | | |
|--|------------------|-------------------|--------------------------------------|--------------------|---------|--------|
| | | | Number of Degrees | Percent of Degrees | Average | Median |
| Bachelors | 503 | 67 | 3,540 | 40 | 7.0 | 5 |
| Masters | 57 | 7 | 564 | 6 | 9.9 | 8 |
| Doctorates | 194 | 26 | 4,842 | 54 | 25.0 | 17 |

There are an additional 7 doctoral-granting physics departments that do not offer a bachelor’s degree. There were 8,946 physics bachelor’s degrees conferred in the class of 2018.

Table 2**Bachelor's-Only Departments Averaging 15 or More Physics Bachelor's Degrees Per Year, Classes of 2016 to 2018**

| | Annual Average | | Annual Average |
|--------------------------------------|----------------|-------------------------------------|----------------|
| SUNY College at Geneseo (NY) | 40 | Vassar College (NY) | 18 |
| Loyola University-Chicago (IL) | 34 | Western Washington University | 18 |
| U of Wisconsin, La Crosse | 34 | Georgia College | 17 |
| CA Poly State U, San Luis Obispo | 31 | Siena College (NY) | 17 |
| Rowan University (NJ) | 31 | University of North Georgia | 17 |
| Fordham University (NY) | 29 | Whitworth University (WA) | 17 |
| Saint Olaf College (MN) | 27 | Boise State University (ID) | 16 |
| Bethel University (MN) | 25 | Brigham Young University-Idaho | 16 |
| University of Wisconsin, Eau Claire | 25 | CA State University, San Bernardino | 16 |
| Harvey Mudd College (CA) | 24 | College of Charleston (SC) | 16 |
| Salisbury University (ME) | 23 | Davidson College (NC) | 16 |
| United States Naval Academy (MD) | 23 | Gustavus Adolphus College (MN) | 16 |
| Carleton College (MN) | 21 | Illinois Wesleyan University | 16 |
| Central Washington University | 20 | Lewis University (IL) | 16 |
| Grinnell College (IA) | 20 | University of Northern Colorado | 16 |
| James Madison U (VA) | 20 | Wellesley College (MA) | 16 |
| Reed College (OR) | 20 | Augustana College (IL) | 15 |
| The College of New Jersey | 20 | Bates College (ME) | 15 |
| University of Wisconsin, River Falls | 20 | Colby College (ME) | 15 |
| Illinois State U | 19 | Furman University (SC) | 15 |
| University of North Florida | 19 | Ithaca College (NY) | 15 |
| West Virginia Wesleyan College | 19 | Middle Tennessee St University | 15 |
| Bowdoin College (ME) | 18 | Oberlin College (OH) | 15 |
| Colgate University (NY) | 18 | Occidental College (CA) | 15 |
| Middlebury College (VT) | 18 | Point Loma Nazarene U (CA) | 15 |
| United States Military Academy (NY) | 18 | Sacramento State University (CA) | 15 |

List includes only those departments that offered a bachelor's as their highest physics degree in 2018 and contributed degree data for all three years. The departments listed in this table represent 11% of all physics departments that offer a bachelor's as their highest physics degree.

Table 3

Master's-Granting Departments Averaging 15 or More Physics Bachelor's Degrees Per Year, Classes of 2016 to 2018

| | Annual Average |
|---------------------------------|----------------|
| CA State University, Long Beach | 40 |
| Appalachian State U (NC) | 35 |
| Northern Arizona U | 24 |
| Virginia Commonwealth U | 21 |
| U of North Carolina, Charlotte | 20 |
| U of Texas, Rio Grande Valley | 19 |
| CA State University, Fullerton | 18 |
| City College (NY) | 17 |
| Miami U (OH) | 17 |
| Texas State U | 17 |
| Towson U (MD) | 16 |
| U of Texas at El Paso | 16 |
| U of Memphis (TN) | 15 |

List includes only those departments that offered a master's as their highest physics degree in 2018 and contributed degree data for all three years. The departments listed in this table represent 12% of all physics departments that offer a master's as their highest physics degree.

Table 4

Doctoral-Granting Departments Averaging 50 or More Physics Bachelor's Degrees Per Year, Classes of 2016 to 2018

| | Annual Average | | Annual Average |
|---------------------------------|----------------|---------------------------------|----------------|
| U of Washington | 150 | Colorado School of Mines | 61 |
| U of Illinois, Urbana/Champaign | 147 | Ohio State University | 61 |
| U of California, Santa Barbara | 117 | U of Virginia | 59 |
| U of California, Berkeley | 111 | U of California, Santa Cruz | 57 |
| U of Texas at Austin | 90 | Harvard University (MA) | 56 |
| U of California, Los Angeles | 78 | Arizona State University | 54 |
| Rutgers U, New Brunswick (NJ) | 76 | Brigham Young University (UT) | 54 |
| U of Maryland, College Park | 70 | U of California, San Diego | 54 |
| U of Colorado, Boulder | 69 | U of Minnesota, Minneapolis | 54 |
| U of Chicago (IL) | 66 | VA Polytech Institute & State U | 51 |
| U of Michigan, Ann Arbor | 63 | Stony Brook University (NY) | 50 |

List includes only those departments that offered a doctorate as their highest physics degree in 2018 and contributed degree data for all three years. The departments listed in this table represent 11% of all physics departments that offer a PhD as their highest physics degree.

Characteristics

Citizenship

Non-US citizens among physics bachelor's degree recipients in the class of 2018 has reached an all-time high at around 10% (see **Table 5**). This compares to 4% for all STEM bachelor's fields [2] and 5% for all bachelors nationally [3] in the class of 2018. A decade earlier, the representation of non-US citizens among physics bachelors was about 6%. The representation of non-US citizens among physics bachelors is considerably lower than the representation of non-US citizens among exiting physics masters and physics PhDs, 35% and 47%, respectively, for the class of 2018.

Age

The median age for physics bachelors is 22.4 (see **Table 5**). Sixteen percent of physics bachelors were 24 years old or older; this compares to 35.8% of all first-time bachelor's degree recipients in 2015–16 [4].

Table 5

Demographic Profile of Physics Bachelors, Class of 2018

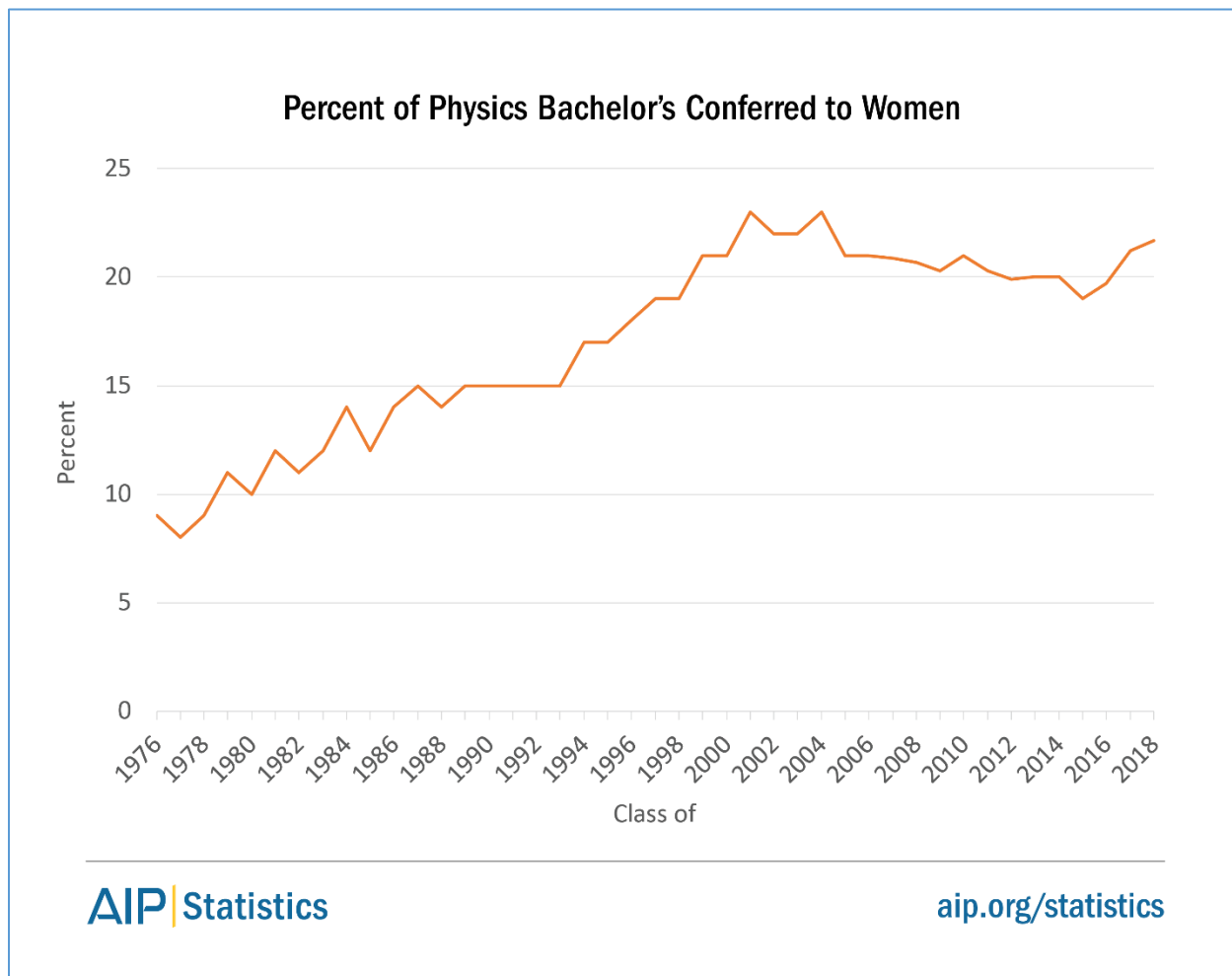
| | | |
|-------------|-------------|------|
| Gender | Men | 78% |
| | Women | 22% |
| Citizenship | US | 90% |
| | Non-US | 10% |
| Age* | Median | 22.4 |
| | 24 or Older | 16% |

*Age data is from the AIP Follow-Up Survey of Physics Bachelors, Classes of 2017 and 2018 combined.

Gender

The class of 2018 represents the third consecutive year there has been a gain in the representation of women among physics bachelors. The proportion of women in the class of 2018 (22%) has almost returned to the all-time high level (23%) seen in the early 2000s (see **Figure 4**). Data from the AIP Degree Recipient Follow-up Survey, classes of 2017 and 2018 combined, finds that about 1% of physics bachelor's identified themselves in a gender category other than a man or a woman.

Figure 4



Two-Year College Background

Physics bachelors were asked: “After graduating from high school, did you start your college education at a two-year or community college?” Fifteen percent of bachelors indicated they had (see **Table 6**). This compares to 27.4% of all bachelor’s degree recipients in the class of 2015–16 [4]. Physics bachelors who received their degrees in certain states (Oregon, Idaho, Florida, California, and Arizona) were more likely to have started at a two-year college than bachelors receiving their degrees from other states. A larger percentage of physics bachelors who were men (17%) indicated having started at a two-year college than women (11%).

Double Majors, Minors, and Degree Focus

A significant fraction of physics bachelors indicated they had graduated with a double major (35%) or minor (44%) (see **Table 6**). The percentage of physics bachelors graduating with a double major is far greater than the 5% for all bachelors nationally [5]. There was no statistically significant difference between the proportion of physics bachelors receiving a double major by gender.

Physics bachelors who graduated with a second major did so in a diverse set of both STEM and non-STEM subjects. A second major in mathematics represented the largest proportion (44%) of those with second majors. Mathematics was also the most frequent minor that physics bachelors earned. In total, 31% of physics bachelors indicated either having earned a double major or a minor with mathematics. Physics bachelors who started their college education at a two-year college were less likely (26%) to graduate with a double major than individuals who did not (36%).

Many undergraduate physics programs offer their students the option to choose a particular focus to their physics major. In the combined classes of 2017 and 2018, 30% of the physics bachelors indicated their degree had a particular focus (see **Table 6**). An engineering or applied physics focus was cited most frequently, with 13% of the bachelors having graduated with such a focus to their degree.

Table 6

**Education Characteristics of Physics Bachelors,
Classes of 2017 and 2018 Combined**

| | |
|---|-----|
| Started Education at a Two-Year College: | |
| Overall | 15% |
| Men | 17% |
| Women | 11% |
| Graduated with a double major* | 35% |
| Graduated with a minor* | 44% |
| Did not graduate with a double major or minor | 31% |
| Focus of Physics Bachelor's Degree: | |
| Traditional degree | 70% |
| Engineering or applied physics | 13% |
| Astrophysics | 7% |
| Biophysics | 3% |
| High school teaching | 2% |
| Other focus | 5% |

The data in this table come from the AIP Follow-Up Survey of Physics Bachelors, Classes of 2017 and 2018 combined.

*Nine percent of physics bachelors graduated with both a double major and a minor.

Race and Ethnicity

African Americans and Hispanics continue to be underrepresented, comprising 4 and 8% of the class of 2018 (see **Table 7**). For comparison, the college-age population (18- to 24-year-olds) in 2017 was composed of 14% African Americans and 22% Hispanics [6].

Table 7

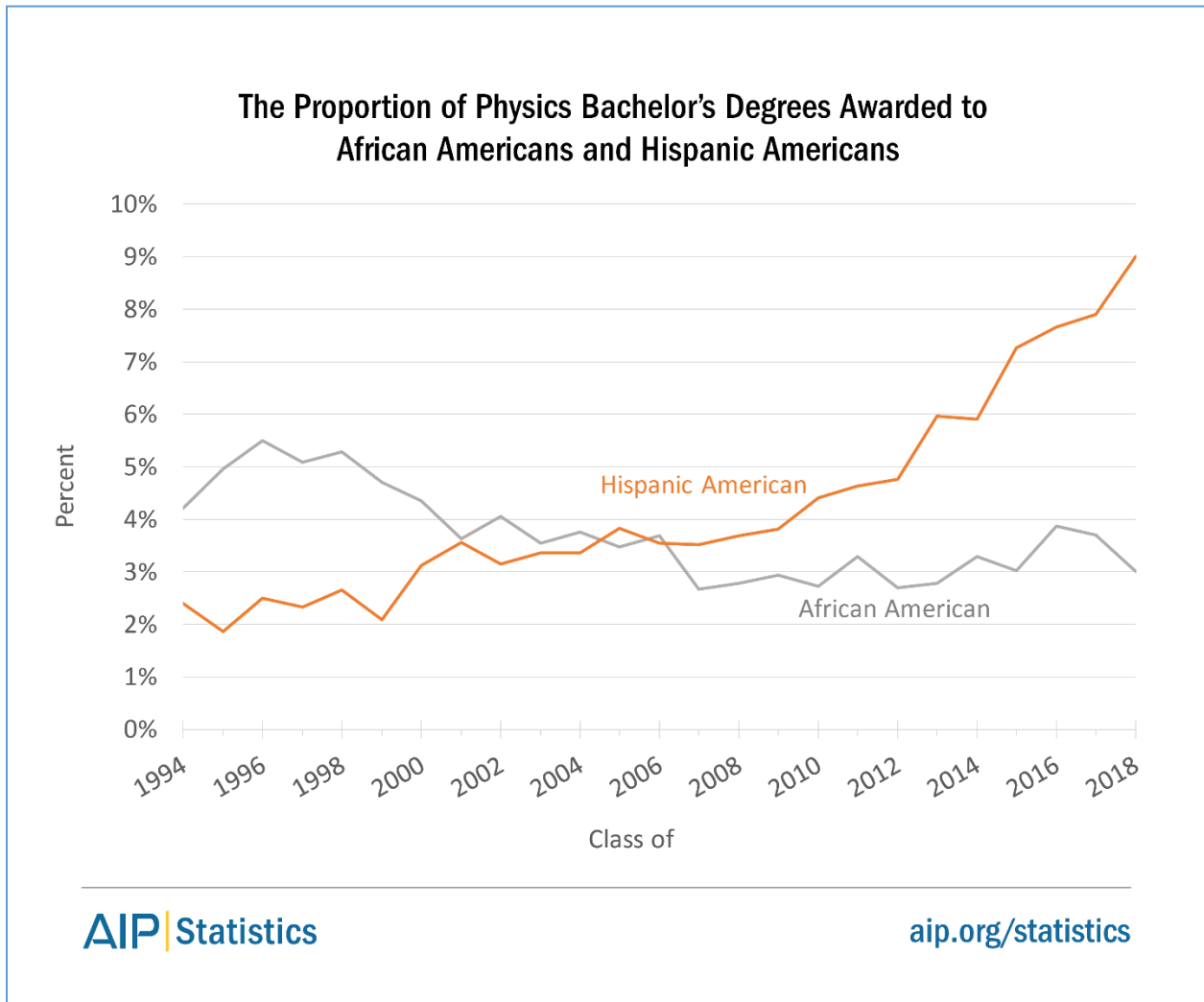
Race and Ethnicity of Physics Bachelors, Classes of 2017 and 2018

| | Number (2-Year Average) | Percent |
|--------------------------|----------------------------|---------|
| White | 6,140 | 77 |
| Asian American | 651 | 8 |
| African American / Black | 284 | 4 |
| Hispanic American | 686 | 9 |
| Other | 228 | 3 |
| Total US Citizens | 7,989 | 100% |

Non-US citizens represented 9% of physics bachelors in the combined classes of 2017 and 2018.
Data does not add to 100% due to rounding.

The proportion of physics bachelor’s degrees earned by Hispanics has been increasing steadily since around 2000, with their representation increasing by about 200% (see **Figure 5**). This outpaces their increasing representation among their college-age population, which has increased about 22% during the same time period [6]. These encouraging gains in representation for Hispanics have not been realized for African Americans. The representation of African Americans among physics bachelors has declined from about 5% in the late 1990s to 3% for the class of 2018. The representation of African Americans among the college-age population has been relatively unchanged since 2000.

Figure 5



The American Institute of Physics has published a report, “The Time Is Now: Systemic Changes to Increase African Americans with Bachelor’s Degrees in Physics and Astronomy” which discusses the reasons for low representation of African Americans in undergraduate physics and provides actionable recommendations for community wide efforts to reverse this trend. <https://www.aip.org/diversity-initiatives/team-up-task-force>

Enrollments

Introductory Physics Courses

Physics departments play an important role at their institutions by providing instruction in service courses. Introductory physics courses meet the curriculum requirements for many other majors or an institution's general education science requirements. About 480,000 undergraduates took introductory physics courses in degree-granting physics departments during the 2017–18 academic year (see **Table 8**). Only about 4% of students enrolled in introductory calculus-based physics courses ultimately become physics majors.

After over two decades of increases in the number of students enrolling in introductory physics classes at degree-granting physics departments, the number has decreased by about 4% in the last two years. The greatest declines have occurred in calculus-based physics classes.

Table 8

**Introductory Physics Course Enrollments at Physics Departments,
Academic Year 2017-18**

| Highest Physics Degree Offered by Department | Calculus Based | Algebra Based | Conceptual |
|--|----------------|----------------|---------------|
| Bachelor's | 59,000 | 58,000 | 27,000 |
| Master's | 23,000 | 25,000 | 10,000 |
| PhD | 160,000 | 92,000 | 26,000 |
| Total | 242,000 | 175,000 | 63,000 |

Introductory Physical Science and Astronomy Courses

Some physics departments are also responsible for teaching the institution's introductory courses in physical science and astronomy, which might also meet an institution's general education requirements (see **Table 9**). About a third of the physics departments offer an introductory physical science course, with total enrollments of 37,000 students in the 2017–18 academic year. In addition, about three-quarters of the separate physics departments offer an introductory astronomy course. These departments had a total introductory astronomy enrollment of 130,000 students during the 2017–18 academic year. In addition, 39 separate astronomy departments and 42 combined physics and astronomy departments had a total of 56,000 students enrolled in introductory astronomy courses.

Table 9

Introductory Physical Science and Astronomy Course Enrollments at Physics Departments, Academic Year 2017-18

| Highest Physics Degree Offered by Department | Physical Science | Astronomy |
|--|------------------|----------------|
| Bachelor's | 20,000 | 48,000 |
| Master's | 6,000 | 22,000 |
| PhD | 11,000 | 60,000 |
| Total | 37,000 | 130,000 |

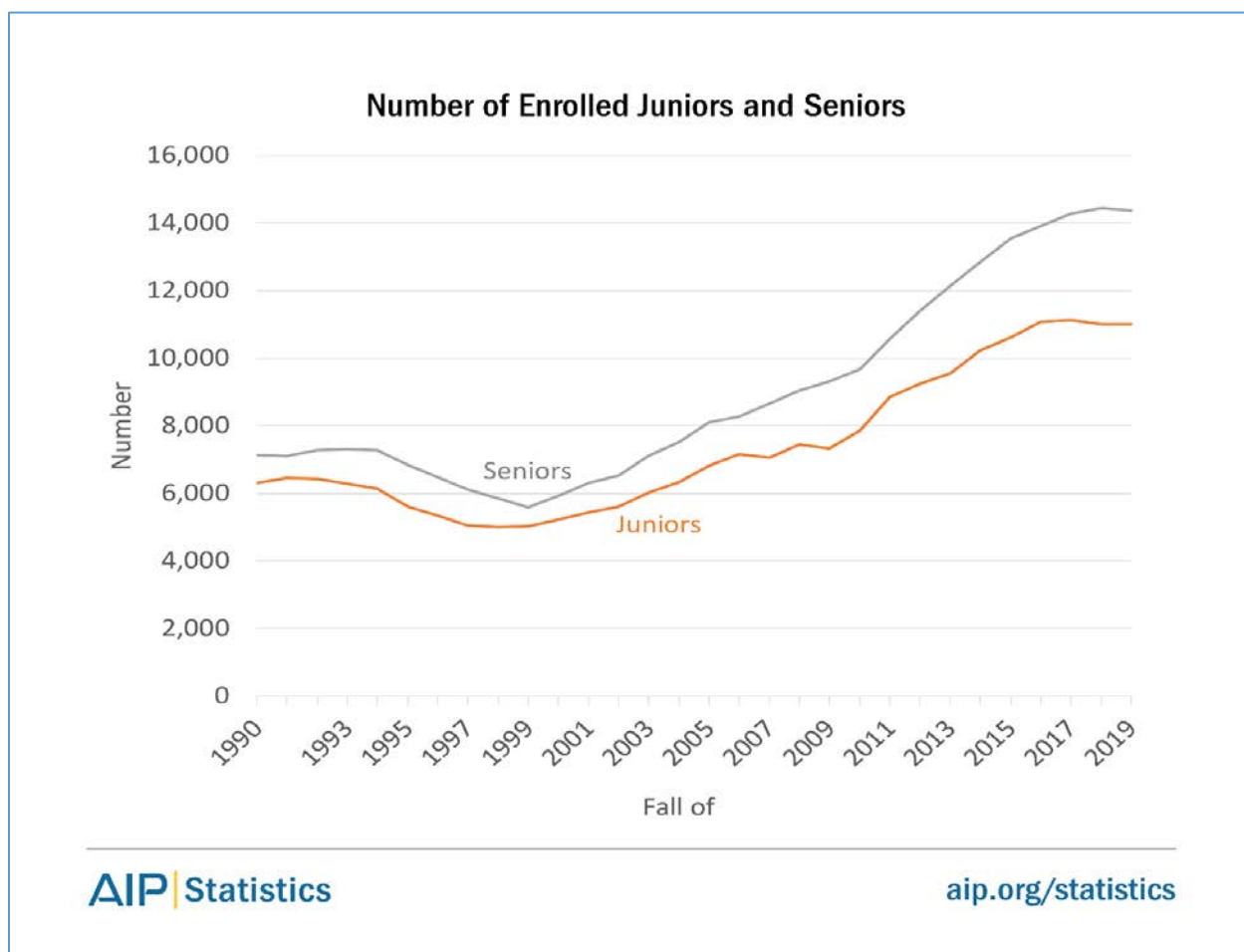
Astronomy enrollments are for stand-alone physics departments. In addition, there were 39 separate astronomy departments and 42 combined physics and astronomy departments that had a total of 56,000 students enrolled in an introductory astronomy course.

Junior and Senior Level Enrollments

After steadily increasing for many years, undergraduate junior and senior physics major enrollments have leveled off (see **Figure 6**). It can be expected that a leveling off of the number of physics bachelor's degrees awarded annually will happen soon.

In recent years, approximately four out of ten physics seniors maintained senior status for more than one year. Many factors contribute to why physics students might require more than four years to obtain their undergraduate degree, including taking additional course work for a double major, changing majors, taking a leave of absence, holding employment while enrolled part time, and transferring from another institution.

Figure 6



Further Reading

The American institute of physics has published a report “The Time Is Now: Systemic Changes to Increase African Americans with Bachelor’s Degrees in Physics and Astronomy” which discusses the reasons for low representation of African Americans in undergraduate physics and provides actionable recommendations for community wide efforts to reverse this trend.

<https://www.aip.org/diversity-initiatives/team-up-task-force>

References

- [1] Tyler, J., Mulvey, P. & Nicholson, S. (2020). Size of Undergraduate Physics and Astronomy Programs. <https://www.aip.org/statistics/reports/size-undergraduate-physics-and-astronomy-programs-16-18>
- [2] Digest of Education Statistics 2019, Table 318.45. https://nces.ed.gov/programs/digest/d19/tables/dt19_318.45.asp
- [3] Digest of Education Statistics 2019, Table 322.30. https://nces.ed.gov/programs/digest/d19/tables/dt19_322.30.asp
- [4] Baccalaureate and Beyond (B&B: 16/17): A First Look at the Employment and Educational Experiences of College Graduates, 1 Year Later, First Look, June 2019. <https://nces.ed.gov/pubs2019/2019241.pdf>
- [5] U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS), 2018, Completions. Retrieved from <https://nces.ed.gov/ipeds/use-the-data> on April 14, 2020.
- [6] National Center for Education Statistics, Status and Trends in the Education of Racial and Ethnic Groups, Fig. 1.4. https://nces.ed.gov/programs/raceindicators/indicator_RAA.asp

Methodology

Each fall the Statistical Research Center (SRC) conducts its Survey of Enrollments and Degrees. The survey is sent to all degree-granting physics and astronomy departments in the United States and Puerto Rico. Departments are asked to provide information concerning the number of students they currently have enrolled and the number of degrees they conferred in the previous academic year. We define the academic year as being from September to August.

In the 2017–18 academic year, 753 departments offered bachelor’s degrees in physics. We received responses from 90% of these departments. For non-responding departments, we estimated numbers and included them in the totals

Data from this survey are also used to produce the “Roster of Physics Departments,” which provides a department-level enrollment and degree snapshot. A copy of the roster can be found at <https://www.aip.org/statistics/reports/roster-physics-2018>.

In the 2017–18 academic year, there were 74 departments that offered a bachelor’s degree in astronomy. About half of these departments are administered as part of a physics and astronomy department with the remainder administered as separate departments. Data concerning astronomy enrollments and degrees from the combined departments are collected separately from physics and combined with the data from the separate astronomy departments. Astronomy enrollment and degree data will be reported in a separate Focus On.

The SRC also conducts an annual follow-up survey of new physics bachelor's degree recipients in the year after they receive their degrees. Some of the data in **Table 5** and all the data in **Table 6** come from that survey. We received degree recipient responses from approximately 25% of the known number of physics bachelors in the classes of 2017 and 2018.

These reports are possible because of the efforts of department chairs, faculty, and staff in providing their departmental data to AIP year after year. We thank them for their ongoing support of this survey series.

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1 Physics Ellipse, College Park, MD 20740

stats@aip.org | 301.209.3070 | aip.org/statistics