



ENGINEERING  
RESEARCH  
CENTERS

# End-of-Year Report

2023

i. 18 ERCs Referenced in Slides 1–5

NSF Nanosystems Engineering Research Center for Nanomanufacturing Systems for Mobile Computing and Mobile Energy Technologies at University of Texas (NASCENT) (Class: 2012; AY: 2012 – 2023; RY: 2012 – 2023)\*

NSF Engineering Research Center for the Internet of Things for Precision Agriculture (IoT4Ag) (Class: 2020; AY: 2020 – 2023; RY: 2020 – 2023)\*

NSF Nanosystems Engineering Research Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST) (Class: 2012; AY: 2012 – 2023; RY: 2012 – 2023)\*

Nanosystems Engineering Research Center for Nanotechnology Enabled Water Treatment Systems at Rice University (NEWT) (Class: 2015; AY: 2015 – 2023; RY: 2015 – 2023)\*

Engineering Research Center for Bio-mediated and Bioinspired Geotechnics at Arizona State University (CBBG) (Class: 2015; AY: 2015 – 2023; RY: 2015 – 2023)\*

ERC for Precise Advanced Technologies and Health Systems for Underserved Populations at Texas A&M University (PATHS-UP) (Class: 2017; AY: 2017 – 2023; RY: 2017 – 2023)\*

ERC for Directed Multiscale Assembly of Cellular Metamaterials with Nanoscale Precision at Boston University (CELL-MET) (Class: 2017; AY: 2017 – 2023; RY: 2017 – 2023)\*

ERC for Power Optimization for ElectroThermal Systems at University of Illinois (POETS) (Class: 2015; AY: 2015 – 2023; RY: 2015 – 2023)\*

ERC for Innovative and Strategic Transformation of Alkane Resources at Purdue University (CISTAR) (Class: 2017; AY: 2017 – 2023; RY: 2017 – 2023)\*

Nanosystems Engineering Research Center for Translational Applications of Nanoscale Multiferroic Systems at University of California Los Angeles (TANMS) (Class: 2012; AY: 2012 – 2023; RY: 2012 – 2023)\*

ERC for Cell Manufacturing Technologies at Georgia Institute of Technology (CMaT) (Class: 2017; AY: 2017 – 2023; RY: 2017 – 2023)\*

NSF Engineering Research Center for Quantum Networks (CQN) (Class: 2020; AY: 2020 – 2023; RY: 2020 – 2023)\*

NSF Engineering Research Center for Advancing Sustainability through Powered Infrastructure for Roadway Electrification (ASPIRE) (Class: 2020; AY: 2020 – 2023; RY: 2020 – 2023)\*

ERC for Smart Streetscapes (CS3) (Class: 2022; AY: 2022 – 2023; RY: 2022 – 2023)\*

NSF Engineering Research Center for Advanced Technologies for Preservation of Biological Systems (ATP-Bio) (Class: 2020; AY: 2020 – 2023; RY: 2020 – 2023)\*

ERC for Hybrid Autonomous Manufacturing Moving from Evolution to Revolution (HAMMER) (Class: 2022; AY: 2022 – 2023; RY: 2022 – 2023)\*

ERC for Advancing Sustainable and Distributed Fertilizer Production (CASFER) (Class: 2022; AY: 2022 – 2023; RY: 2022 – 2023)\*

ERC for Precision Microbiome Engineering (PreMiEr) (Class: 2022; AY: 2022 – 2023; RY: 2022 – 2023)\*

\*AY and RY denotes the Award Year and Reporting Year Range

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ii. “Annualized ERCs” on slides 1–5 include the 18 ERCs from the previous slide and the following additional 9 ERCs

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ERC for Revolutionizing Metallic Biomaterials at North Carolina A&T State University (NCAT) (Class: 2008; AY: 2008 – 2020; RY: 2008 – 2020)\*

ERC for Ultra-wide-area Resilient Electric Energy Transmission Networks at University of Tennessee (CURENT) (Class: 2011; AY: 2011 – 2021; RY: 2011 – 2021)\*

Center for Neurotechnology at University of Washington (CNT) (Class: 2011; AY: 2011 – 2021; RY: 2011 – 2021)\*

ERC for Re-inventing the Nation's Urban Water Infrastructure (ReNUWit) (Class: 2011; AY: 2011 – 2021; RY: 2011 – 2021)\*

ERC for Integrated Access Networks at the University of Arizona (CIAN) (Class: 2008; AY: 2008 – 2019; RY: 2008 – 2019)\*

Future Renewable Electric Energy and Management Systems Center at North Carolina State University (FREEDM) (Class: 2008; AY: 2008 – 2019; RY: 2008 – 2019)\*

Center for Biorenewable Chemicals at Iowa State University (IOWA) (Class: 2008; AY: 2008 – 2019; RY: 2008 – 2019)\*

ERC for Quantum Energy and Sustainable Solar Technologies at Arizona State University (QESST) (Class: 2011; AY: 2011 – 2022; RY: 2011 – 2022)\*

ERC for Lighting Enabled Systems & Applications at Rensselaer Polytechnic Institute (LESA) (Class: 2008; AY: 2008 – 2019; RY: 2008 – 2019)\*

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*\*AY and RY denotes the Award Year and Reporting Year Range*

**1** | ERC Products of Innovation, FY 1985–2023\*

	FY 2023 (18 ERCs)		FY 2018–2022 Annualized		FY 1985–2023 (73 ERCs)
<i>Intellectual Property Transaction</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
Inventions Disclosed	84	5	57	3	2,770
Patent Applications Filed (Provisional and Full)	88	5	79	5	2,498
Patents Awarded	26	1	19	1	955
Licenses Issued	1	< 1	9	1	1,401
<i>Economic Development</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
Spinoff Companies	3	< 1	7	< 1	253
Spinoff Employees	3	< 1	49	3	1,644

\* Does not include centers from the Earthquake Technology Sector

## 2

## ERC Influence on Curriculum, FY 1985–2023\*

	FY 2023 (18 ERCs)		FY 2018–2022 Annualized		FY 1985–2023 (73 ERCs)
<i>Degrees</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
New Full-Degree Programs Based on ERC Research	1	< 1	1	< 1	58
New Degree Minors Based on ERC Research	14	1	1	< 1	49
New Certificate Programs Based on ERC Research	0	< 1	2	< 1	48
<i>Courses</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
New Courses Based on ERC Research	45	3	31	2	1,205
Ongoing Courses With ERC Content	155	9	217	13	3,993
Course Modules Based on ERC Research	43	2	33	2	856
<i>Textbooks</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
New Textbooks Based on ERC Research	2	< 1	3	< 1	191
New Textbook Chapters Based on ERC Research	1	< 1	3	< 1	113

\* Does not include centers from the Earthquake Technology Sector

## 3

## ERC Information Dissemination, FY 1985–2023\*

	FY 2023 (18 ERCs)		FY 2018–2022 Annualized		FY 1985–2023 (73 ERCs)
<i>Peer-Reviewed Publications (Total)</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
Journals**	627	35	798	47	26,981
Conference Proceedings**	188	10	360	21	19,189
Trade Journals	31	2	12	1	712
Coauthored With ERC Students	433	24	454	26	14,269
<i>Education and Outreach</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
Education and Colloquia	636	35	665	39	19,237
Workshops, Short Courses, and Webinars	288	16	380	22	7,014

\* Does not include centers from the Earthquake Technology Sector

\*\* Includes publications that result from center support, associated projects, and sponsored projects

## 4

## Curricular Impact of ERCs, FY 2007–2023\*

	FY 2023 (18 ERCs)		FY 2018–2022 Annualized		FY 2007–2023 (47 ERCs)
<i>New and Ongoing Courses, Workshops, Short Courses, Webinars, and Textbooks Based on ERC Research</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
With Engineered-System Focus	172	10	272	16	4,652
With Multidisciplinary Content	230	13	246	14	4,185
Offered at Undergraduate Level	196	11	201	12	3,076
Offered at Graduate Level	252	14	263	15	4,109
Used at More Than One ERC Institution	130	7	147	8	1446
Team Taught by Faculty in More Than One Department	58	3	122	7	1256

\* Does not include centers from the Earthquake Technology Sector

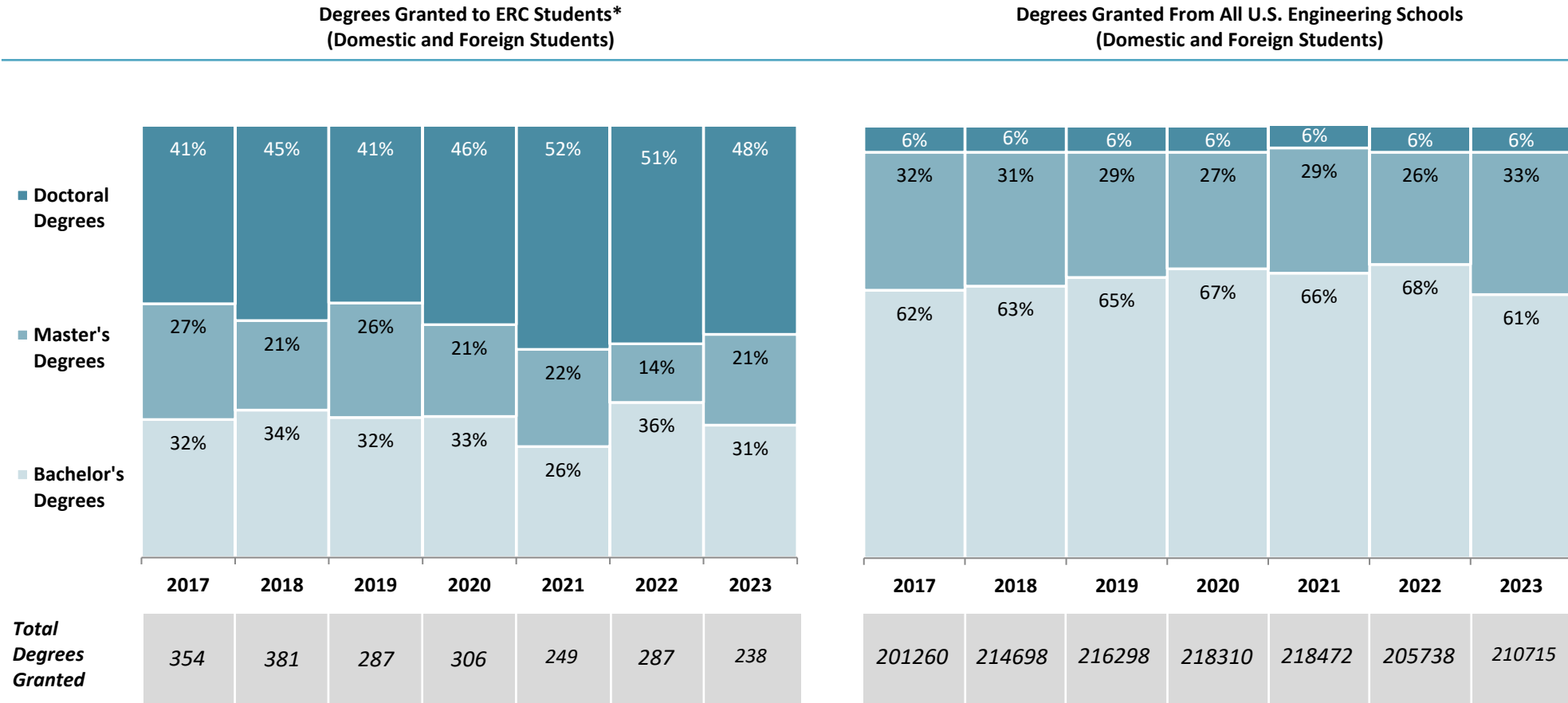
\*\* Data collection of curricular impacts started in 2007

## 5

## ERC Student Degrees, FY 1985–2023\*

<i>Degree Type</i>	<b>FY 2023</b> (18 ERCs)		<b>FY 2018–2022</b> <b>Annualized</b>		<b>FY 1985–2023</b> (73 ERCs)
	<i>Total</i>	<i>Per Center</i>	<i>Total</i>	<i>Per Center</i>	<i>Total</i>
Bachelor's	73	4	98	6	4,847
Master's	50	3	63	4	4,524
Doctoral	115	6	141	8	5,610
<b><i>Total</i></b>	<b>238</b>	<b>13</b>	<b>302</b>	<b>18</b>	<b>14,981</b>

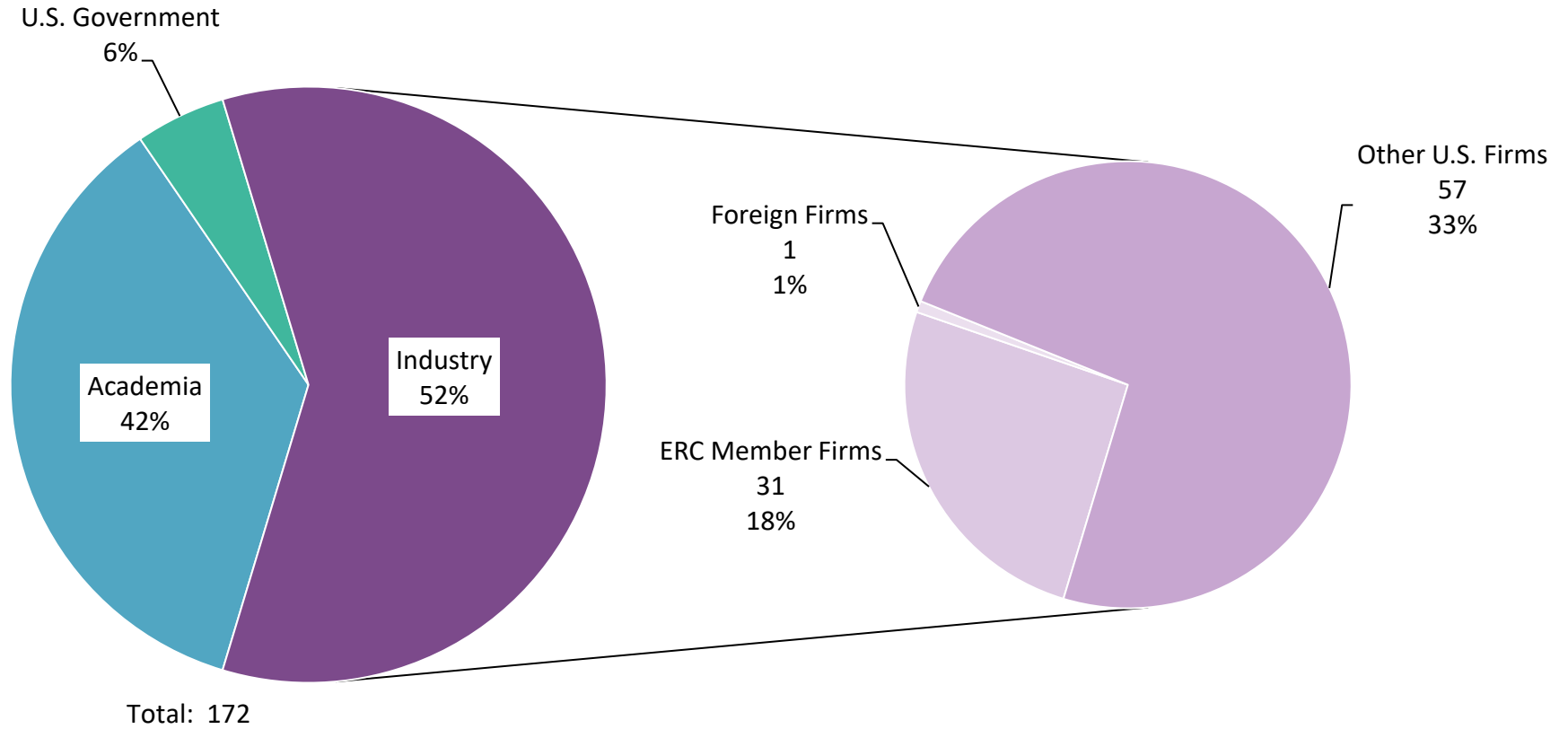
\* Does not include centers from the Earthquake Technology Sector



\* Does not include centers from the Earthquake Technology Sector

Data Source: American Society for Engineering Education (ASEE) (<http://edms.asee.org>)

WHERE ARE ERC GRADUATES EMPLOYED?



## ERC Research and Education Personnel, by Underrepresented Group and Citizenship Status, FY 2023

Personnel Category	Total	Total U.S. Citizens and Permanent Residents	Women*		Underrepresented Racial Minorities*		Hispanic*		Foreign	
			Number	%	Number	%	Number	%	Number	%
<b>Faculty</b>										
Total	647	547	180	33%	52	10%	48	9%	52	8%
<b>Graduate Students</b>										
Postdocs	174	49	14	29%	1	2%	12	24%	111	64%
Graduate Students	1,023	431	170	39%	61	14%	66	15%	456	45%
Doctoral	826	346	146	42%	49	14%	50	14%	391	47%
Master's	198	85	24	28%	12	14%	16	19%	66	33%
Total**	1,195	480	184	38%	62	13%	78	16%	565	47%
<b>Undergraduate Students</b>										
ERC Undergraduate Students (Research Assistants, Non-REU Students)	514	304	134	44%	40	13%	74	24%	25	5%
NSF REU Site Award Students	47	45	23	51%	11	24%	11	24%	0	0%
Center Funding Students	136	115	57	50%	20	17%	32	28%	7	5%
Other NSF Supplemental Funding Students	16	16	8	50%	12	75%	2	13%	0	0%
Total**	684	460	213	46%	80	17%	111	24%	27	4%
<b>Community College</b>										
Participants in RET Program	5	3	2	67%	2	67%	0	0%	0	0%
<b>K-12 Teachers</b>										
K-12 RET	85	74	39	53%	11	15%	23	31%	0	0%
K-12 Non-RET	57	49	32	65%	9	18%	18	37%	1	2%
Total	142	123	71	58%	20	16%	41	33%	1	1%
<b>Young Scholars</b>										
Total	134	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>Grand Total***</b>	<b>2,816</b>	<b>1,622</b>	<b>656</b>	<b>40%</b>	<b>217</b>	<b>13%</b>	<b>282</b>	<b>17%</b>	<b>645</b>	<b>24%</b>

\* U.S. citizens and permanent residents only

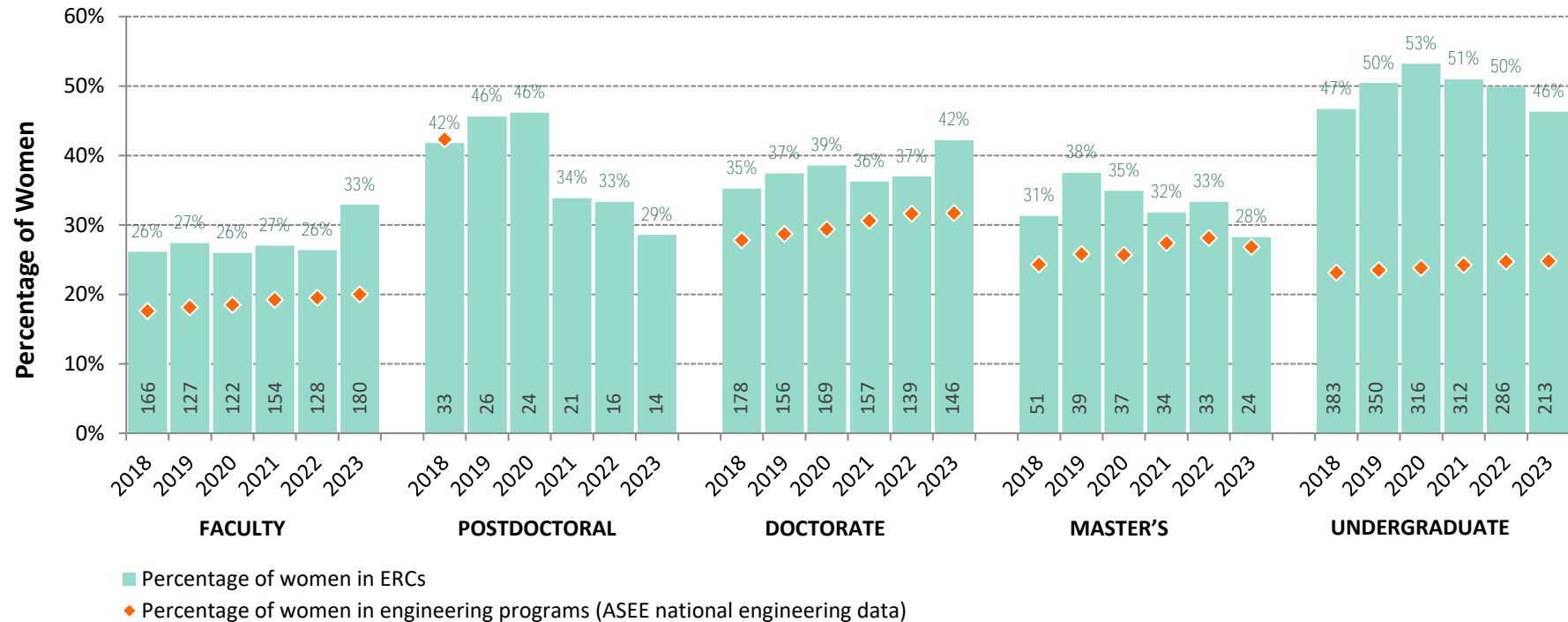
\*\* The sum of the number of personnel for each row may exceed the total because personnel may belong to multiple categories

\*\*\* Leadership/Administration Directors, Research Thrust Leaders, and Engineering Workforce Development Program Leaders are included in the Grand Total. For the Grand Total row, all columns exclude Young Scholars, except the Total column

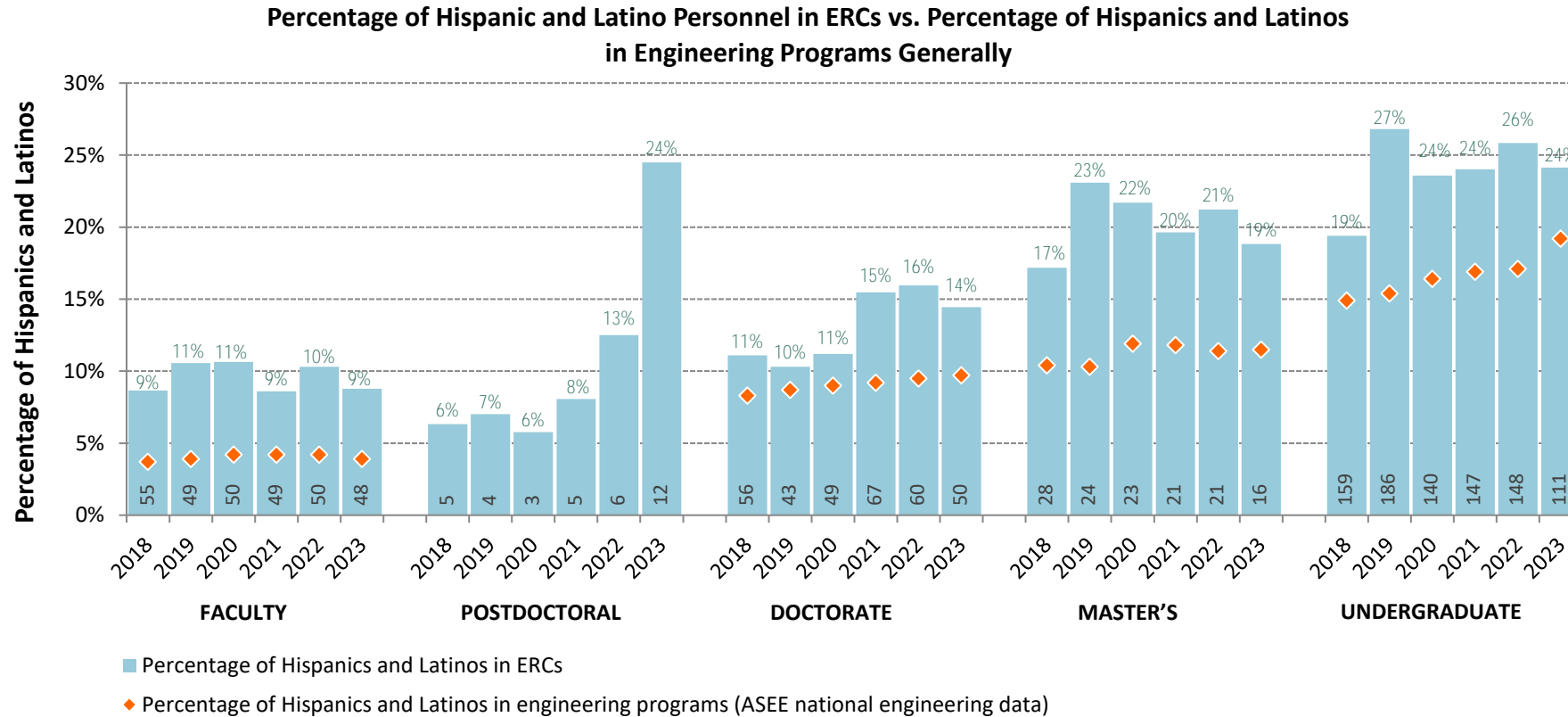
**NOTE:** For years in which the center entered demographic data by institution rather than per person, data are not included

Outreach Participants	Total
<b><i>Community College Events</i></b>	
Faculty Who Attended ERC-Sponsored Educational Outreach Events	99
Students Who Attended ERC-Sponsored Educational Outreach Events	368
Total	467
<b><i>K-12 Events</i></b>	
Pre-college K-12 Teachers	4,912
K-12 Students	31,737
Total	36,649
<b><i>Grand Total</i></b>	<b><i>37,116</i></b>

Percentage of Women Personnel in ERCs vs. Percentage of Women in Engineering Programs Generally

**NOTES:**

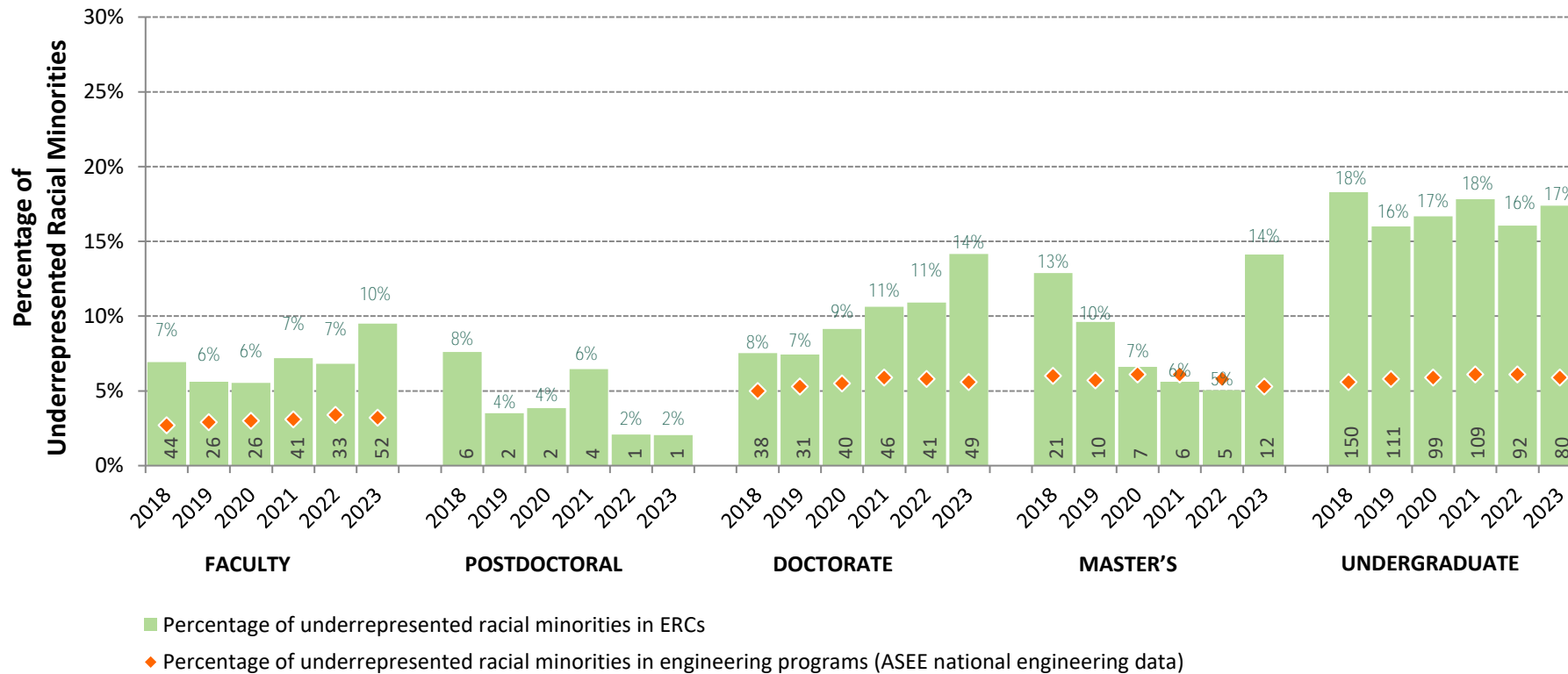
- Data from centers are not included for years in which the center entered demographic data by institution rather than per person
- Both ERC data and National statistics are for U.S. citizens and permanent residents only
- Undergraduates include REU students
- The percentages of women are calculated out of the total number of U.S. citizens and permanent residents, including personnel who did not report gender
- ASEE data were not collected postdoctoral for 2019, 2020, 2021, 2022 and 2023
- The percentages of personnel who did not report gender are as follows: 2018: 10.67%, 2019: 10.95%, 2020: 9.94%, 2021: 10.36%, 2022: 10.62%, 2023: 11.80%



**NOTES:**

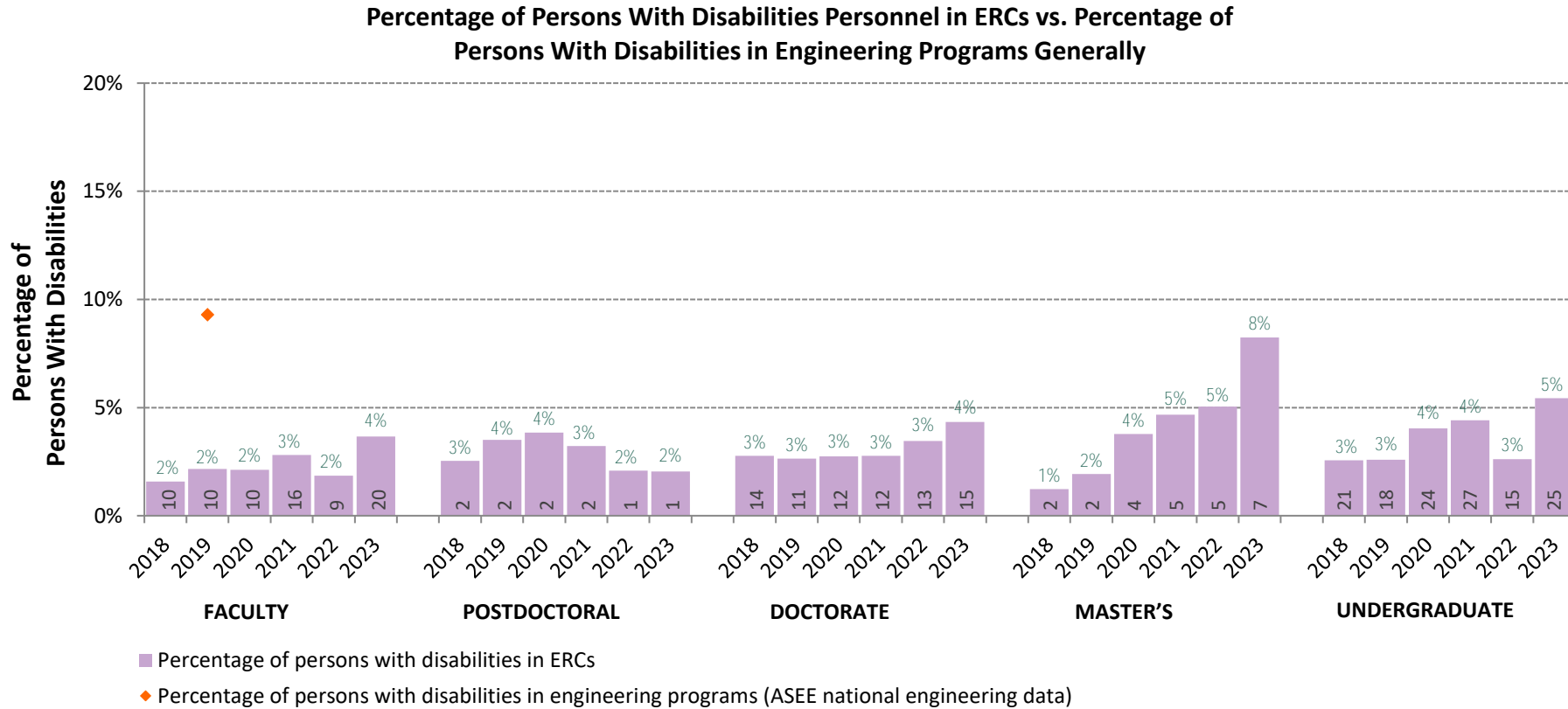
- Data from centers are not included for years in which the center entered demographic data by institution rather than per person
- Both ERC data and National statistics are for U.S. citizens and permanent residents only
- Undergraduates include REU students
- The percentages of Hispanics and Latinos are calculated out of the total number of U.S. citizens and permanent residents, including personnel who did not report ethnicity
- ASEE data were not collected postdoctoral for 2018–2023
- The percentages of personnel who did not report ethnicity are as follows: 2018: 15.81%, 2019: 15.57%, 2020: 15.11%, 2021: 14.17%, 2022: 16.18%, 2023: 16.74%

**Percentage of Underrepresented Racial Minority Personnel in ERCs vs. Percentage of Underrepresented Racial Minorities in Engineering Programs Generally**



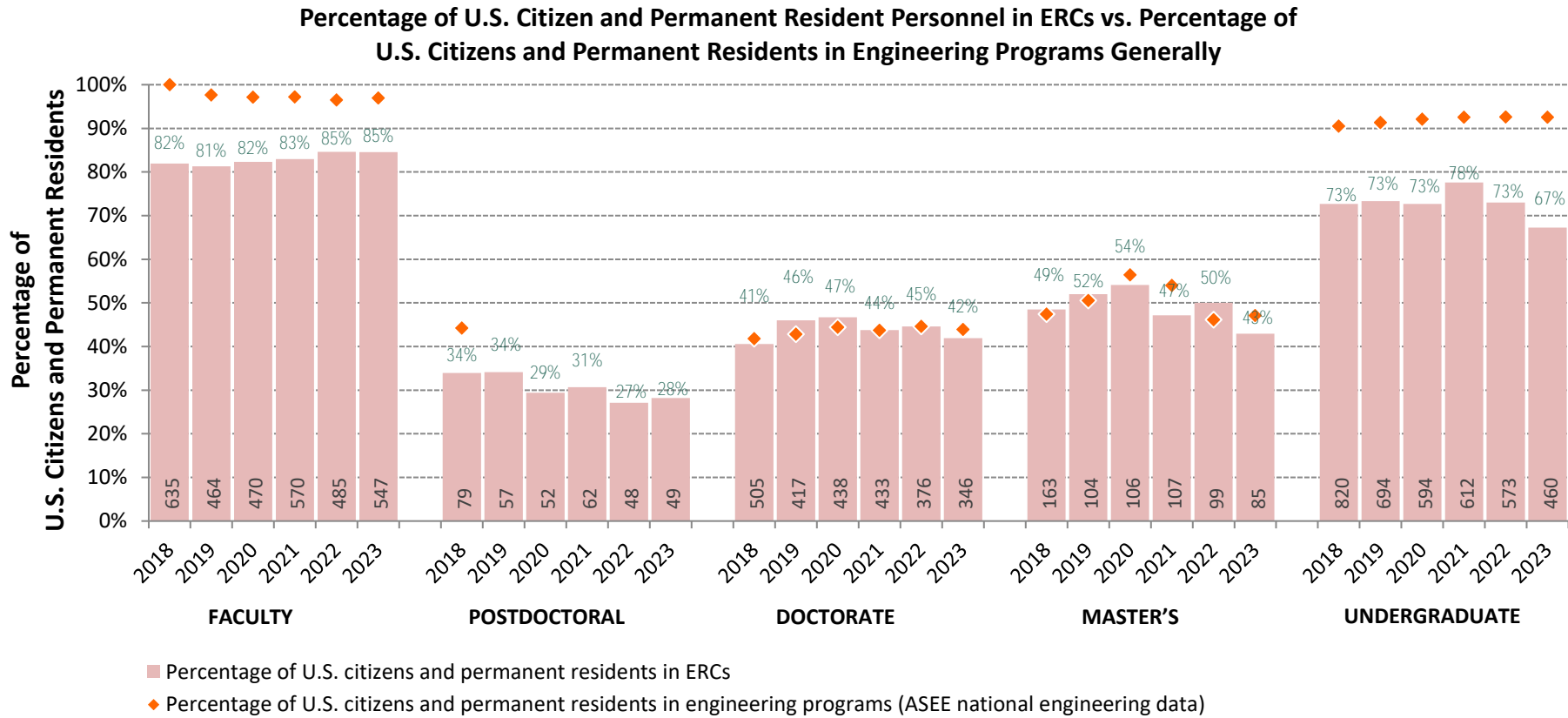
**NOTES:**

- Data from centers are not included for years in which the center entered demographic data by institution rather than per person
- Both ERC data and National statistics are for U.S. citizens and permanent residents only
- Undergraduates include REU students
- The percentages of underrepresented racial minorities are calculated out of the total number of U.S. citizens and permanent residents, including personnel who did not report race
- ASEE data were not collected for postdoctoral for 2018–2023
- The percentages of personnel who did not report race are as follows: 2018: 16.91%, 2019: 17.68%, 2020: 16.37%, 2021: 16.46%, 2022: 19.12%, 2023: 19.79%



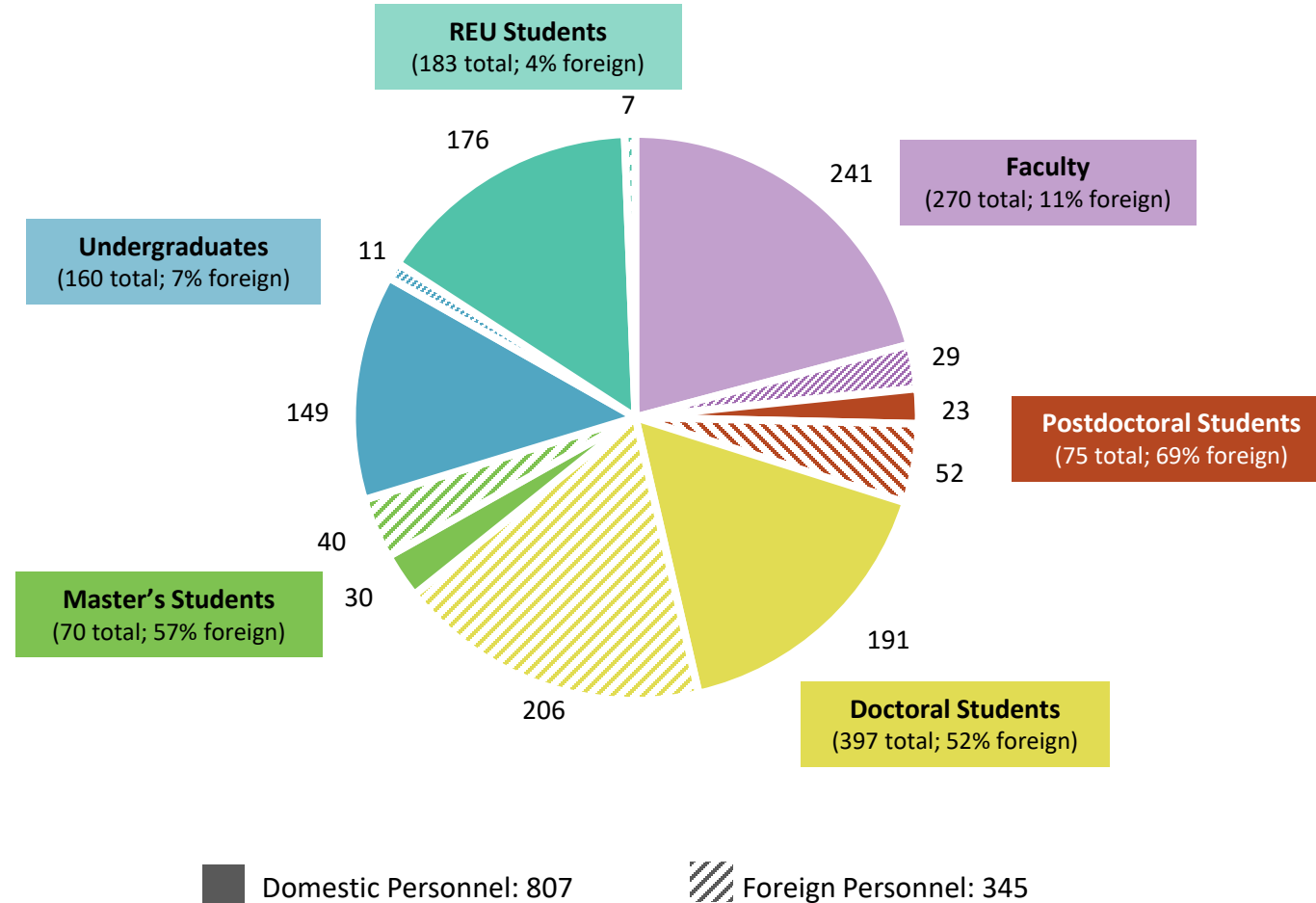
**NOTES:**

- Data from centers are not included for years in which the center entered demographic data by institution rather than per person
- Undergraduates include REU students
- The percentages of persons with disabilities are calculated out of the total number of U.S. citizens and permanent residents, including personnel who did not report disability status
- The national percentages for persons with disabilities are for all persons, regardless of citizenship. The national percentages for doctoral students with disabilities and master’s students with disabilities are from the national percentages for graduate students (master’s and doctoral students combined)
- ASEE data are only available for faculty for 2019
- The percentages of personnel who did not report disability status are as follows: 2018: 20.44%, 2019: 21.66%, 2020: 18.34%, 2021: 17.21%, 2022: 17.31%, 2023: 19.21%



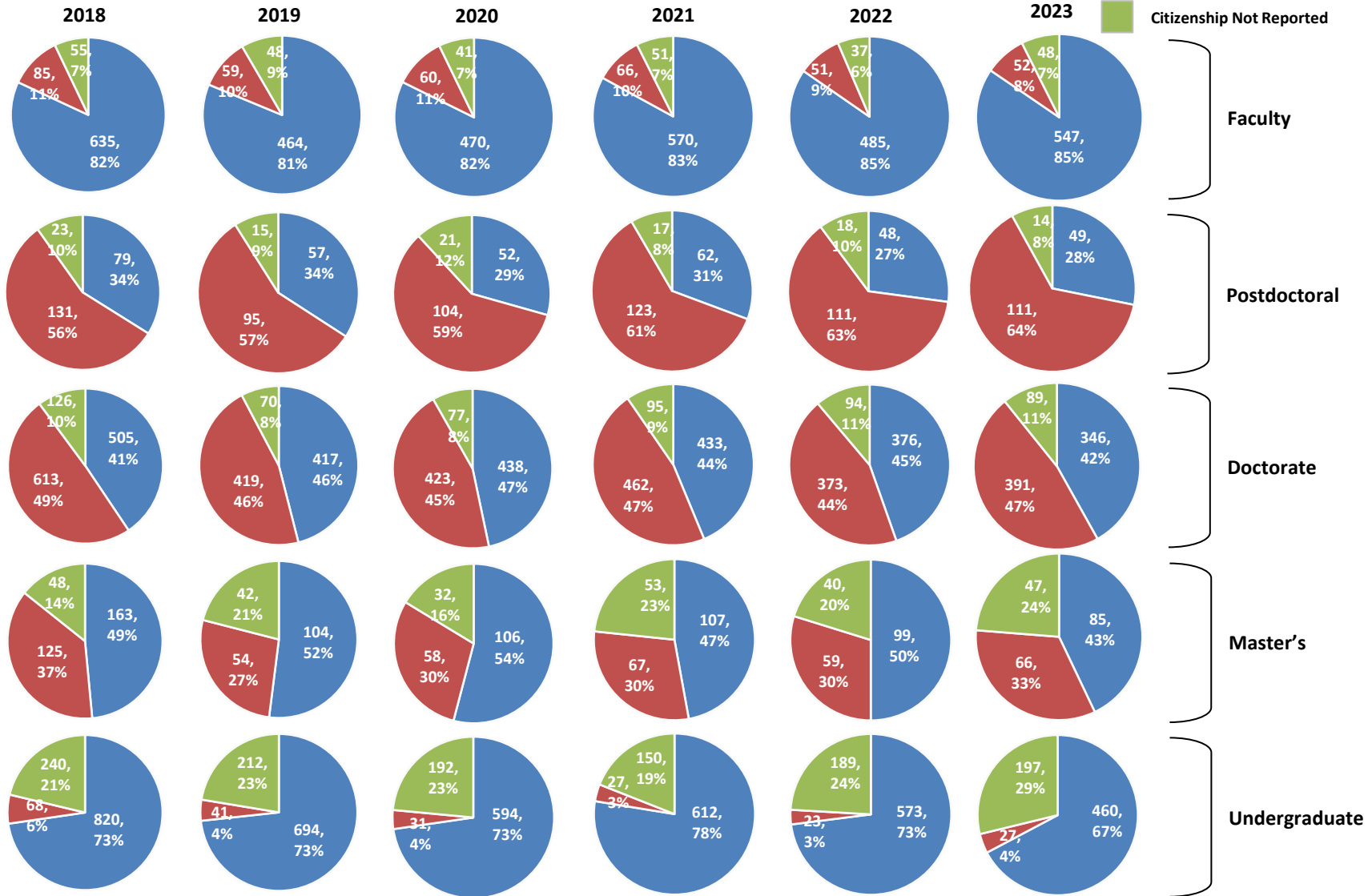
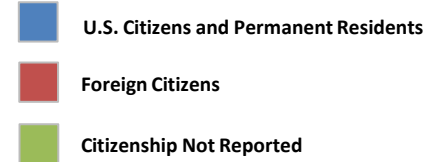
**NOTES:**

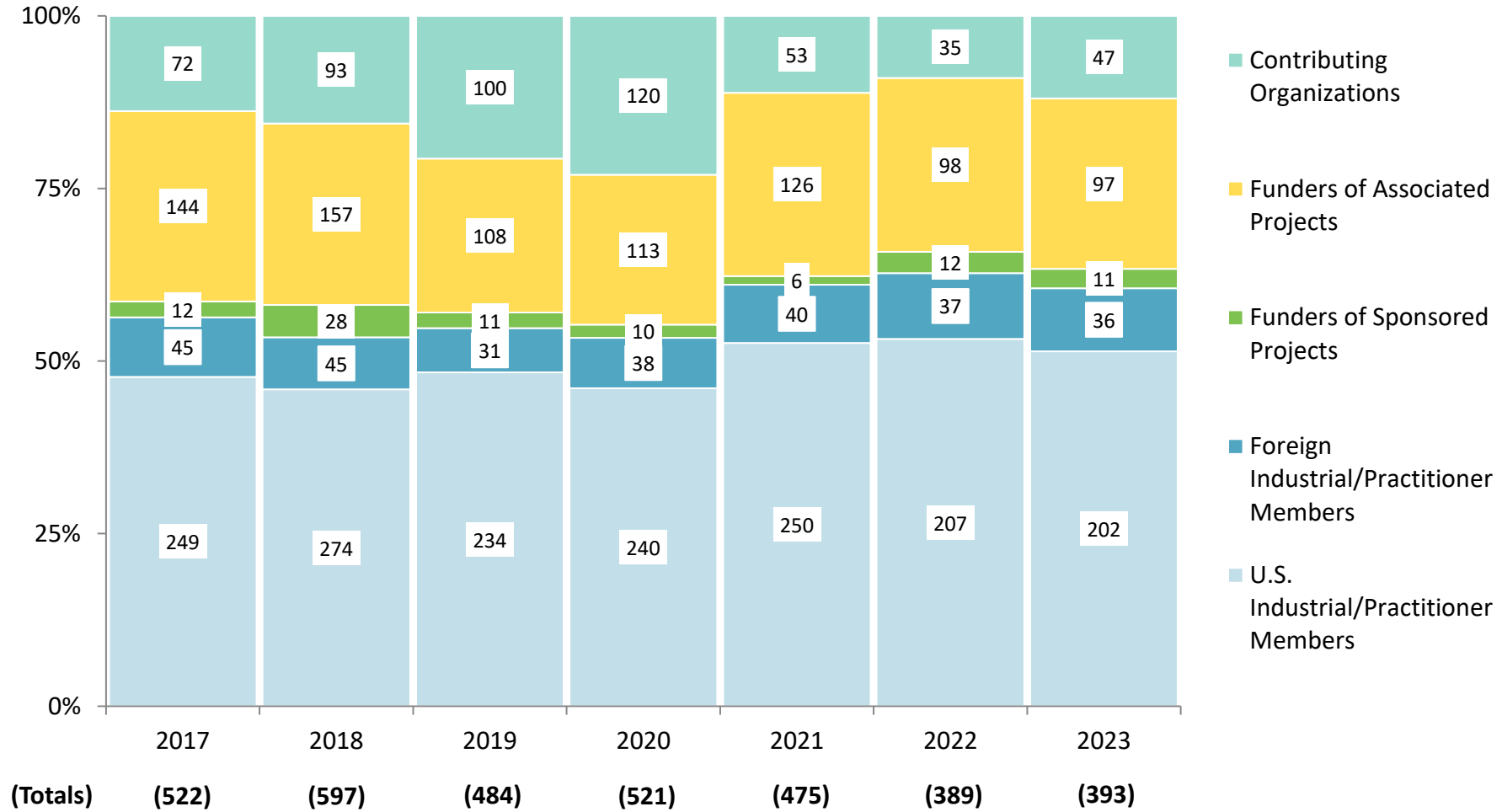
- Data from centers are not included for years in which the center entered demographic data by institution rather than per person
- Undergraduates include REU students
- The percentages of U.S. citizens and permanent residents are calculated out of the total number of personnel, including personnel who did not report citizenship
- ASEE data are not available for postdoctoral for 2019-2023
- The percentages of personnel who did not report citizenship are as follows: 2018: 13.09%, 2019: 12.73%, 2020: 12.64%, 2021: 12.12%, 2022: 14.63%, 2023: 15.47%



**NOTES:**

- The sum of the number of personnel for each category may exceed the total number of personnel because personnel may belong to multiple categories
- Percentage of foreign personnel is calculated out of domestic and foreign personnel, excluding personnel who did not report citizenship





\* Does not include centers from the Earthquake Technology Sector

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
<b><i>Organization Type</i></b>							
Contributing Organizations	72	93	100	120	53	35	47
Funders of Associated Projects	144	157	108	113	126	98	97
Funders of Sponsored Projects	12	28	11	10	6	12	11
Foreign Industrial/Practitioner Members	45	45	31	38	40	37	36
U.S. Industrial/Practitioner Members	249	274	234	240	250	207	202
<b><i>Total Number of Organizations</i></b>	<b><i>522</i></b>	<b><i>597</i></b>	<b><i>484</i></b>	<b><i>521</i></b>	<b><i>475</i></b>	<b><i>389</i></b>	<b><i>393</i></b>
<b><i>Total Number of Centers</i></b>	<b><i>16</i></b>	<b><i>19</i></b>	<b><i>19</i></b>	<b><i>15</i></b>	<b><i>18</i></b>	<b><i>15</i></b>	<b><i>18</i></b>
<b><i>Average Number of Organizations per Center</i></b>	<b><i>33</i></b>	<b><i>31</i></b>	<b><i>25</i></b>	<b><i>35</i></b>	<b><i>26</i></b>	<b><i>26</i></b>	<b><i>22</i></b>

\* Does not include centers from the Earthquake Technology Sector

## Industrial/Practitioner Member Support by Year, FY 2017–2023\*

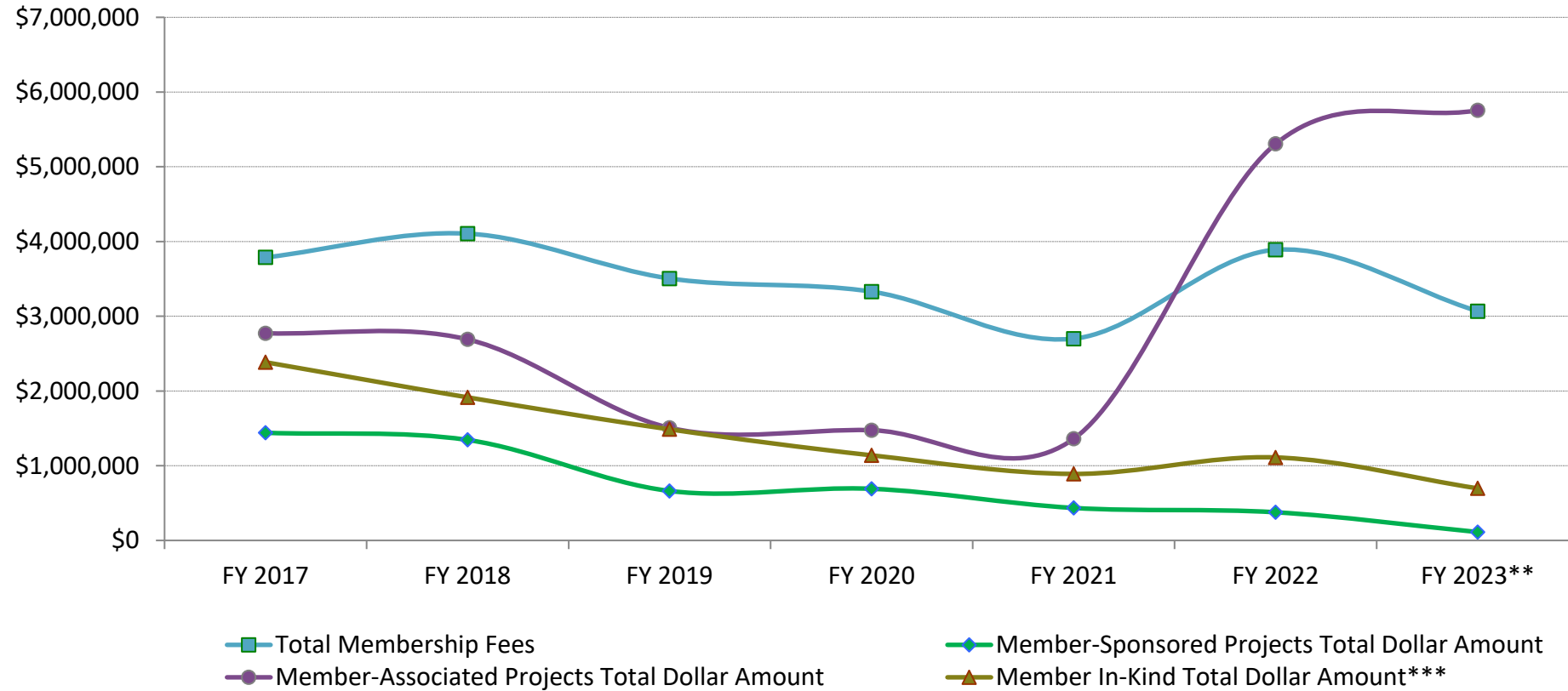
	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023**
<i>Type of Support</i>							
Total Membership Fees	\$3,786,620	\$4,105,519	\$3,505,352	\$3,329,864	\$2,699,714	\$3,889,583	\$3,068,104
Member-Sponsored Projects Total Dollar Amount	\$1,440,493	\$1,344,913	\$662,354	\$691,321	\$434,796	\$376,869	\$112,408
Member-Associated Projects Total Dollar Amount	\$2,772,841	\$2,690,570	\$1,506,932	\$1,475,615	\$1,359,434	\$5,305,913	\$5,755,192
Member In-Kind Total Dollar Amount***	\$2,384,789	\$1,914,975	\$1,486,785	\$1,139,124	\$890,196	\$1,110,903	\$696,937
<b>Total Dollar Amount, Industrial/Practitioner Member Support to Center</b>	<b>\$10,384,743</b>	<b>\$10,055,977</b>	<b>\$7,161,423</b>	<b>\$6,635,924</b>	<b>\$5,384,140</b>	<b>\$10,683,268</b>	<b>\$9,632,641</b>

\* Does not include centers from the Earthquake Technology Sector

\*\* Support received by the end of the current reporting year. Includes data for centers that have entered partial data during a no-cost extension (NCE)

\*\*\* Data for this row are from the In-Kind Support reported in the Organizations section

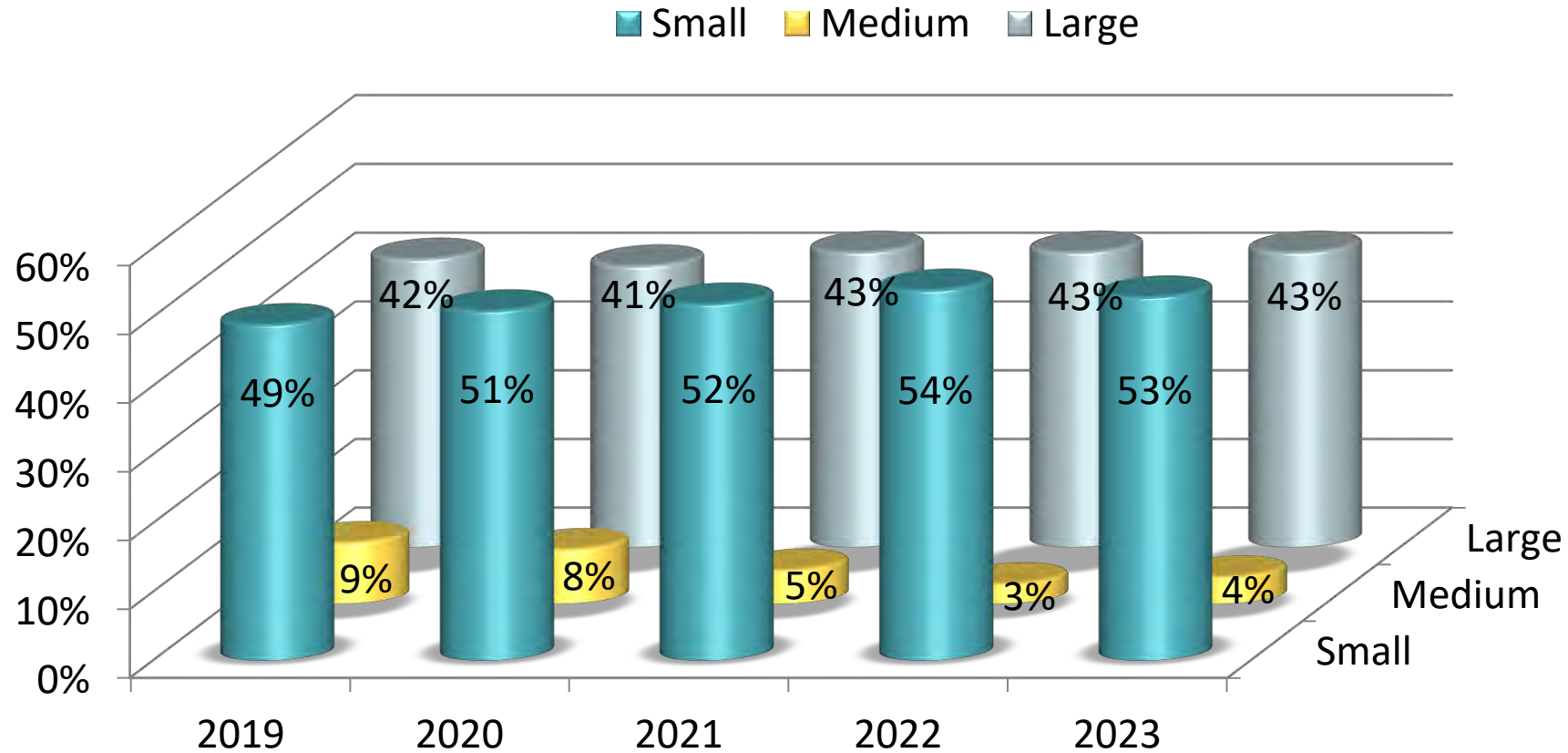
Industrial/Practitioner Member Support by Year, FY 2017–2023\*



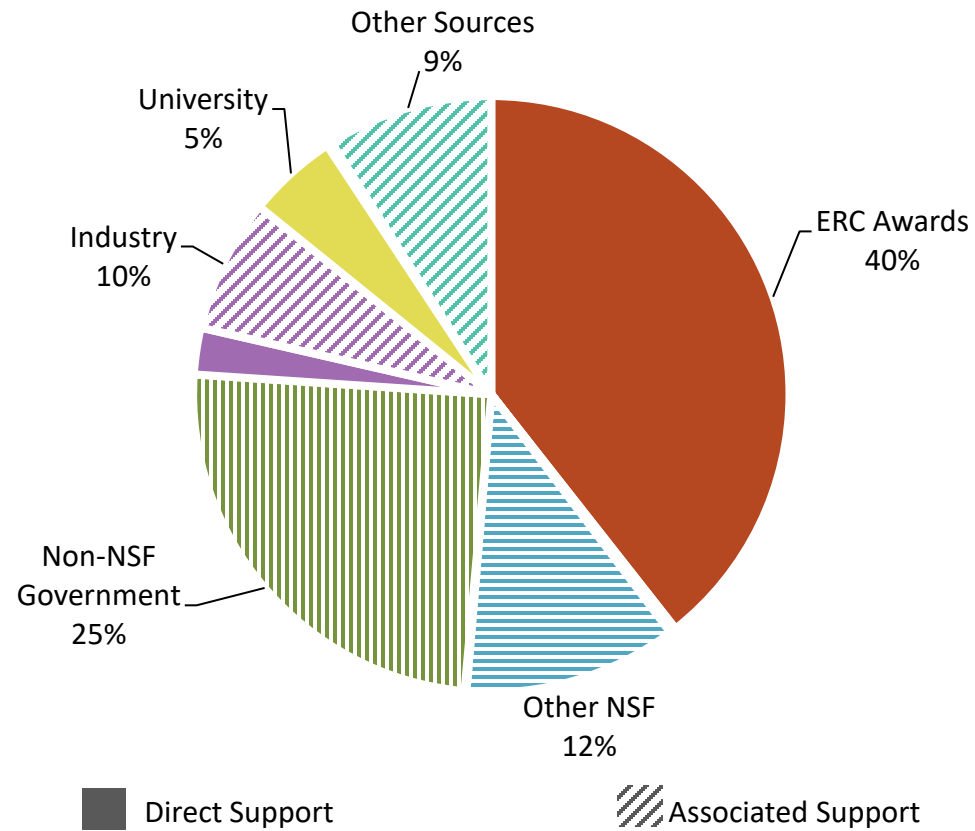
\* Does not include centers from the Earthquake Technology Sector

\*\* Support received by the end of the current reporting year. Includes data for centers that have entered partial data during a no-cost extension (NCE)

\*\*\* Data for this line are from the In-Kind Support reported in the Organizations section

**NOTES:**

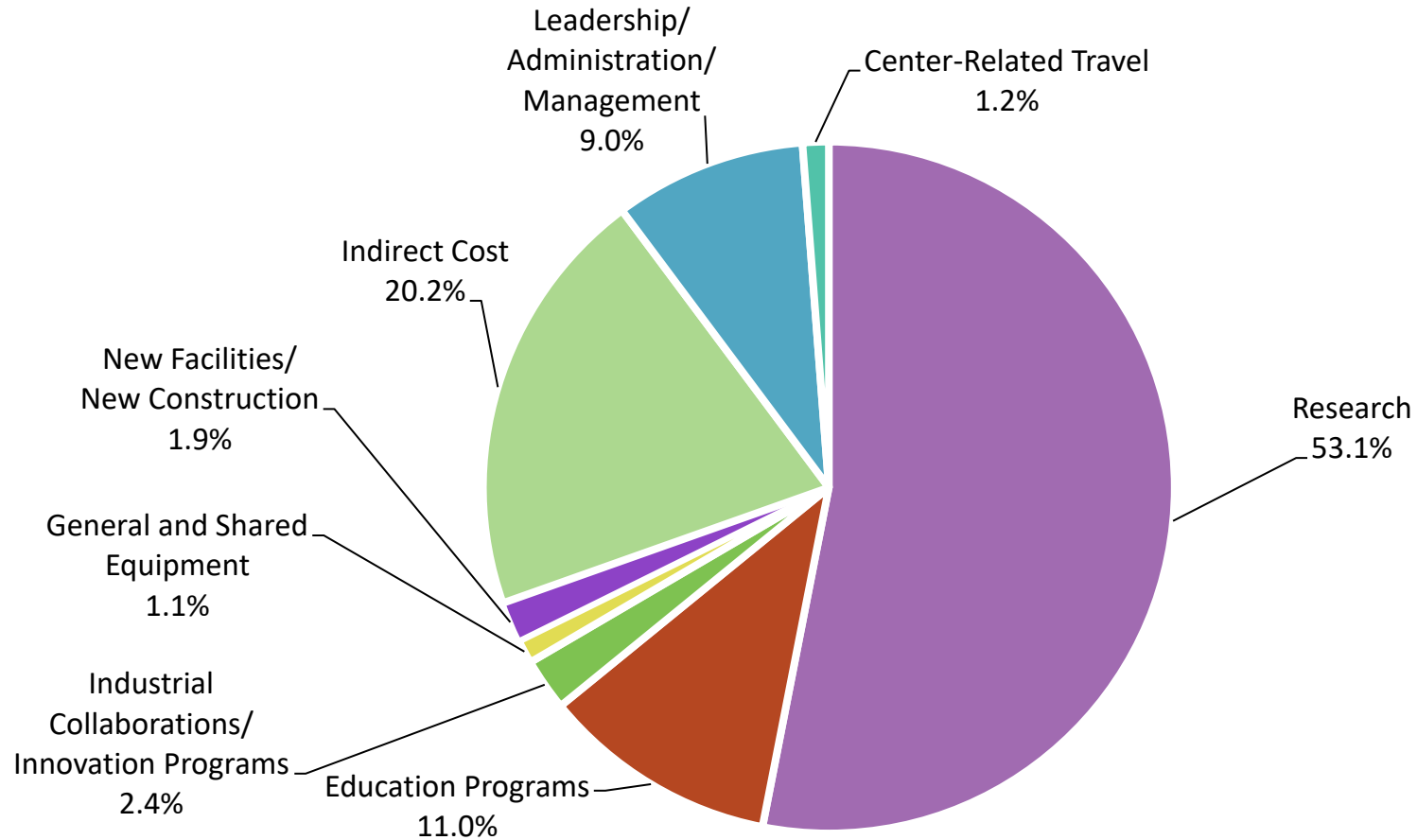
- The total number of firms is as follows: 2019: 222, 2020: 239, 2021: 263, 2022: 229, 2023: 222
- Industry sizes are as follows: Small = <500 employees, Medium = 500–1,000 employees, Large = >1,000 employees



Total value of support: \$178 million

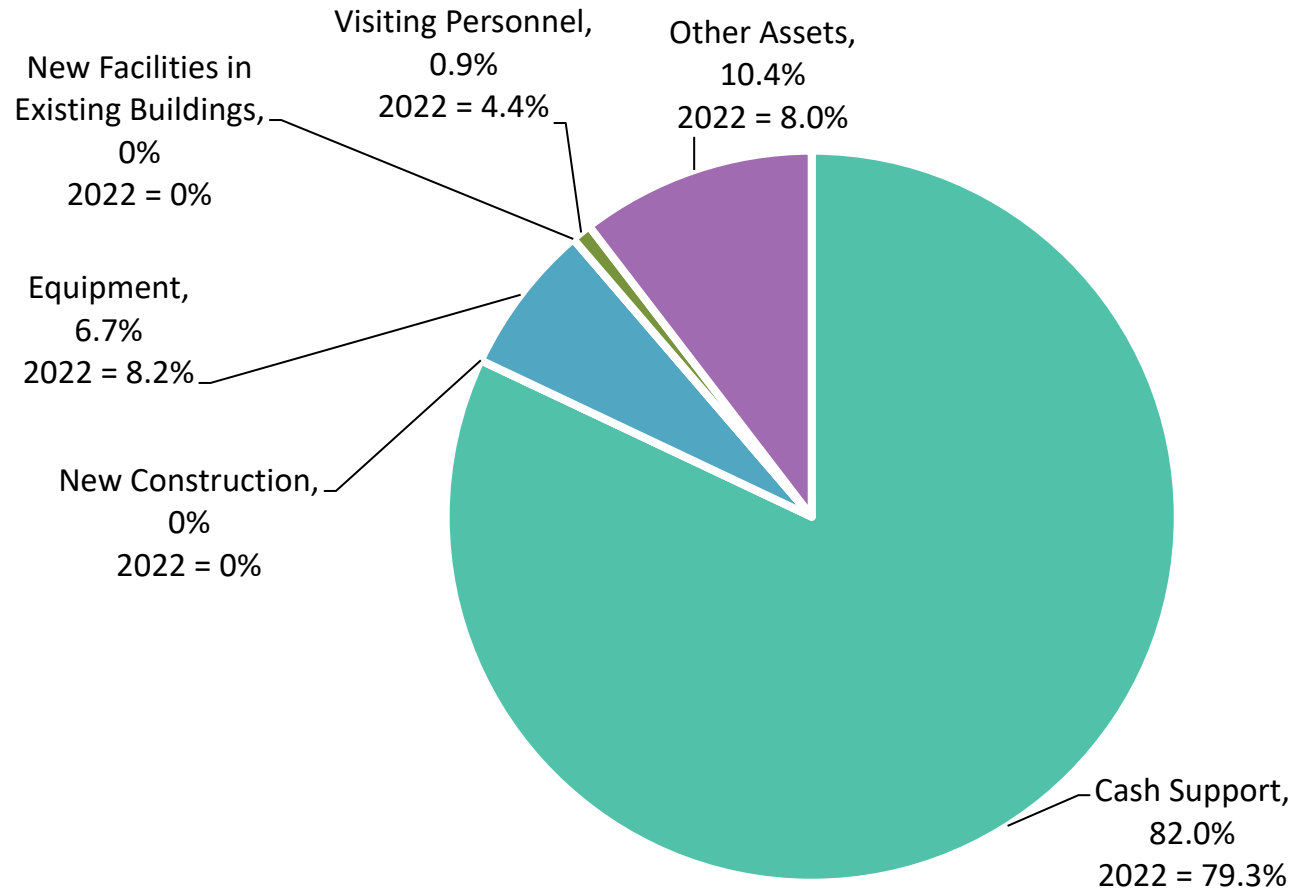
**NOTES:**

- Percentages shown are Direct Support and Associated Support combined
- Non-NSF Government includes U.S. Government (Not NSF), State Government, Local Government, Foreign Government, and Quasi-government Research Organizations
- Other Sources include Medical Facilities, Nonprofit Organizations, Private Foundations, Venture Capitalists and Other Sources



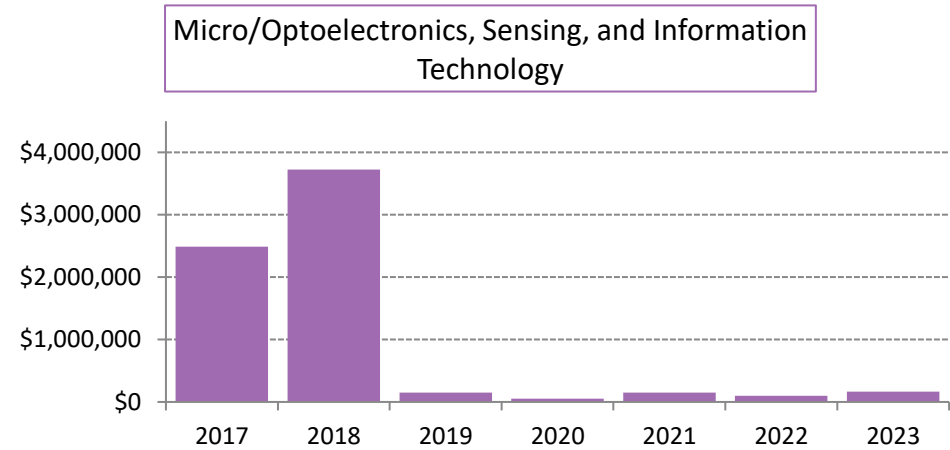
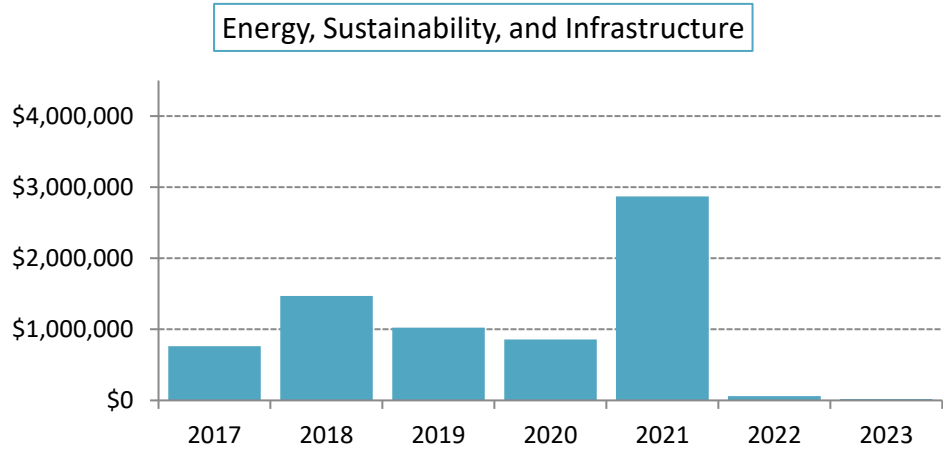
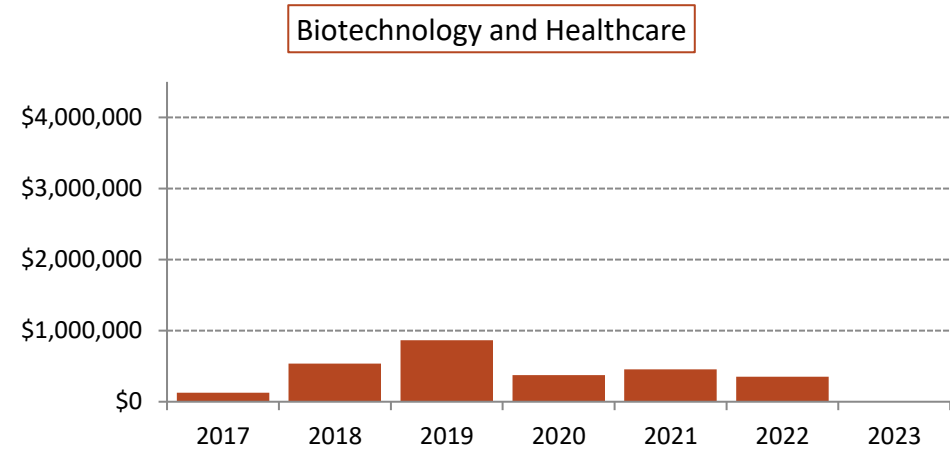
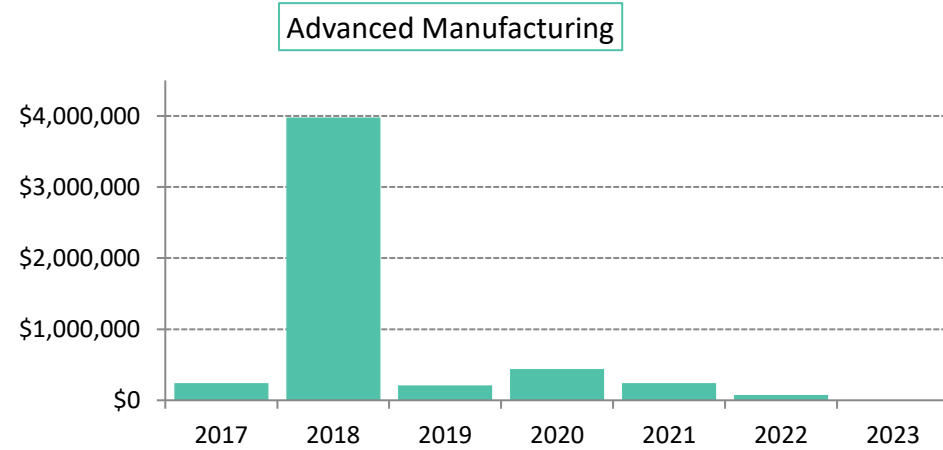
Direct Support total: \$78,777,928

\* Includes in-kind support but not residuals



Total value of support: \$3.9 million

Non-NSF Government Support by ERC Technology Sector, FY 2017–2023\*,\*\*,\*\*\*

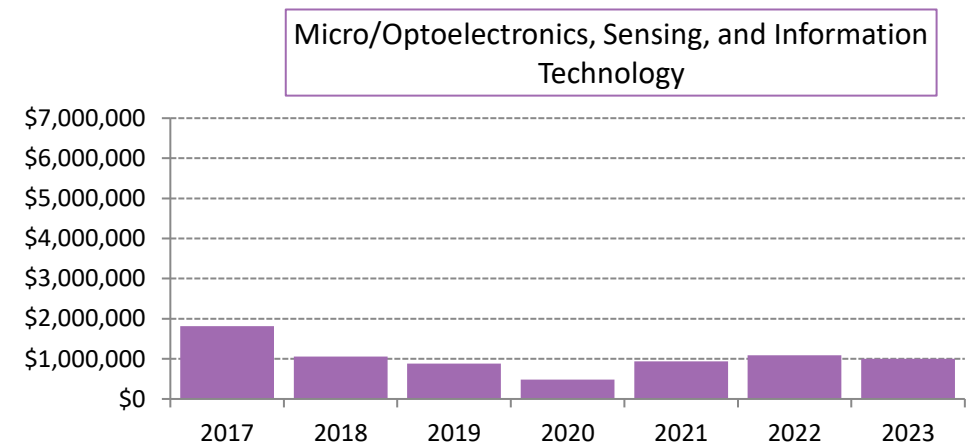
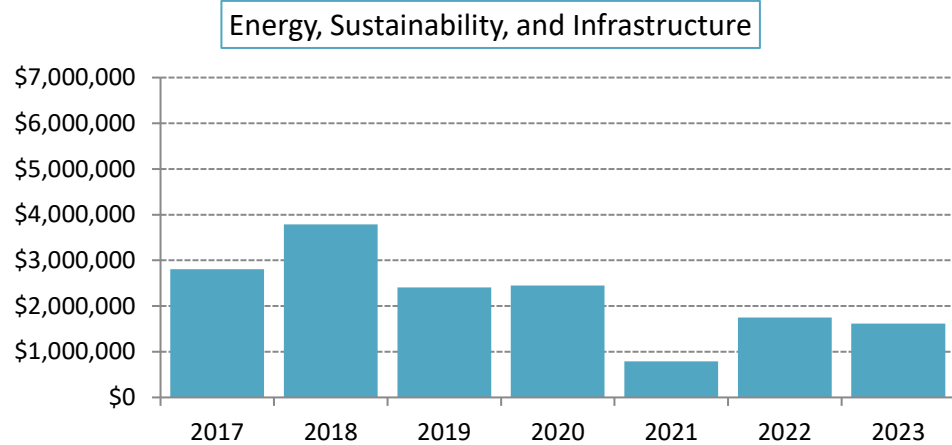
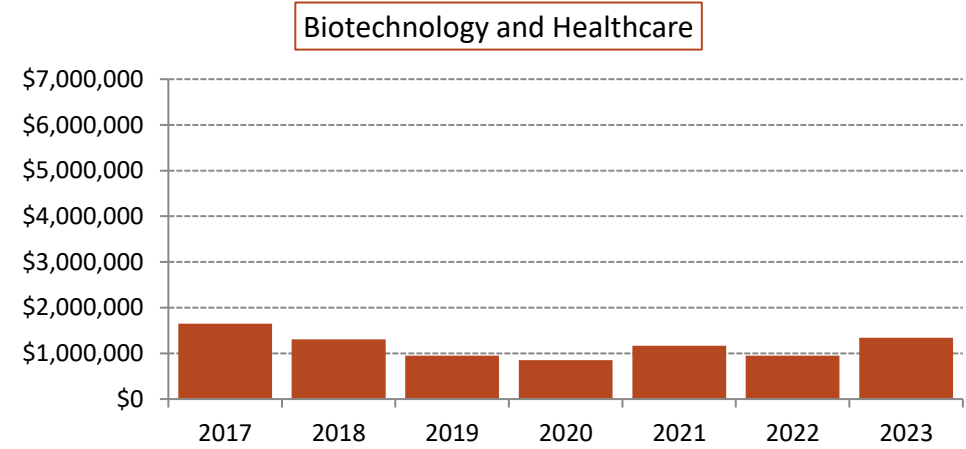
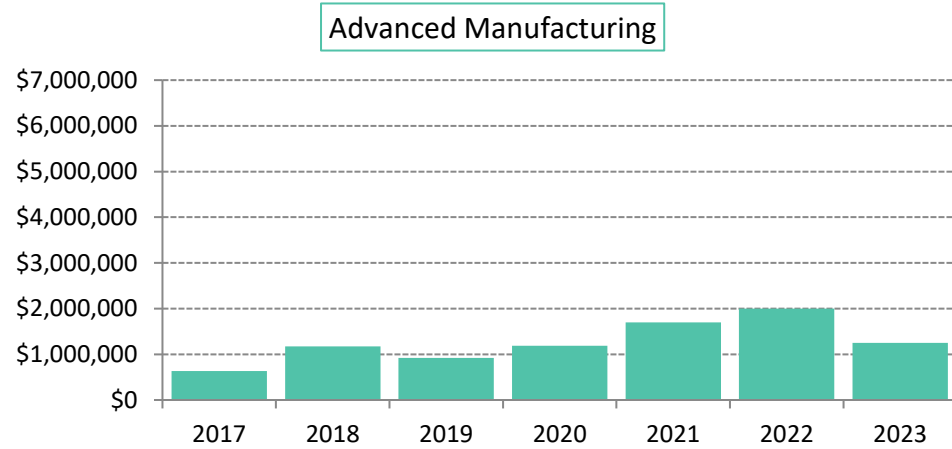


\* Does not include centers from the Earthquake Technology Sector

\*\* Support includes Unrestricted Cash, Restricted Cash, and In-Kind Support

\*\*\* Includes data for centers that have entered partial data during a no-cost extension (NCE)

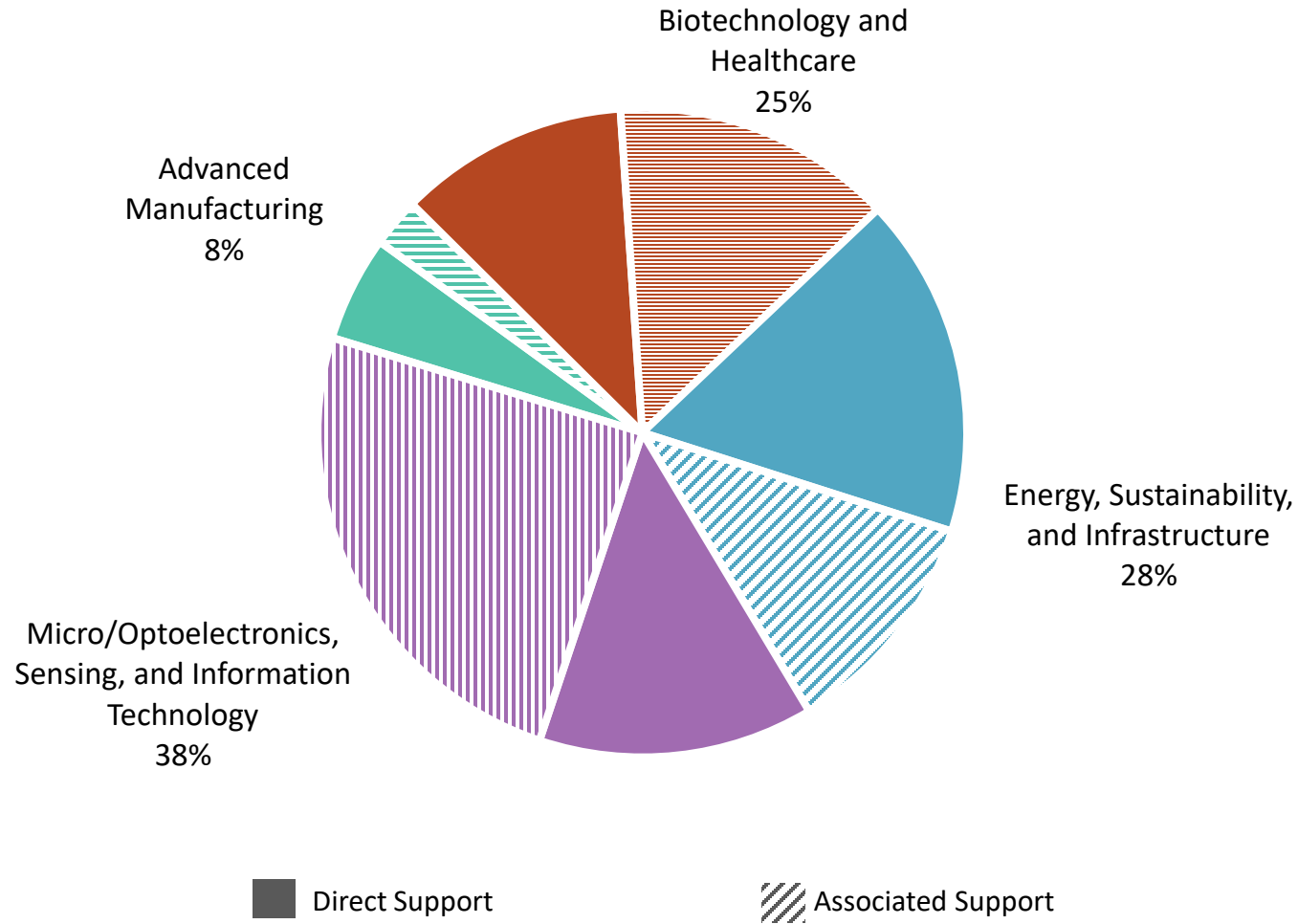
Industry Support by ERC Technology Sector, FY 2017–2023 <sup>\*,\*\*,\*\*\*</sup>



\* Does not include centers from the Earthquake Technology Sector

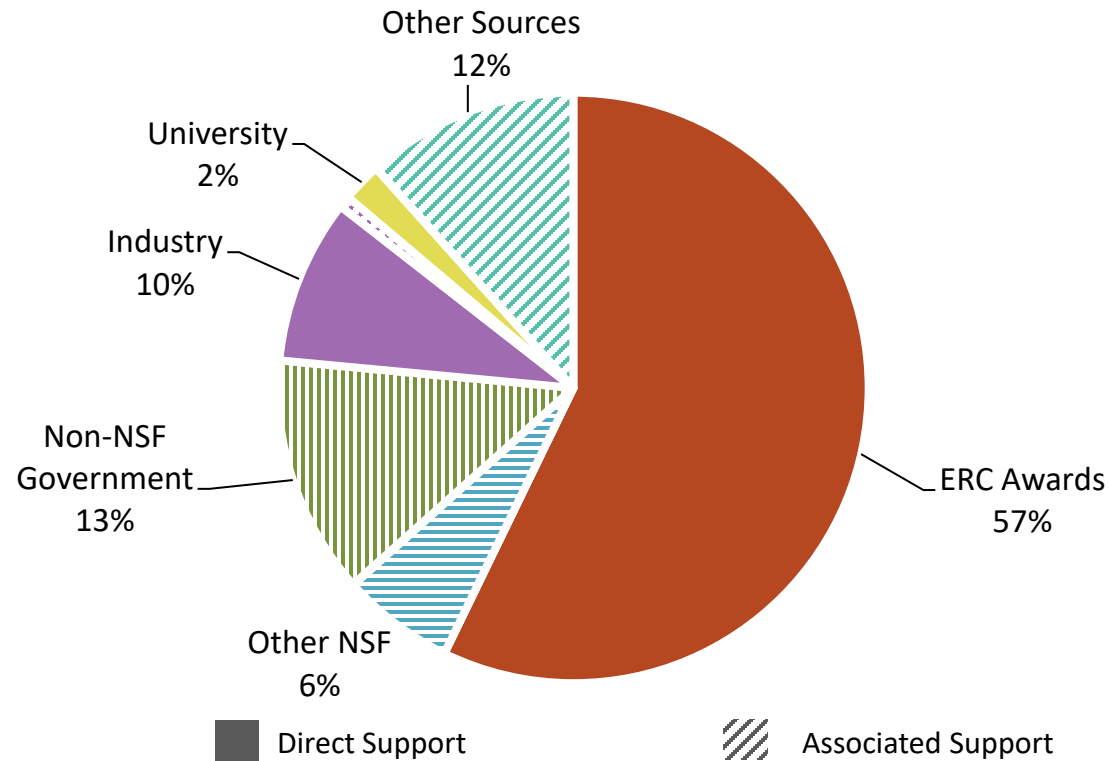
\*\* Support includes Unrestricted Cash, Restricted Cash, and In-Kind Support

\*\*\* Includes data for centers that have entered partial data during a no-cost extension (NCE)



Total value of support: \$179 million

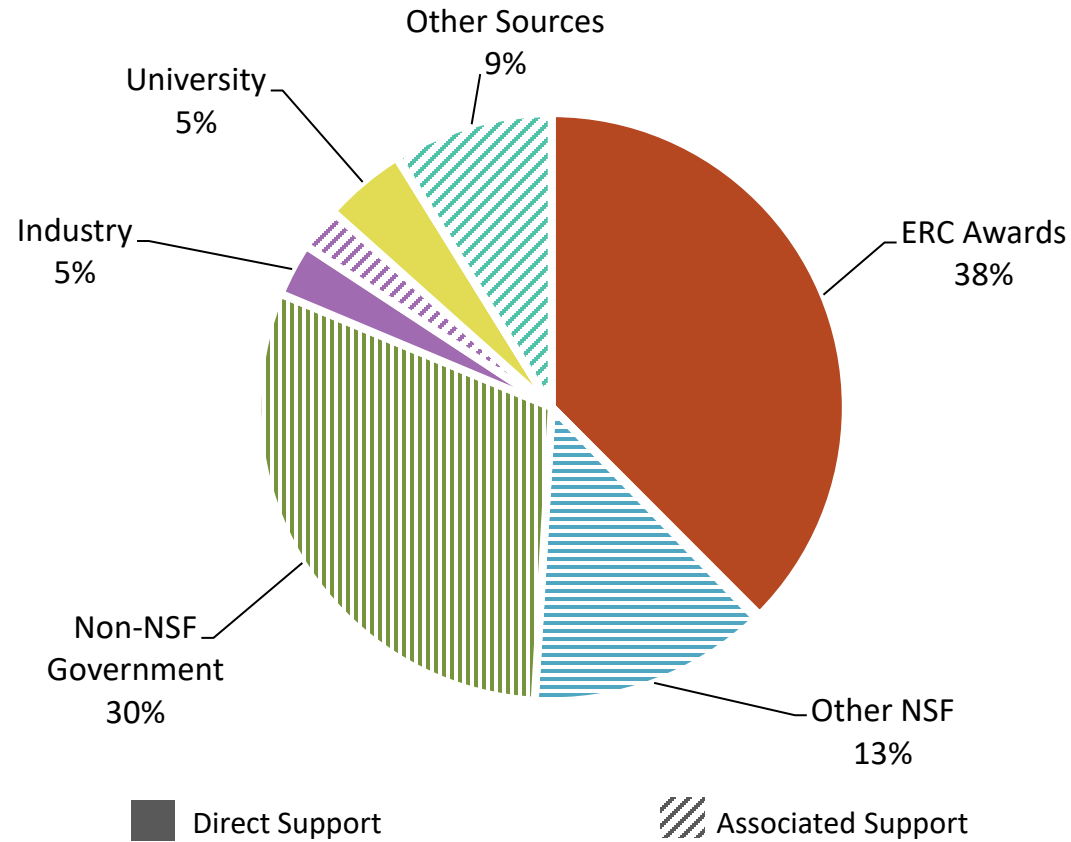
**NOTE:** Sources of Support include Unrestricted Cash, Restricted Cash, In-Kind, and Associated Projects. Residuals are not included



Total value of support: \$13.8 million

**NOTES:**

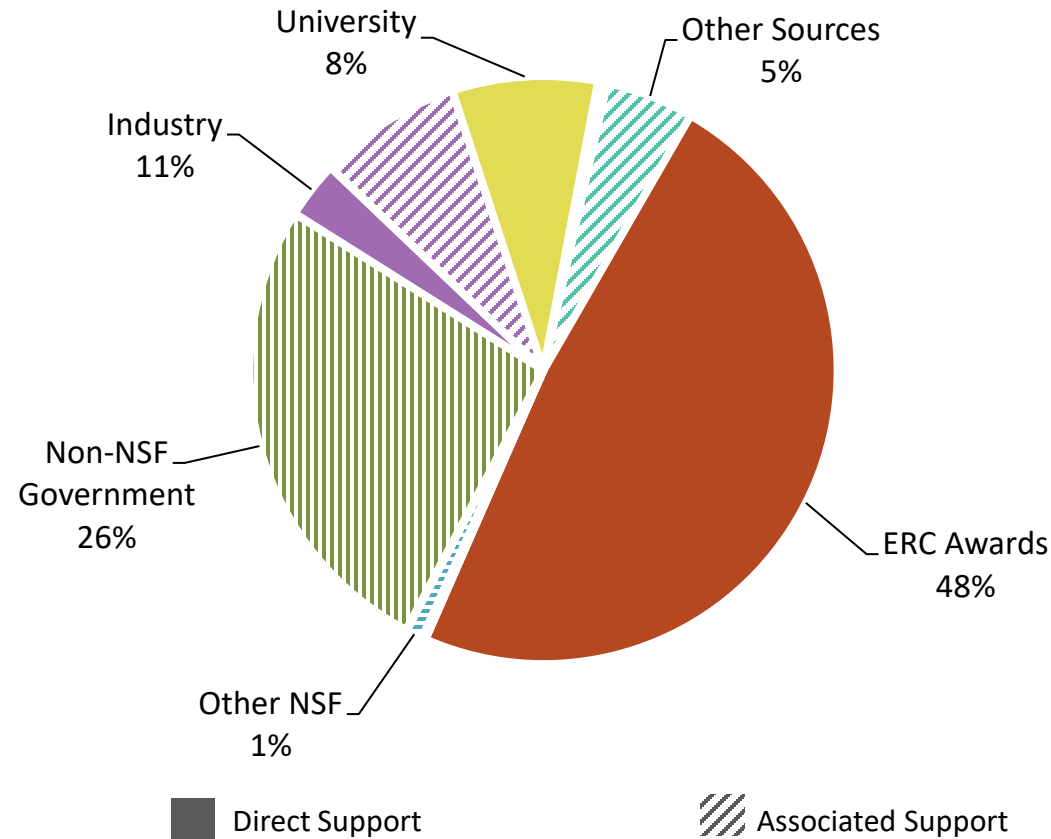
- Sources of Support include Unrestricted Cash, Restricted Cash, In-Kind, and Associated Projects. Residuals are not included
- Non-NSF Government includes U.S. Government (not NSF), State government, local government, foreign government, and quasi-government research organizations
- Other Sources includes medical facilities, nonprofit organizations, private foundations, venture capitalists, and other sources



Total value of support: \$45.5 million

**NOTES:**

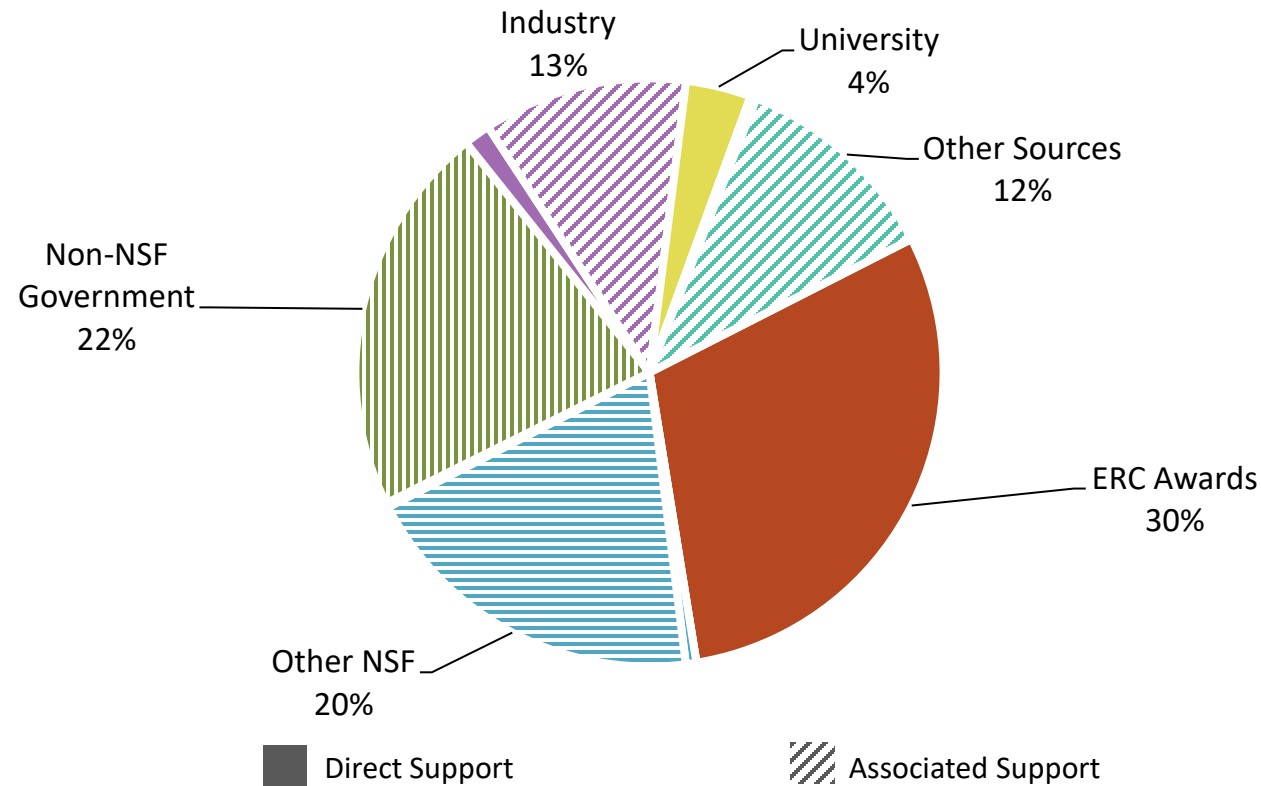
- Sources of Support include Unrestricted Cash, Restricted Cash, In-Kind, and Associated Projects. Residuals are not included
- Non-NSF Government includes U.S. Government (not NSF), State government, local government, foreign government, and quasi-government research organizations
- Other Sources includes medical facilities, nonprofit organizations, private foundations, venture capitalists, and other sources



Total value of support: \$50.9 million

**NOTES:**

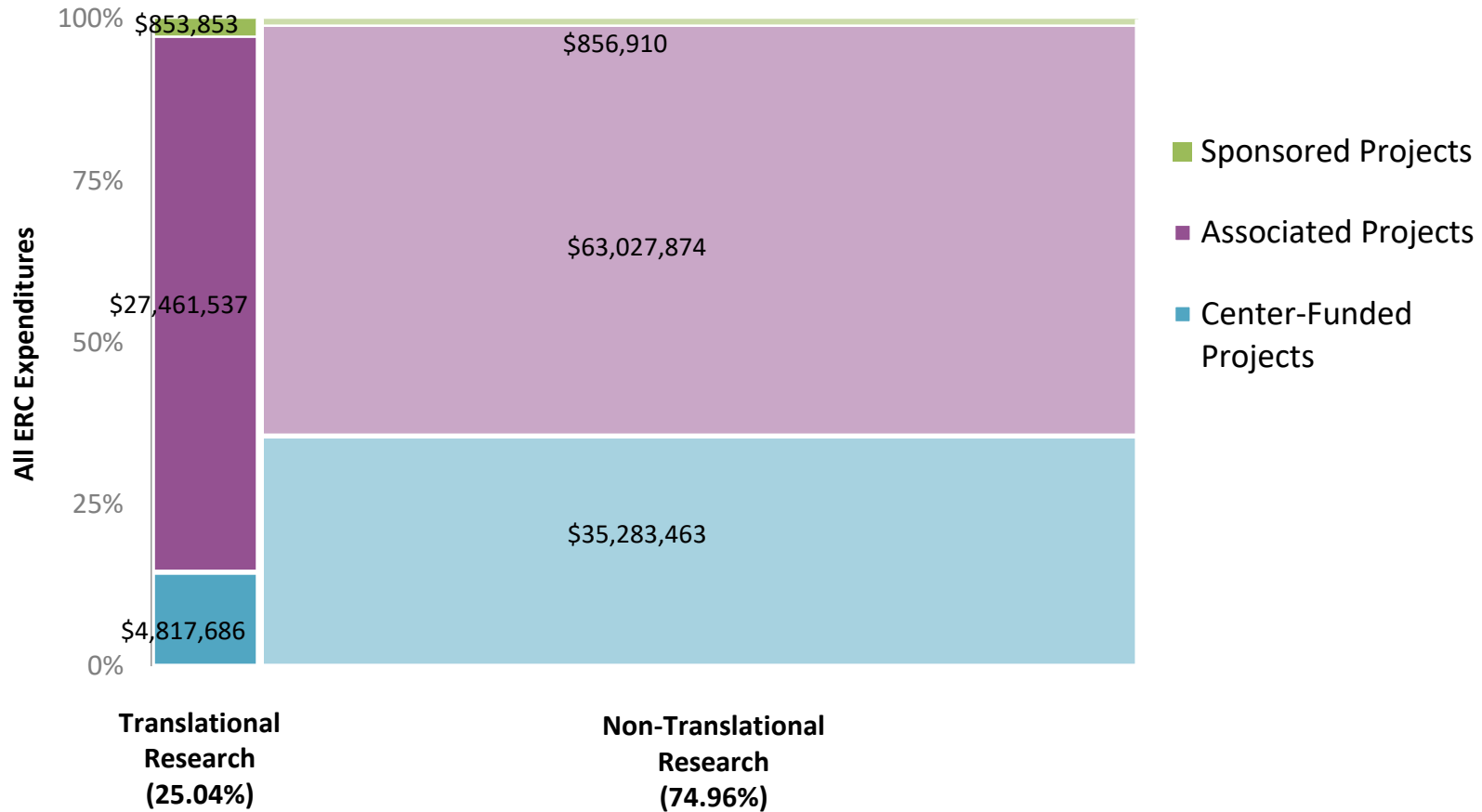
- Sources of Support include Unrestricted Cash, Restricted Cash, In-Kind, and Associated Projects. Residuals are not included
- Non-NSF Government includes U.S. Government (not NSF), State government, local government, foreign government, and quasi-government research organizations
- Other Sources includes medical facilities, nonprofit organizations, private foundations, venture capitalists, and other sources



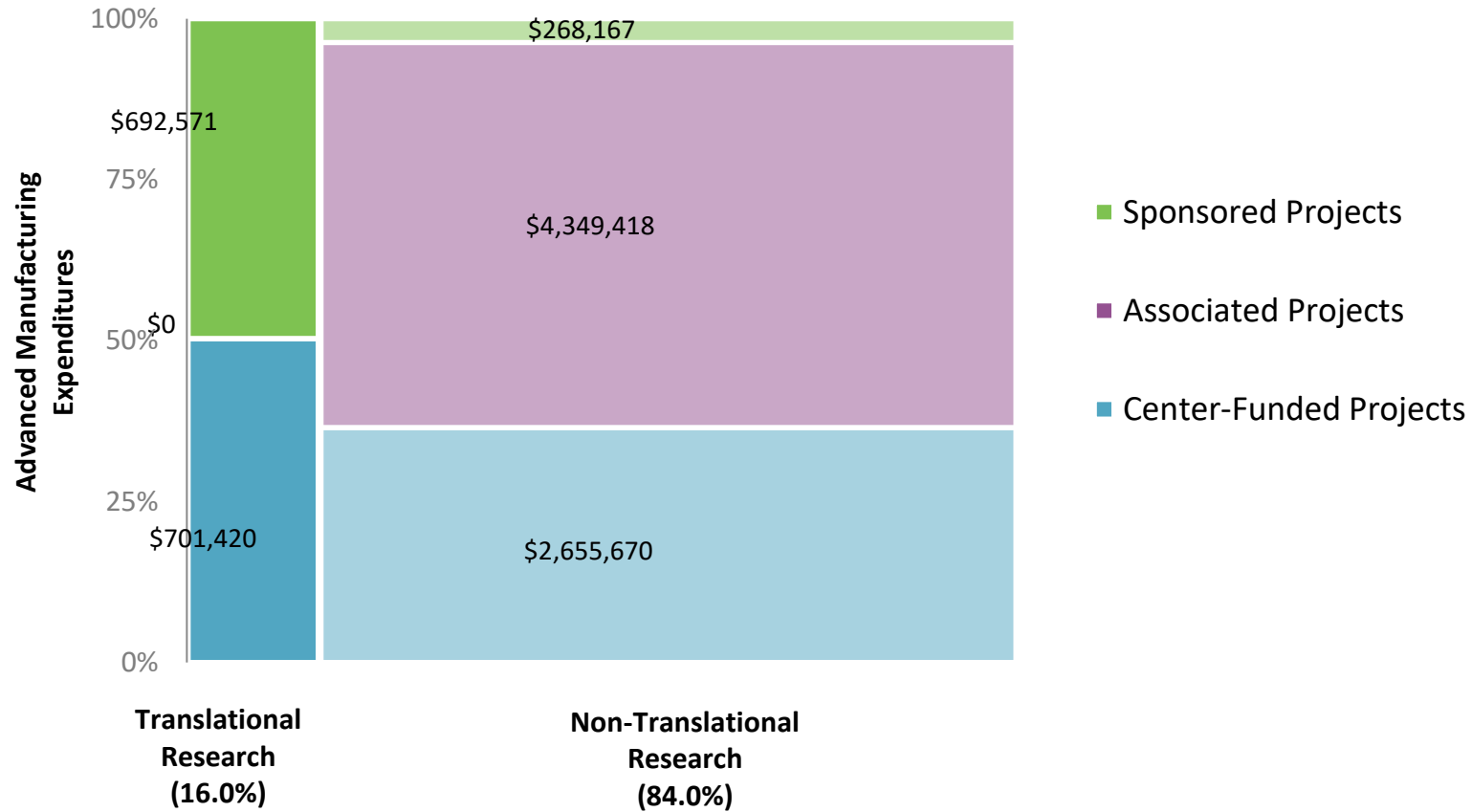
Total value of support: \$68.4 million

**NOTES:**

- Sources of Support include Unrestricted Cash, Restricted Cash, In-Kind, and Associated Projects. Residuals are not included
- Non-NSF Government includes U.S. Government (not NSF), State government, local government, foreign government, and quasi-government research organizations
- Other Sources includes medical facilities, nonprofit organizations, private foundations, venture capitalists, and other sources

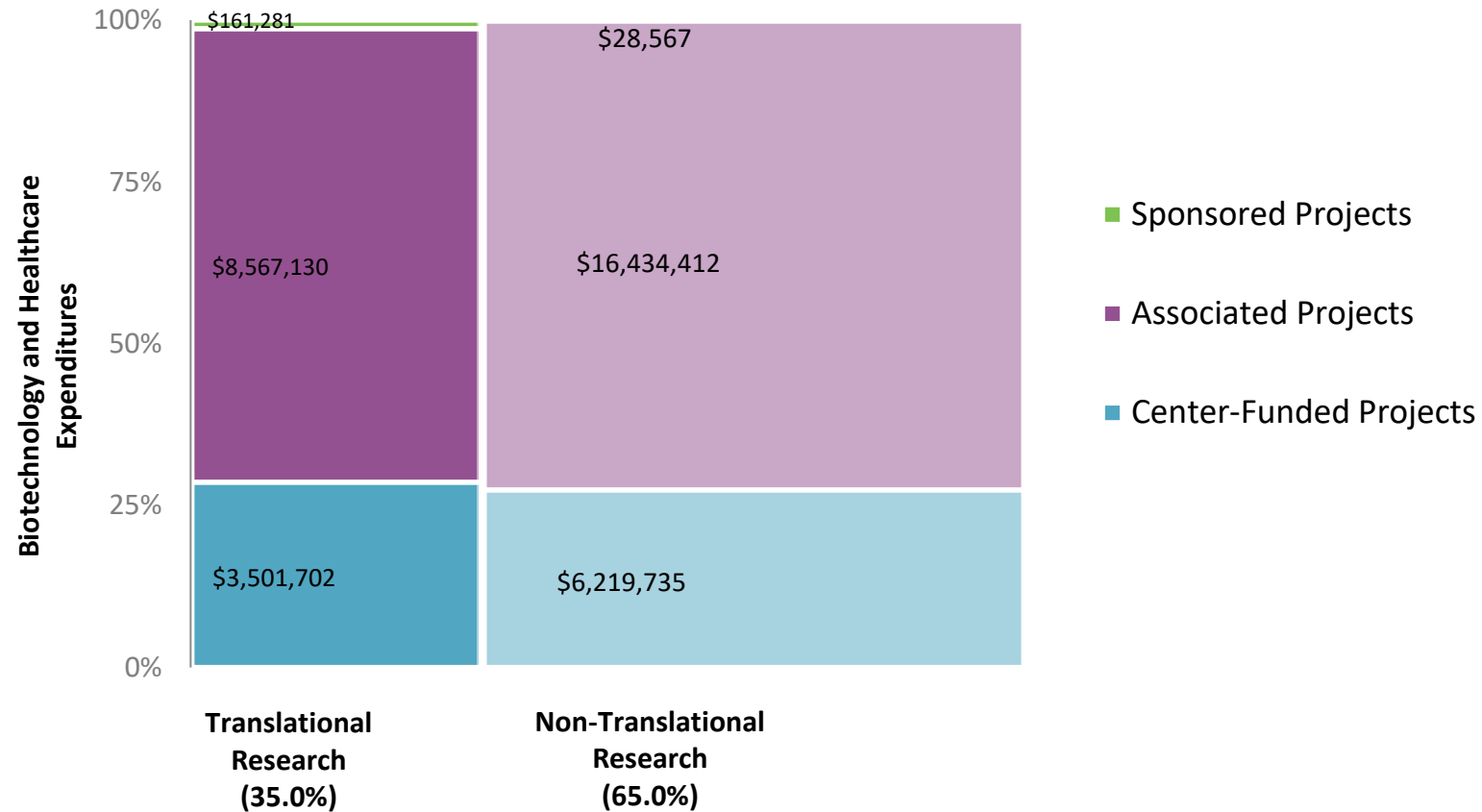


Total value of support: \$132.3 million



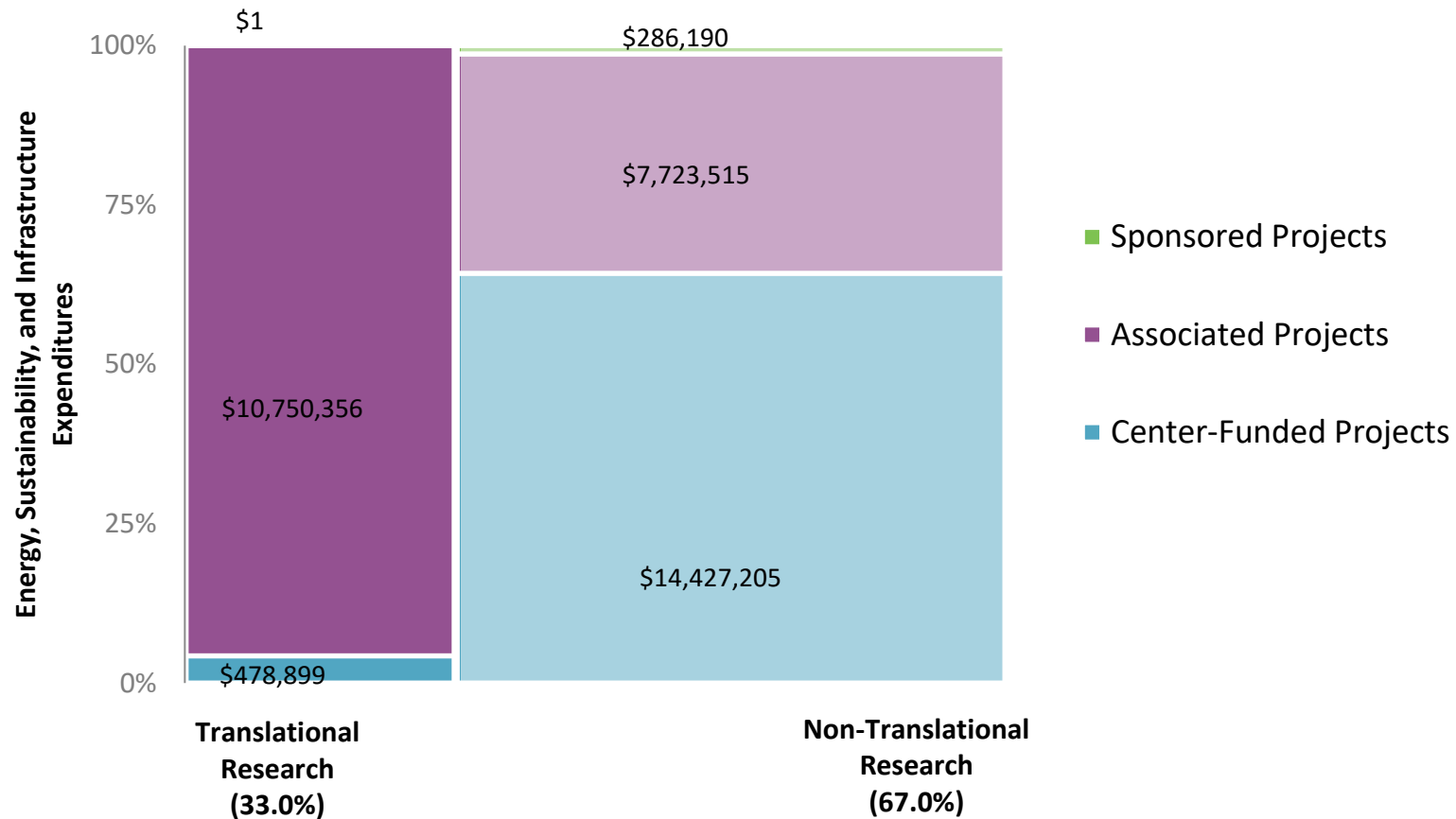
Total value of support: \$8.7 million

**NOTE:** \$0 corresponds to Associated Project expenditures for Translational Research. Area is not visible due to no data or the small relative size.



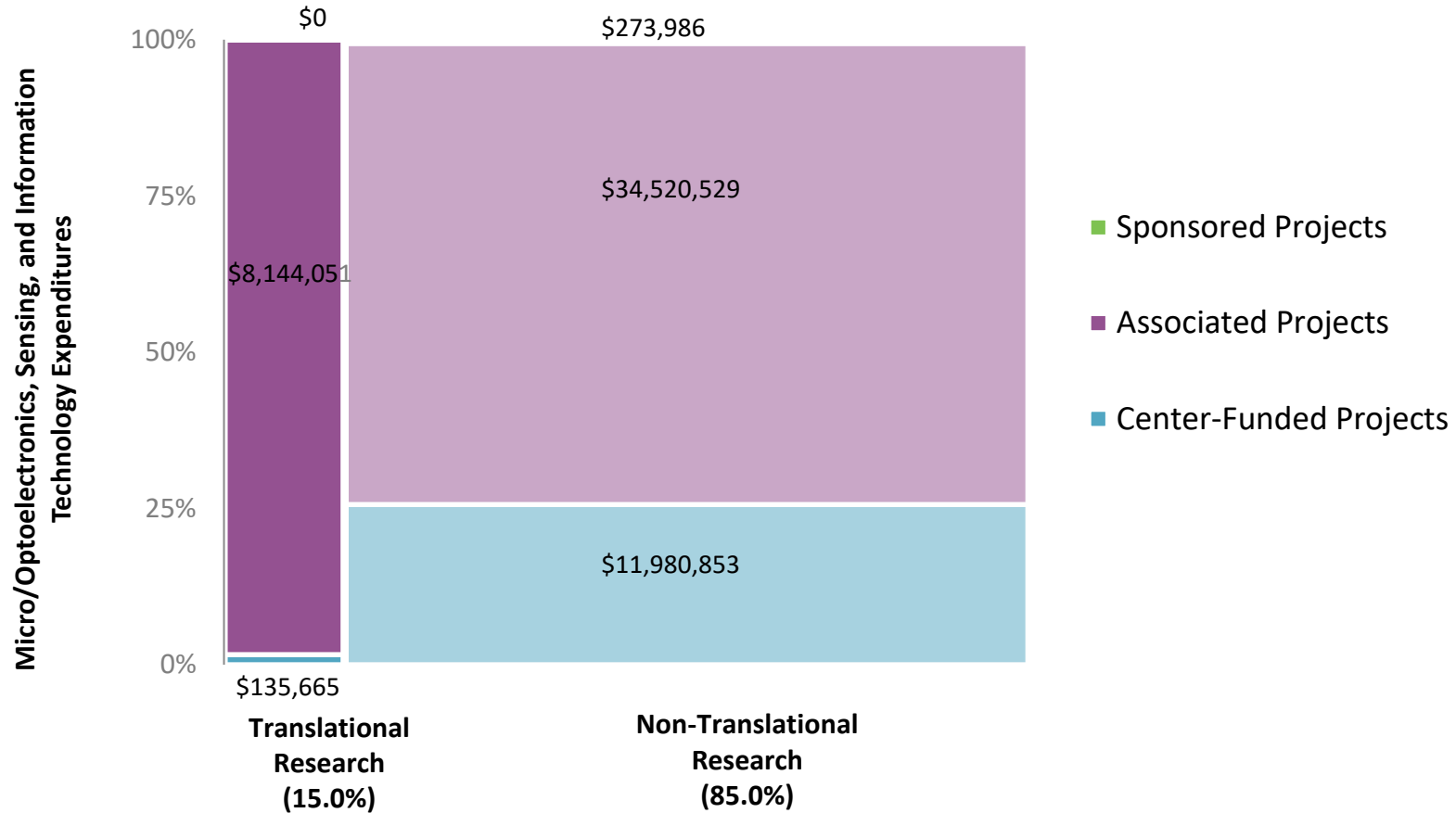
Total value of support: \$34.9 million

**NOTE:** \$28,567 corresponds to Sponsored Projects expenditures for Non-Translational Research. Area is not visible due to the small relative size



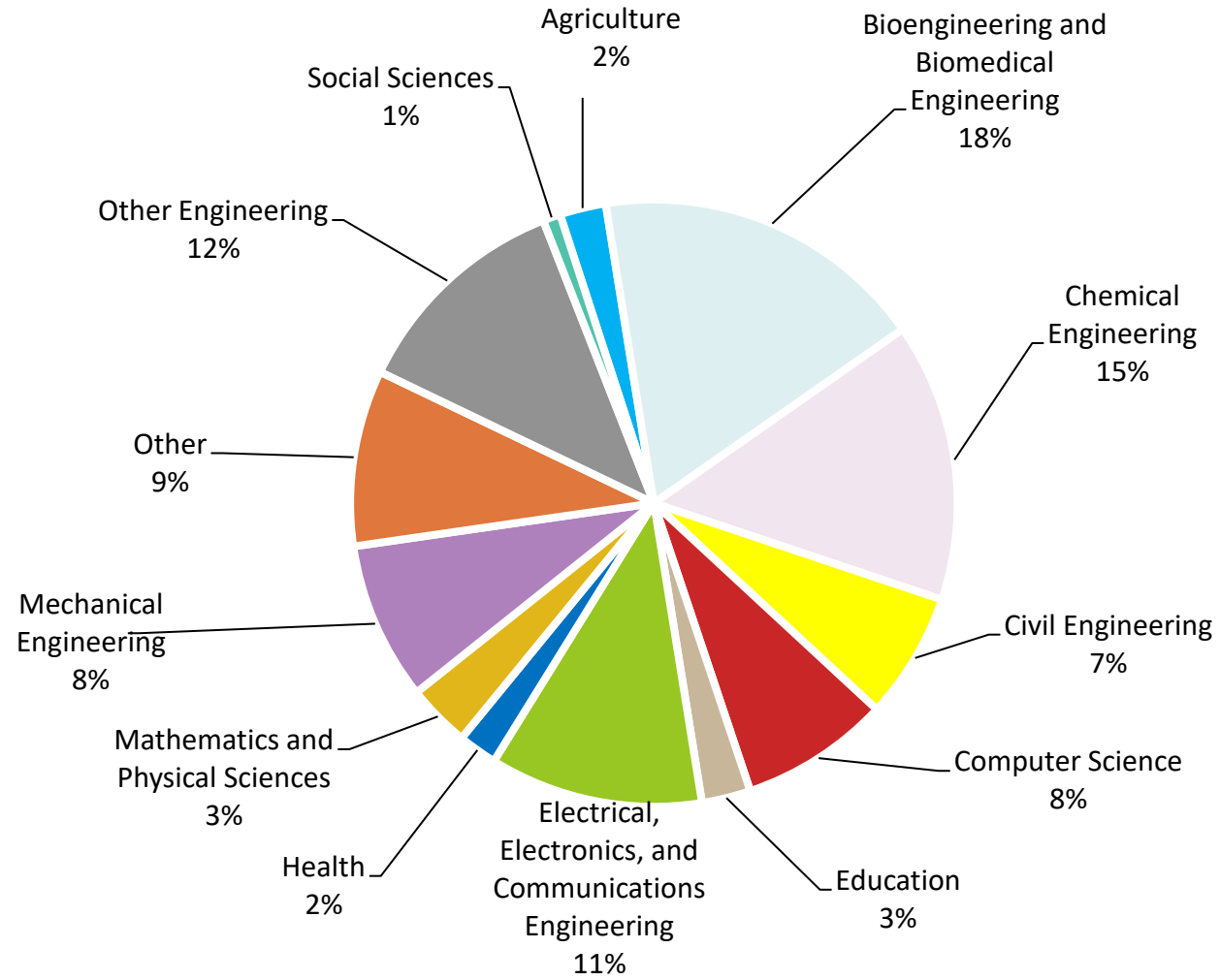
Total value of support: \$33.7 million

**NOTE:** \$1 corresponds to Sponsored Projects expenditures for Translational Research. Area is not visible due to the small relative size

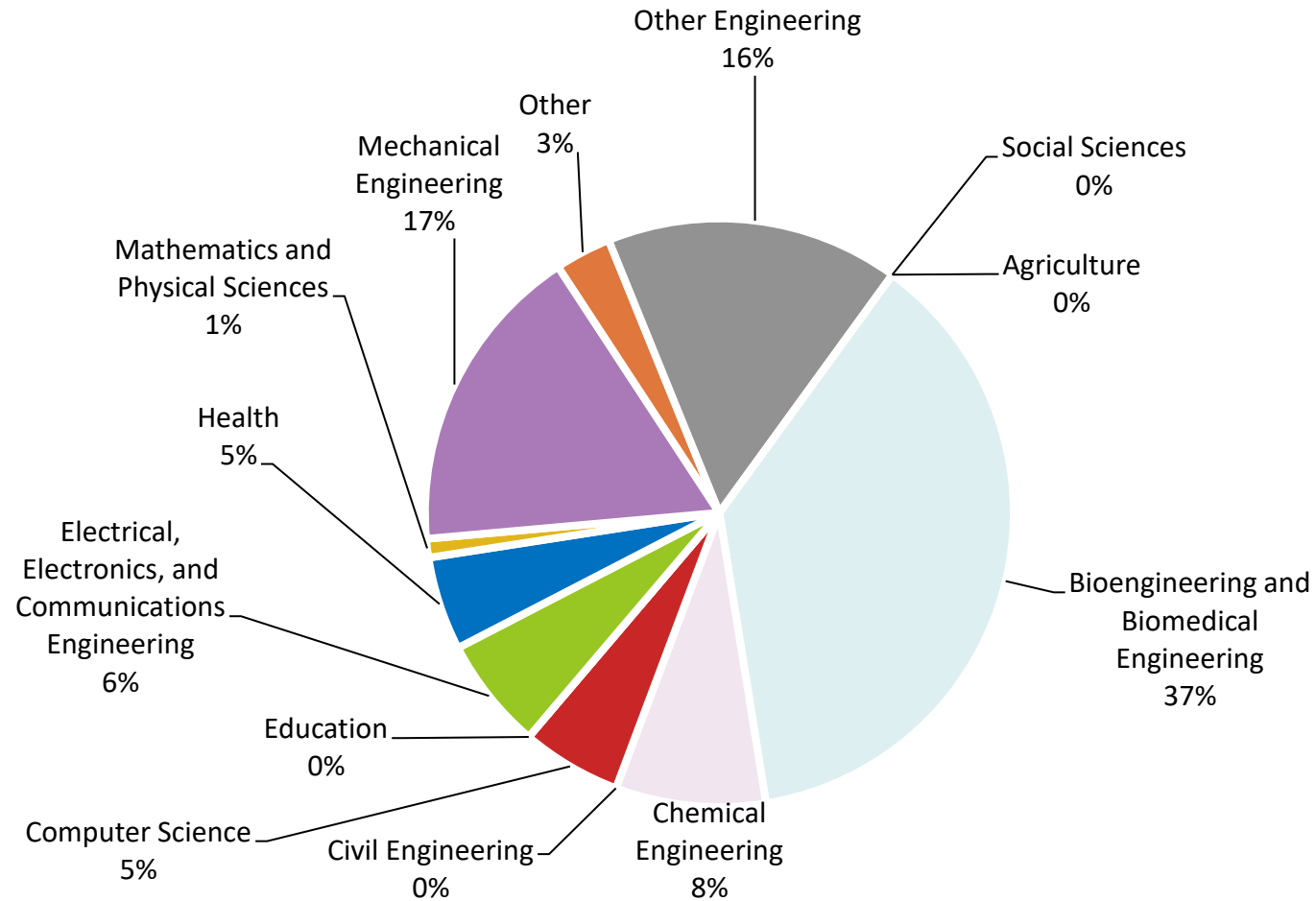


Total value of support: \$55 million

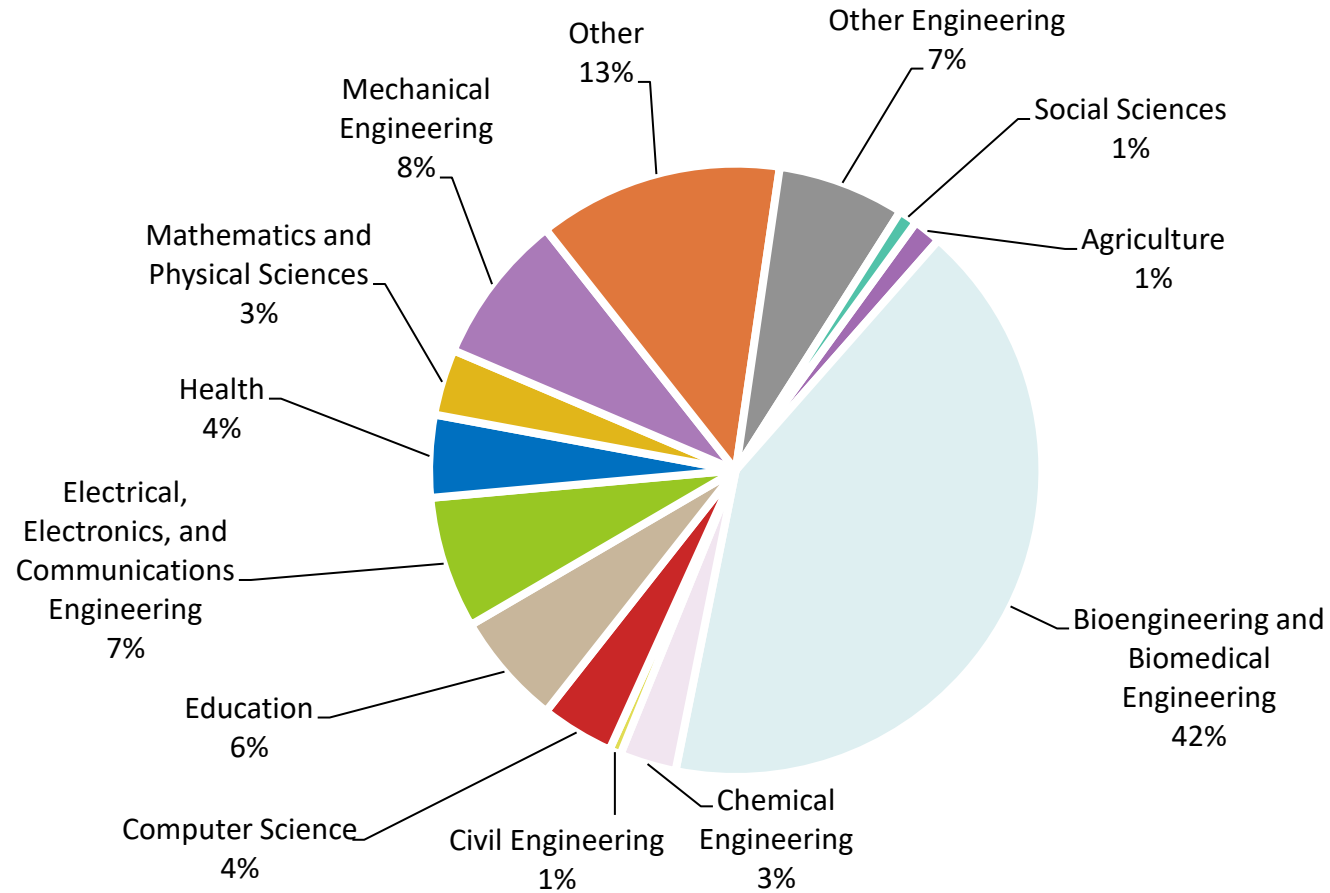
**NOTE:** \*\$273,986 and \$0 corresponds to Sponsored Projects expenditures for Non-Translational Research and Translational Research. Area is not visible due to no data or the small relative size.



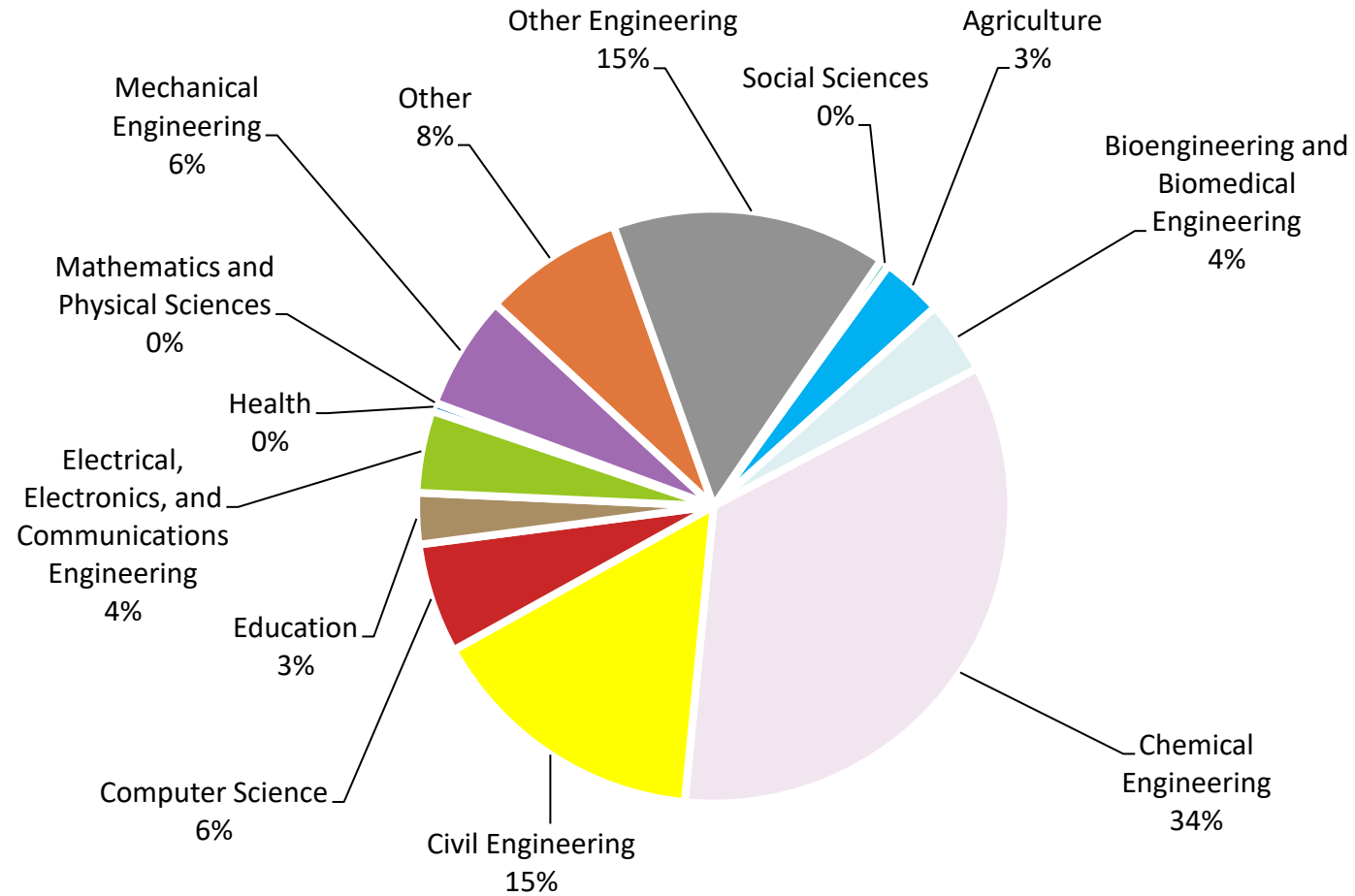
Total number of Project Investigators (PIs): 569



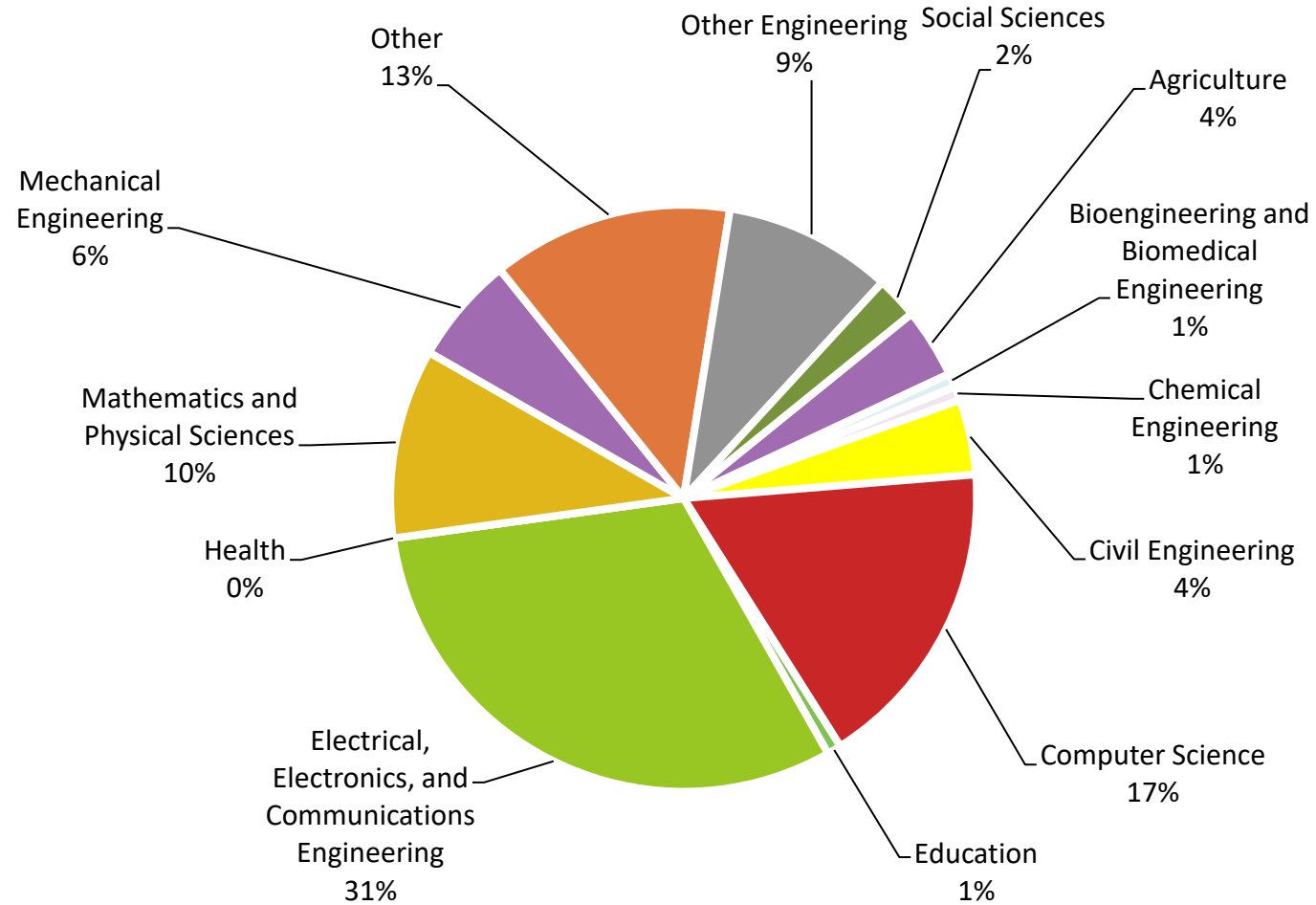
Total number of Project Investigators (PIs): 97



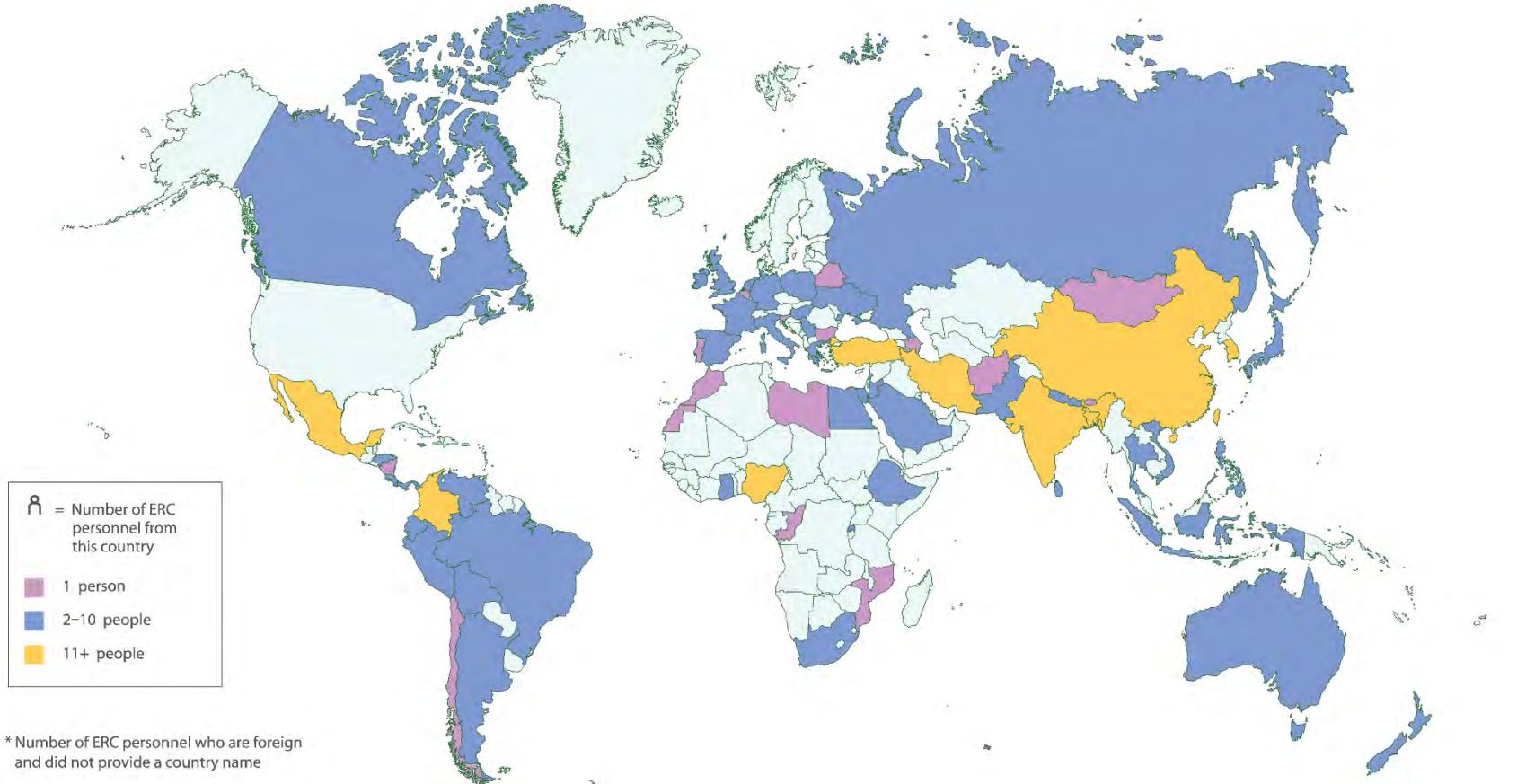
Total number of Project Investigators (PIs): 134



Total number of Project Investigators (PIs): 209



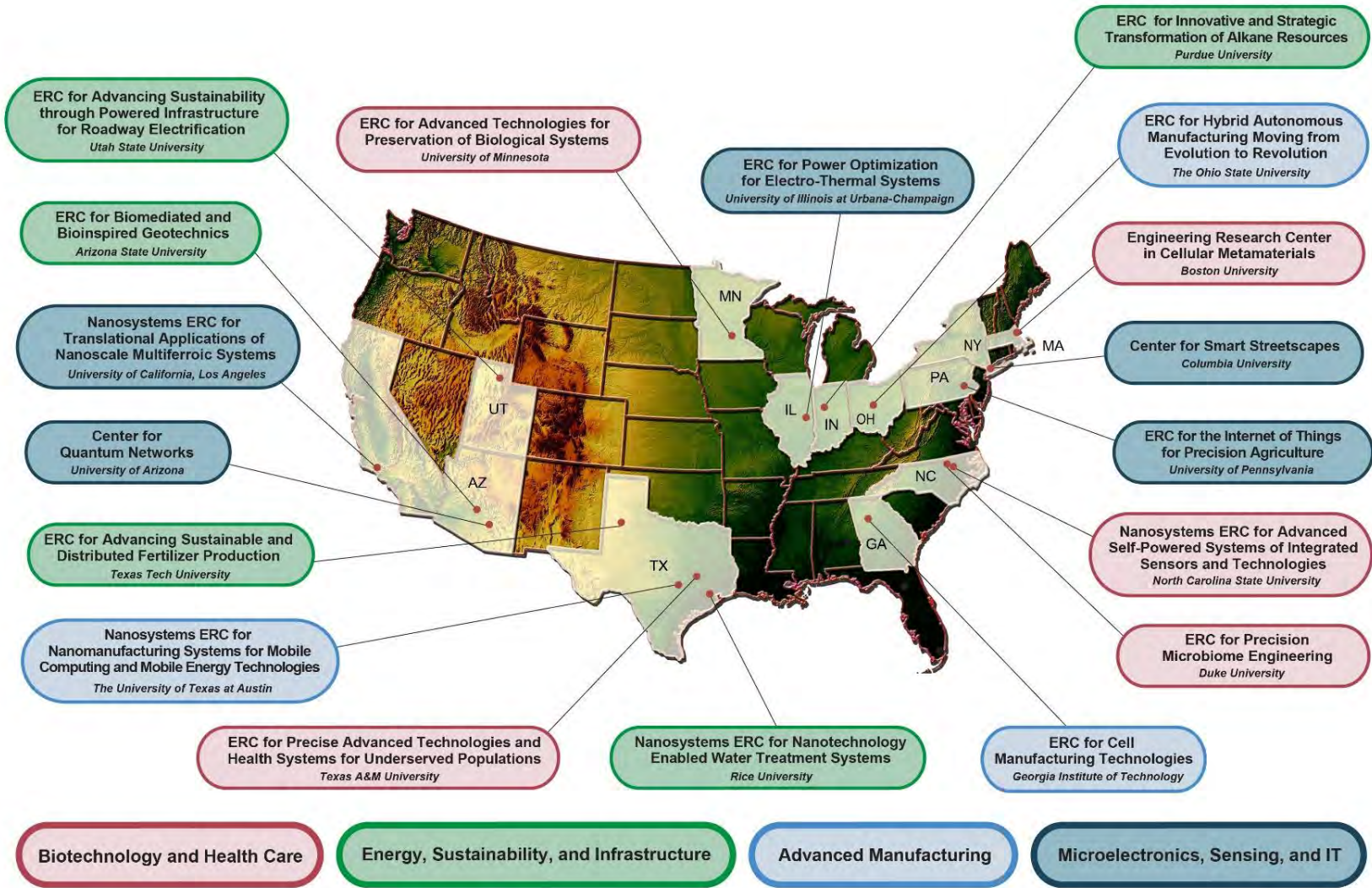
Total number of Project Investigators (PIs): 129



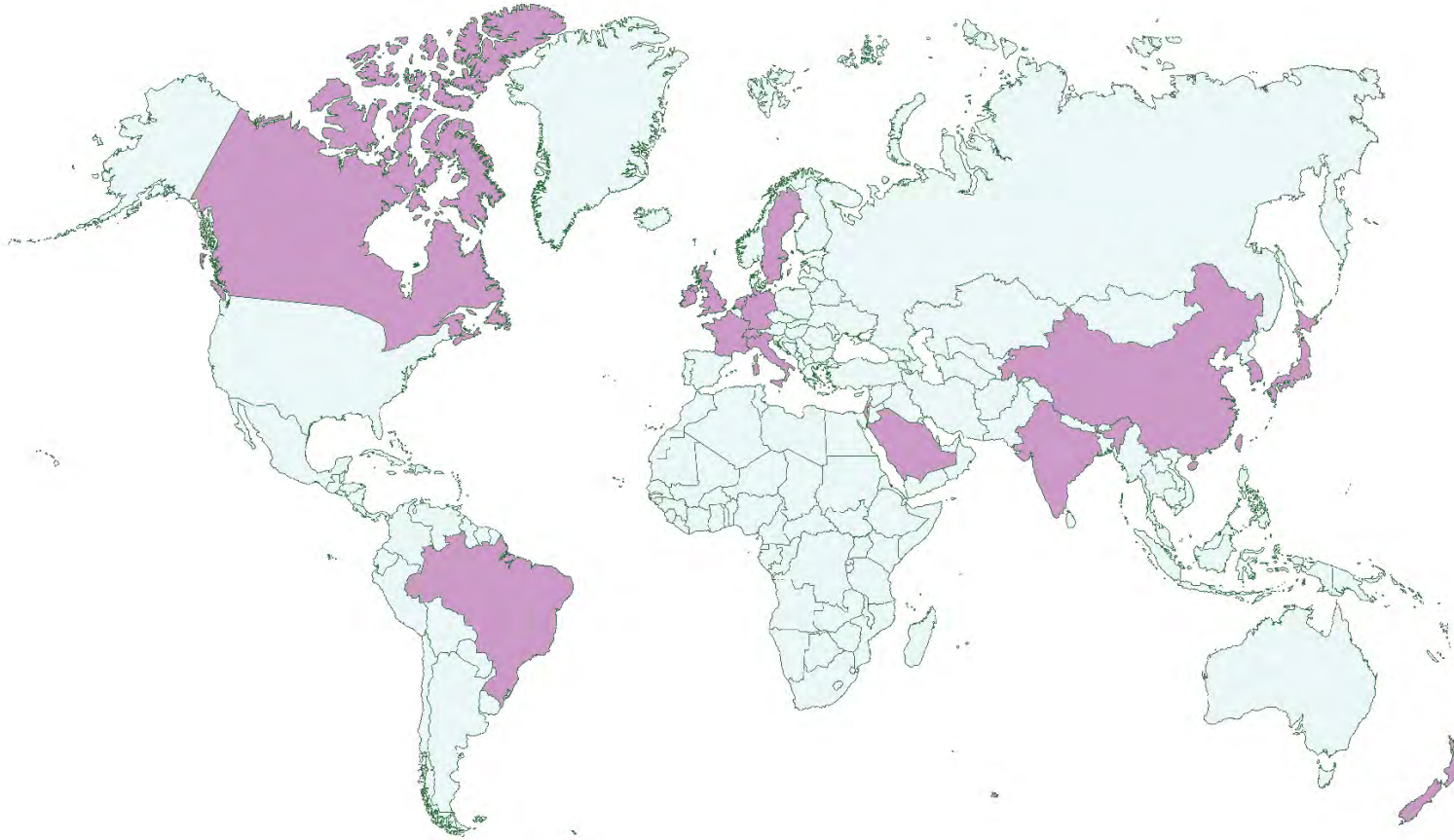
= Number of ERC personnel from this country  
 1 person  
 2-10 people  
 11+ people

\* Number of ERC personnel who are foreign and did not provide a country name

1 person			2-10 people						11+ people		11+ people	
Afghanistan	Bhutan	Nicaragua	Argentina (3)	Ethiopia (2)	Ireland (3)	New Zealand (5)	Saudi Arabia (3)	Venezuela (5)	Bangladesh	29	South Korea	36
Antigua and Barbuda	Bulgaria	Portugal	Australia (3)	France (8)	Italy (5)	Pakistan (10)	Serbia (3)	Vietnam (6)	China	148	Taiwan	15
	Chile	Republic of the Congo	Bolivia (3)	Germany (6)	Jamaica (2)	Panama (3)	South Africa (2)		Colombia	18	Turkey	11
Azerbaijan	Hong Kong	Slovenia	Brazil (10)	Ghana (7)	Japan (4)	Peru (4)	Spain (5)		India	123		
Bahamas, The	Libya	Trinidad and Tobago	Canada (6)	Greece (9)	Jordan (2)	Philippines (2)	Sri Lanka (7)		Iran	36		
Bahrain	Mongolia		Costa Rica (2)	Honduras (3)	Lebanon (9)	Poland (2)	Thailand (2)		Mexico	25		
Belarus	Morocco		Ecuador (6)	Hungary (2)	Nepal (3)	Russia (2)	Ukraine (2)		Nigeria	15	Country Not Reported	22*
Belgium	Mozambique		Egypt (4)	Indonesia (2)	Netherlands (3)	Rwanda (2)	United Kingdom (5)					



Note: All centers are multi-university partnerships; university shown is lead institution.


**Countries with 1- 20 collaborators**

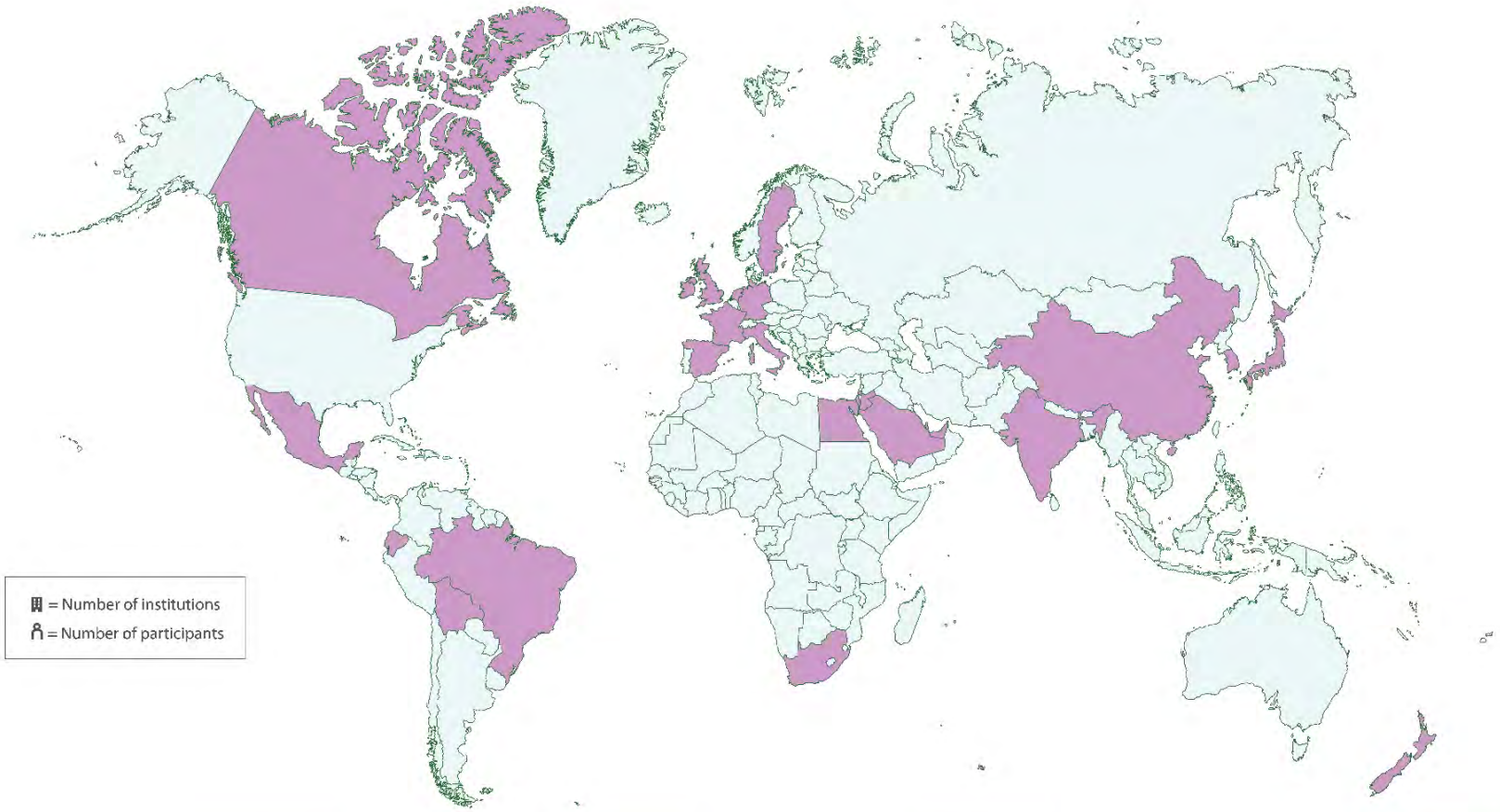
Brazil (2)	Italy (1)	Taiwan (2)
Canada (3)	Japan (5)	United Kingdom (7)
China (1)	Netherlands (3)	
France (2)	New Zealand (1)	
Germany (6)	Saudi Arabia (1)	
India (1)	South Korea (2)	
Ireland (1)	Sweden (1)	
Israel (2)	Switzerland (4)	

**Countries with 21- 40 collaborators**

No Countries Reported

**Countries with 41+ collaborators**

No Countries Reported

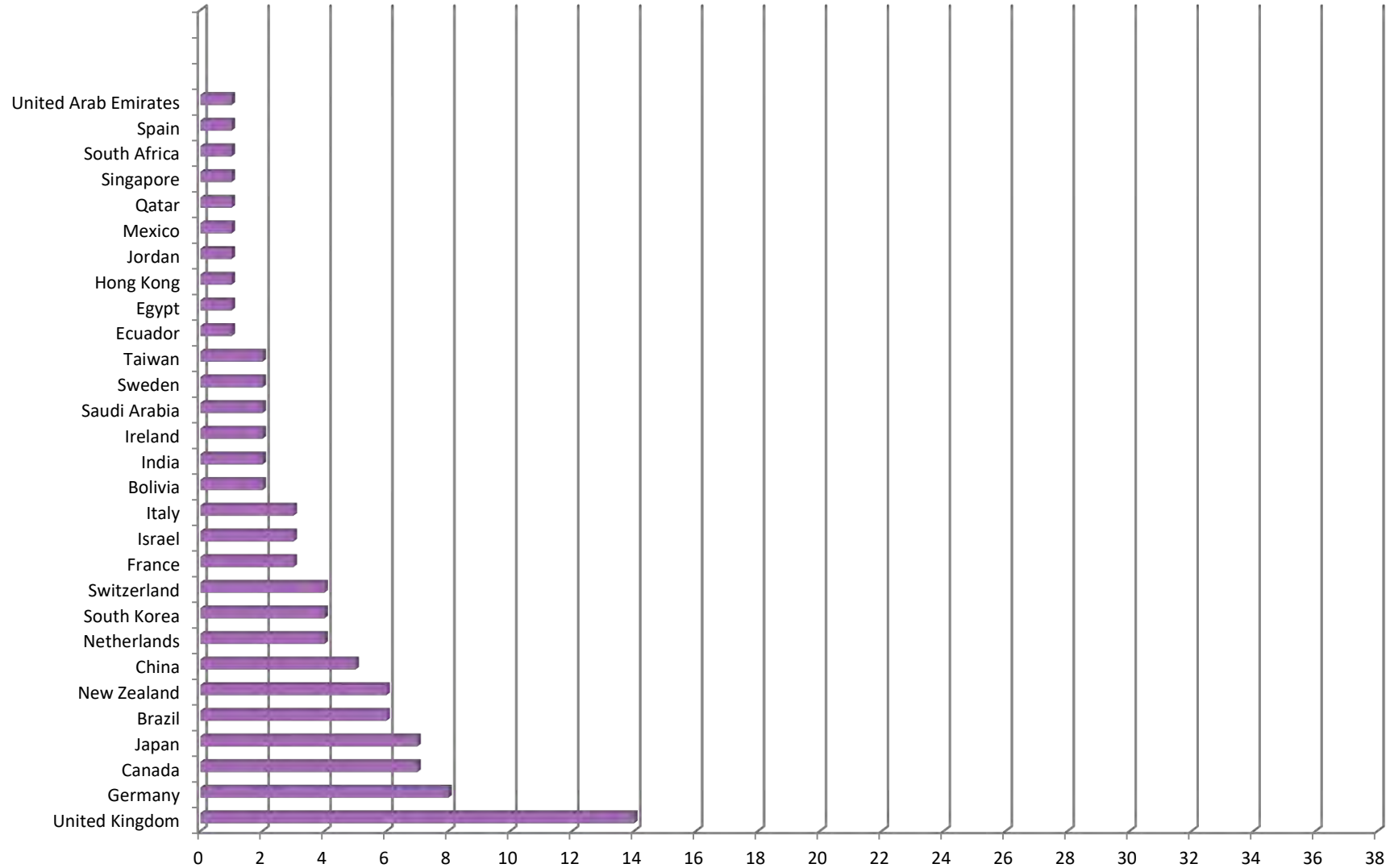


	🏢	👤
Bolivia	2	0
Brazil	4	1
Canada	4	5
China	4	2
Ecuador	1	1
Egypt	1	0
France	1	1
Germany	2	0

	🏢	👤
Hong Kong	1	0
India	1	1
Ireland	1	6
Israel	1	0
Italy	2	1
Japan	2	1
Jordan	1	0
Mexico	1	0

	🏢	👤
Netherlands	1	0
New Zealand	5	34
Qatar	1	0
Saudi Arabia	1	0
Singapore	1	0
South Africa	1	0
South Korea	2	3
Spain	1	1

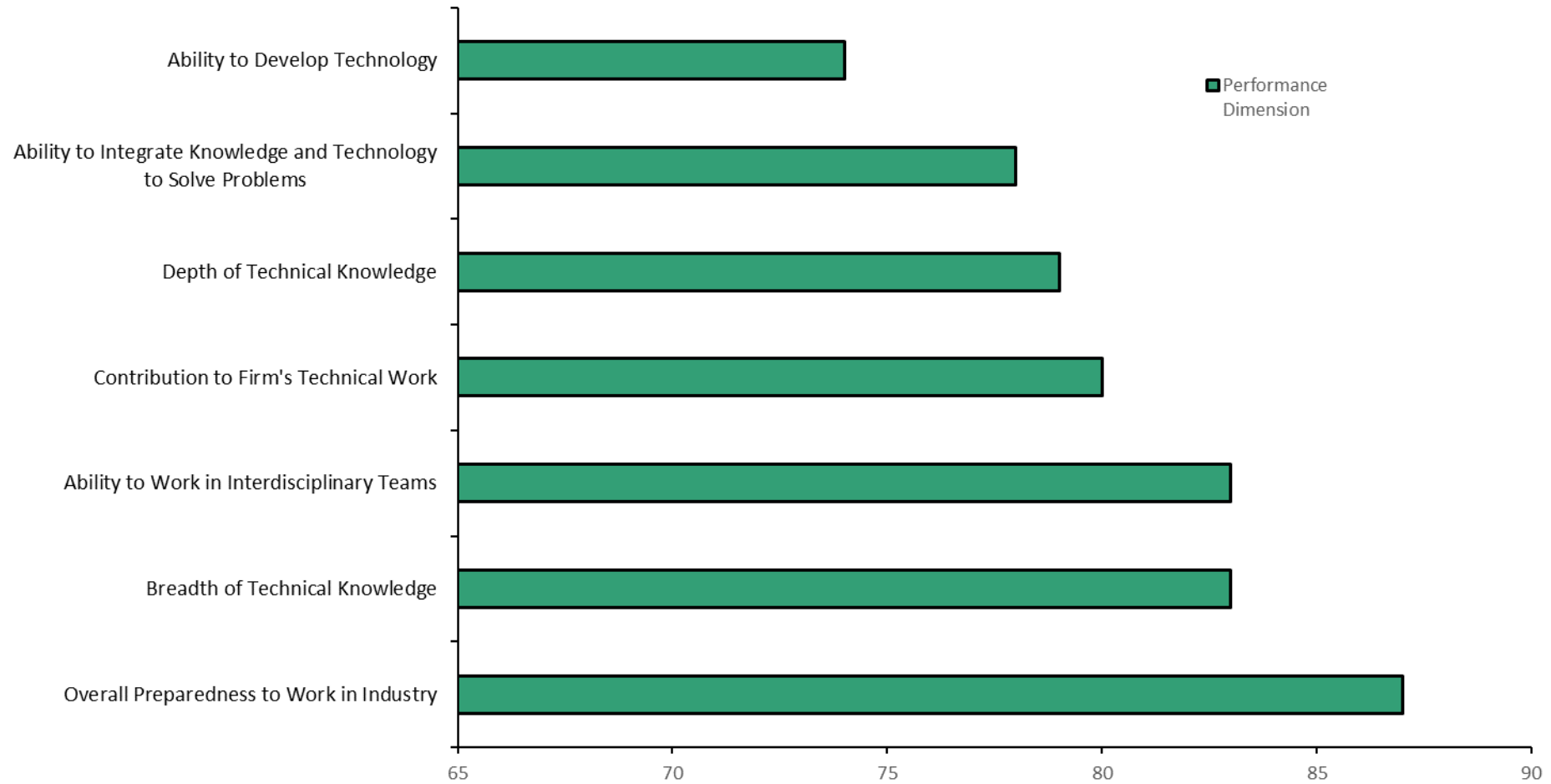
	🏢	👤
Sweden	1	1
United Arab Emirates	1	0
United Kingdom	7	4



\* Displays counts of Industrial/Practitioner members, Funders of Associated Projects, Funders of Sponsored Projects, Contributing Organizations, Collaborating Institutions, Non-ERC Institutions Providing REU Students, and Foreign Partner Institutions

\*\* Community college and Pre-college institutions are excluded

## Comparisons by Member Firms of the Performance of ERC Hires vs. Non-ERC Hires\*



\* Percentage of industrial supervisors rating the former ERC students/graduates hired by their firms as "Better Than" or "Much Better Than" equivalent hires without ERC experience