

Size of Undergraduate Physics and Astronomy Programs

Results from the Enrollments and Degrees and Academic Workforce Surveys

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The size of physics and astronomy departments varies greatly depending on the characteristics of each institution. The data presented in this report provide an overall view of the relationship of full-time equivalent (FTE) faculty to the number of physics and astronomy bachelor's degrees conferred. Department's missions are not homogenous, so this relationship is not a measure of productivity. Rather, interested parties can compare their departments with others.

Physics Departments

The majority (67%) of degree-granting physics departments in the United States grant a bachelor's degree as their highest degree (**Table 1**). Among departments that grant bachelor's degrees in physics, less than 10% also offer master's degrees, and about one-fourth offer PhDs as their highest physics degree. According to the AIP 2018 Survey of Enrollments and Degrees, PhD-granting physics departments confer over half of all physics bachelor's degrees (Nicholson and Mulvey, 2019). The breakdown of departments by the highest degree conferred shows their considerable variation in the average and median number of degrees conferred. Within each department type, the average number of degrees conferred is considerably larger than the median. This is the result of a few departments conferring considerably more bachelor's degrees than the typical department, causing the distribution to be positively skewed. Both the physics and astronomy bachelor's degree data for combined physics and astronomy departments are included with the physics department data.

Table 1

Physics Bachelor's Degree-Granting Departments, 2018

	Highest Physics Degree Offered			Overall
	Bachelor's	Master's	PhD	
Number of departments	503	57	194	754
Percent of departments	67%	7%	26%	100%
Three-year average number of bachelor's degrees conferred	7.1	10.1	25.4	12.1
Median number of bachelor's degrees conferred	5	8	17	7

There are an additional eight physics departments that do not grant bachelor's degrees. The bachelor's degree data includes astronomy bachelors at the 45 combined physics and astronomy departments.

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Physics Bachelor's Degree–Granting Departments

Historically, departments that offer only a physics bachelor's degree average fewer FTE faculty and bachelor's degrees conferred per year than master's and PhD–granting departments.

Figure 1 shows the distribution of departments by the number of bachelor's degrees conferred for those departments that offer only a bachelor's degree.

Figure 1

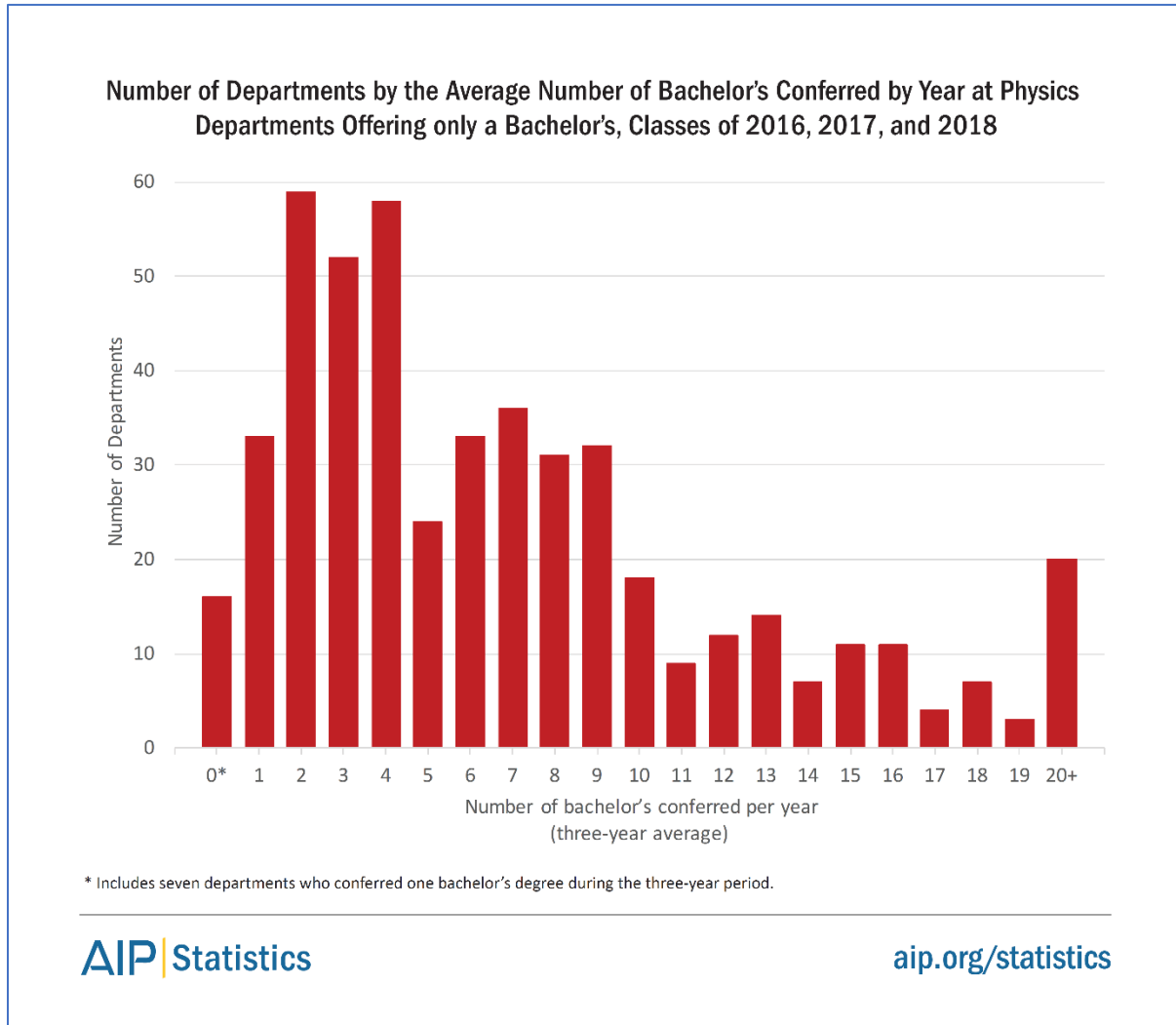
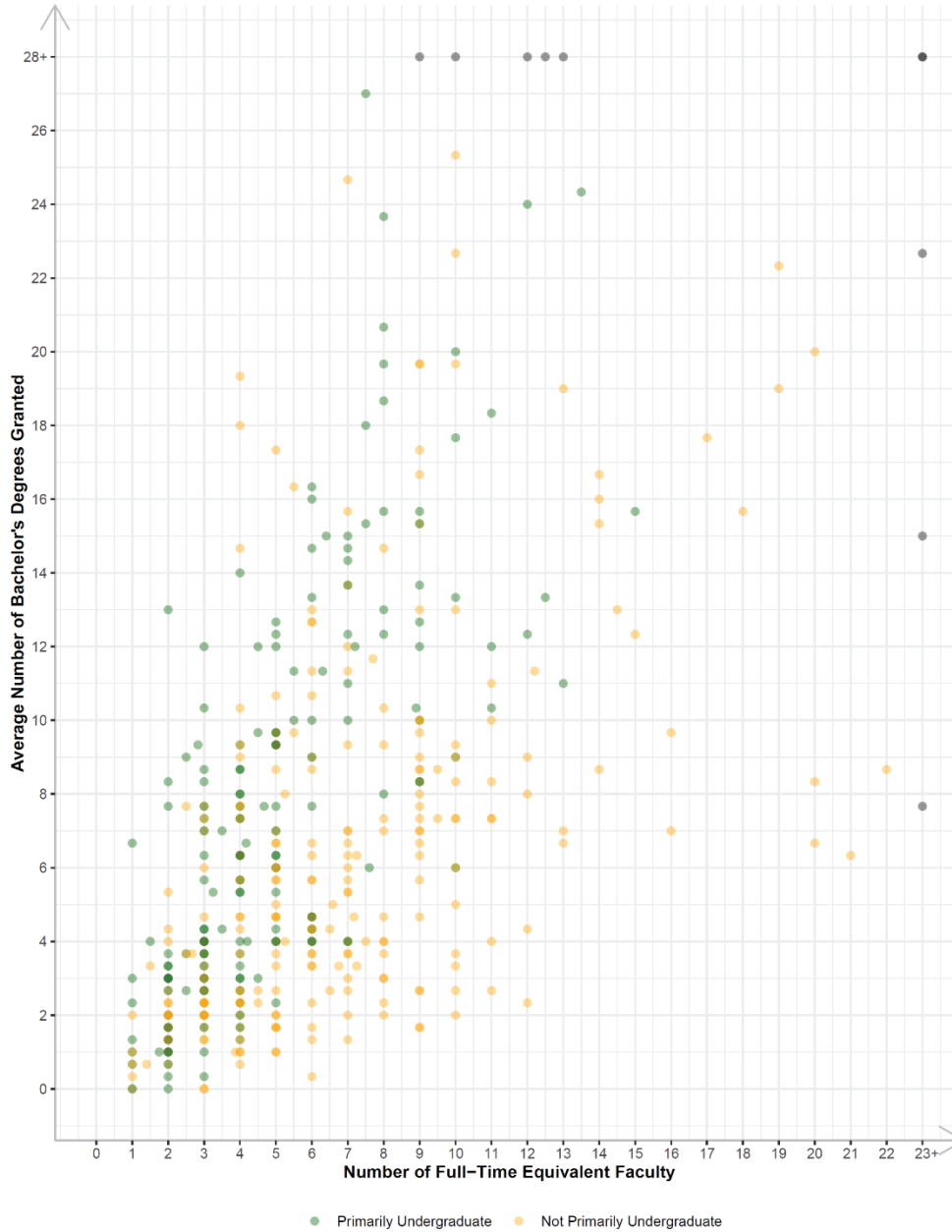


Figure 2 shows the average number of bachelor's degrees conferred by the number of FTE faculty at each department where the bachelor's degree was the highest physics degree offered. Departments are separated by whether they are at institutions that are classified as primarily undergraduate institutions or not. Generally, bachelor's-only physics departments at primarily undergraduate institutions confer more bachelor's degrees with fewer FTE faculty members than their counterparts at comprehensive and research institutions. This is evidenced by the two distinct patterns of displayed departments in the figure below.

Figure 2

Average Number of Bachelor's Conferred by the Number of FTE Faculty Members from Physics Departments Offering Only a Bachelor's, 2016 to 2018



Departments that fall beyond the chart range are displayed in gray.
Includes only departments where a bachelor's degree is the highest physics degree offered.
The average number of bachelor's degrees granted is a three-year average from the classes of 2016, 2017, and 2018. The number of full-time equivalent (FTE) faculty is from the 2017-18 academic year.
The primarily undergraduate distinction comes from the Carnegie classification framework denoting baccalaureate colleges.
(The Carnegie Classification System of Institutions of Higher Learning, n.d.)

Physics Master's Degree–Granting Departments

There are 57 departments that grant a master's as their highest degree, making up 7% of physics departments. **Figure 3** shows the distribution of departments by the average number of bachelor's degrees conferred for master's-granting physics departments. **Figure 4** shows the average bachelor's degrees conferred by the number of FTE faculty at master's-granting departments.

Figure 3

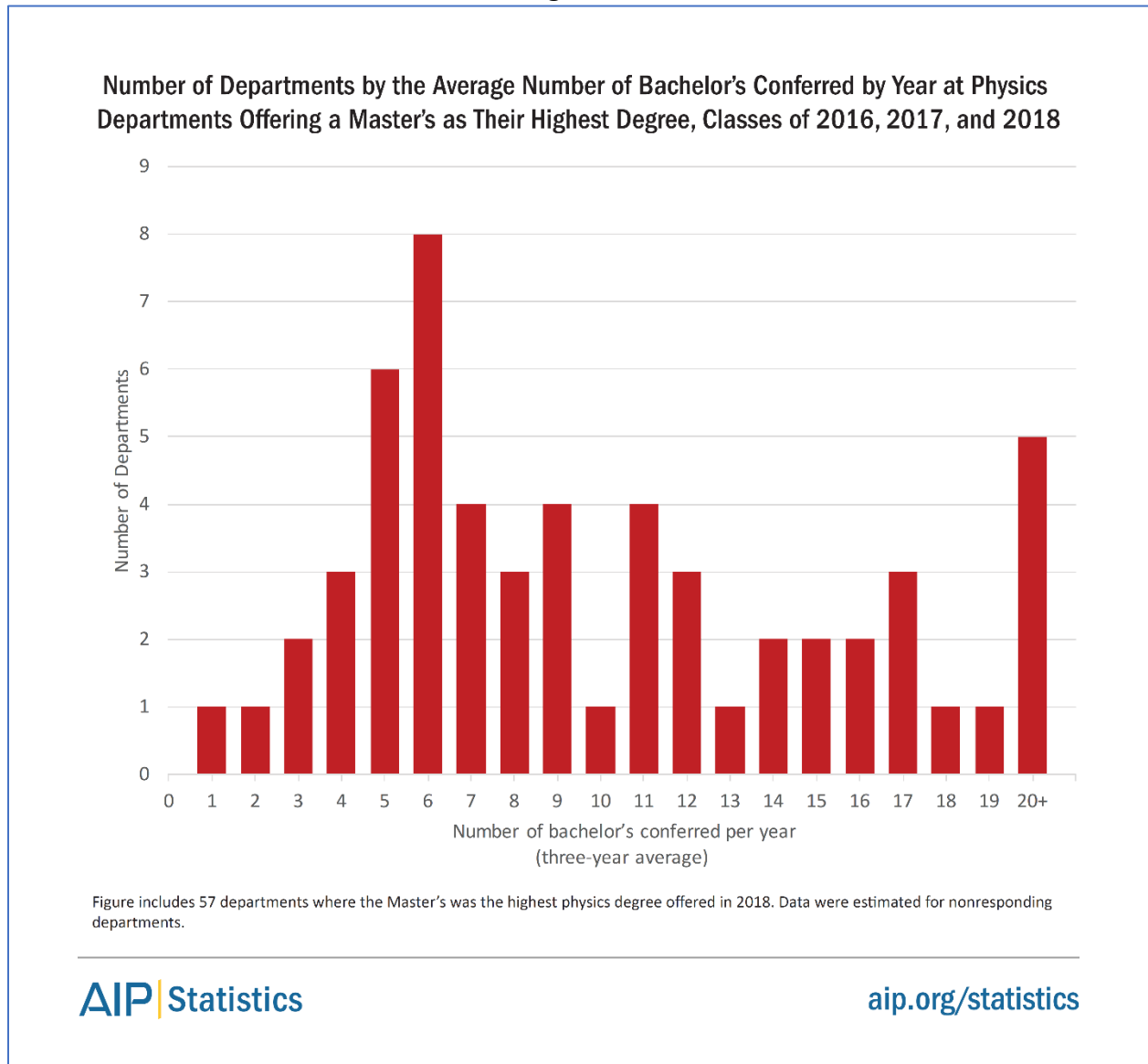
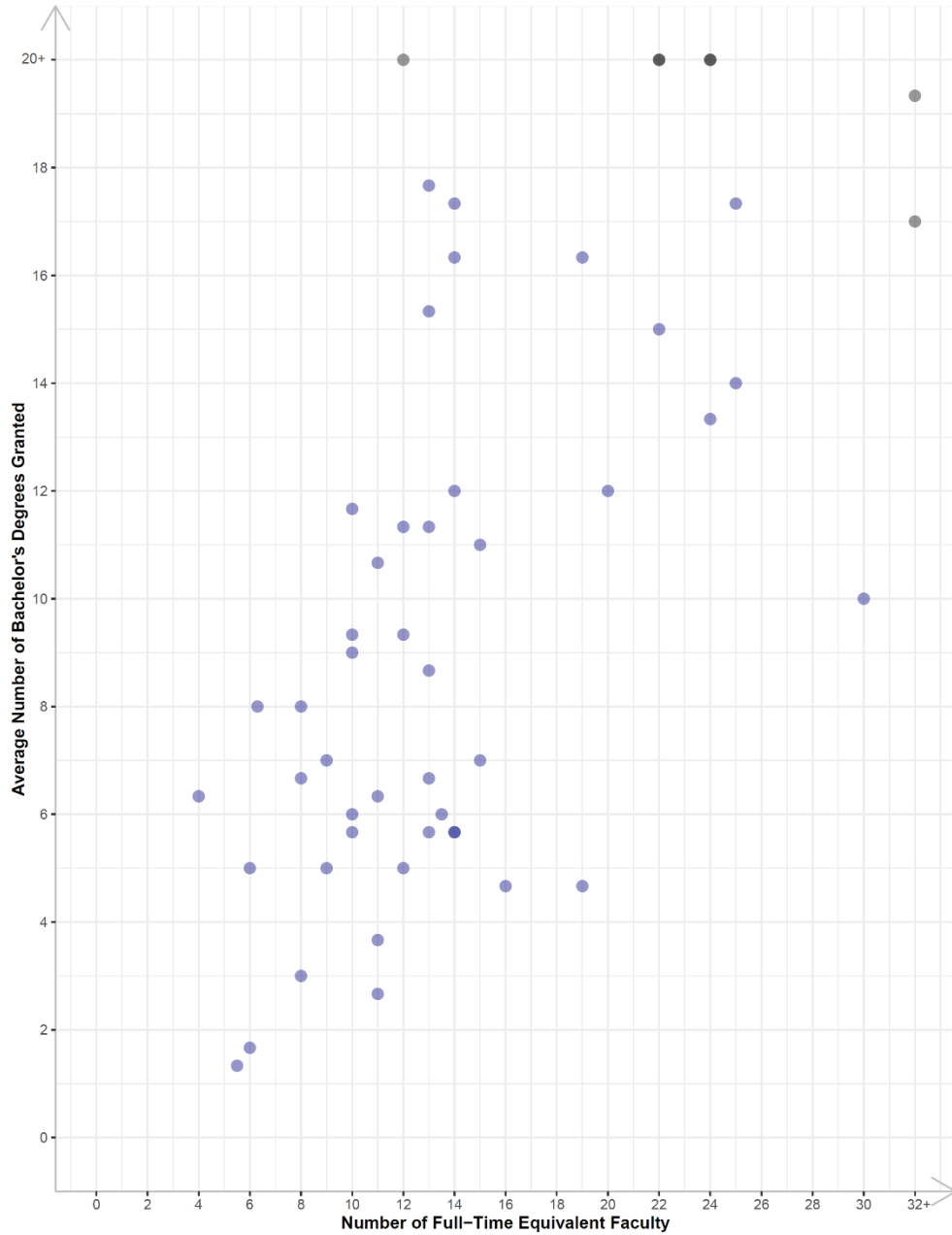


Figure 4

Average Number of Bachelor's Conferred by the Number of FTE Faculty Members from Physics Departments Offering a Master's as Their Highest Degree, 2016 to 2018



Departments that fall beyond the chart range are displayed in gray.

Includes only departments where a master's degree is the highest physics degree offered.

The average number of bachelors' degree granted is a three-year average from the classes of 2016, 2017, and 2018. The number of full-time equivalent (FTE) faculty is from the 2017-18 academic year.

Physics PhD–Granting Departments

Physics departments that offer a PhD typically have a greater number of FTE faculty and confer considerably more bachelor’s degrees than the bachelor’s and master’s–granting departments. **Figure 5** shows the distribution of departments by the number of bachelor’s degrees conferred for PhD-granting physics departments.

Figure 5

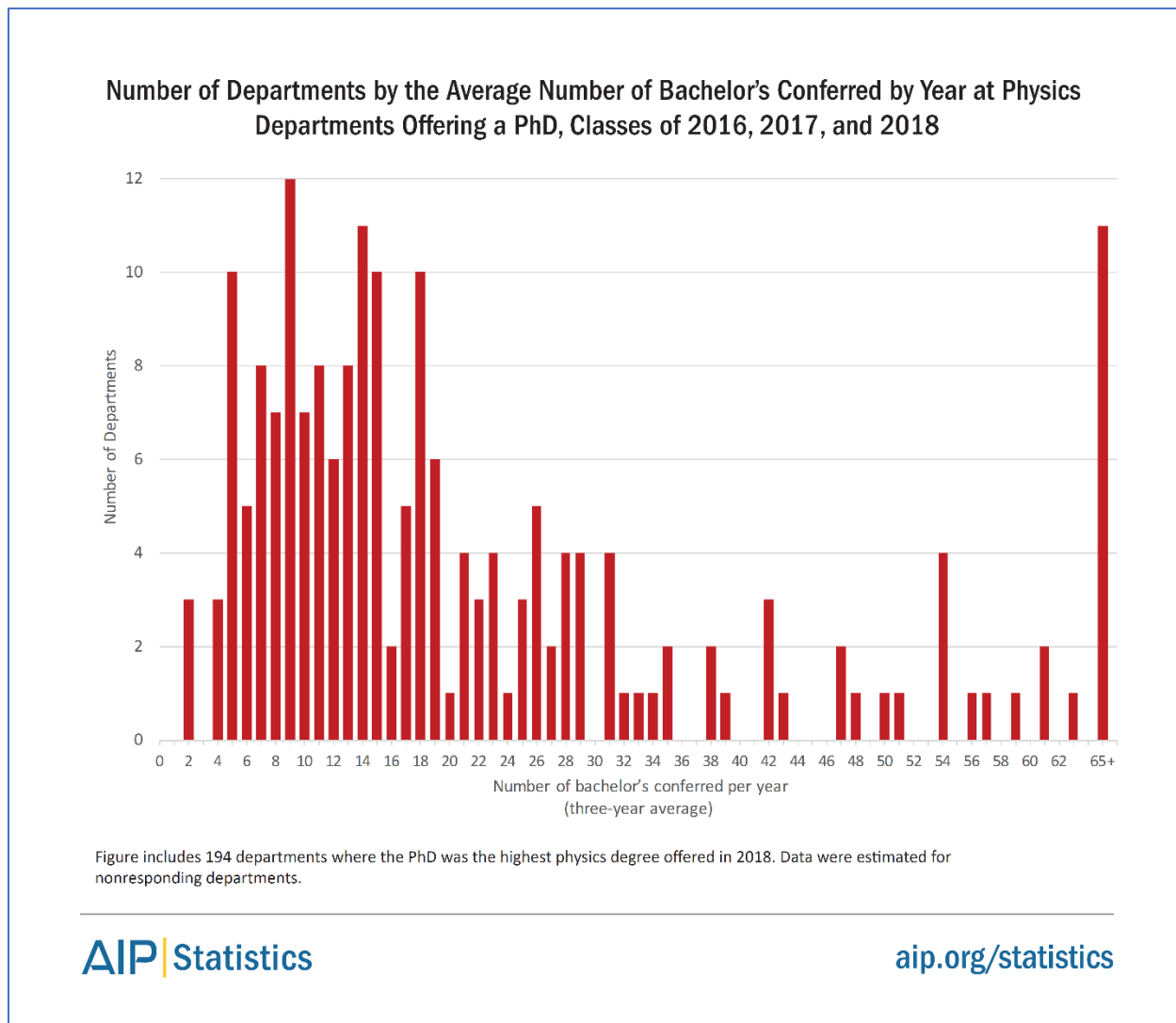
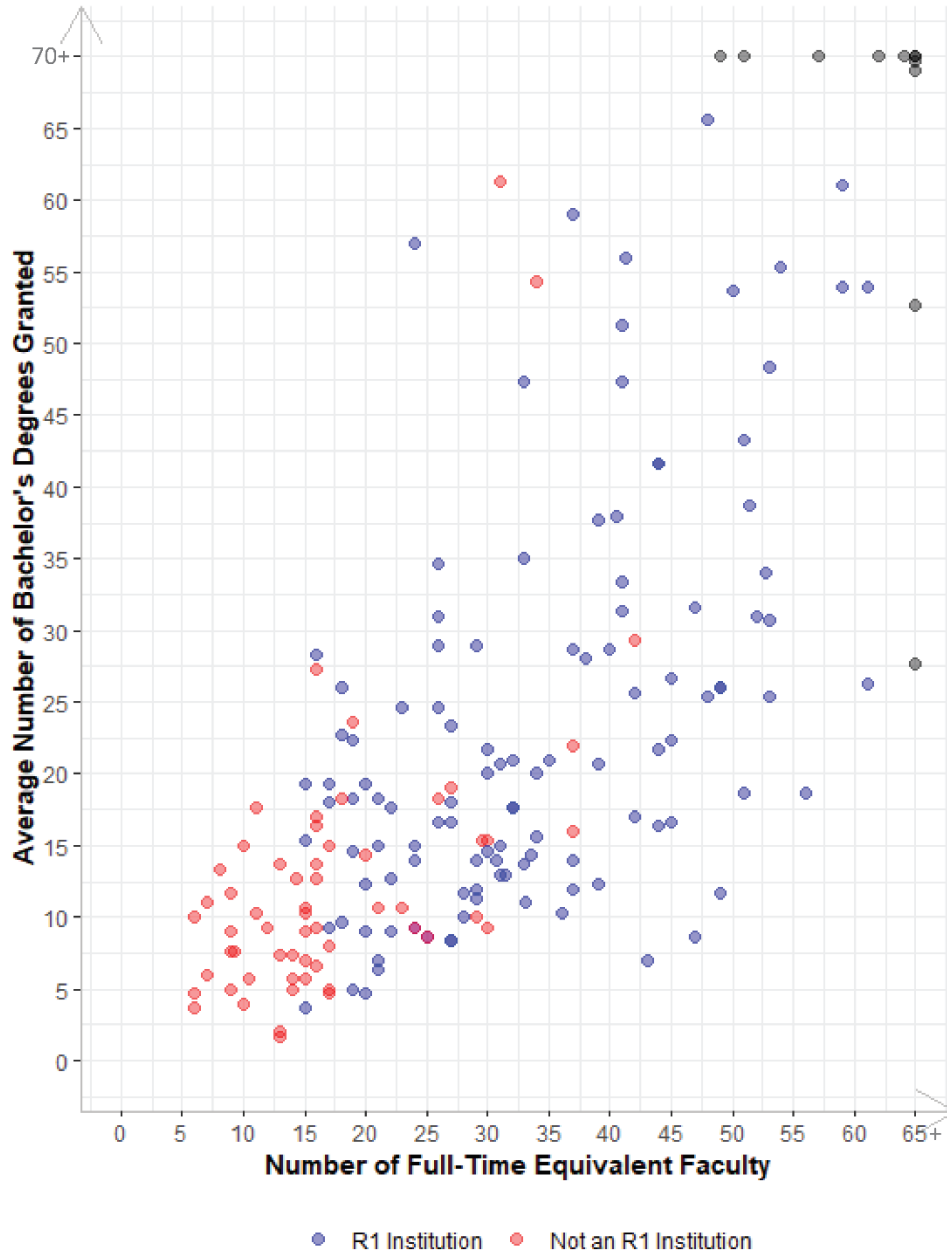


Figure 6 shows the average number of bachelor’s conferred by the number of FTE faculty at PhD-granting departments by whether the institution was classified as an institution with very high research activities (R1) or not. As seen in the following figure, departments at institutions classified as R1s generally have more FTE and confer more bachelor’s degrees than their non-R1 counterparts. As can be seen in the graphic, there are eight departments that conferred an average of more than 70 bachelor’s a year. Four of these departments conferred an average of more than 100 bachelor’s a year.

Figure 6

Average Number of Bachelor's Conferred by the Number of FTE Faculty Members from Physics Departments Offering a PhD, 2016 to 2018



Departments that fall beyond the chart range are displayed in gray.
Includes only departments where a PhD is the highest physics degree offered.
The average number of bachelors' degree granted is a three-year average from the classes of 2016, 2017, and 2018. The number of full-time equivalent (FTE) faculty is from the 2017-18 academic year.
The R1 classification comes from the Carnegie classification framework and denotes institutions with very high research activities (The Carnegie Classification System of Institutions of Higher Learning, n.d.)

Astronomy Departments

There are 84 departments that grant astronomy bachelor's degrees. Of these departments, 39 are separate, stand-alone astronomy departments, and 45 are in departments that award both astronomy and physics degrees. Thirty-four of the stand-alone astronomy departments conferred bachelor's degrees in 2016, 2017, and 2018. Both the physics and astronomy bachelor's degree data and all faculty for the combined physics and astronomy departments are included with the physics department data above. The majority of the separate astronomy departments are PhD-granting departments; they conferred over 90% of the astronomy bachelor's at the separate departments. **Table 2** displays the number of separate astronomy departments and the average number of bachelor's degrees conferred by the highest astronomy degree offered by the department. **Figure 7** shows the average bachelor's by the number of FTE faculty at each separate astronomy degree-granting department.

Table 2

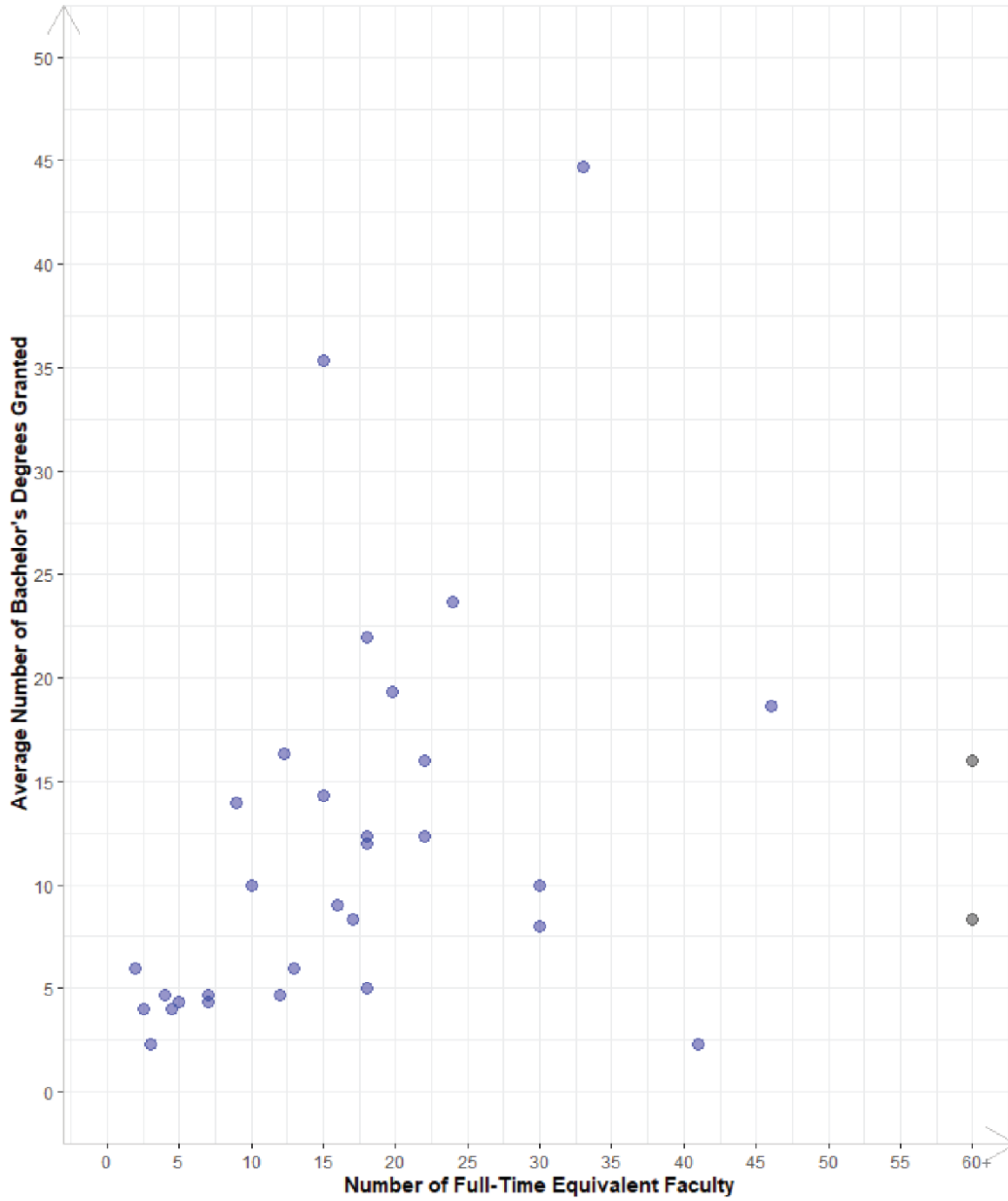
Separate Astronomy Bachelor's Degree-Granting Departments, 2018

	Total
Number of separate astronomy departments	34
Number of separate astronomy departments offering a PhD	26
Average number of bachelor's degrees conferred	11.5

Average astronomy bachelor's degree data is based on 3-year average from the classes of 2016, 2017, and 2018. Table includes only separate astronomy departments. Additionally, there are 45 combined physics and astronomy departments. The data for the combined departments are included in the physics department tables and figures.

Figure 7

Average Number of Bachelor's Conferred by the Number of FTE Faculty Members from Separate Astronomy Departments, 2016 to 2018



Departments that fall beyond the chart range are displayed in gray.

The average number of bachelor's degrees granted is a three-year average from the classes of 2016, 2017, and 2018. The number of full-time equivalent (FTE) faculty is from the 2017-18 academic year.

References

Nicholson, S. & Mulvey, P (2019). Roster of Physics Departments with Enrollment and Degree Data, 2018. Retrieved from www.aip.org/statistics/reports/roster-physics-2018.

The Carnegie Classification of Institutions of Higher Education (n.d.). About Carnegie Classification. Retrieved (2/7/2020) from <http://carnegieclassifications.iu.edu/>.

Methodology

This Focus On uses data from two AIP departmental surveys, the 2018 Academic Workforce Survey and the Survey of Enrollments and Degrees. The Academic Workforce Survey has been conducted every two years since 1986. Departments are asked to provide the number of full-time equivalent faculty members in their department. The data in this Focus On is for the number of faculty in the 2017–18 academic year. The Survey of Enrollments and Degrees is conducted annually in the fall and collects the number of bachelor's degrees conferred at each department. The data in this Focus On comes from the classes of 2016, 2017, and 2018. Data were estimated for nonresponding departments.

In 2018, the Indiana University Center for Postsecondary Research released an update to the Carnegie Classification of Institutions of Higher Education, which is a framework for describing institutions based on institutional characteristics.

The full definitions for the 2018 Basic Carnegie Classification are located here: https://carnegieclassifications.iu.edu/classification_descriptions/basic.php.

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Published: July 2020

A product of the Statistical Research Center of the American Institute of Physics
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