

Research Briefing

BACKGROUND

Oregon State University strives to be a leader in conducting research, producing knowledge and generating innovations that contribute to addressing global grand challenges, particularly in the university's three signature areas; training the next generation of scientists and scholars; and contributing to the economic growth and prosperity of Oregon and beyond.

This report summarizes the University's progress in reaching its research goals, describes special initiatives aimed at advancing the research enterprise, and discusses research-related opportunities and threats facing the institution.

RESEARCH AT OSU

Research activity at OSU is grounded in the colleges, schools and departments, and secondarily in the centers and institutes. A longstanding culture of low "disciplinary walls" and a high spirit of collaboration aid the work of our faculty, graduate students, postdoctoral scholars, and undergraduate students engaged in research. Indeed, our collaborative atmosphere is a key reason cited by faculty across a range of disciplines for coming to OSU.

The Research Office (RO) is the central arm of the university organized to support and enable faculty research. The office includes three functional areas:

- 1) The *Office of Sponsored Research and Award Administration (OSRAA)* supports the full lifecycle of research administration, including proposal submission, award negotiation and acceptance, and management and closeout of awards;
- 2) The *Office of Research Integrity* oversees compliance with federal, state and OSU regulations and policies, as well as with grant and contract obligations; and
- 3) The *Office for Commercialization and Corporate Development* develops intellectual property strategies, executes agreements with industry and entrepreneurs, and provides resources to support the launch of student and faculty led startups and the culture of innovation.

The RO also oversees the operations, strategy and central support funding of 19 centers, institutes, and core facilities. The RO has a small research and faculty development function to help meet SP4.0 strategic goals and partners with colleges in supporting this function.

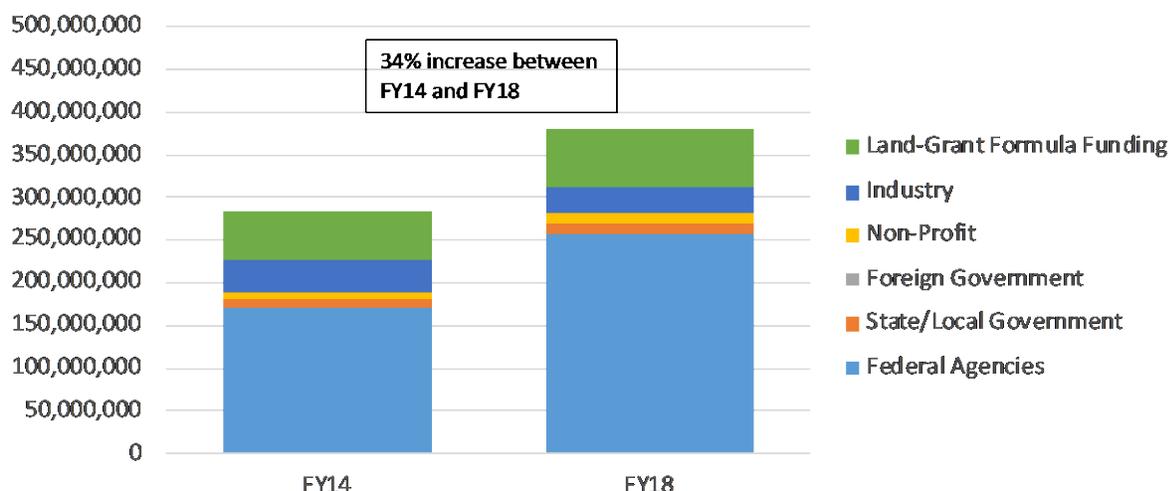
METRICS

There are several metrics by which we track our success in attracting funding, conducting research, and generating economic impact. Below is an analysis of these key metrics and associated data.

Research and Development Awards and Expenditures

OSU has seen increases in total research and development revenue over the past three fiscal years. As Figure 1 shows, research and development (R&D) revenue totals have increased by 34%. These totals include the National Science Foundation (NSF) regional ocean-going research vessel award of \$121M in FY2017 and \$88M in FY2018. (An additional \$88M has been booked in FY2019.)

Figure 1. FY2014 and FY2018 Research and Development Revenue by Sponsor Type – includes all financials directly and indirectly related to research.

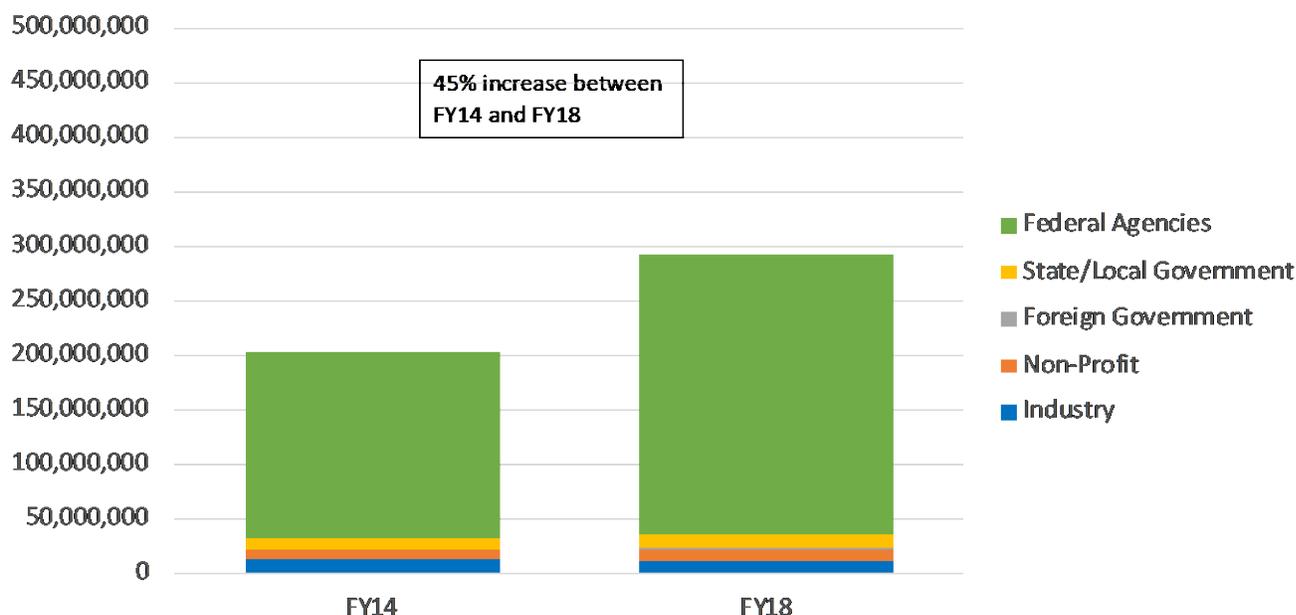


	FY14	FY18
Land-Grant Formula Funding	58,829,591	69,134,602
Industry	36,226,833	31,432,999
Non-Profit	8,550,522	11,737,836
Foreign Government	979,033	197,150
State/Local Government	9,485,376	12,677,044
Federal Agencies	170,547,940	256,450,159
TOTAL	284,619,295	381,629,790

Source: RO Annual Award Data. Note that this data includes sponsored project awards managed in the RO, as well as Foundation gifts, testing, licensing revenues in support of industry research, Federal and State Land-grant formula funding

Of these awards, the vast majority of the funding (88%) is awarded by federal agencies, with only 4% coming from industry and 4% from state/local government. Figure 2 shows awards that are directly related to sponsored research, broken down by sponsor type, totaling to \$292M for FY2018 (an increase of 45% when compared to FY2014). This illustrates OSU’s dependence on federal funding, and the need to diversify our funding portfolio in light of anticipated declines in federal funding.

Figure 2. FY2014 and FY2018 Sponsored Research Awards by Sponsor Type – includes all financials directly related to sponsored research



	FY14	FY18
Industry	13,021,239	11,520,493
Non-Profit	8,191,175	11,391,979
Foreign Government	979,033	197,150
State/Local Government	9,485,376	12,677,044
Federal Agencies	170,547,940	256,450,159
TOTAL	202,224,763	292,236,825

Source: RO Annual Award Data for awards resulting from proposal submissions

While federal funding will remain a primary source of research revenue, there is an opportunity to diversify the types of agencies from which we seek funding. Forty-five percent of our federal funding comes from the National Science Foundation (NSF). Note that OSU’s current funding rate with NSF is 10-15%, not including early career grants which have a higher approval rate. We are pursuing a number of strategies to diversify funding sources including:

1. Targeting agencies with increased funding such as Department of Defense and Department of Energy—from which we currently receive only 6% and 4% of our funding respectively—through strategic engagement and lobbying;
2. Devising strategies to obtain funding from health and medical-centric agencies such as National Institutes of Health (NIH); and,

3. Training our faculty to be successful in writing winning proposals and successfully engaging funding program directors.

Funding trends over the last five fiscal years by college—see Figure 3—indicate that the biggest performers are the College of Earth, Ocean, and Atmospheric Sciences (CEOAS); College of Agricultural Sciences; and the College of Engineering in terms of numbers of awards (or total dollars awarded).

Figure 3. FY2014 and FY2018 Research Awards and Expenditures per College

College*	FY14 Data			FY18 Data		
	T/TT**	Awards	Expenditures***	T/TT**	FY18 Awards	FY18 Expenditures***
Cascades Campus	19	1,312,216	772,575	18	906,468	1,040,900
Centers and Institutes	0	23,902,741	20,297,762	0	21,198,195	20,056,746
College of Agricultural Sciences	169	45,446,585	83,786,967	172	49,009,912	94,071,428
College of Business	47	1,670,808	1,119,523	52	(85,778)	88,263
College of Earth, Ocean and Atmospheric Science	77	41,488,436	40,999,854	75	120,217,246	59,766,469
College of Education	17	1,558,206	1,190,323	15	590,849	860,379
College of Engineering	142	38,193,403	30,579,942	167	37,570,247	45,209,228
College of Forestry	49	10,636,319	21,259,902	49	11,042,684	20,231,754
College of Liberal Arts	158	606,003	833,003	174	2,517,058	1,752,354
College of Pharmacy	25	3,899,708	1,873,138	24	4,913,235	6,226,288
College of Public Health and Human Science	55	16,361,632	15,894,978	61	20,334,912	20,401,084
College of Science	117	9,924,152	16,686,065	121	11,923,163	15,941,252
College of Veterinary Medicine	36	3,906,737	3,047,116	32	2,934,504	3,898,722
Total	911	202,224,763	238,341,148	960	292,236,825	289,544,869

*Non-academic units are excluded

**Tenured/Tenure Headcount

***Definition of Research Expenditures for these metrics:

All restricted funds administered by the Research Office (includes Other Sponsored Activities, as well as Federal and non-Federal Ag. Exp. Station and Forest Res. Lab)

Does not include endowments, gifts, construction, financial aid

Sources: Award and Expenditure Data from Research Office Annual Report; Tenured/Tenure-Track Faculty Headcount from Institutional Research

The amounts shown for the College of Earth, Ocean, and Atmospheric Sciences include the ship awards. When awards are normalized to the number of faculty per college, other colleges such as the colleges of Pharmacy, Forestry and Public Health and Human Sciences have a high research rate for faculty. In collaboration with the colleges, the Research Office will be working collaboratively with the colleges to increase opportunities for interdisciplinary collaborations that

will engage additional colleges, as well as train new faculty to be successful as quickly as possible with different types of sponsors.

Invention Disclosures

The university has not achieved the aspirational targets of SP3.0 in terms of invention disclosures. As shown in Figure 4, invention disclosures have increased by 15% over the last year but total only 78 compared to the SP3.0 target of 120. As of December 2018, 33 inventions have been reported. The RO has worked on several key actions that, given time, will support an increase in the next five years, including:

1. Offering programing in partnership with key colleges, such as innovation days and brown bags to promote resources and encourage participation;
2. Adding a simpler path for faculty to start a conversation about their options before and during their research, rather than submitting a full invention at the end of their research;
3. Re-assigning a staff member to focus on building engagement across the university and connecting faculty to programs and resources; and,
4. Leading efforts to advance the SP4.0 action to strengthen OSU's support system for innovation and entrepreneurship. One tactic in this action will be to incentivize faculty participation through the promotion and tenure process.

Licensing Revenues

While licensing revenue rose slightly to \$4.4M in FY2018, and as of December 12 stands at \$2.7M, it remains well below the SP3.0 target of \$10.9M (Figure 4). Licensing revenue leveraged per appropriated dollar for the statewide public service programs has fallen from a high ratio of 2.92 in FY2012 to 2.12 in FY2018, well below the goal of 3.0. However, licensing revenue should be normalized with research expenditures and viewed as an average over a five-year period. Viewed in this manner, OSU continues to excel in translating licenses into revenues, providing an average of 2.4% over five years, well above the national average of approximately 1%.

Industry Sponsored Research

The data in Figure 4 indicate that industry sponsored research has been relatively flat over the last five years. SP4.0 includes an action that will prioritize development of a university-wide industry relations strategy and associated implementation plan to grow this effort. The strategy will focus on growing industry sponsored research, increasing internships and connections for students, enhancing industry access to services and testing, and cultivating gifts.

Figure 4. FY2014-18 Inventions, Licensing Revenues, and Industry Sponsored Research Awards by College

Invention Disclosures	FY14	FY15	FY16	FY17	FY18	Total
Agricultural Sciences	16.5	16.0	16.1	14.0	20.5	83.1
Business	0.0	0.0	0.3	0.0	0.0	0.3
Earth, Ocean and Atmospheric Sciences	1.0	0.0	2.6	1.0	1.0	5.6
Education	0.0	1.0	1.0	0.0	0.0	2.0
Engineering	23.0	25.5	23.8	35.0	32.5	139.8
Forestry	2.5	4.5	3.5	3.0	2.5	16.0
Liberal Arts	0.0	0.0	0.3	0.0	0.0	0.3
Pharmacy	4.0	11.0	8.0	6.0	7.5	36.5
Public Health and Human Sciences	0.0	4.0	0.0	1.0	2.0	7.0
Science	13.5	8.0	11.0	7.0	8.0	47.5
Veterinary Medicine	1.5	2.0	3.5	1.0	3.0	11.0
Other (C&I)	0.0	0.0	0.0	0.0	1.0	1.0
Total	62.0	72.0	70.0	68.0	78.0	350.0
Licensing Revenue	FY14	FY15	FY16	FY17	FY18	Total
Agricultural Sciences	\$ 2,944,624	\$ 2,674,061	\$ 2,926,233	\$ 2,110,811	\$ 2,330,306	\$ 12,986,034
Business	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Earth, Ocean and Atmospheric Sciences	\$ 26,893	\$ 21,347	\$ 35,400	\$ 24,623	\$ 15,933	\$ 124,196
Education	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Engineering	\$ 1,556,512	\$ 6,313,124	\$ 345,973	\$ 830,597	\$ 1,253,911	\$ 10,300,117
Forestry	\$ 718,045	\$ 630,689	\$ 676,769	\$ 773,634	\$ 100,034	\$ 2,899,171
Liberal Arts	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Pharmacy	\$ 208,276	\$ 226,699	\$ 337,851	\$ 134,222	\$ 300,348	\$ 1,207,396
Public Health and Human Sciences	\$ 2,035	\$ 4,010	\$ 8,287	\$ 9,583	\$ 7,534	\$ 31,449
Science	\$ 425,920	\$ 312,026	\$ 135,816	\$ 121,379	\$ 157,956	\$ 1,153,096
Veterinary Medicine	\$ -	\$ 3,000	\$ -	\$ -	\$ 5,000	\$ 8,000
Other (C&I)	\$ 55,960	\$ 108,185	\$ 678,108	\$ 73,403	\$ 230,166	\$ 1,145,822
Total	\$ 5,938,265	\$ 10,293,140	\$ 5,144,438	\$ 4,078,251	\$ 4,401,187	\$ 29,855,281
Industry Sponsored Research	FY14	FY15	FY16	FY17	FY18	Total
Agricultural Sciences	\$ 3,026,639	\$ 743,212	\$ 969,661	\$ 719,221	\$ 677,537	\$ 6,136,270
Business	\$ 559,428	\$ 35,775	\$ 58,507	\$ -	\$ -	\$ 653,710
Earth, Ocean and Atmospheric Sciences	\$ 70,814	\$ 256,491	\$ 361,312	\$ 181,897	\$ -	\$ 870,514
Education	\$ -	\$ -	\$ -	\$ -	\$ 20,000	\$ 20,000
Engineering	\$ 2,075,776	\$ 4,195,034	\$ 4,327,015	\$ 3,813,492	\$ 3,262,488	\$ 17,673,805
Forestry	\$ 66,250	\$ 194,912	\$ 36,987	\$ 225,199	\$ 99,749	\$ 623,097
Liberal Arts	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Pharmacy	\$ 701,406	\$ 465,998	\$ 273,977	\$ 1,040,034	\$ 16,153	\$ 2,497,568
Public Health and Human Sciences	\$ 26,946	\$ 15,000	\$ 44,000	\$ 83,600	\$ 49,179	\$ 218,725
Science	\$ 123,844	\$ 95,004	\$ 23,828	\$ 216,556	\$ 287,489	\$ 746,721
Veterinary Medicine	\$ 80,651	\$ 158,447	\$ 433,517	\$ 816,501	\$ 512,852	\$ 2,001,968
Other (C&I)	\$ 503,039	\$ 1,032,523	\$ 1,185,981	\$ 990,090	\$ 411,502	\$ 4,123,135
Total	\$ 7,234,792	\$ 7,192,396	\$ 7,714,785	\$ 8,086,590	\$ 5,336,949	\$ 35,565,512

SPECIAL INITIATIVES & PROJECTS

To advance the university's research endeavors, OSU is prioritizing the following actions in 2019:

1. Reviewing Research Office processes and procedures to ensure unnecessary administrative burdens on faculty are minimized;
2. Reviewing centers and institutes to assess their impact, efficiency and relevance to SP4.0 goals, working with the Academic Strategies Committee as appropriate;
3. Reviewing the condition of OSU research facilities and informing the work of the Infrastructure Working Group and the allocation of any available facility improvement funds, with the aim of attracting and retaining top faculty; and
4. Determining ways to increase our economic impact through industry partnerships and innovation, shifting away from licensing revenue as a driving metric to a broader set of measures that takes into account the full breadth of contributions to economic development and other societal benefits.

Review of Research Office Processes, Policies and Efficiencies

In fall 2018, the RO began benchmarking its structure and operations against peers, gathering input from RO staff and university stakeholders, and reviewing feedback on the OSU research enterprise assembled through the SP4.0 development process. This effort is ongoing, but results thus far are suggesting a number of ways faculty can be better supported in their research activities.

An area of particular concern identified by faculty is growing administrative burden around compliance, both due to the increasing number of federal regulations and the implementation of those regulations by the Research Office and other university entities. For example, there are over 70 federal regulations governing federal research funding, and the number continues to increase. The RO has implemented a few changes over the last several years to mitigate the compliance burden, but there is more that can be done. One challenge is that the RO has tended to take a very risk-averse approach to compliance, placing a heavy burden on faculty and potentially reducing contracts and grants activity. The preliminary assessment suggests there is room for more balance. Advisory groups composed of faculty, research administrators, and business center staff affiliated with the colleges have been formed to work with the three main functions of the Research Office to review processes and look for ways to introduce appropriate flexibility in interpreting the regulations and compliance options. Throughout this process, the RO will consult with the Office of General Counsel and the Director of Compliance, who have been supportive of the project's goals.

Review of Centers and Institutes

There are 19 university centers and institutes at OSU, including the Center for Genome Research and Biocomputing, the Center for the Humanities, the Center for Lifelong STEM Learning, the Hatfield Marine Science Center, and the Institute for Natural Resources, the Institute for Water and Watersheds, and the Linus Pauling Institute.

These centers and institutes are established to provide students and faculty unique opportunities to build collaborations, conduct interdisciplinary research, and attract extramural support. To date, the centers and institutes have been reviewed only occasionally and intermittently. In addition to centers and institutes, core facilities provide the spaces and labs to conduct cutting-edge research and enable student and faculty success.

Beginning in 2019, to ensure resources are being used effectively to advance the university's research enterprise and the goals of SP4.0, all centers, institutes and core facilities will be subject to rigorous, periodic reviews. The results of these careful assessments of goals, strategies, and accomplishments will inform resource allocation decisions and investments going forward.

Review of Research Facilities

The condition of many of OSU's research laboratories and facilities threatens to limit the faculty's research productivity and funding. However, we are making progress on addressing the problem. The renovation of Cordley Hall will significantly improve research space for the biological sciences for both the College of Science and College of Agricultural Sciences. The purchase of the 103,000 square-foot Research Way building as swing space for the Cordley Hall renovation will facilitate other future research building renovations on campus, as well as provide excellent, long-term research space. It will also result in approximately \$70M in savings compared to constructing a new building.

A fire in Burt Hall 2 in November 2018 impacted about 20,000 ft² of teaching and research space. Remediation is underway from smoke and water damage and restoration and remediation is expected to take one year. As a result, about 40 CEOAS faculty members and 10 laboratories have been relocated.

The Marine Studies Building will add state-of-the-art research space to OSU, as will the Oregon Quality Food and Beverage Center, if the project is realized.

The new STEM buildings envisioned in Ten-Year Capital Forecast will allow decommissioning and demolition of unrenovable research facilities, including our 90-year old chemistry building (Gilbert Hall). Developing the philanthropic support and other funding sources for these new buildings is a critical priority.

Strategy for Advancing Innovation-based Economic Development

It is part of OSU's mission to advance economic prosperity and social progress in Oregon and beyond. The Research Office provides leadership in advancing the university's economic development and innovation goals. Continuing work begun in 2018, the RO will work with stakeholders across the university to develop an innovation and entrepreneurship strategy for OSU. The aim is to maximize OSU's societal impact by attracting and retaining impact-driven faculty and students, and increasing use-inspired research and opportunities for commercialization.

The RO will also partner with the OSU Foundation and college leadership to retool OSU's approach to university-industry engagement. Through this effort, industry will gain better access

to a pool of talented career-ready graduates and our world-class faculty, research capabilities, facilities, and innovations.

Specific objectives, actions, an organizational structure and communications strategy will be developed and refined for successful implementation.

OPPORTUNITIES AND THREATS

Growing our research funding to sustain excellence requires an assessment and monitoring of trends or events that might hinder efforts and actions that counter those threats. The following is a summary of the main threats we are tracking and the strategies we are pursuing to address them.

Threat: *Increased competition for federal and state funding.*

Strategies:

- Target heavily funded agencies (e.g., Department of Defense—DOD, Department of Energy—DOE) and agencies we do not engage (e.g., National Institutes of Health—NIH) more aggressively through lobbying firm partnership to diversify funding portfolio.
- Explore ways to increase our competitiveness for DOD classified research funding opportunities.
- Have industry sponsored research embedded in OSU's SP4.0 to retool our approach and broaden our objectives.
- Target Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs (one of the largest sources of early-stage capital for technology commercialization) to advance economic development.
- Better align centers and institutes goals to open up new opportunities to go after interdisciplinary funding via collaborative teams.

Threat: *Lack of capacity for doing upfront proposal development work and supporting large collaborations and collaborative teams.*

Strategies:

- Establish a process and build RO capacity to support proactive research development, to open up new funding opportunities (getting ahead of the game) and help expose federal agencies (especially for DOD and NIH) to our faculty and OSU.
- Establish a process and incentives with the colleges to help facilitate sharing of increasingly limited resources and strengthening OSU's collaborative environment by stimulating cross-college, interdisciplinary, and high dollar research funding.
- Engage our federal lobbying firm to strengthen OSU's visibility among federal agencies.

Threat: *Lack of a holistic innovation-based economic development strategy focused on turning knowledge into value for the state of Oregon and beyond.*

Strategies:

- Work with the colleges to collectively invest in industry relationship building.
- Explore the possibility of hiring of an OSU Foundation industry relations director.
- Embed and incentivize an innovation and entrepreneurial culture throughout OSU.
- Collaborate with the Office of the Provost on the SP4.0 action to review and revise promotion and tenure criteria.

Threat: *Disparities in our research ambition and the quality of our research infrastructure resulting in recruitment and retention issues for the most sought after researchers.*

Strategies:

- Improve research space for the colleges of Science and Agricultural Sciences through the renovation of Cordley Hall.
- Rethink current space needs for CEOAS in light of the recent fire in Burt Hall.
- Engage in targeted fundraising to add new state-of-the-art facilities.

Threat: *Increasing administrative demands due to stricter federal regulations.*

Strategies:

- Form advisory groups to review processes and regulations for the main RO functions, to identify areas where processes can be simplified or streamlined.
- Partner with the Office of Audit, Risk and Compliance, the Division of Finance and Administration, and the Office of General Counsel to monitor and appropriately address Federal regulatory requirements.
- Train and benchmark with other universities to determine best practices on how to devise processes that are efficient and flexible while making sure they comply with regulations.