ANNUAL RESEARCH REPORT
FY 2014
July 1, 2013 – June 30, 2014

BOARD OF Regents ARIZONA'S PUBLIC UNIVERSITIES

EDUCATE · DISCOVER · IMPACT

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Much of the innovation that improves people's lives springs from university research and Arizona's public universities are critical incubators for such research and activity.

The body of knowledge created by university research can be measured in part by inventions, patents and start-up companies, all of which fuel the private sector and translate into jobs – high-paying, high-skill jobs.

The Arizona Board of Regents has defined several key measures to evaluate the growth of its research enterprise in the university system and it continues to make steady progress.

Through research activity at the universities, millions of dollars are reinvested annually into the community. In 2014, Arizona's public universities brought in more than $1 billion in research expenditures, dollars that drive purchases and employment within Arizona. Research activity also directly resulted in 24 different startup companies, over 470 invention disclosures, 84 U.S. patents issued, and public-private partnerships which will help fuel Arizona's economy going forward.

Increasing the research capabilities and performance of the Arizona University System to a level of competitive prominence with peer rankings of top American research universities is a significant part of the regents' overarching goal to contribute to the vitality of Arizona's future.

The information in this report demonstrates that the discovery and innovation taking place at Arizona's public universities is expanding and that translates to more discoveries, a better quality of life for Arizonans, and more jobs for the State.

BOARD OF Regents ARIZONA'S PUBLIC UNIVERSITIES ®

EDUCATE · DISCOVER · IMPACT

Introduction

The Report's Design

This report provides an in-depth and comprehensive review of Arizona's higher education research enterprise. It is designed to allow the reader to easily locate any single research metric or indicator for any of Arizona's three public universities and quickly compare each Arizona university's performance against those of its Board-approved peers.

The metrics are categorized into five areas for each university:

- Enterprise size
- Discovery and scholarly impact
- Economic development
- Leadership and recognition
- Technology transfer activity

A review of the metrics in these five areas will provide the reader with a better understanding of the progress being made by Arizona's public universities toward creating new knowledge, finding solutions for challenges in Arizona and worldwide, and creating economic opportunity for the state.

The final section, Strategic Initiatives, provides a glimpse into the impact of Technology Research Initiative Fund (TRIF) investments. The full Annual TRIF report can be found on the Regents' website.

ASU Arizona State University

Northern Arizona University

The University of Arizona

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BOARD OF Regents ARIZONA'S PUBLIC UNIVERSITIES

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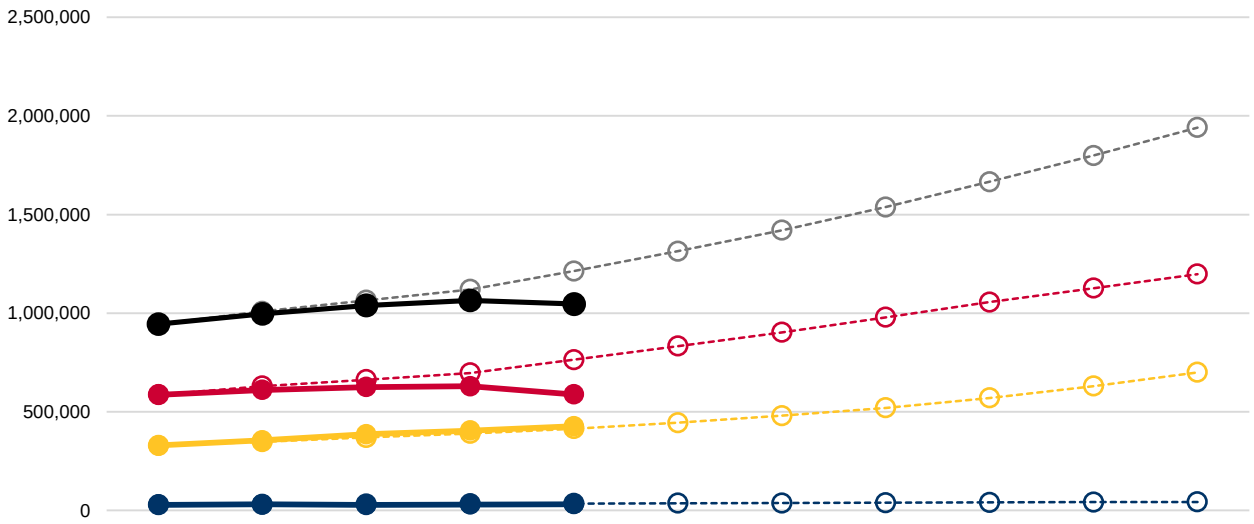
Enterprise Metrics

Enterprise Size

Total Research Expenditures (in Thousands)



ABOR Enterprise Plan	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	945,080	1,009,276	1,065,160	1,120,569	1,213,978	1,314,387	1,420,796	1,538,205	1,666,614	1,799,023	1,941,432
Actual	944,795	996,565	1,039,424	1,065,136	1,046,329						
Difference	-285	-12,711	-25,736	-55,433	-167,649						

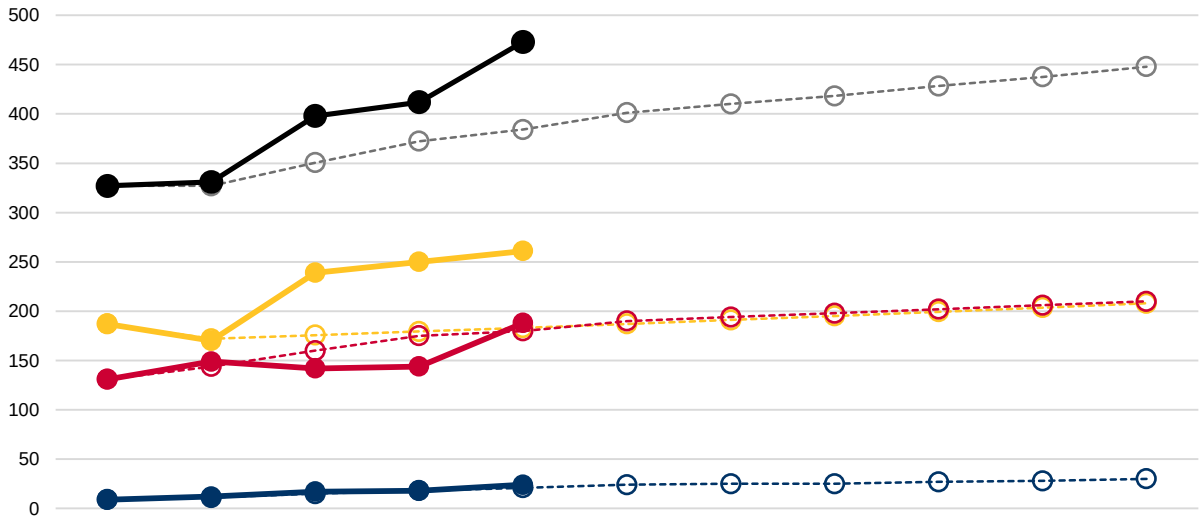
Arizona State University	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	329,345	348,525	370,000	390,000	415,000	445,000	480,000	520,000	570,000	630,000	700,000
Actual	329,345	355,215	385,959	405,154	426,651						
Difference	0	6,690	15,959	15,154	11,651						

Northern Arizona University	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	28,803	30,751	32,160	33,569	34,978	36,387	37,796	39,205	40,614	42,023	43,432
Actual	28,803	30,785	28,100	30,516	31,590						
Difference	0	34	-4,060	-3,053	-3,388						

The University of Arizona	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	586,932	630,000	663,000	697,000	764,000	833,000	903,000	979,000	1,056,000	1,127,000	1,198,000
Actual	586,647	610,565	625,365	629,466	588,088						
Difference	-285	-19,435	-37,635	-67,534	-175,912						

Discovery and Scholarly Impact

Invention Disclosures Transacted



ABOR Enterprise Plan	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	327	327	351	372	384	401	410	418	428	438	448
Actual	327	331	398	412	473						
Difference	0	4	47	40	89						

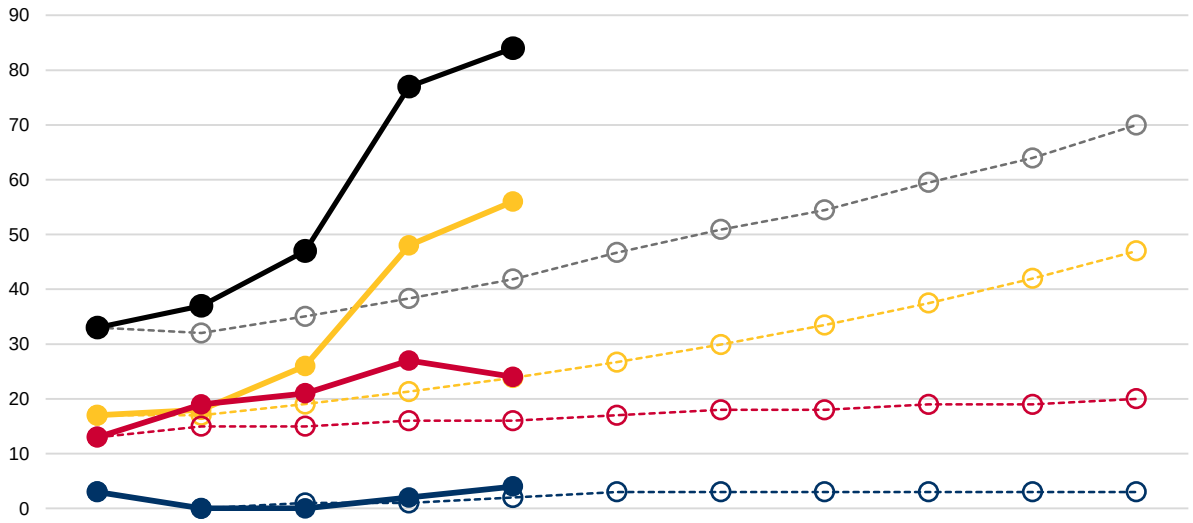
Arizona State University	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	187	172	176	179	183	187	191	195	199	204	208
Actual	187	170	239	250	261						
Difference	0	-2	63	71	78						

Northern Arizona University	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	9	11	15	18	21	24	25	25	27	28	30
Actual	9	12	17	18	24						
Difference	0	1	2	0	3						

The University of Arizona	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	131	144	160	175	180	190	194	198	202	206	210
Actual	131	149	142	144	188						
Difference	0	5	-18	-31	8						

Discovery and Scholarly Impact

U.S. Patents Issued



ABOR Enterprise Plan	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	33	32	35	38	42	47	51	54	59	64	70
Actual	33	37	47	77	84						
Difference	0	5	12	39	42						

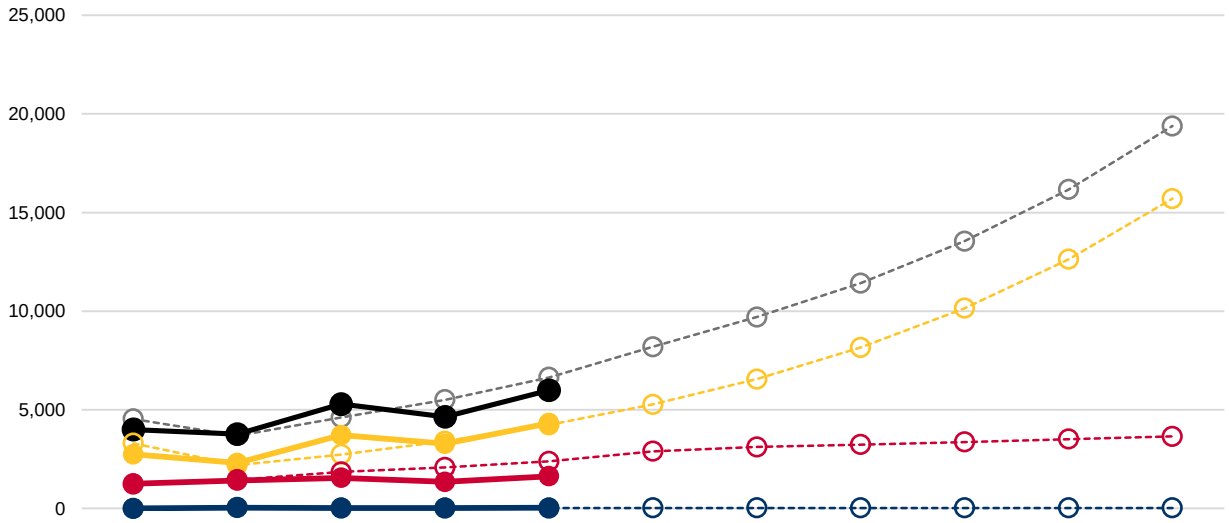
Arizona State University	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	17	17	19	21	24	27	30	33	37	42	47
Actual	17	18	26	48	56						
Difference	0	1	7	27	32						

Northern Arizona University	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	3	0	1	1	2	3	3	3	3	3	3
Actual	3	0	0	2	4						
Difference	0	0	-1	1	2						

The University of Arizona	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	13	15	15	16	16	17	18	18	19	19	20
Actual	13	19	21	27	24						
Difference	0	4	6	11	8						

Economic Development

Intellectual Property Income (in Thousands)



ABOR Enterprise Plan	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	4,533	3,690	4,607	5,506	6,647	8,193	9,700	11,422	13,544	16,164	19,389
Actual	4,003	3,764	5,288	4,645	5,988						
Difference	-530	74	681	-861	-659						

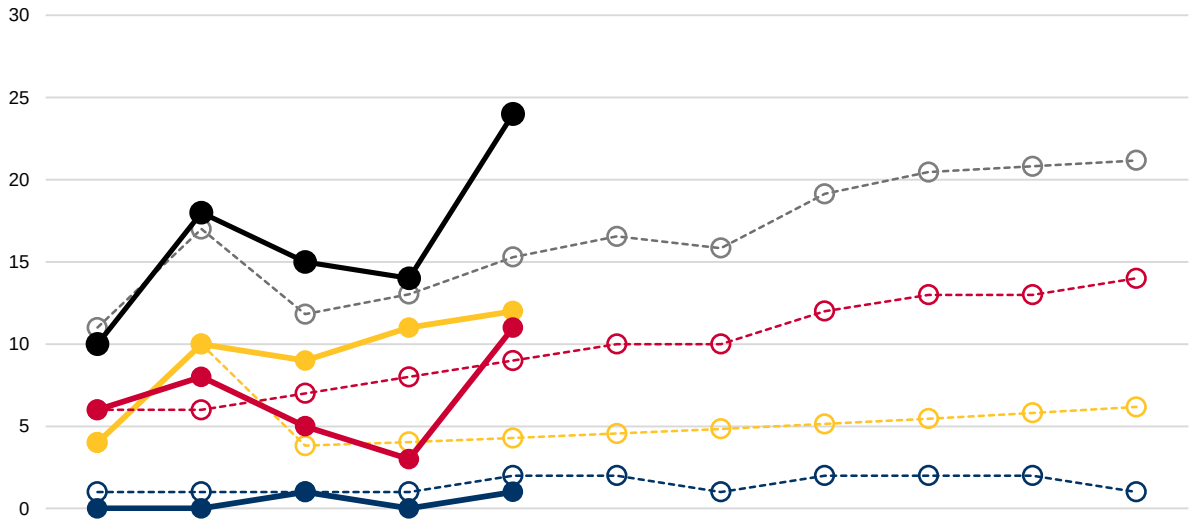
Arizona State University	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	3,300	2,200	2,737	3,405	4,236	5,271	6,557	8,158	10,149	12,627	15,709
Actual	2,742	2,307	3,716	3,275	4,328						
Difference	-558	107	979	-130	92						

Northern Arizona University	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	3	40	20	21	21	22	23	24	25	27	30
Actual	3	43	22	25	32						
Difference	0	3	2	4	11						

The University of Arizona	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	1,230	1,450	1,850	2,080	2,390	2,900	3,120	3,240	3,370	3,510	3,650
Actual	1,258	1,414	1,550	1,345	1,628						
Difference	28	-36	-300	-735	-762						

Economic Development

Startup Companies



ABOR Enterprise Plan	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	11	17	12	13	15	17	16	19	20	21	21
Actual	10	18	15	14	24						
Difference	-1	1	3	1	9						

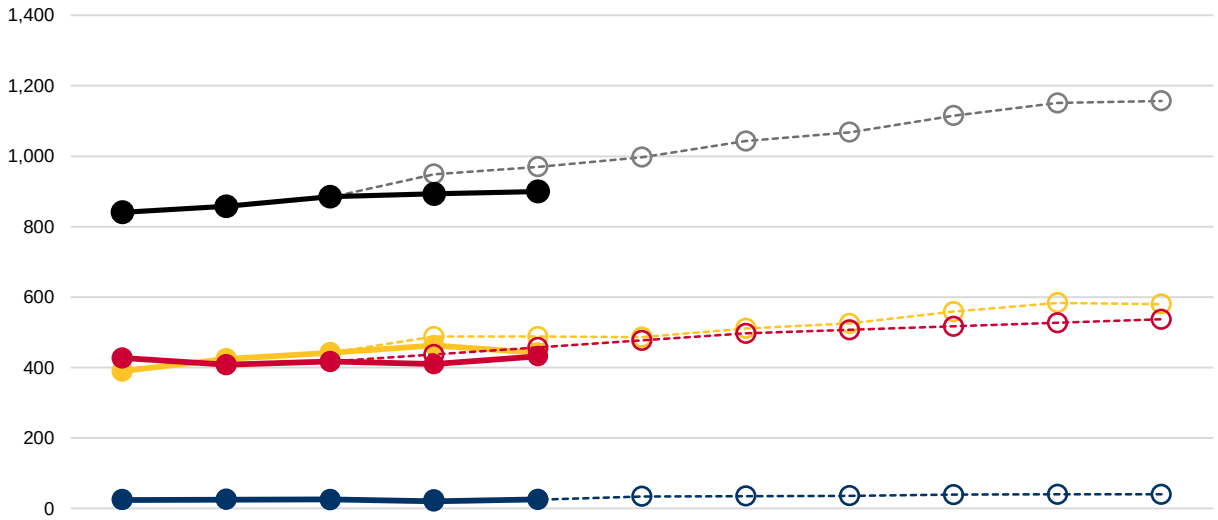
Arizona State University	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	4	10	4	4	4	5	5	5	5	6	6
Actual	4	10	9	11	12						
Difference	0	0	5	7	8						

Northern Arizona University	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	1	1	1	1	2	2	1	2	2	2	1
Actual	0	0	1	0	1						
Difference	-1	-1	0	-1	-1						

The University of Arizona	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	6	6	7	8	9	10	10	12	13	13	14
Actual	6	8	5	3	11						
Difference	0	2	-2	-5	2						

Economic Development

Ph.D. Degrees Conferred



ABOR Enterprise Plan	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	842	859	883	949	970	997	1,043	1,068	1,115	1,151	1,157
Actual	841	858	885	893	900						
Difference	-1	-1	2	-56	-70						

Arizona State University	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	390	425	442	488	488	486	511	525	559	584	580
Actual	390	425	442	463	442						
Difference	0	0	0	-25	-46						

Northern Arizona University	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	25	26	24	24	25	34	35	36	39	40	40
Actual	24	25	26	20	26						
Difference	-1	-1	2	-4	1						

The University of Arizona	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Goal	427	408	417	437	457	477	497	507	517	527	537
Actual	427	408	417	410	432						
Difference	0	0	0	-27	-25						

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Annual Research Report - FY2014

Introductory Letter

Arizona State University (ASU) has had another impressive year of growth in research and discovery, **exceeding $426 million in research expenditures** in fiscal year 2014 (FY14). Since 2002, our research expenditures have more than tripled, making our research enterprise one of the fastest growing among universities that have more than $100 million in research expenditures. Technology transfer and entrepreneurship activities have resulted in over 70 companies, attracting more than $425 million in investment.

This sustained achievement is aligned with the university's charter, which states our commitment to being a comprehensive public research university measured not by whom we exclude, but rather by whom we include and how they succeed; advancing research and discovery of public value; and assuming fundamental responsibility for the economic, social, cultural and overall health of the communities we serve.

ASU engages students, faculty and community in use-inspired, multidisciplinary research. We build on ASU's competitive positioning to drive economic development and take pride in our critical role in advancing the Arizona economy. Each year ASU faculty and researchers advance discoveries and develop solutions that translate into tangible impacts in the marketplace. This results in positive economic impact and recognition for our state. ASU is ranked as **4th in patents among institutions without a medical school** as well as **one of the top 10 universities in technology transfer.** This accomplishment puts us among a select group of leading research universities.

This year ASU celebrates a 20-year legacy of accomplishments as a Research I university, a distinction conferred by the Carnegie Foundation for the Advancement of Teaching. This designation ranks ASU among a distinguished group of universities for the volume and quality of our research efforts. Our faculty have made significant contributions that have helped us understand our world and universe, from the origins of humankind to the surface of Mars. They have achieved this while also focusing on unparalleled excellence at scale in serving ASU's growing student population.

This success demonstrates our commitment to excellence, access and impact. Looking ahead to the next 20 years, we will accelerate our trajectory of enterprise advancement as our faculty discover and create solutions that materially impact a broad spectrum of fields, including the health, security and sustainability of the human race.

Sincerely,

Sethuraman "Panch" Panchanathan
Senior Vice President of Knowledge Enterprise Development

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Enterprise Size

As the New American University, ASU has built its research enterprise on the principles of conducting transdisciplinary, use-inspired and socially embedded research. ASU not only continues to be one of the fastest growing research enterprises among U.S. universities but also remains nimble and responsive to emerging research and economic development opportunities.

As a result of our consistent achievements and efforts, the research enterprise continues to make significant progress towards achieving our goal of $700 million in research expenditures by 2020.

Total research volume, proposal submissions and extramural awards in FY14 testify to our progress:

- $426.7 million in total research expenditures
- Proposal submissions exceeded $1.6 billion, representing a 34% increase over FY13

ASU continues to be ranked among the top U.S. universities for total research expenditures in the most recent National Science Foundation Higher Education Research and Development survey. This includes exemplary rankings such as:

- 8th in social sciences, which ranks higher than leading institutions like Stanford, University of Pennsylvania, and UCLA
- 10th in Health and Human Services (including NIH) expenditures among institutions without a medical school, ranking higher than Caltech, Georgia Tech and Northwestern University
- 12th overall among institutions without a medical school, above Princeton and Carnegie Mellon
- 12th in National Aeronautics and Space Administration (NASA) funded expenditures, above top universities like Harvard University, Columbia University and Cornell University
- 17th in humanities, ranking above UC Berkeley, Penn State University and New York University
- 28th in National Science Foundation (NSF) expenditures, which ranks higher than Harvard University, University of Chicago and Duke University

The growth of our research enterprise includes establishing new research centers that are forging new discoveries and collaborations, both internal and external to the university. In the past year we established the Center for Applied Structural Discovery, led by Dr. Petra Fromme in the Department of Chemistry and Biochemistry, and have launched the Global Securities Initiative. This initiative will serve as a university-wide interdisciplinary hub for global security research and is the evolution of our Security and Defense Systems Initiative.

A cooperative agreement of **$20 million over five years was secured from the National Geospatial-Intelligence Agency** (NGA) to launch a research partnership, known as the Foresight Initiative. The partnership will explore approaches for anticipating and mitigating national security risks associated with climate change and represents the leading edge of complex decision-making research.

Dr. Joshua LaBaer at the Biodesign Institute is leading an effort funded by the Biomedical Advanced Research and Development Authority (BARDA), a federal agency within the U.S. Department of Health and Human Services. The **$9 million project phase continues research to produce a diagnostic test to rapidly measure an individual's level of absorption of ionizing radiation.**

The **single largest investment in human origins research** has been given to the Institute of Human Origins from the John Templeton Foundation. The **$4.9 million, three-year grant** supports 11 linked projects to explore the question of "how we became human." The grant also includes a supplement to support K-12 educational outreach in human origins.

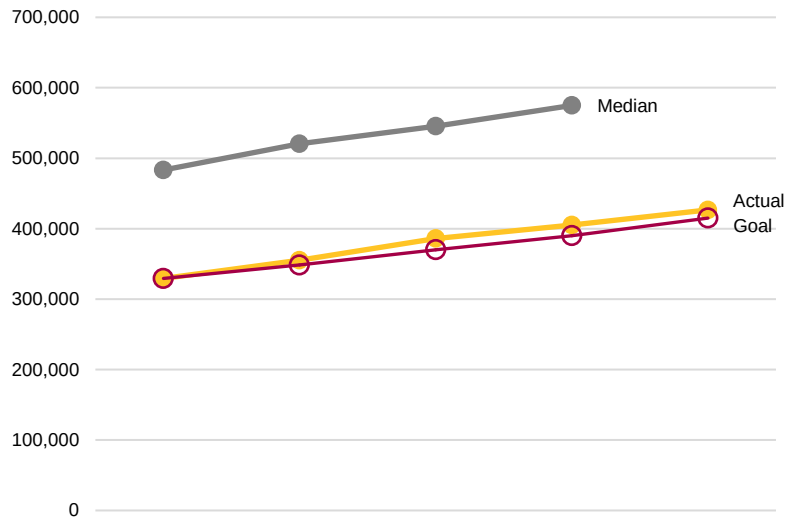
Dr. Jim Bell and his team in the School of Earth and Space Exploration have been selected to **design, deliver and oversee a pair of color panoramic zoom cameras for the 2020 Mars rover mission**. ASU will receive **more than $10 million** to support the Mastcam-Z imaging investigation.

Nearly **$3 million in new funding from the National Science Foundation** will help an ASU professor **improve how new secondary education science teachers instruct and engage English language learners**. The Mary Lou Fulton Teachers College will lead the four-year project, titled "Secondary Science Teaching with English Language and Literacy Acquisition."

A team of ASU engineers is leading a national project promising a significant advance in the technology for converting sunlight into electricity. With support from a **$3.5 million, three-year grant from the U.S. Department of Energy's SunShot Initiative**, the team will develop new ultra-thin silicon solar cells designed to increase the amount of electricity that can be produced through direct conversion of sunlight.

Enterprise Size

Total Research Expenditures (in Thousands)

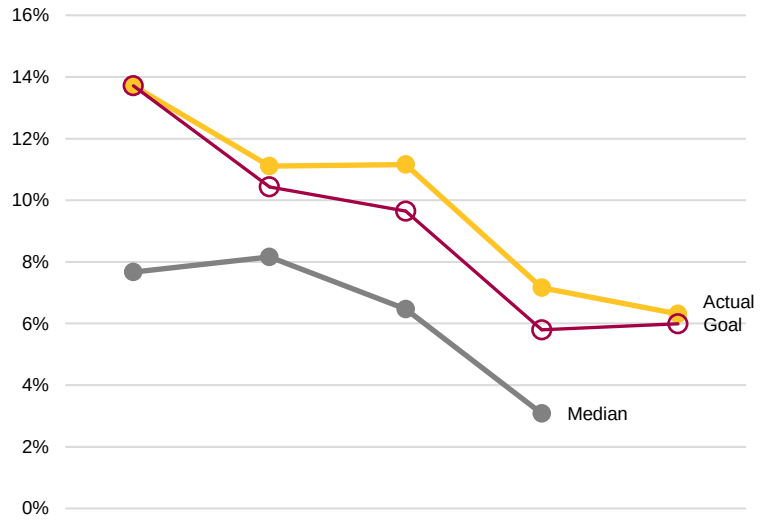


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	329,345	355,215	385,959	405,154	426,651
Goal	329,345	348,525	370,000	390,000	415,000
Difference	0	6,690	15,959	15,154	11,651

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X		1,022,740	1,148,533	1,109,008	1,192,513		1
University of Wisconsin - Madison	X		1,029,295	1,111,642	1,169,779	1,123,501		2
University of California - Los Angeles	X		936,995	982,357	1,003,375	966,659		3
University of Minnesota - Twin Cities	X		786,074	847,419	826,173	858,378		4
Ohio State University - Columbus	X		755,194	832,126	766,513	793,373		5
University of Illinois - Urbana-Champaign			515,133	545,669	583,754	743,487		6
Pennsylvania State University - University Park		X	682,233	692,708	695,177	730,212		7
University of Texas - Austin			589,502	632,171	621,538	634,132		8
Michigan State University	X		431,373	454,248	507,061	515,707		9
Rutgers the State University of NJ - New Brunswick		X	428,432	432,306	434,901	493,320		10
University of Maryland - College Park			451,415	495,382	502,406	491,998		11
University of Iowa	X		444,034	443,893	446,429	435,377		12
Arizona State University			329,345	355,215	385,959	405,154	426,651	13
Florida State University	X		227,329	230,411	225,378	250,877		14
Indiana University - Bloomington		X	177,520	184,096	184,486	197,897		15
University of Connecticut - Storrs		X	135,608	152,554	154,395	145,617		16
Median			483,274	520,526	545,408	574,920		

Enterprise Size

Average Growth Rate in Total Research Expenditures Over 3 Years

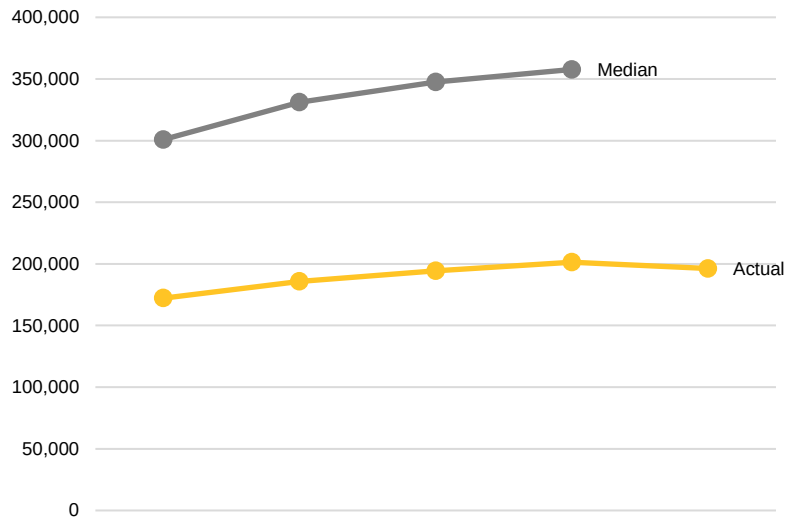


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	13.7%	11.1%	11.2%	7.2%	6.3%
Goal	13.7%	10.4%	9.6%	5.8%	6.0%
Difference	0	0	1.5%	1.4%	0.3%

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Illinois - Urbana-Champaign			3.2%	3.3%	1.4%	13.4%		1
Arizona State University			13.7%	11.1%	11.2%	7.2%	6.3%	2
Michigan State University	X		6.4%	8.5%	10.8%	6.2%		3
University of Washington - Seattle	X		11.4%	15.1%	13.4%	5.5%		4
Rutgers the State University of NJ - New Brunswick		X	15.7%	14.1%	11.7%	5.0%		5
Indiana University - Bloomington		X	7.4%	7.0%	5.7%	3.7%		6
Florida State University	X		6.6%	8.3%	5.2%	3.5%		7
University of Wisconsin - Madison	X		7.0%	8.0%	7.1%	3.1%		8
University of Minnesota - Twin Cities	X		8.0%	7.5%	3.8%	3.1%		9
University of Maryland - College Park			7.9%	7.9%	7.2%	3.0%		10
University of Connecticut - Storrs		X	7.9%	11.6%	5.8%	2.7%		11
University of Texas - Austin			9.8%	8.8%	7.3%	2.5%		12
Pennsylvania State University - University Park		X	5.4%	3.8%	1.6%	2.3%		13
Ohio State University - Columbus	X		1.6%	5.9%	2.6%	1.9%		14
University of California - Los Angeles	X		4.4%	4.1%	4.1%	1.1%		15
University of Iowa	X		9.3%	15.6%	11.7%	-0.6%		16
Median			7.7%	8.2%	6.5%	3.1%		

Enterprise Size

Federally Financed Research Expenditures (in Thousands)

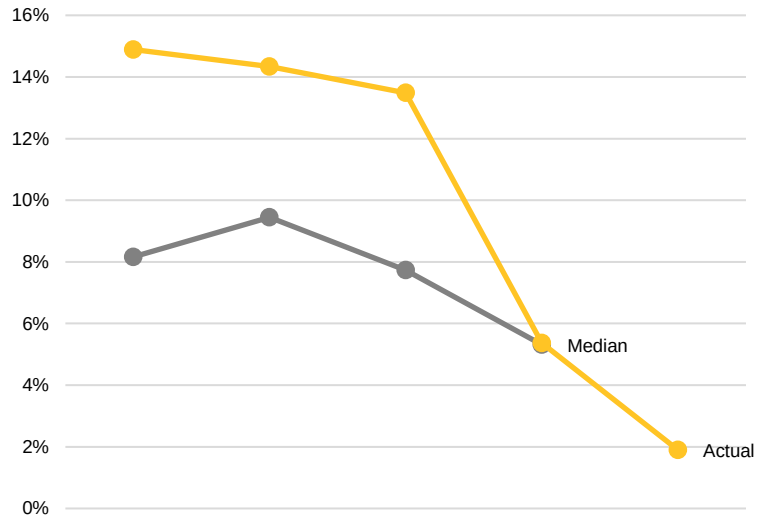


	2010	2011	2012	2013	2014
Actual	172,202	185,766	194,376	201,363	196,270

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X		829,885	948,976	909,652	928,193		1
University of Wisconsin - Madison	X		545,189	593,633	580,661	555,875		2
University of California - Los Angeles	X		538,521	563,560	539,054	501,368		3
University of Minnesota - Twin Cities	X		426,359	489,480	485,462	494,206		4
Pennsylvania State University - University Park		X	407,256	404,065	459,521	483,062		5
University of Illinois - Urbana-Champaign			303,852	323,454	359,989	468,798		6
Ohio State University - Columbus	X		399,942	493,130	445,635	456,590		7
University of Texas - Austin			350,308	355,437	354,873	372,633		8
University of Maryland - College Park			297,896	338,780	340,180	342,778		9
Rutgers the State University of NJ - New Brunswick		X	224,894	239,908	279,161	295,028		10
Michigan State University	X		214,134	240,837	268,952	260,610		11
University of Iowa	X		282,465	283,627	269,734	255,329		12
Arizona State University			172,202	185,766	194,376	201,363	196,270	13
Florida State University	X		134,794	140,850	140,419	148,413		14
University of Connecticut - Storrs		X	75,336	86,727	92,127	89,354		15
Indiana University - Bloomington		X	71,208	74,143	79,727	85,852		16
Median			300,874	331,117	347,527	357,706		

Enterprise Size

Average Growth Rate in Federally Financed Research Expenditures Over 3 Years

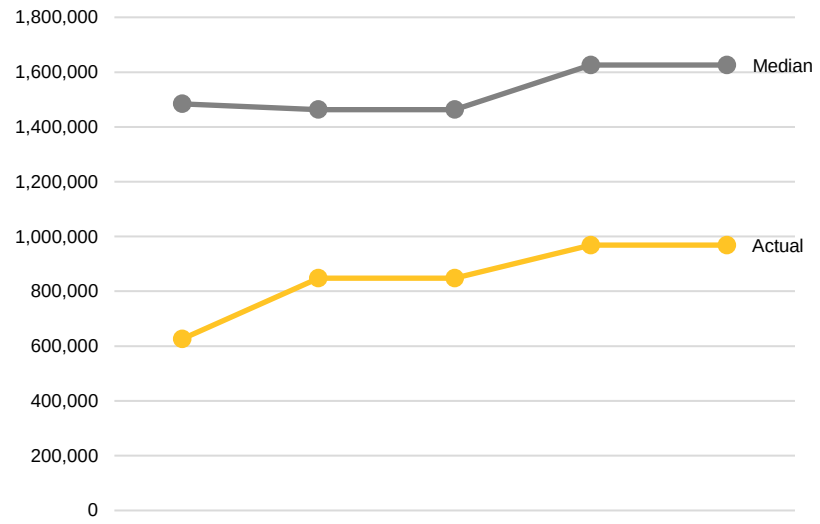


	2010	2011	2012	2013	2014
Actual	14.9%	14.3%	13.5%	5.4%	1.9%

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Illinois - Urbana-Champaign			6.2%	6.6%	7.7%	16.0%		1
Rutgers the State University of NJ - New Brunswick		X	22.9%	23.6%	23.9%	9.6%		2
Michigan State University	X		9.2%	16.8%	18.2%	7.0%		3
Indiana University - Bloomington		X	3.8%	3.2%	0.8%	6.4%		4
University of Connecticut - Storrs		X	10.6%	16.4%	22.2%	6.1%		5
Pennsylvania State University - University Park		X	7.1%	4.0%	6.1%	6.0%		6
Ohio State University - Columbus	X		8.7%	14.1%	10.5%	5.4%		7
Arizona State University			14.9%	14.3%	13.5%	5.4%	1.9%	8
University of Minnesota - Twin Cities	X		8.1%	10.4%	7.7%	5.3%		9
University of Maryland - College Park			11.0%	12.9%	11.6%	5.0%		10
University of Washington - Seattle	X		11.3%	16.4%	14.7%	4.1%		11
Florida State University	X		6.1%	8.5%	6.4%	3.3%		12
University of Texas - Austin			6.9%	3.4%	4.9%	2.1%		13
University of Wisconsin - Madison	X		5.2%	7.8%	4.7%	0.8%		14
University of California - Los Angeles	X		3.6%	6.3%	5.2%	-2.2%		15
University of Iowa	X		8.3%	7.4%	2.5%	-3.3%		16
Median			8.2%	9.4%	7.7%	5.3%		

Enterprise Size

Net Assignable Square Feet

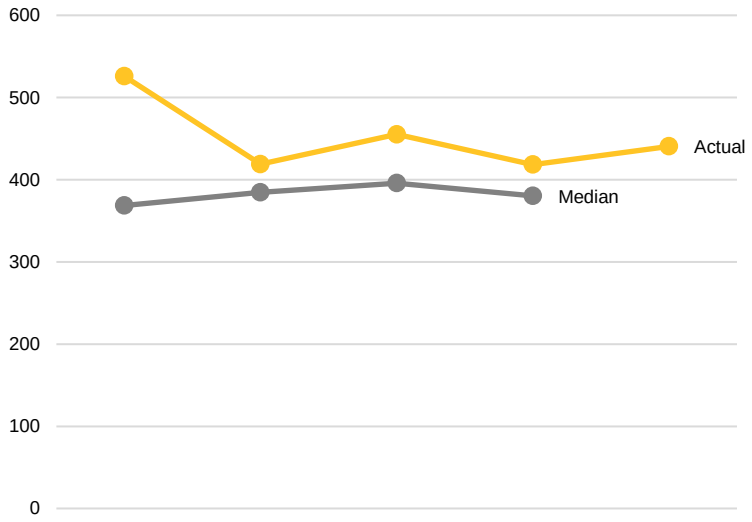


	2010	2011	2012	2013	2014	
Actual	626,416	847,836	847,836	968,595	968,595	

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Minnesota - Twin Cities	X		3,684,378	3,531,048	3,531,048	3,672,847	3,672,847	1
University of Illinois - Urbana-Champaign			4,561,500	4,631,400	4,631,400	3,108,558	3,108,558	2
Ohio State University - Columbus	X		1,487,468	1,447,310	1,447,310	2,973,355	2,973,355	3
University of Wisconsin - Madison	X		2,844,272	2,935,571	2,935,571	2,774,278	2,774,278	4
University of California - Los Angeles	X		2,496,563	2,632,450	2,632,450	2,717,533	2,717,533	5
Pennsylvania State University - University Park		X	2,654,356	2,552,837	2,552,837	2,381,918	2,381,918	6
Michigan State University	X		2,324,423	2,274,375	2,274,375	2,253,911	2,253,911	7
University of Washington - Seattle	X		1,795,359	1,874,449	1,874,449	1,796,285	1,796,285	8
University of Texas - Austin			1,480,462	1,478,523	1,478,523	1,455,474	1,455,474	9
Rutgers the State University of NJ - New Brunswick		X	1,105,494	1,106,675	1,106,675	1,167,010	1,167,010	10
Arizona State University			626,416	847,836	847,836	968,595	968,595	11
University of Maryland - College Park			712,085	769,581	769,581	769,581	769,581	12
University of Iowa	X		616,700	659,913	659,913	700,757	700,757	13
Indiana University - Bloomington		X	1,387,317	591,765	591,765	637,564	637,564	14
Florida State University	X		675,000	511,000	511,000	553,000	553,000	15
University of Connecticut - Storrs		X	437,718	540,215	540,215	521,957	521,957	16
Median			1,483,965	1,462,917	1,462,917	1,625,879.5	1,625,879.5	

Enterprise Size

Total Research Expenditures per Net Assignable Square Foot

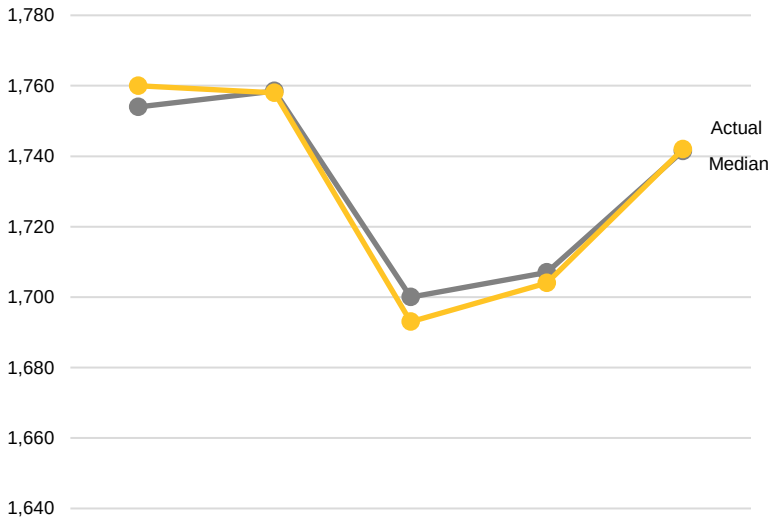


	2010	2011	2012	2013	2014
Actual	526	419	455	418	440

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X		570	613	592	664		1
University of Maryland - College Park			634	644	653	639		2
University of Iowa	X		720	673	676	621		3
Florida State University	X		337	451	441	454		4
University of Texas - Austin			398	428	420	436		5
Rutgers the State University of NJ - New Brunswick		X	388	391	393	423		6
Arizona State University			526	419	455	418	440	7
University of Wisconsin - Madison	X		362	379	398	405		8
University of California - Los Angeles	X		375	373	381	356		9
Indiana University - Bloomington		X	128	311	312	310		10
Pennsylvania State University - University Park		X	257	271	272	307		11
University of Connecticut - Storrs		X	310	282	286	279		12
Ohio State University - Columbus	X		508	575	530	267		13
University of Illinois - Urbana-Champaign			113	118	126	239		14
University of Minnesota - Twin Cities	X		213	240	234	234		15
Michigan State University	X		186	200	223	229		16
Median			369	385	396	380.3		

Enterprise Size

Total Faculty Population

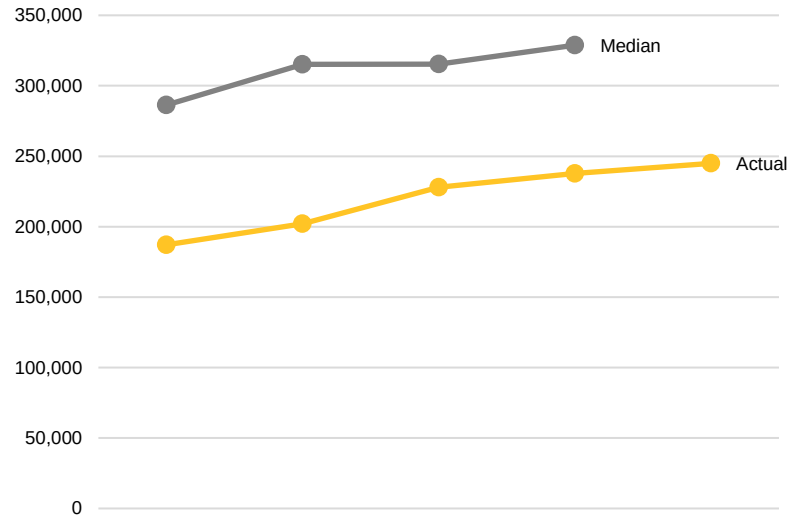


	2010	2011	2012	2013	2014
Actual	1,760	1,758	1,693	1,704	1,742

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
Ohio State University - Columbus	X		2,602	2,560	2,511	2,489	2,508	1
University of Minnesota - Twin Cities	X		2,319	2,277	2,251	2,412	2,408	2
University of Wisconsin - Madison	X		2,047	2,057	2,014	2,067	2,082	3
Rutgers the State University of NJ - New Brunswick		X	1,519	1,518	1,546	1,514	1,919	4
University of Texas - Austin			1,981	1,954	1,910	1,910	1,898	5
Michigan State University	X		1,948	1,906	1,883	1,732	1,825	6
University of Illinois - Urbana-Champaign			1,856	1,778	1,707	1,710	1,753	7
Arizona State University			1,760	1,758	1,693	1,704	1,742	8
Pennsylvania State University - University Park		X	1,748	1,759	1,763	1,731	1,741	9
University of California - Los Angeles	X		1,840	1,822	1,776	1,747	1,725	10
University of Iowa	X		1,572	1,527	1,538	1,576	1,551	11
University of Washington - Seattle	X		1,548	1,536	1,525	1,487	1,498	12
University of Maryland - College Park			1,472	1,463	1,501	1,483	1,476	13
Indiana University - Bloomington		X	1,368	1,351	1,356	1,344	1,357	14
University of Connecticut - Storrs		X	1,186	1,200	1,235	1,264	1,320	15
Florida State University	X		1,079	1,040	989	1,027	1,039	16
Median			1,754	1,759	1,700	1,707	1,742	

Enterprise Size

Total Research Expenditures per Faculty

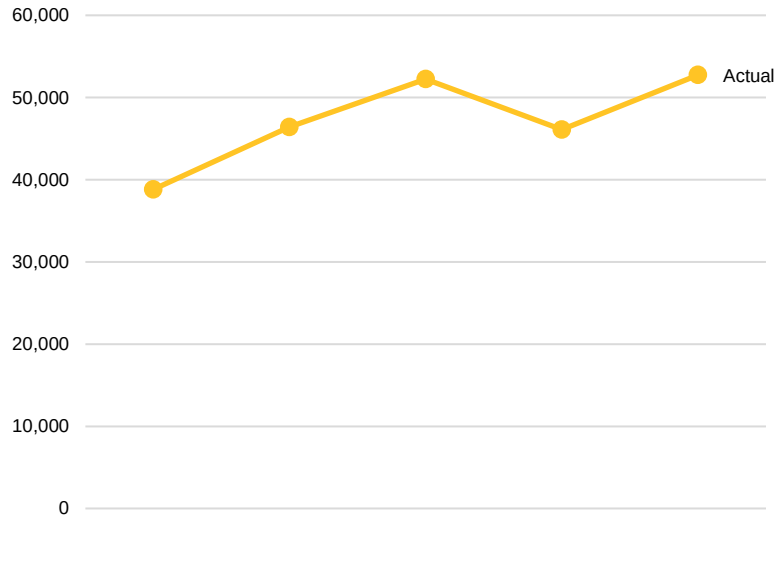


	2010	2011	2012	2013	2014
Actual	187,128	202,056	227,973	237,766	244,920

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X		660,685	747,743	727,218	801,959		1
University of California - Los Angeles	X		509,236	539,164	564,963	553,325		2
University of Wisconsin - Madison	X		502,831	540,419	580,824	543,542		3
University of Illinois - Urbana-Champaign			277,550	306,900	341,977	434,788		4
Pennsylvania State University - University Park		X	390,293	393,808	394,315	421,844		5
University of Minnesota - Twin Cities	X		338,971	372,165	367,025	355,878		6
University of Texas - Austin			297,578	323,527	325,413	332,006		7
University of Maryland - College Park			306,668	338,607	334,714	331,759		8
Rutgers the State University of NJ - New Brunswick		X	282,049	284,787	281,307	325,839		9
Ohio State University - Columbus	X		290,236	325,049	305,262	318,752		10
Michigan State University	X		221,444	238,325	269,284	297,752		11
University of Iowa	X		282,464	290,696	290,266	276,254		12
Florida State University	X		210,685	221,549	227,885	244,281		13
Arizona State University			187,128	202,056	227,973	237,766	244,920	14
Indiana University - Bloomington		X	129,766	136,266	136,052	147,245		15
University of Connecticut - Storrs		X	114,340	127,129	125,016	115,203		16
Median			286,350	315,214	315,337	328,799		

Enterprise Size

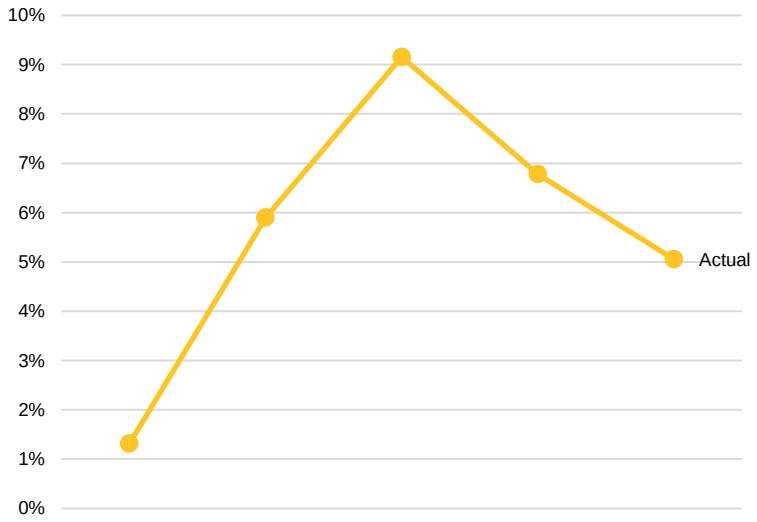
Other Sponsored Project Expenditures (in Thousands)



	2010	2011	2012	2013	2014
Actual	38,827	46,422	52,235	46,097	52,731

Enterprise Size

Average Growth Rate in Other Sponsored Project Expenditures Over 3 Years



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	1.3%	5.9%	9.2%	6.8%	5.1%

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Discovery and Scholarly Impact

From studying the cosmic universe to microscopic molecules, our researchers are making discoveries and creating meaningful impact through their research. This year, with help from ASU, astronomers were able to create the most comprehensive picture ever assembled of the evolving universe. The images were captured from the Hubble Space Telescope's Wide Field Camera 3, which ASU has had major scientific involvement with since 1998. In addition, Dr. Charlie Arntzen, founding director of the Biodesign Institute, has been recognized for his research in plant biology that laid the groundwork for an Ebola treatment administered to two American aid workers infected with the virus.

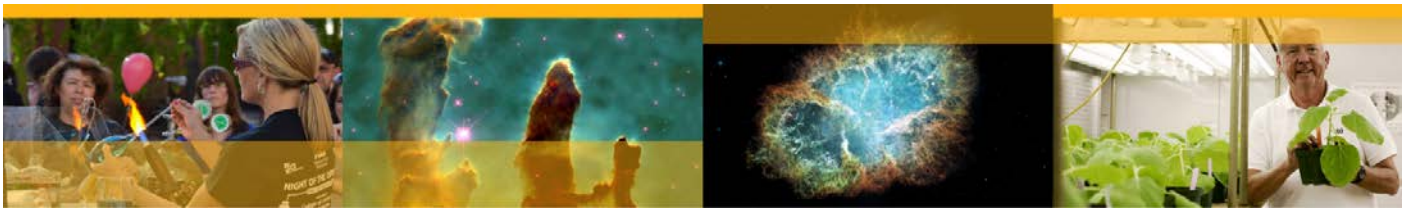
Each year, ASU hosts numerous events across all campuses that invite the public to learn about and benefit from the research enterprise. Large signature events such as Night of the Open Door and the Origins lecture series attract thousands of community members each year. More than 15,000 community members attended Night of the Open Door in 2014, making it the most successful year to date.

Origins events included "The Great Debate" panel discussion on violence, humanity and our future. The lecture featured ASU's Lawrence Krauss as well as Richard Dawkins and was attended or viewed by 2,800 people. A national broadcast of NPR's Science Friday was recorded as part of the Origins Project and reached over 1.3 million listeners.

In addition, our partnership with Arizona Science Center shares discoveries and innovation at the university with the Arizona community and more than half a million people who visit the center each year. Exhibits showcasing ASU research inspire K-12 students to pursue post-secondary education in the STEM disciplines.

Future Tense is a partnership between ASU, Slate and the New America Foundation and offers thought-provoking online content to the public on the impact of the newest technologies. Each month, the ideas and knowledge of ASU faculty reach two million Future Tense readers and spark learning around the world.

Each of these endeavors demonstrates our pledge to advance research and discovery of public value and to disseminate knowledge not only to our students but also to the communities that we serve.



Each year, ASU faculty members publish their scholarly work in the best peer-reviewed journals. Examples from the past year include:

- The **first images of photosynthesis** in action are the result of an international research collaboration led by Dr. Petra Fromme in the Department of Chemistry and Biochemistry. The results of the study were **published in *Nature***. Capturing images of the mechanics of photosynthesis will pave the way for creating artificial systems that mimic or even improve the process.

- A new study **published in *Nature*** co-authored by Dr. Ian Gilby in the School of Human Evolution and Social Change, reveals that **lethal aggression in chimpanzees is not the result of human impact,** as previously thought.

- A team of researchers in the Biodesign Institute, led by Dr. Karen Brenneman, has developed **new technology that improves the ability of reengineered salmonella to deliver immunity** by surviving highly acidic human stomach. The results are published in the journal ***PLOS ONE***.

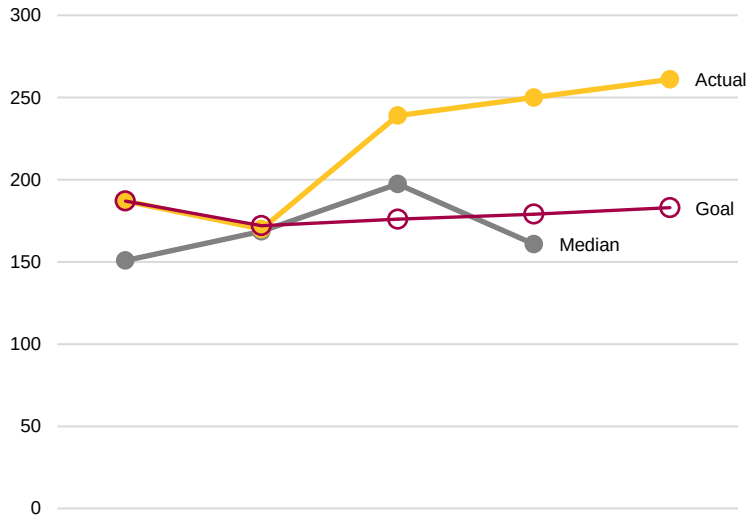
- Researchers at ASU, along with colleagues at Argonne National Laboratory, reported **advances toward perfecting a functional artificial leaf**. Using nature as a template, the team improved the efficiency of the two-step reaction in which light energy is used to convert hydrogen to oxygen. The results are published in an online edition of ***Nature Chemistry***.

- Dr. Steve Neuberg in the Department of Psychology and Dr. Carolyn Warner in the School of Politics and Global Studies found that **disadvantaged groups are more likely to engage in conflict with stronger groups if they are religiously infused**. Their results are published in the journal ***Psychological Science***.

- Dr. Stuart Lindsay of the Biodesign Institute and his colleagues have developed methodology that identifies amino acid fingerprints. The research **advances the prospect of clinical protein sequencing and the discovery of new biomarkers**. The results are published in ***Nature Nanotech***.

Discovery and Scholarly Impact

Invention Disclosures Transacted

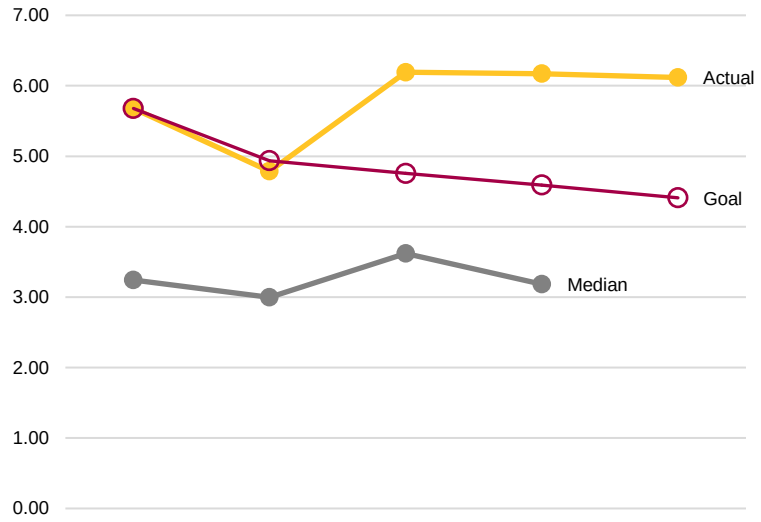


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	187	170	239	250	261
Goal	187	172	176	179	183
Difference	0	-2	63	71	78

ABOR Peer Group	Med. Sch.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X		354	356	462	410		1
University of Wisconsin - Madison	X		356	357	373	386		2
Ohio State University - Columbus	X		173	216	319	384		3
University of California - Los Angeles	X		379	299	343	359		4
University of Minnesota - Twin Cities	X		255	250	321	331		5
Arizona State University			187	170	239	250	261	6
University of Illinois - Urbana-Champaign			180	182	223	181		7
Pennsylvania State University - University Park		X	118	127	117	141		8
Rutgers the State University of NJ - New Brunswick		X	129	167	172	127		9
Michigan State University	X		116	110	127	122		10
University of Iowa	X		70	68	102	96		11
Indiana University - Bloomington		X	58	63	74	88		12
Florida State University	X		45	64	74	58		13
University of Connecticut - Storrs		X	52	40	49	43		14
University of Maryland - College Park								
University of Texas - Austin								
Median			151	169	197	161		

Discovery and Scholarly Impact

Invention Disclosures Transacted per $10 Million in Total Research Expenditures

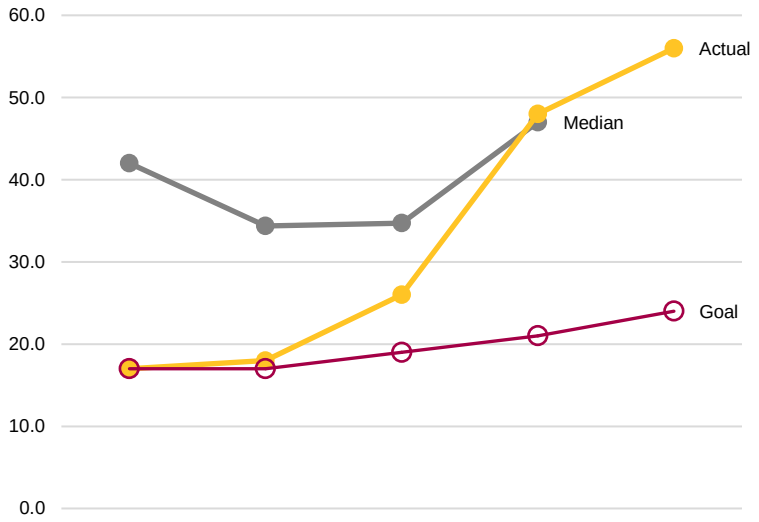


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	5.7	4.8	6.2	6.2	6.1
Goal	5.7	4.9	4.8	4.6	4.4
Difference	0.0	-0.1	1.4	1.6	1.7

ABOR Peer Group	Med. Sch.	NSF Adj.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
Arizona State University				5.7	4.8	6.2	6.2	6.1	1
Ohio State University - Columbus	X			2.3	2.6	4.2	4.8		2
Indiana University - Bloomington		X	X	3.2	3.4	4.0	4.5		3
University of Minnesota - Twin Cities	X			3.2	3.0	3.9	3.9		4
University of California - Los Angeles	X			4.0	3.0	3.4	3.7		5
University of Washington - Seattle	X			3.5	3.1	4.2	3.4		6
University of Wisconsin - Madison	X			3.5	3.2	3.2	3.4		7
University of Connecticut - Storrs		X	X	3.8	2.6	3.2	2.9		8
Rutgers the State University of NJ - New Brunswick		X	X	3.0	3.9	3.9	2.6		9
University of Illinois - Urbana-Champaign				3.5	3.3	3.8	2.4		10
Michigan State University	X			2.7	2.4	2.5	2.4		11
Florida State University	X			2.0	2.8	3.3	2.3		12
University of Iowa	X			1.6	1.5	2.3	2.2		13
Pennsylvania State University - University Park		X	X	1.7	1.8	1.7	1.9		14
University of Maryland - College Park									
University of Texas - Austin									
Median				3.2	3.0	3.6	3.2		

Discovery and Scholarly Impact

U.S. Patents Issued

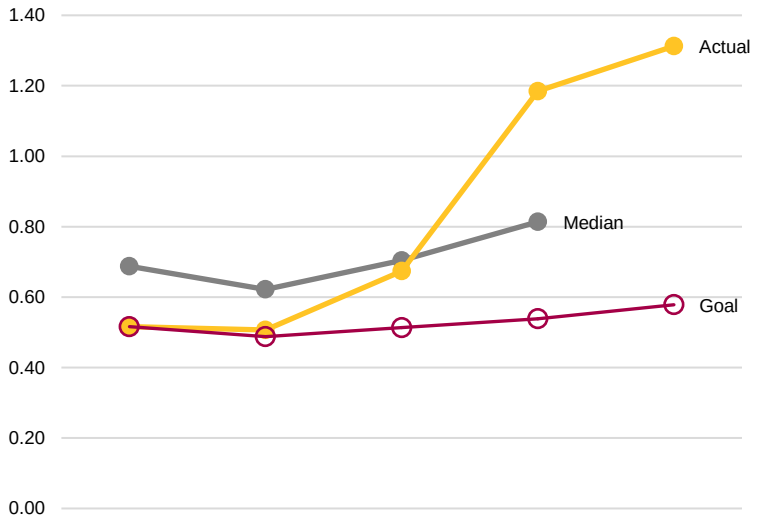


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	17	18	26	48	56
Goal	17	17	19	21	24
Difference	0	1	7	27	32

ABOR Peer Group	Med. Sch.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Wisconsin - Madison	X		133	156	153	157		1
University of California - Los Angeles	X		47	56	74	95		2
University of Washington - Seattle	X		69	70	61	94		3
University of Illinois - Urbana-Champaign			69	68	76	72		4
University of Minnesota - Twin Cities	X		46	41	59	64		5
Ohio State University - Columbus	X		38	30	41	62		6
Arizona State University			17	18	26	48	56	7
Michigan State University	X		52	38	31	46		8
Florida State University	X		21	36	27	43		9
Rutgers the State University of NJ - New Brunswick		X	29	27	35	40		10
Pennsylvania State University - University Park		X	48	33	35	36		11
University of Iowa	X		32	31	31	24		12
University of Connecticut - Storrs		X	18	11	22	12		13
Indiana University - Bloomington		X	3	7	4	6		14
University of Maryland - College Park								
University of Texas - Austin								
Median			42	34	35	47		

Discovery and Scholarly Impact

U.S. Patents Issued per $10 Million in Total Research Expenditures



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	0.5	0.5	0.7	1.2	1.3
Goal	0.5	0.5	0.5	0.5	0.6
Difference	0.0	0.0	0.2	0.6	0.7

ABOR Peer Group	Med. Sch.	NSF Adj.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
Florida State University	X			0.9	1.6	1.2	1.7		1
University of Wisconsin - Madison	X			1.3	1.4	1.3	1.4		2
Arizona State University				0.5	0.5	0.7	1.2	1.3	3
University of California - Los Angeles	X			0.5	0.6	0.7	1.0		4
University of Illinois - Urbana-Champaign				1.3	1.2	1.3	1.0		5
Michigan State University	X			1.2	0.8	0.6	0.9		6
University of Connecticut - Storrs		X	X	1.3	0.7	1.4	0.8		7
Rutgers the State University of NJ - New Brunswick		X	X	0.7	0.6	0.8	0.8		8
University of Washington - Seattle	X			0.7	0.6	0.6	0.8		9
Ohio State University - Columbus	X			0.5	0.4	0.5	0.8		10
University of Minnesota - Twin Cities	X			0.6	0.5	0.7	0.7		11
University of Iowa	X			0.7	0.7	0.7	0.6		12
Pennsylvania State University - University Park		X	X	0.7	0.5	0.5	0.5		13
Indiana University - Bloomington		X	X	0.2	0.4	0.2	0.3		14
University of Maryland - College Park									
University of Texas - Austin									
Median				0.7	0.6	0.7	0.8		

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Economic Development

ASU is an engine that drives Arizona's economy. Entrepreneurship is woven into the ASU experience for all students, regardless of major, and our graduates are highly competitive professionals who adapt to the quickly changing economic and employment landscape. Companies started by ASU students bring new products and services to the marketplace and we have earned a reputation as being one of the top schools for entrepreneurs. In the past fiscal year alone companies in the Edson Student Entrepreneur Initiative program raised $737,500 and filed 11 patents.

Numerous resources and programs are available each year to students and community members through our Chandler Innovation Center, which includes a TechShop workshop and ASU classrooms. The tools, machinery and classes available through TechShop enable members to launch ventures and learn new skills without significant up-front investment, encouraging the growth of new businesses and a skilled local workforce. TechShop currently has over 1,100 memberships, 700 of which are ASU memberships.

Companies are consistently attracted to Arizona and the Phoenix metro area because of the proximity to ASU. As an example, the tech firm GoDaddy has opened its Global Technology Center at ASU Research Park and will hire an additional 250 employees. State Farm is currently constructing its regional headquarters just north of the ASU Tempe campus and has cited ASU's presence as a key factor in choosing the location. The project has the potential to create 8,000 jobs in Arizona. To ensure this continued economic and workforce development we consistently partner with the Arizona Commerce Authority, the Greater Phoenix Economic Council and Tucson Regional Economic Opportunities.

Currently **more than 70 companies** operate from the ASU SkySong complex and represent **14 countries**. This reflects our commitment to serve our community and to be a beacon of knowledge and economic opportunity. This year, ASU was **recognized for its role in economic and global development** at the annual University Economic Development Association summit. Numerous ASU programs and people were featured during the conference and **ASU received the Judges' Award for overall commitment to economic development**. Our Entrepreneurship Outreach Network, which develops co-working space in libraries, won the Community Connected Campus Award. We also **received the Arizona Association for Economic Development's Best of Arizona Award** at the association's annual Economic Development Distinguished Excellence awards ceremony.

Of the clean technology venture investments made to Arizona companies in 2013, **over half of the funding went to ASU spinout companies Heliae and Fluidic Energy**, which raised $28,400,000 and $20,809,212, respectively.

HealthTell Inc., a biotech spinout from ASU, raised $4 million in funding to help commercialize a new test for lung, breast, prostate and colorectal cancers.

SkySong-based student startup **Bosse Tools received a major investment of $200,000 from the Maricopa Country Manufacturing Venture Fund** to ramp up production of its ergonomically designed tools. The venture fund was created to invest in companies that are engaged with ASU-supported accelerator programs, helping them take the next step in their development with early stage manufacturing startup support.

Notebowl, an Edson Student Entrepreneur Initiative company, offers an improved learning management system for universities in a comprehensive platform that blends educational tools with avenues for social connection. **Notebowl has raised $910,000** since it was established in July 2011.

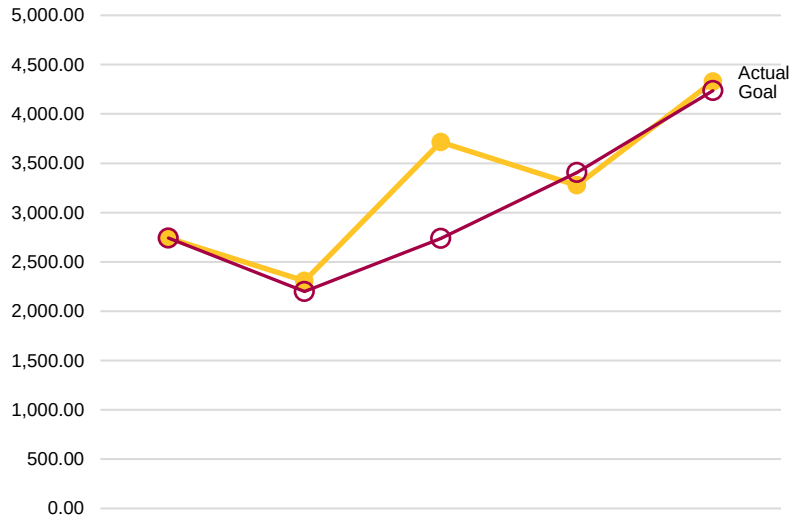
Learning Ovations received a $1.05 million grant from the U.S. Department of Education to support the development of cloud-based tools for enhancing literacy instruction. The SkySong-based education technology company is one of only two to win funding this year from the U.S. Department of Education's Institute of Education Sciences' Small Business Innovation Research (SBIR) program.

Weebly, a global website builder, has located its North American headquarters in Scottsdale and **cites the close proximity to ASU as a main reason for the relocation**. Weebly plans to hire more than 250 people over the next three years and the expansion is **estimated to have a $256 million economic impact** over the next five years.

Workiva, a data company that offers the cloud-based productivity platform Wdesk, is **emblematic of the growth SkySong-based businesses experience as part of ASU's culture of innovation**. When Workiva first established an Arizona presence at SkySong in 2011, the company leased 2,000 square feet for its offices. Today Workiva is leasing the 36,000-square-foot top floor of SkySong 3, the newest building at the complex.

Economic Development

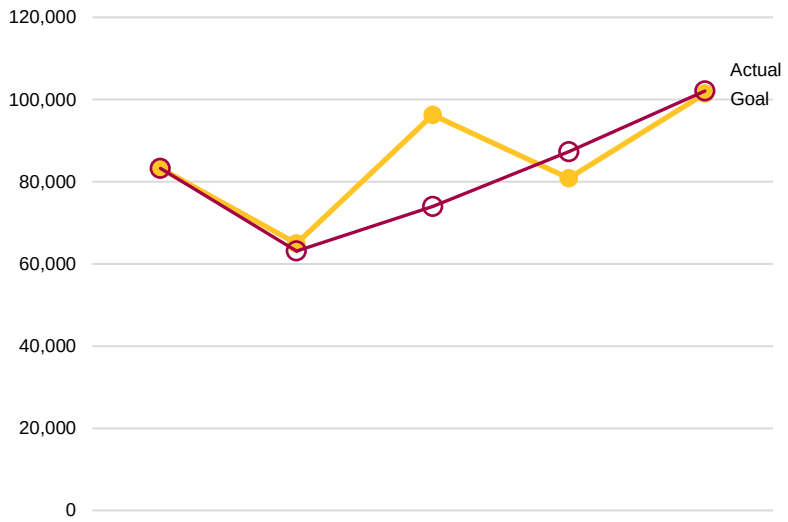
Intellectual Property Income (in Thousands)



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	2,742	2,307	3,715	3,275	4,328
Goal	2,742	2,200	2,737	3,405	4,236
Difference	0	107	978	-130	92

Economic Development

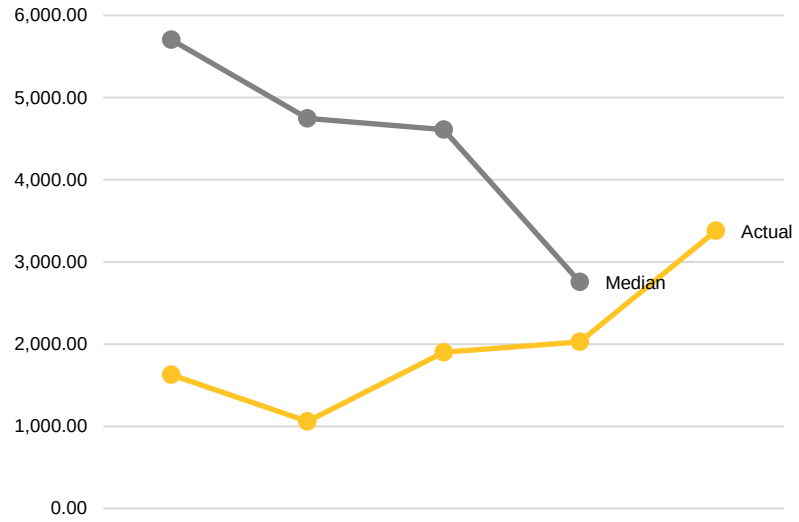
Intellectual Property Income per $10 Million in Total Research Expenditures



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	83,252	64,946	96,251	80,840	101,433
Goal	83,252	63,123	73,973	87,308	102,072
Difference	0.0	1,823.3	22,278.4	-6,467	-639

Economic Development

Licenses and Options Income (in Thousands)

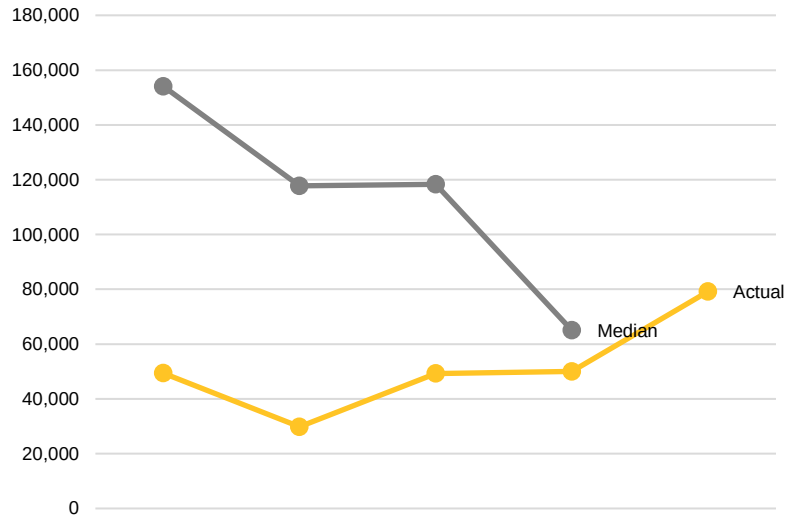


	2010	2011	2012	2013	2014	
Actual	1,626	1,059	1,900	2,027	3,377	

ABOR Peer Group	Med. Sch.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X		69,032	67,362	76,956	99,491		1
University of Wisconsin - Madison	X		54,300	57,730	41,100	94,170		2
University of Minnesota - Twin Cities	X		83,906	10,079	45,652	38,030		3
University of California - Los Angeles	X		27,485	16,153	17,833	23,423		4
Rutgers the State University of NJ - New Brunswick		X	8,105	5,463	5,515	7,734		5
University of Illinois - Urbana-Champaign			6,126	6,363	6,410	4,914		6
Michigan State University	X		4,017	3,616	3,704	3,302		7
Indiana University - Bloomington		X	5,278	4,030	2,607	2,207		8
Ohio State University - Columbus	X		1,907	1,420	2,170	2,105		9
Arizona State University			1,626	1,059	1,900	2,027	3,377	10
Pennsylvania State University - University Park		X	2,010	2,608	2,739	2,006		11
University of Iowa	X		26,991	6,285	7,234	1,205		12
Florida State University	X		1,315	1,468	1,133	1,036		13
University of Connecticut - Storrs		X	512	455	580	589		14
University of Maryland - College Park								
University of Texas - Austin								
Median			5,702	4,746	4,609	2,755		

Economic Development

Licenses and Options Income per $10 Million in Total Research Expenditures

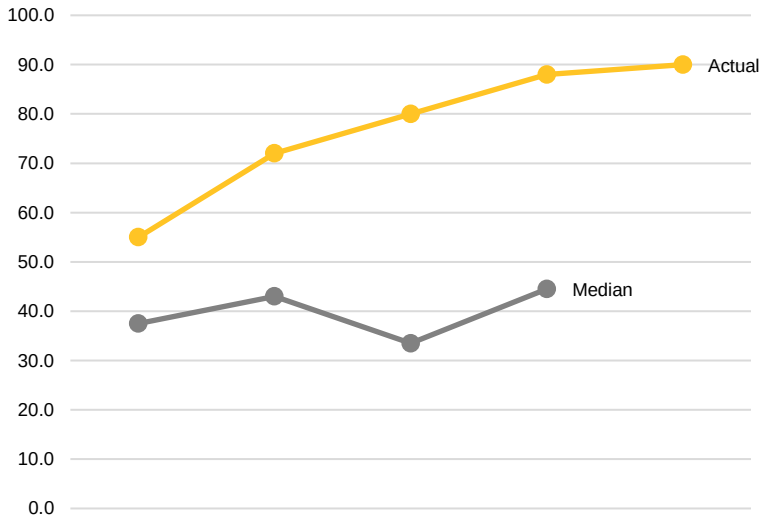


	2010	2011	2012	2013	2014
Actual	49,362	29,823	49,237	50,023	79,151

ABOR Peer Group	Med. Sch.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Wisconsin - Madison	X		527,546	519,322	351,348	838,183		1
University of Washington - Seattle	X		674,973	586,506	693,916	834,298		2
University of Minnesota - Twin Cities	X		1,067,402	118,932	552,566	443,050		3
University of California - Los Angeles	X		293,331	164,431	177,730	242,309		4
Rutgers the State University of NJ - New Brunswick		X	189,173	126,363	126,809	156,780		5
Indiana University - Bloomington		X	297,309	218,891	141,288	111,518		6
University of Illinois - Urbana-Champaign			118,925	116,601	109,813	66,088		7
Michigan State University	X		93,115	79,596	73,041	64,035		8
Arizona State University			49,362	29,823	49,237	50,023	79,151	9
Florida State University	X		57,842	63,711	50,274	41,304		10
University of Connecticut - Storrs		X	37,752	29,842	37,580	40,451		11
University of Iowa	X		607,862	141,587	162,043	27,685		12
Pennsylvania State University - University Park		X	29,460	37,654	39,401	27,476		13
Ohio State University - Columbus	X		25,252	17,065	28,304	26,534		14
University of Maryland - College Park								
University of Texas - Austin								
Median			154,049	117,766	118,311	65,062		

Economic Development

Licenses and Options Executed

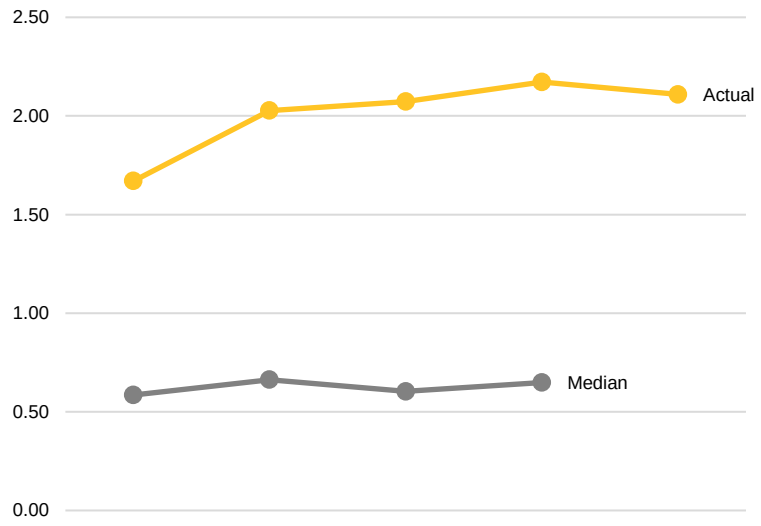


	2010	2011	2012	2013	2014
Actual	55	72	80	88	90

ABOR Peer Group	Med. Sch.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X		196	194	209	260		1
University of Minnesota - Twin Cities	X		73	113	75	91		2
Arizona State University			55	72	80	88	90	3
University of Wisconsin - Madison	X		62	62	60	63		4
Rutgers the State University of NJ - New Brunswick		X	75	69	58	59		5
Ohio State University - Columbus	X		35	25	33	50		6
University of Illinois - Urbana-Champaign			40	55	46	46		7
University of California - Los Angeles	X		52	46	34	43		8
Michigan State University	X		31	40	32	33		9
Pennsylvania State University - University Park		X	21	20	19	32		10
University of Iowa	X		21	24	21	29		11
Florida State University	X		6	10	13	15		12
Indiana University - Bloomington		X	10	14	14	13		13
University of Connecticut - Storrs		X	7	4	5	11		14
University of Maryland - College Park								
University of Texas - Austin								
Median			38	43	34	45		

Economic Development

Licenses and Options Executed per $10 Million in Total Research Expenditures

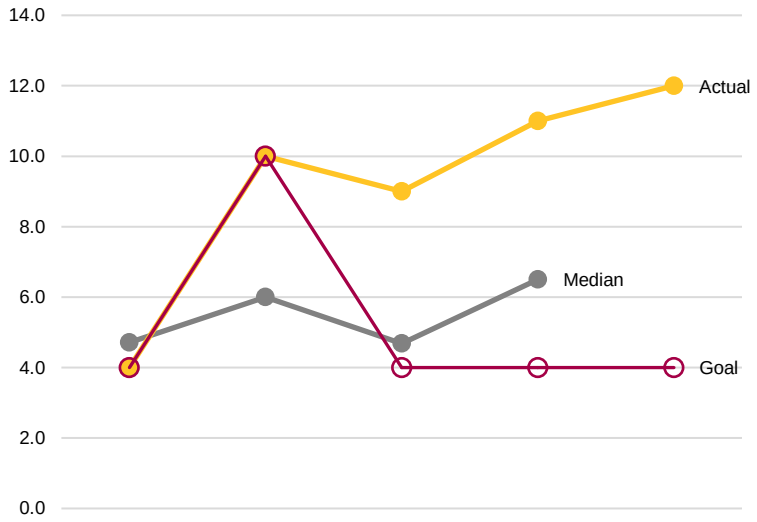


	2010	2011	2012	2013	2014
Actual	1.7	2.0	2.1	2.2	2.1

ABOR Peer Group	Med. Sch.	NSF Adj.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X			1.9	1.7	1.9	2.2		1
Arizona State University				1.7	2.0	2.1	2.2	2.1	2
Rutgers the State University of NJ - New Brunswick		X	X	1.7	1.6	1.3	1.2		3
University of Minnesota - Twin Cities	X			0.9	1.3	0.9	1.1		4
University of Connecticut - Storrs		X	X	0.5	0.3	0.4	0.8		5
University of Iowa	X			0.5	0.5	0.5	0.7		6
Indiana University - Bloomington		X	X	0.6	0.8	0.8	0.7		7
Michigan State University	X			0.7	0.9	0.6	0.6		8
Ohio State University - Columbus	X			0.5	0.3	0.4	0.6		9
University of Illinois - Urbana-Champaign				0.8	1.0	0.8	0.6		10
Florida State University	X			0.3	0.4	0.6	0.6		11
University of Wisconsin - Madison	X			0.6	0.6	0.5	0.6		12
University of California - Los Angeles	X			0.6	0.5	0.3	0.4		13
Pennsylvania State University - University Park		X	X	0.3	0.3	0.3	0.4		14
University of Maryland - College Park									
University of Texas - Austin									
Median				0.6	0.7	0.6	0.6		

Economic Development

Startup Companies

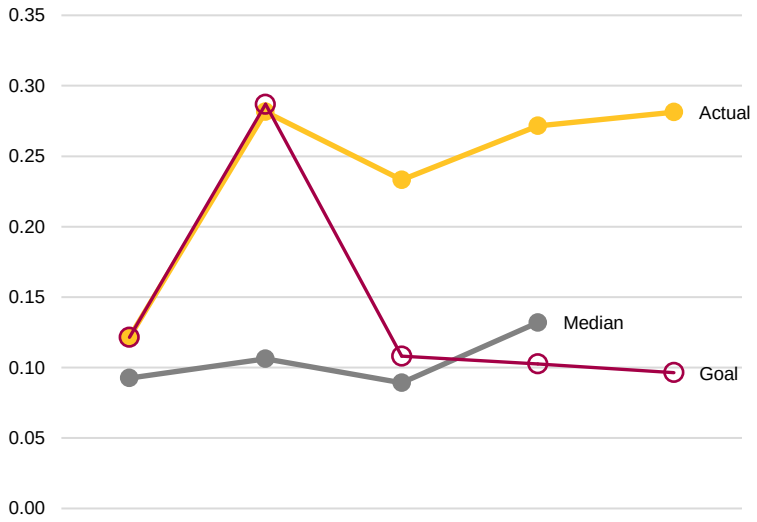


ABOR Enterprise Plan	2010	2011	2012	2013	2014	
Actual	4	10	9	11	12	
Goal	4	10	4	4	4	
Difference	0	0	5	7	8	

ABOR Peer Group	Med. Sch.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of California - Los Angeles	X		27	19	13	17		1
University of Washington - Seattle	X		7	9	9	17		1
University of Minnesota - Twin Cities	X		8	9	12	14		3
Arizona State University			4	10	9	11	12	4
Ohio State University - Columbus	X		8	6	5	10		5
Pennsylvania State University - University Park		X	4	4	4	9		6
University of Wisconsin - Madison	X		5	4	4	7		7
University of Illinois - Urbana-Champaign			5	12	5	6		8
University of Iowa	X		3	2	4	6		8
Indiana University - Bloomington		X	1	3	5	6		10
Florida State University	X		2	4	2	3		11
University of Connecticut - Storrs		X	3		3	2		12
Rutgers the State University of NJ - New Brunswick		X	7	7	5	2		13
Michigan State University	X		0	1	3	1		14
University of Maryland - College Park								
University of Texas - Austin								
Median			5	6	5	7		

Economic Development

Startup Companies per $10 Million in Total Research Expenditures

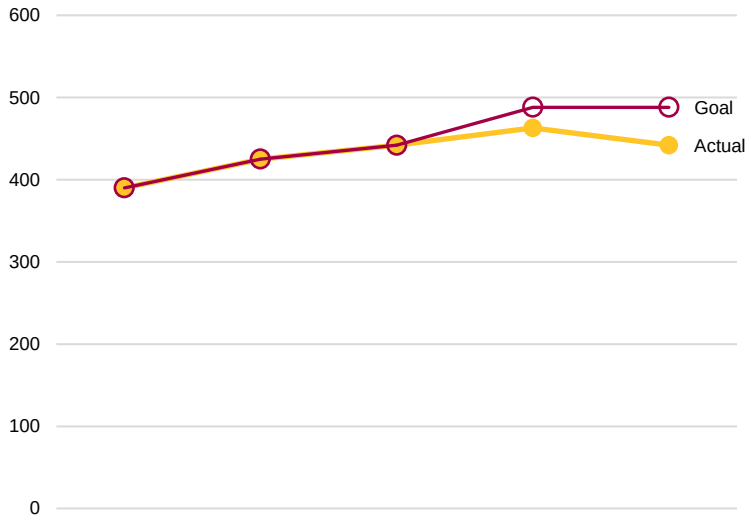


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	0.1	0.3	0.2	0.3	0.3
Goal	0.1	0.3	0.1	0.1	0.1
Difference	0.0	0.0	0.1	0.2	0.2

ABOR Peer Group	Med. Sch.	NSF Adj.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
Indiana University - Bloomington		X	X	0.1	0.1	0.3	0.3		1
Arizona State University				0.1	0.3	0.2	0.3	0.3	2
University of California - Los Angeles	X			0.3	0.2	0.1	0.2		3
University of Connecticut - Storrs		X	X	0.3		0.2	0.2		4
University of Minnesota - Twin Cities	X			0.1	0.1	0.1	0.2		5
University of Washington - Seattle	X			0.1	0.1	0.1	0.1		6
University of Iowa	X			0.1	0.0	0.1	0.1		7
Ohio State University - Columbus	X			0.1	0.1	0.1	0.1		8
Pennsylvania State University - University Park		X	X	0.1	0.1	0.1	0.1		9
Florida State University	X			0.1	0.2	0.1	0.1		10
University of Illinois - Urbana-Champaign				0.1	0.2	0.1	0.1		11
University of Wisconsin - Madison	X			0.0	0.0	0.0	0.1		12
Rutgers the State University of NJ - New Brunswick		X	X	0.2	0.2	0.1	0.0		13
Michigan State University	X			0.0	0.0	0.1	0.0		14
University of Maryland - College Park									
University of Texas - Austin									
Median				0.1	0.1	0.1	0.1		

Economic Development

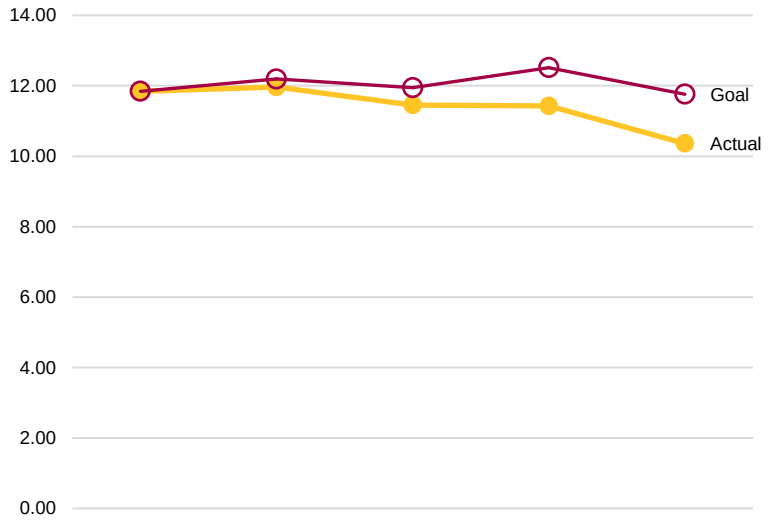
Ph.D. Degrees Conferred



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	390	425	442	463	442
Goal	390	425	442	488	488
Difference	0	0	0	-25	-46

Economic Development

Ph.D. Degrees Conferred per $10 Million in Total Research Expenditures



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	11.8	12.0	11.5	11.4	10.4
Goal	11.8	12.2	11.9	12.5	11.8
Difference	0.0	-0.2	-0.5	-1.1	-1.4

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Leadership and Recognition

ASU's academic and research pursuits have garnered national and international attention. Examples of our achievements include:

- We are ranked **88th among U.S. and international universities**, and **48th among all U.S. universities** by the Academic Rankings of World Universities in recognition of our transformation and exemplary status as the New American University.
- The Princeton Review **ranked ASU one of the country's top universities for undergraduate education** in its 2015 edition of "The Best 379 Colleges." The ranking **puts ASU in the top 15 percent of all four-year colleges in America**.
- Several graduate programs were **named among "America's Best Graduate Schools"** in the 2015 rankings from U.S. News and World Report, including:
    - The College of Liberal Arts and Sciences garnered several national rankings including 20th in earth sciences.
    - Ira A. Fulton Schools of Engineering ranks 11th nationally among online graduate programs in engineering; the Fulton schools placed 43rd among graduate engineering programs overall.
    - The School of Public Affairs ranks 16th for its master's degree programs.
    - Mary Lou Fulton Teachers College ranks 18th among public graduate schools of education and 25th among all public and private graduate programs in the field of education.

Recognition of our exceptional faculty is reflected by memberships in prestigious academies such as:

- 13 members of the National Academy of Sciences
- 66 fellows of the American Association for the Advancement of Science
- 11 members of the American Academy of Arts and Sciences
- 10 members of the National Academy of Engineering
- 5 members of the National Academy of Public Administration
- 3 members of the National Academy of Inventors

Faculty members inducted to national academies in FY14 include:

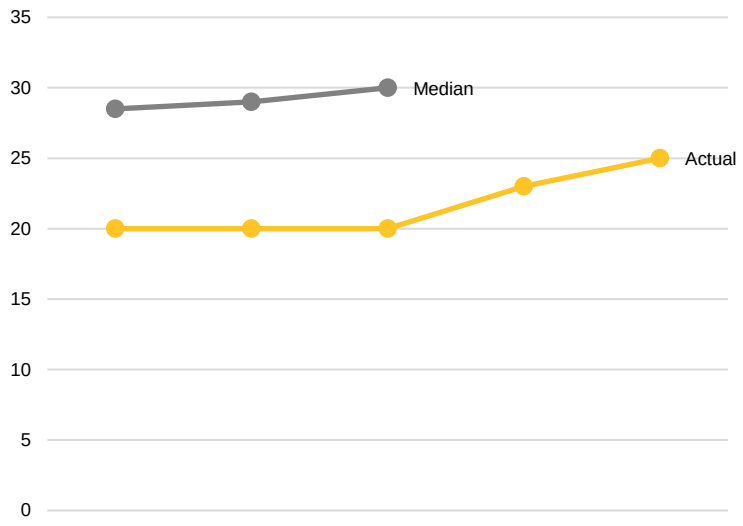
- Dr. Janet Franklin, professor in the School of Geographical Sciences and Urban Planning, and Dr. Kelin Whipple, professor in the School of Earth and Space Exploration, **elected to the National Academy of Sciences**.
- Drs. Jennifer Mensik and Adriana Perez, faculty associate and assistant professor, respectively, in the College of Nursing and Health Innovation, **inducted to the American Academy of Nursing**.
- Drs. Stuart Lindsay and Michael Kozicki, professor in the Biodesign Institute and professor in the School of Electrical, Computer and Energy Engineering, respectively, have been **named fellows of the National Academy of Inventors**.

ASU faculty have also garnered national honors, including:

- **President Barack Obama** appointed Dr. Sethuraman Panchanathan, senior vice president of Knowledge Enterprise Development, to the **National Science Board**. Dr. Panchanathan has also been **selected to serve on the National Advisory Council on Innovation and Entrepreneurship**.
- Drs. Janet Franklin and Elizabeth Wentz, professors in the School of Geographical Sciences and Urban Planning, are **serving terms as presidents** of the U.S. national chapters of the **International Association for Landscape Ecology** and the **University Consortium for Geographic Information Science**, respectively.
- Dr. Lawrence Krauss, Foundation Professor in the Department of Physics, was **honored at the Academia Film Olomouc for his contributions to public understanding of science**, and for his work in increasing awareness of science in society.
- Dr. Neal Lester, founding director of ASU Project Humanities and Foundation Professor of English, was presented the **2014 Francis Andrew March Award by the Modern Language Association of America**. Project Humanities also received national recognition as the inaugural recipient of the **Key of Excellence Award** for leadership and impact presented by Phi Beta Kappa Society's National Arts and Sciences Initiative.

Leadership and Recognition

National Academy Members

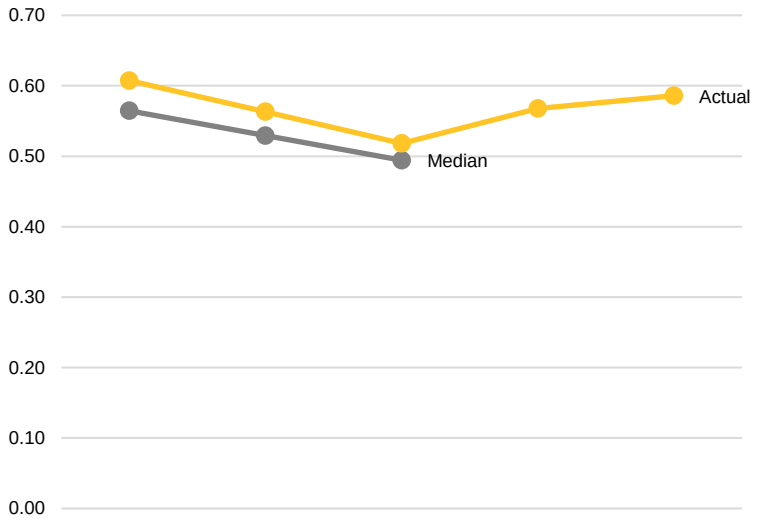


	2010	2011	2012	2013	2014
Actual	20	20	20	23	25

ABOR Peer Group	Med. Sch.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X	102	104	109			1
University of California - Los Angeles	X	91	95	94			2
University of Wisconsin - Madison	X	71	67	68			3
University of Texas - Austin		67	68	67			4
University of Illinois - Urbana-Champaign		59	57	55			5
University of Minnesota - Twin Cities	X	41	39	38			6
Rutgers the State University of NJ - New Brunswick		36	35	34			7
Ohio State University - Columbus	X	27	28	30			8
University of Maryland - College Park		30	30	30			8
Pennsylvania State University - University Park		24	23	24			10
University of Iowa	X	22	22	21			11
Arizona State University		20	20	20	23	25	12
Indiana University - Bloomington		10	10	10			13
Michigan State University	X	7	8	9			14
Florida State University	X	7	7	7			15
University of Connecticut - Storrs		1	1	1			16
Median		29	29	30			

Leadership and Recognition

National Academy Members per $10 Million in Total Research Expenditures



	2010	2011	2012	2013	2014
Actual	0.6	0.6	0.5	0.6	0.6

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Texas - Austin			1.1	1.1	1.1			1
University of Washington - Seattle	X		1.0	0.9	1.0			2
University of Illinois - Urbana-Champaign			1.1	1.0	0.9			3
University of California - Los Angeles	X		1.0	1.0	0.9			4
Rutgers the State University of NJ - New Brunswick		X	0.8	0.7	0.7			5
University of Maryland - College Park			0.7	0.6	0.6			6
University of Wisconsin - Madison	X		0.7	0.6	0.6			7
Arizona State University			0.6	0.6	0.5	0.6	0.6	8
University of Iowa	X		0.5	0.5	0.5			9
University of Minnesota - Twin Cities	X		0.5	0.5	0.5			10
Ohio State University - Columbus	X		0.4	0.3	0.4			11
Florida State University	X		0.3	0.3	0.3			12
Pennsylvania State University - University Park		X	0.3	0.3	0.3			13
Indiana University - Bloomington		X	0.2	0.2	0.2			14
Michigan State University	X		0.2	0.2	0.2			15
University of Connecticut - Storrs		X	0.0	0.0	0.0			16
Median			0.6	0.5	0.5			

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Technology Transfer

Arizona Technology Enterprises (AzTE), the exclusive intellectual property management and technology transfer organization for ASU, had a banner year supporting, servicing and commercializing the university's innovations.

AzTE has tailored its marketing process to accommodate the unique nature of ASU's life science and physical science portfolios. This strategy is based on our historical data and belief that, in most cases, technology transfer offices cannot predict specific company interest. AzTE is now more broadly marketing throughout the value chain.

This year, ASU faculty working with AzTE set new record highs for technology transfer and helped attract **$12.7 million in industry sponsored research** into ASU labs. Technology transfer activity at ASU this year included:

- 261 invention disclosures
- 12 new start-up companies
- 56 U.S. patents
- 90 major licensing and option transactions

The Association of University Technology Managers (AUTM) reports the technology commercialization results for almost 200 universities and research hospitals annually. Over the five most recent years of available data, ASU was one of just four schools to achieve top ten rankings for licensing agreements, startups and invention disclosures per $10 million in research, among research institutions that achieved at least $300 million in annual research expenditures. In addition, **ASU now ranks among the top 50 universities worldwide for U.S. patents issued**.

Start-up companies that have licensed ASU intellectual property received more than $40 million in venture capital and other funding this fiscal year alone. To date, **more than 70 companies have been launched based on ASU innovations**. These companies and their sub-licensees have **attracted more than $425 million in funding** from venture capital firms and other investors, with much of this financing occurring during the last several years. **Recently launched startups now employ more than 200 people in Arizona alone.**

Technology Transfer

Statistical Exhibits

ARIZONA STATE UNIVERSITY

Technology Transfer Activities	2010	2011	2012	2013	2014
Invention Disclosures Transacted	187	170	239	250	261
Invention Disclosures Transacted Year/Year Percentage Change		-9%	41%	5%	4%
New Patent Applications	99	93	106	168	163
New Patent Applications Year/Year Percentage Change		-6%	14%	58%	-3%
U.S. Patents Issued	17	18	26	48	56
U.S. Patents Issued Year/Year Percentage Change		6%	44%	85%	17%
Licenses and Options Executed	55	72	80	88	90
Licenses and Options Executed Year/Year Percentage Change		31%	11%	10%	2%
Other Major Agreements	108	126	160	186	162
Other Major Agreements Year/Year Percentage Change		17%	27%	16%	-13%

Licensing and Other Revenue	2010	2011	2012	2013	2014
Licensing Revenue (Including Options)	1,625,716	1,059,372	1,900,333	2,026,689	3,376,965
Licensee Legal Reimbursements	1,111,111	1,205,679	1,274,577	970,482	941,229
Other Revenue	5,021	41,945	540,000	278,102	9,469
Total	2,741,848	2,306,996	3,714,910	3,275,273	4,327,663

Sponsored Research Facilitated	2010	2011	2012	2013	2014
Total	5,623,534	8,945,930	9,601,072	9,790,451	12,692,880

Royalty Distribution	2010	2011	2012	2013	2014
Inventors	-281,466	-242,493	-210,800	-576,056	-1,005,051
Laboratories and Units	-313,358	-208,090	-180,287	-532,439	-618,461
University	-235,699	-138,557	-124,835	-517,940	-611,253
Undistributed	548,128	169,983	100,694	2,975	86,930

Nanopore and Carbon Nanotube Based DNA Sequencer and a Serial Recognition Sequencer – M08-058L, US Patent No. 8,628,649
This patent describes methods and equipment able to sequence entire genes using a single, full-length DNA molecule. The technique is also adaptable to sequencing other long biopolymers such as proteins. It is currently licensed to Roche for the sequencing of DNA and RNA, and is also exclusively optioned to startup Recognition AnalytiX. Dr. Stuart Lindsay, a Regents' Professor in the Department of Chemistry and Biochemistry and Director of the Center for Single Molecule Biophysics within the Biodesign Institute, developed this technology.

DNA Replicon System for High-level Rapid Production of Vaccines and Monoclonal Antibody Therapeutics in Plants – M08-086L, US Patent No. 8,513,397
This patent describes a novel method for producing therapeutic monoclonal antibodies in tobacco plants. The method has several important advantages, including the ability to produce large quantities of antibodies much more quickly than existing methods, and reducing the time to market of newly discovered antibodies for infectious outbreaks. This technology was developed by Dr. Hugh Mason, associate professor in the Center for Infectious Diseases and Vaccinology within the Biodesign Institute.

Tridentate Platinum (II) Complexes – M08-056P, US Patent No. 8,669,364
This patent describes new materials that can be used to produce organic light emitting diodes (OLEDs). These devices are used as back-lighting sources in electronic devices such as cell phones, computers and TVs, as well as for solid state lighting. The new materials specifically address the problem of blue light emission. They are longer lasting and result in enhanced display quality compared to existing blue OLED materials. Dr. Jian Li, associate professor in the School for Engineering of Matter, Transport and Energy, developed this technology.

Method of Preparing a Flexible Substrate Assembly and Flexible Substrate Assembly Therefrom – M09-057P, US Patent No. 8,481,859
Flexible displays and electronic devices are attractive for future generations of smart devices, since they are lighter, more robust and consume less power than their rigid counterparts. However, processing on plastic substrates is difficult, since they can become distorted during processing, and cannot withstand high-temperature processing. This patent describes methods that overcome the distortion problem, enabling improved device processing on flexible substrates. The technology was developed by researchers at ASU's Flexible Electronics and Display Center (FEDC).

Agilent Technologies Inc.
Agilent is the world's premier measurement company and a leader in chemical analysis and measurement equipment. Agilent has entered into an option agreement for a nozzle technology that produces nanoscale droplets from a virtual gas nozzle without clogging.

Life Technologies Corporation
Acquired by Thermo Fisher Scientific, Life Technologies Corporation is a global life sciences company that provides high-quality, innovative life science solutions for research applications. Life Technologies entered into an agreement with ASU to purchase a suite of patents primarily related to microchip-based DNA sequencing technology.

INanoBio, LLC
INanoBio is a Tempe-based nano-biotechnology company with a mission to commercialize Fully Depleted Exponentially Coupled Field Effect Transistor (FET) nanosensor technology developed at ASU. The novel nanosensor technology is capable of exponential capacitive transduction for ultra-high sensitivity molecular detection, coupled with exceptional selectivity. The proprietary technology can be used in sensing chemical and biological species with very low false positives and false negatives. Commercial applications may include health care diagnostics, industrial leak detection systems and security.

Presidium USA, Inc.
Presidium is a U.S. subsidiary of a Canadian venture company developing new materials for athletic and safety equipment. The company has signed a field of use license for a composite material technology for use in athletic helmets, and is interested in expanding this license to other fields of use. In FY13, Presidium licensed the pressure sensor technology developed by Dr. Jeffrey LaBelle and others in the Bioengineering Department.

Dynamic Blade Technologies, Inc.
Dynamic Blade Technologies is a Delaware company focused on improving the performance of wind power facilities. The company has entered into an option agreement to license ASU technology that provides short-term analysis and modeling of local wind patterns to more efficiently utilize wind.

This section updates the progress of three ASU startups:

Thync, Inc.
In March 2009, AzTE spun out SynSonix, based on ASU research to further develop and commercialize non-invasive ultrasound technology. The company has been renamed Thync and is creating a new category of wearable consumer products based on advanced neuroscience. Thync has raised a total of $13 million since inception from top-tier investors, including lead investor Khosla Ventures. Thync is gearing up to sell a lifestyle wearable neurostimulator to shift and optimize people's state of mind in areas related to energy, stress and focus.

TF Health Corporation
TF Health is commercializing novel sensor technologies for health and fitness applications. The company utilizes a proprietary design process that enables detection of highly sensitive levels of targeted agents. TF Health's initial product, Breezing, is a smartphone device and app that tracks metabolism over time and helps create a diet and exercise plan that's customized for optimal health. The company was launched in December 2011, based on technology developed by a team led by ASU researcher Dr. Nongjian Tao.

Heart in your Hand, LLC
Heart in Your Hand (HYH) produces personalized three-dimensional cardiac models. The company was spun out in June 2012 to produce heart models that are used as surgical planning for cardiac surgeons in cardiovascular malformation, including congenital heart defects, coronary artery disease and valvular heart disease. To date, HYH has provided heart models for teaching and surgical planning to more than 20 medical institutions in seven different countries. The company is currently building on the license of its technology to Materialise, the world's largest 3D printing service provider.

Several achievements over the past year testify to the success of our diverse and pioneering entrepreneurial endeavors. The Furnace Technology Transfer Accelerator is an innovative, three-phase process developed at ASU to form multidisciplinary startup teams and move compelling, use-inspired research from lab to startup. The phases include (1) technology triage and marketing (2) business model competition and (3) acceleration services.

After successfully deploying the Furnace platform among all three Arizona public universities, Dignity Health and Mayo Clinic, **ASU was awarded a $1 million grant from the Department of Defense (DoD) to create a new Pracademic Center of Excellence in Technology Transfer (PACE/T2)**. PACE/T2 leverages ASU's proven method and record of success in technology transfer to facilitate the commercialization of new technologies originating within DoD laboratories. The center is a collaboration led by ASU's Office of Entrepreneurship and Innovation in conjunction with AzTE and other ASU programs.

The Maricopa County Industrial Development Authority (MCIDA) has **awarded $1 million to ASU to create a new venture capital fund with a mission of economic development and job creation,** specifically targeting manufacturing startups. The fund will invest in spinout companies supported by ASU accelerator programs, helping them take the next step in their development. Accessing this early-stage risk capital will allow Arizona companies and entrepreneurs to create jobs and move innovative products forward. This supports the mission of MCIDA, which is to create and maintain jobs within Maricopa County and help residents achieve a better standard of living and way of life.

The Edson Student Entrepreneur Initiative nurtures entrepreneurship in students from all majors and provides funding, office space and mentoring. The initiative launched 48 companies this fiscal year, 15 of which are already generating revenue and shipping product. In total, **these companies have raised $1,243,500** in grants, investments and awards. **Force Impact Technologies won the "Best Arizona Student Startup Company"** at the Arizona Collegiate Venture Competition. Since 2011, ASU student companies have **raised over $2.6 million in external funding**.

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Strategic Initiatives

Research at ASU advances and evolves to address the world's most pressing challenges. As we grow our knowledge enterprise we are focused on:

- **Accelerating research in established focus areas and increasing return on the state's investment.**

  Our strategic portfolio includes the three signature focus areas advanced by the investment from the Technology and Research Initiative Fund (TRIF): Improving Health, National Security Systems, and Water, Environmental and Energy Systems. In the focus area of Improving Health we are exploring new opportunities in the study of the microbiome. Efforts to understand and diagnose disruption of the microbiome will help to address many conditions such as autism, obesity, and diabetes and represents an emergent area of research.

  The reconceptualization of the Global Security Initiative will be launched in fiscal year 2015 and represents a significant advancement of the National Security Systems focus area. The initiative includes a new center on cyber security and digital forensics and gives us a competitive advantage for funding from the intelligence and security community.

  Our focus on the food-water-energy nexus in Water, Environmental and Energy Systems allows us to address key concerns regarding the scarcity and distribution of critical resources. As an example, the Swette Center for Environmental Biotechnology focuses on improving water quality and is using biologic processes to reduce toxic chemicals. In addition, we have launched the Food Systems Transformation Initiative in the Julie Ann Wrigley Global Institute of Sustainability, which supports the development of more equitable, diverse and resilient food systems at all scales.

- **Launching new research initiatives to position ASU competitively in emerging funding areas.**

  The vision of the new Biodesign Center for Applied Structural Discovery is to create a sustainable future by unraveling the building blocks of life. The center is developing new techniques that reveal the structure and dynamics of biomolecules, creating opportunities for new visionary discoveries in medicine and energy conversion. The establishment of the center reflects ASU's evolution as a leading research university, and underscores our commitment to innovation in the pursuit of solutions to some of the world's most pressing problems. This center also positions us to compete for new, significant funding opportunities.

  Education Through Exploration (ETX@ASU) is a network that is leading a digital revolution in science education. The "DDR" center *d*evelops, *d*eploys, and *r*esearches digitally enabled teaching networks that educate-through-exploration effectively and at scale, especially in science and engineering. ETX@ASU also develops exemplary courseware to "seed" these networks, pioneers novel technologies to enhance courseware, and conducts research to improve network and courseware effectiveness.

- **Strengthening new and existing partnerships that will broaden the impact of ASU research while refining ASU's competitive edge in the global arena.**

  ASU continues to advance international partnerships such as those with Dublin City University and University of New South Wales in the development of a Global Knowledge Network. This network establishes a team of universities ready to deliver on the discovery and dissemination of knowledge across the globe.

Focus on these strategic initiatives ensures our path to becoming a leading global center for interdisciplinary scholarship, discovery and development. Our unique capability and demonstrated performance in the social sciences, arts and humanities allow us to increase our competitiveness in seeking external support to fund the advancement of the ideas of our faculty. As a result of our commitment to use-inspired and socially engaged research, the potential sources of support and partnerships for our activity are broad and diverse.

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NORTHERN ARIZONA UNIVERSITY

Annual Research Report - FY2014

Introductory Letter

NORTHERN ARIZONA UNIVERSITY

Northern Arizona University is pleased to provide this summary of our research activity for FY 2014 and to report on our progress toward achieving our 2020 enterprise research goals.
Fiscal Year 2014 was a year in which we worked through a number of challenges and came out stronger in terms of high productivity research programs, newly recruited research active faculty, and a renewed sense of the research mission of the university. Of course, challenges remain: These include relatively low numbers of tenure track (and therefore research-active) faculty compared with 7 years ago, limited research space, and a need to broaden our research scope. At the same time, we are energizing the NAU research culture with new hires, new programs underway and in development, new research Centers, increasing research expenditures, and increasing expectations for higher research and technology transfer productivity.

Two new research centers are thriving: The Center for Ecosystems Science and Society and the Landscape Conservation Initiative. We launched a new research Center in 2014—the Center for Bioengineering Innovation—with a $1 Million W. M. Keck Award to Kiisa Nishikawa, Regents Professor in Biological Sciences. In FY 2014 we recruited three highly productive research-intensive faculty and created the Informatics and Computing Program (ICP) to develop interdisciplinary research projects around informatics and computing. These activities will generate more extramural funding and will take us in new research directions. All of these efforts, together, are helping to energize NAU's research culture and stimulate innovation, and will contribute to the economic vitality of the region and state.

In FY 2014, Northern Arizona University formally adopted "nationally-recognized research excellence" as one of its institutional strategic goals, aligning with the Arizona Higher Education Enterprise goal to increase research capabilities, outcomes, and impact. This marked an important culture shift at NAU, embracing research as integral to the overall goals of the institution. Another sign of this expanding commitment to research is seen with the acquisition of a powerful high performance computing cluster. The high capacity cluster was fully operational and running at close to full capacity after just two months of operation in Spring of 2014. High performance computing capacity will not only enhance the work of our established "big data" researchers, but will also help NAU departments—including the new ICP—be more competitive in faculty recruitments.

Also in FY 2014, NAU increased focus on translational health research. Discussions with the Flinn Foundation led to a formal MOU with Northern Arizona Healthcare (NAH) in February, establishing a research collaboration with Flagstaff Medical Center on precision medicine and health informatics. The collaboration with NAH has resulted in a new hire in health informatics supported jointly by NAH and NAU; this development fits well with NAU's larger strategy to build the Northern Arizona end of the biomedical research corridor.

Northern Arizona University is making significant progress in its research capacity development. Our plans and current implementation of research initiatives will increase our yearly research expenditures, expand our technology transfer activities, promote a more competitive graduating workforce, and enhance NAU's economic impact on the state.

William Haller

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NORTHERN ARIZONA UNIVERSITY

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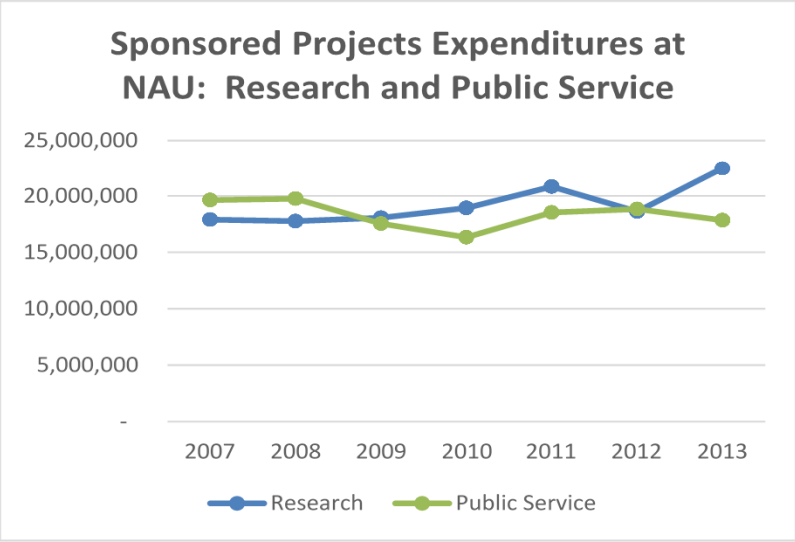
Enterprise Size

Research and "Other Sponsored Projects" Expenditures. In higher education, institutional research performance is generally measured by "total research expenditures" and "federally sponsored research expenditures". However, public service activities comprise a significant portion of the scholarship activity conducted by NAU faculty. Between 2007 and 2013, sponsored project expenditures for research and for public service activities are closely aligned, as shown in the chart below-right (direct award dollars leading to expenditures), and together demonstrate the full economic impact of our faculty's scholarly activities. While we did not meet our enterprise goal for Research expenditures in FY2014, total expenditures did increase slightly over FY2013 (3.5% to $31.6 million). In addition, NAU's federally-funded research expenditures increased in FY2014 by more than 15% over FY2013. While it is yet too soon to know if this is a trend, we are encouraged by the significant uptick in this performance metric, demonstrating that we have improved our rates of success in obtaining federal funds. It should be noted that "other sponsored projects expenditures" (i.e., primarily public service and instructional expenses funded by external sources) also increased slightly in FY2014 as well (3.2%). While not a specific enterprise metric, public service expenditures helps to demonstrate the growing economic impact that Northern Arizona University is having on the region and state.



Research Space. We remain well below the median of our peer group with regard to availability of research space. While we continue to invest in renovating and using space more efficiently, we recognize the need to bring more research space online in order to reach 2020 research goals. In FY2014 we finalized plans to build two buildings that will increase considerably the available research space at Northern Arizona University.

Faculty and Research Personnel. University faculty is one of the most important components contributing to the impact that NAU has on the state through its research enterprise. Faculty bring the highest levels of expertise to the table, they compete with their colleagues nationwide for external funds, and they carry out the work that leads to the creation of new knowledge and innovation. NAU's tenured/tenure eligible faculty numbers remained flat in FY2014, while slightly higher research expenditures as described above resulted in a slight increase (3.7%) in research expenditures per faculty member. However, it is important to note that although Northern Arizona University ranks towards the bottom of our peer group (14th out of 16 institutions) in number of faculty, we rank 10th in expenditures per faculty member, indicating that our faculty are quite productive. We are working to reverse the downward trend in our faculty numbers, and in FY2014 we also began strategically recruiting faculty who have demonstrated high levels of research productivity (as evidenced by extramural grant funding) at their previous institutions.

W.M. Keck Foundation awards $1 million to NAU for transformative muscle research. Regents' Professor Kiisa Nishikawa, a biologist, leads a group that has been working for six years to refine a winding filament hypothesis of muscle contraction that remains one tiny step away—literally nanometers—from widespread acceptance. The convincing evidence would be direct observation of the protein titin, no wider than a strand of DNA, winding on thin filaments in muscle fibers. "If our idea is right, it could change the way we think and do things ir physiology, medicine and robotics," Nishikawa said. "This award gives us the opportunity to really get the ball rolling."

Kiisa Nishikawa and Brent Nelson bring to bear biology and engineering expertise attempting to produce a direct observation of the protein titin.

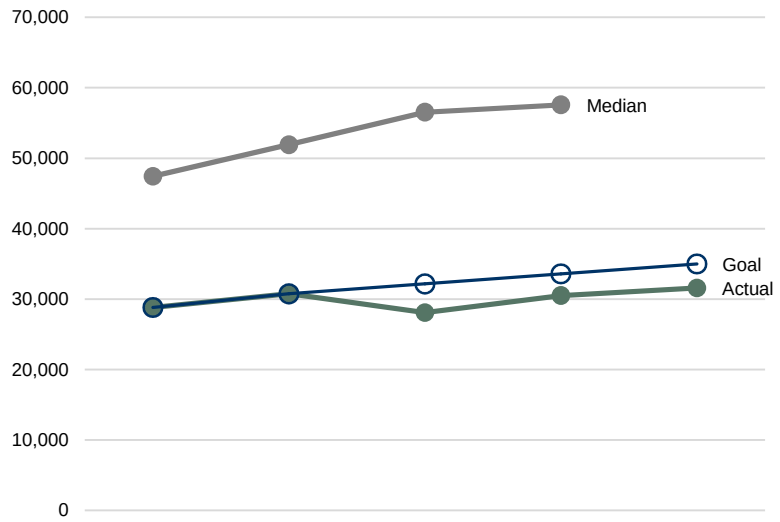
NAU Awarded $2.5 million to examine genetic response of 'foundation' species to climate impacts. The National Science Foundation has awarded Northern Arizona University a five-year, $2.5 million grant to examine how future climate change and invasive species will affect Fremont cottonwood trees, a "foundation species" of the Southwest's rapidly vanishing stream-side habitats. "This research has the potential to transform human understanding of how foundation species respond to environmental change," said associate professor Gery Allan, director of NAU's Environmental Genetics and Genomics Laboratory and the project's principal investigator. "More importantly, our findings can be used to identify the genetic lines that can best cope with environmental change and develop more effective conservation strategies."

NAU awarded $1.5 million for undergraduate conservation scholars program. Northern Arizona University is one of three institutions selected to receive a $1.5 million grant to launch the Doris Duke Conservation Scholars Program, a major science education initiative funded by the Doris Duke Charitable Foundation. NAU, along with the Universities of Washington and Florida, will provide students with opportunities to participate in mentored research activities in conservation biology and other disciplines relevant to land, water and wildlife conservation. "We have developed some incredible opportunities for students by connecting strong science with conservation applications," said Tom Sisk, Director of the Landscape Conservation Initiative. "We can't wait to get these bright students out in the field, where they can develop their understanding of science and work creatively to strengthen and diversify the conservation profession."

NAU launches new research center. Northern Arizona University established the Ecosystem Science and Society (Ecoss) Center in FY2014, led by Bruce Hungate, Professor of Biological Sciences and Director of the U.S. Department of Energy's Western Regional Center of the National Institute for Climatic Change Research. The Center focuses on how ecosystems respond to and shape environmental change. Ecoss houses the Colorado Plateau Analytical Laboratory, a major service center for the NAU science community as well as scientists around the world who require chemical analyses of environmental samples. Ecoss also has a strong focus on training future scientists and on communicating discovery and its relevance to a wide audience.

Enterprise Size

Total Research Expenditures (in Thousands)

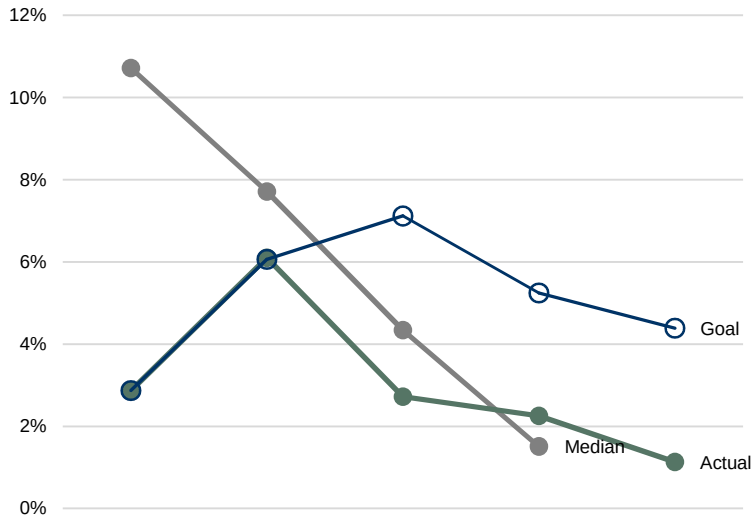


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	28,803	30,785	28,100	30,516	31,590
Goal	28,803	30,751	32,160	33,569	34,978
Difference	0	34	-4,060	-3,053	-3,388

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
Georgia State University			81,015	92,725	91,148	111,999		1
Old Dominion University			97,176	102,192	104,579	99,138		2
George Mason University			84,120	88,089	90,198	95,913		3
University of Maine			111,282	111,600	92,135	77,583		4
Southern Illinois University - Carbondale	X		69,924	71,130	71,097	70,854		5
University of Akron			52,884	65,536	66,413	69,640		6
Wichita State University			51,524	50,194	61,279	61,388		7
Ohio University	X		50,440	57,643	57,203	59,734		8
University of Alabama			40,762	53,633	55,885	55,443		9
University of Nevada - Las Vegas			44,457	39,526	34,543	35,935		10
Northern Arizona University			28,803	30,785	28,100	30,516	31,590	11
Kent State University - Kent			26,331	27,455	26,507	23,149		12
Northern Illinois University			27,036	21,748	21,823	23,027		13
Western Michigan University			26,391	25,051	21,073	18,979		14
University of North Carolina - Greensboro			22,436	26,121	19,080	16,590		15
Bowling Green State University			8,124	8,999	8,566	13,157		16
Median			47,449	51,914	56,544	57,589		

Enterprise Size

Average Growth Rate in Total Research Expenditures Over 3 Years

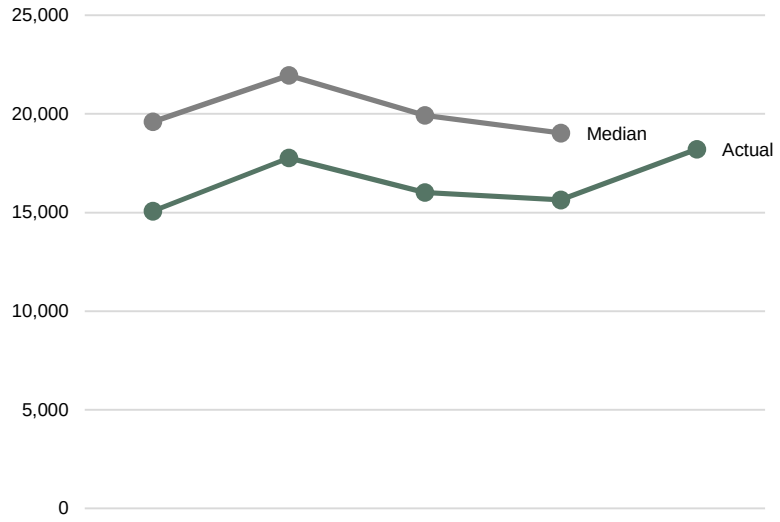


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	2.9%	6.1%	2.7%	2.3%	1.1%
Goal	2.9%	6.1%	7.1%	5.2%	4.4%
Difference	0	0	-4.4%	-3.0%	-3.3%

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
Bowling Green State University			-2.5%	-4.7%	0.9%	19.9%		1
Georgia State University			21.0%	8.7%	15.5%	11.9%		2
University of Alabama			4.4%	18.1%	15.8%	11.7%		3
University of Akron			26.8%	34.7%	26.2%	10.0%		4
Wichita State University			5.6%	4.5%	-0.8%	6.6%		5
Ohio University	X		9.7%	14.9%	11.9%	6.0%		6
George Mason University			13.3%	6.7%	4.8%	4.5%		7
Northern Arizona University			2.9%	6.1%	2.7%	2.3%	1.1%	8
Old Dominion University			23.6%	16.1%	14.2%	0.8%		9
Southern Illinois University - Carbondale	X		2.7%	2.0%	2.4%	0.4%		10
Kent State University - Kent			11.7%	5.6%	2.0%	-4.0%		11
Northern Illinois University			19.5%	16.5%	3.9%	-4.6%		12
University of Nevada - Las Vegas			-6.2%	-6.8%	-3.4%	-6.6%		13
University of North Carolina - Greensboro			58.8%	54.8%	35.1%	-7.9%		14
Western Michigan University			24.8%	28.1%	25.8%	-10.3%		15
University of Maine			5.1%	5.6%	-2.2%	-11.0%		16
Median			10.7%	7.7%	4.3%	1.5%		

Enterprise Size

Federally Financed Research Expenditures (in Thousands)

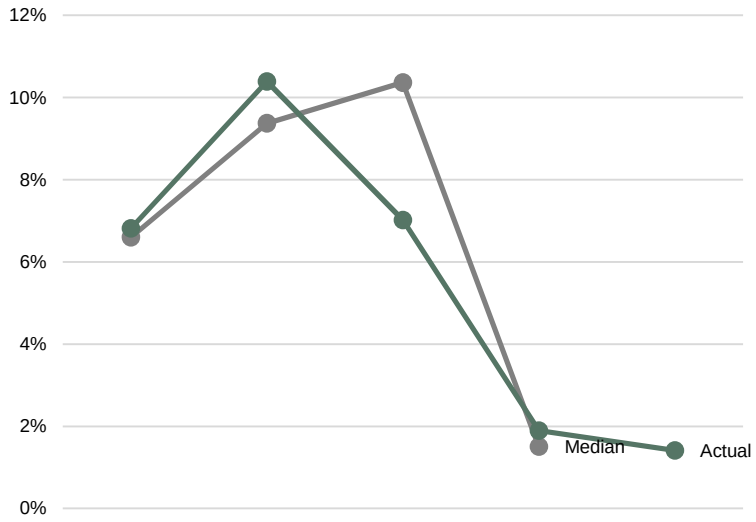


	2010	2011	2012	2013	2014	
Actual	15,070	17,765	16,015	15,638	18,209	

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
George Mason University			63,011	65,301	63,786	65,096		1
Old Dominion University			34,687	39,534	38,555	39,963		2
Georgia State University			27,073	28,210	34,075	37,521		3
University of Maine			50,163	59,800	39,661	34,252		4
University of Alabama			26,364	32,999	33,023	28,375		5
University of Nevada - Las Vegas			32,441	30,457	25,068	24,502		6
Ohio University	X		18,466	23,051	20,780	20,203		7
University of Akron			12,107	12,130	16,768	19,658		8
Southern Illinois University - Carbondale	X		22,209	23,696	22,055	18,398		9
Northern Arizona University			15,070	17,765	16,015	15,638	18,209	10
University of North Carolina - Greensboro			19,477	20,868	16,530	13,658		11
Wichita State University			13,751	12,972	19,078	13,434		12
Northern Illinois University			17,334	11,807	12,861	12,415		13
Western Michigan University			19,738	18,736	14,378	12,322		14
Kent State University - Kent			14,586	15,085	14,882	11,506		15
Bowling Green State University			4,963	6,164	7,005	9,323		16
Median			19,608	21,960	19,929	19,028		

Enterprise Size

Average Growth Rate in Federally Financed Research Expenditures Over 3 Years

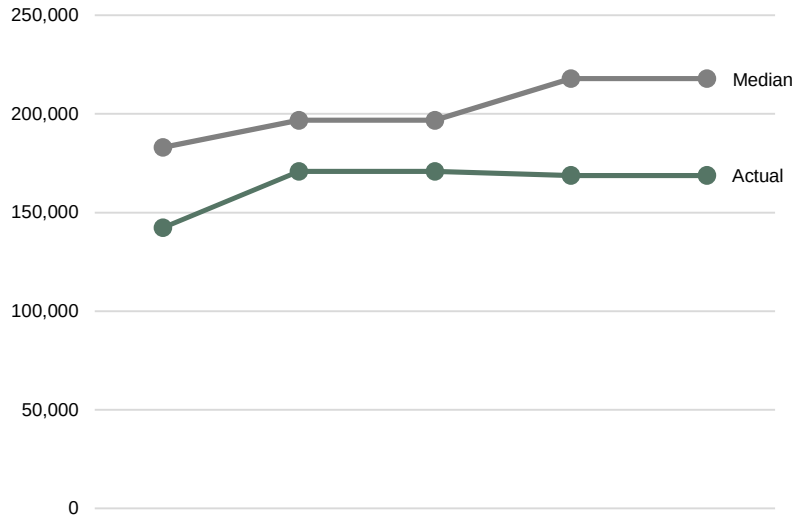


	2010	2011	2012	2013	2014
Actual	6.8%	10.4%	7.0%	1.9%	1.4%

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
Bowling Green State University			-5.9%	4.1%	17.9%	23.6%		1
University of Akron			3.8%	9.6%	16.3%	18.6%		2
Georgia State University			3.7%	2.8%	12.5%	11.7%		3
Old Dominion University			11.1%	12.4%	12.3%	5.0%		4
Ohio University	X		0.1%	9.1%	8.9%	4.1%		5
Wichita State University			-7.4%	-0.9%	17.9%	3.9%		6
University of Alabama			-1.1%	12.5%	11.8%	3.7%		7
Northern Arizona University			6.8%	10.4%	7.0%	1.9%	1.4%	8
George Mason University			10.6%	9.1%	4.8%	1.1%		9
Southern Illinois University - Carbondale	X		8.0%	10.7%	5.1%	-5.6%		10
Kent State University - Kent			14.5%	6.6%	4.0%	-6.9%		11
University of Nevada - Las Vegas			-11.8%	-9.0%	-6.7%	-8.7%		12
Northern Illinois University			12.6%	5.8%	-7.2%	-8.8%		13
University of Maine			6.4%	13.6%	-2.8%	-9.4%		14
University of North Carolina - Greensboro			61.1%	56.7%	38.1%	-10.3%		15
Western Michigan University			40.7%	44.4%	38.6%	-14.2%		16
Median			6.6%	9.4%	10.4%	1.5%		

Enterprise Size

Net Assignable Square Feet

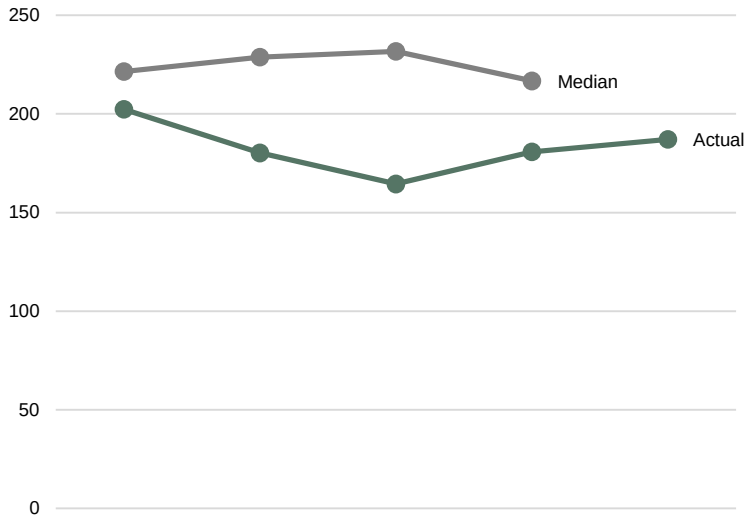


	2010	2011	2012	2013	2014	
Actual	142,340	170,831	170,831	168,829	168,829	

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Maine			643,390	625,692	625,692	585,049	585,049	1
Wichita State University			220,272	273,072	273,072	466,134	466,134	2
Southern Illinois University - Carbondale	X		328,265	328,265	328,265	328,265	328,265	3
Old Dominion University			263,988	298,718	298,718	260,270	260,270	4
Ohio University	X		331,694	239,382	239,382	253,560	253,560	5
Georgia State University			198,532	214,269	214,269	251,222	251,222	6
University of Nevada - Las Vegas			181,955	192,977	192,977	219,428	219,428	7
University of Akron				221,282	221,282	218,357	218,357	8
University of Alabama			183,990	192,311	192,311	217,398	217,398	9
George Mason University			161,103	200,572	200,572	194,894	194,894	10
Northern Arizona University			142,340	170,831	170,831	168,829	168,829	11
Bowling Green State University			170,600	160,592	160,592	166,234	166,234	12
University of North Carolina - Greensboro			97,658	125,616	125,616	146,500	146,500	13
Northern Illinois University			122,986	122,986	122,986	122,986	122,986	14
Kent State University - Kent			183,065	105,565	105,565	106,372	106,372	15
Western Michigan University			83,055	83,055	83,055	80,862	80,862	16
Median			183,065	196,775	196,775	217,878	217,878	

Enterprise Size

Total Research Expenditures per Net Assignable Square Foot

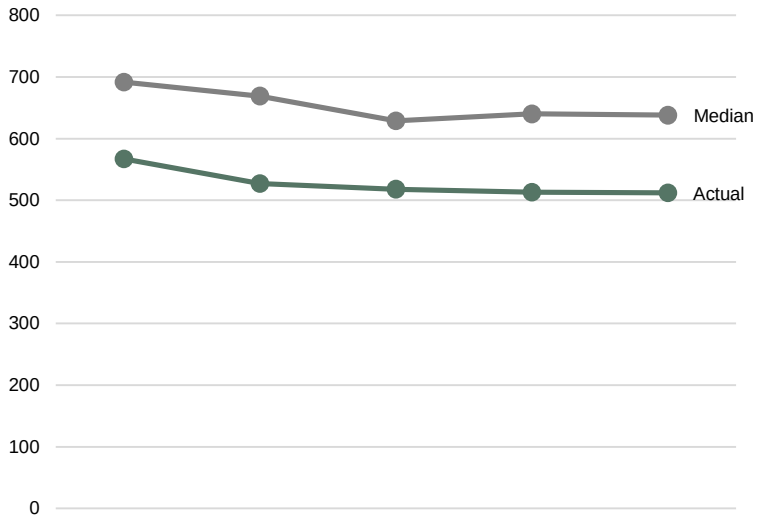


	2010	2011	2012	2013	2014
Actual	202	180	164	181	187

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
George Mason University			522	439	450	492		1
Georgia State University			408	433	425	446		2
Old Dominion University			368	342	350	381		3
University of Akron				296	300	319		4
University of Alabama			222	279	291	255		5
Ohio University	X		152	241	239	236		6
Western Michigan University			318	302	254	235		7
Kent State University - Kent			144	260	251	218		8
Southern Illinois University - Carbondale	X		213	217	217	216		9
Northern Illinois University			220	177	177	187		10
Northern Arizona University			202	180	164	181	187	11
University of Nevada - Las Vegas			244	205	179	164		12
University of Maine			173	178	147	133		13
Wichita State University			234	184	224	132		14
University of North Carolina - Greensboro			230	208	152	113		15
Bowling Green State University			48	56	53	79		16
Median			222	229	232	216.7		

Enterprise Size

Total Faculty Population

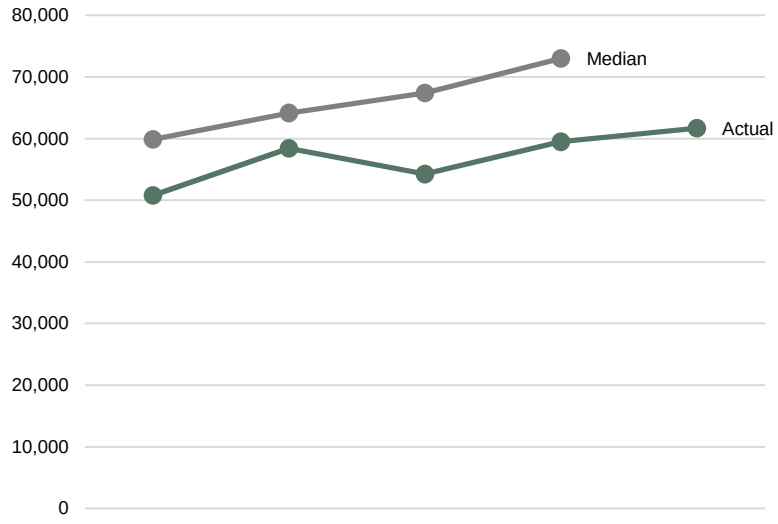


	2010	2011	2012	2013	2014
Actual	567	527	518	513	512

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
George Mason University			885	882	888	915	908	1
University of Akron			636	636	616	619	858	2
Western Michigan University			828	829	808	811	808	3
Georgia State University			739	736	745	763	772	4
Ohio University	X		898	886	833	728	718	5
Southern Illinois University - Carbondale	X		860	841	795	789	698	6
Northern Illinois University			758	732	714	699	677	7
University of Nevada - Las Vegas			699	672	616	648	661	8
Kent State University - Kent			684	666	642	632	615	9
University of Alabama			823	848	845	867	609	10
Old Dominion University			525	553	567	582	569	11
University of North Carolina - Greensboro			573	593	583	530	542	12
Bowling Green State University			533	508	527	530	514	13
Northern Arizona University			567	527	518	513	512	14
University of Maine			466	449	447	427	405	15
Wichita State University			378	360	361	373	387	16
Median			692	669	629	640	638	

Enterprise Size

Total Research Expenditures per Faculty

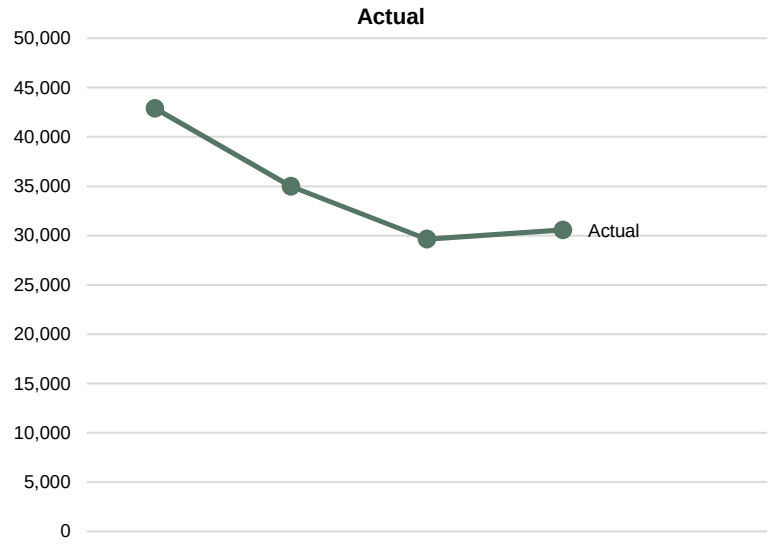


	2010	2011	2012	2013	2014
Actual	50,799	58,416	54,247	59,485	61,699

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Maine			238,803	248,552	206,119	181,693		1
Old Dominion University			185,097	184,796	184,443	170,340		2
Wichita State University			136,307	139,428	169,748	164,579		3
Georgia State University			109,628	125,985	122,346	146,788		4
University of Akron			83,151	103,044	107,813	112,504		5
George Mason University			95,051	99,874	101,574	104,823		6
Southern Illinois University - Carbondale	X		81,307	84,578	89,430	89,802		7
Ohio University	X		56,169	65,060	68,671	82,052		8
University of Alabama			49,529	63,246	66,136	63,948		9
Northern Arizona University			50,799	58,416	54,247	59,485	61,699	10
University of Nevada - Las Vegas			63,601	58,818	56,076	55,455		11
Kent State University - Kent			38,496	41,224	41,288	36,628		12
Northern Illinois University			35,668	29,710	30,564	32,943		13
University of North Carolina - Greensboro			39,155	44,049	32,727	31,302		14
Bowling Green State University			15,242	17,715	16,254	24,825		15
Western Michigan University			31,873	30,218	26,080	23,402		16
Median			59,885	64,153	67,404	73,000		

Enterprise Size

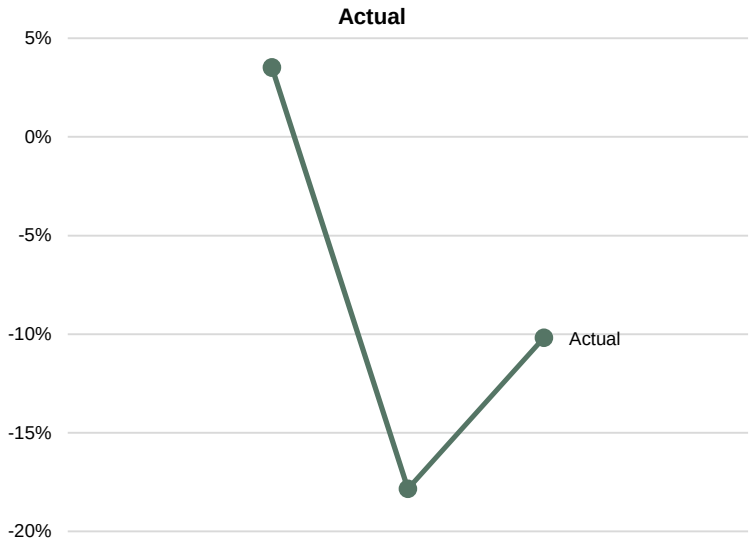
Other Sponsored Project Expenditures (in Thousands)



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	42,894	34,998	29,645	30,580	

Enterprise Size

Average Growth Rate in Other Sponsored Project Expenditures Over 3 Years



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual		3.5%	-17.8%	-10.2%	

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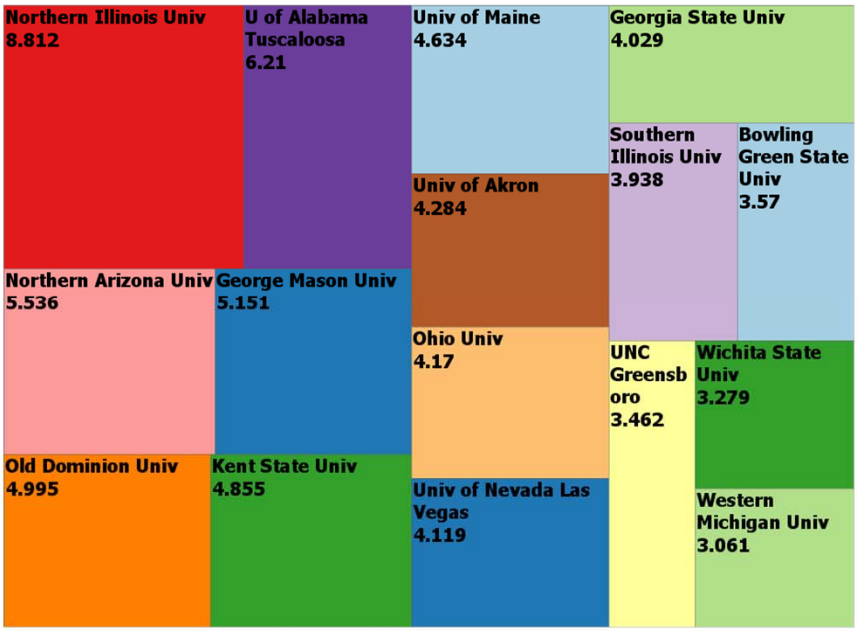
Discovery and Scholarly Impact

Invention Disclosures. NAU researchers have learned to recognize the commercial potential of their research, and the number of invention disclosures transacted has climbed. The university's technology transfer "in-reach" program enables us to stay informed about the research interests and activities of our faculty and also serves to educate faculty about how and why they should recognize the potential commercial applications of their work. In FY2014, we continued to see evidence that in-reach efforts are having an impact. We again received more disclosures in FY2014 than ever before, and the vast majority of these disclosures were received spontaneously. This means that more NAU researchers are understanding how to recognize the commercial potential of their work and are willing and eager to engage in technology transfer. We are pleased to report that we met our goal for invention disclosures transacted in FY2014.

Patents Issued. In FY2014, we met our enterprise goal for U.S. patents issued. NAU *Innovations* is starting to develop and implement more aggressive patent strategies for fast-tracking certain selected patent applications. In doing so we will be able to bring NAU innovations to the marketplace more quickly, giving us an edge needed in the highly competitive global innovation landscape.

Publication and Citation. One of the most significant measures of scholarship is publication. The extent to which the knowledge generated by university faculty is recognized and referenced by their peers is a strong indicator of the impact that the institution has in a given academic discipline. The Treemap at right shows that NAU is at the top of its peer group in impact of publications (citations per published document) across all disciplines through the end of calendar year 2013 (half-way through FY2014). In addition, among its peer group, NAU ranks first in citations in the fields of Ecology and Microbiology, second in the fields of Linguistics, Forestry and Geosciences, and fourth in the fields of Environmental Sciences and Zoology. This is especially significant since NAU ranks near the bottom of its peer group in total number of faculty (see Enterprise Size – Total Faculty Population).



Citations per document for publications by NAU faculty between 2010 and 2014.

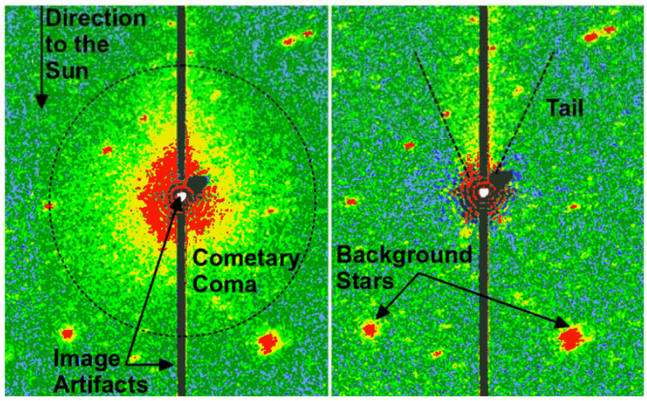


Image courtesy of NASA/JPL-Caltech/DLR/NAU.

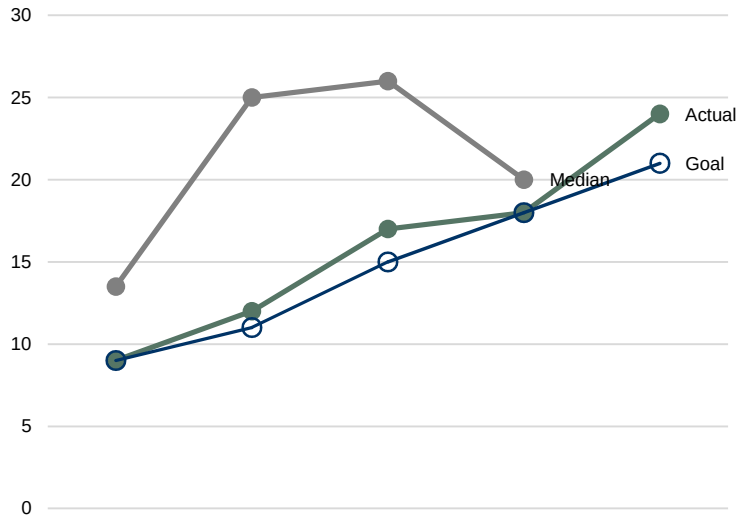
NAU-led team discovers comet. An ongoing project led by researchers at Northern Arizona University resulted in the discovery that a large near-Earth asteroid, 3552 Don Quixote, is actually a comet. During an observation of the object using the Spitzer Space Telescope in August 2009, NAU researchers Michael Mommert (a post-doctoral researcher at NAU who was a Ph.D. student at the German Aerospace Center in Berlin at the time the work was carried out) and David Trilling (NAU Associate Professor of Astronomy) found that it was far brighter than they expected. "The images were not as clear as we would like, so we set them aside," Trilling said. Much later, though, Mommert took a closer look, and partners at the Harvard-Smithsonian found that the object had a coma—a comet's visible atmosphere—and a faint tail. Mommert said this discovery implies that carbon dioxide and water ice also might be present on other near-Earth objects. Mommert presented the team's findings in September at the European Planetary Space Conference in London.

NAU researchers provide expertise to uncover the rise, historical fall and reemergence of plague strains. An international research team discovered that two of the world's most devastating pandemics—the plague of Justinian and the Black Death—were caused by distinct strains of the same pathogen. The strain that helped bring an end to the Roman Empire (Justinian) faded out about 1,500 years ago, but the other, which flourished 800 years later (Black Death), led to worldwide re-emergence in the late 1800s and is still with us today, killing thousands every year. Paul Keim, Regents' Professor at NAU and MGGen Director, said that "Plague has been circulating through civilization for at least 1,500 years and characterizing this ancient genome allows us to understand how diseases arise and then spread from continent to continent—even to locations in Arizona."

NAU contributes to study showing arid areas absorb large amounts of atmospheric carbon. Researchers have found that arid areas, among the biggest ecosystems on the planet, take up an unexpectedly large amount of carbon as levels of carbon dioxide increase in the atmosphere. The findings, published in *Nature Climate Change*, give scientists a better understanding of the Earth's "carbon budget"—how much carbon remains in the atmosphere as CO_2, and how much gets stored in the land or ocean in other forms. Obtaining the results required a novel 10-year experiment in which researchers exposed plots in the Mojave Desert to elevated carbon-dioxide levels similar to those expected in 2050. The researchers then removed soil and plants down to a meter deep and measured how much carbon was absorbed. Derek Sonderegger, assistant professor of mathematics and statistics at Northern Arizona University, used his expertise to help analyze data drawn from the materials.

Discovery and Scholarly Impact

Invention Disclosures Transacted

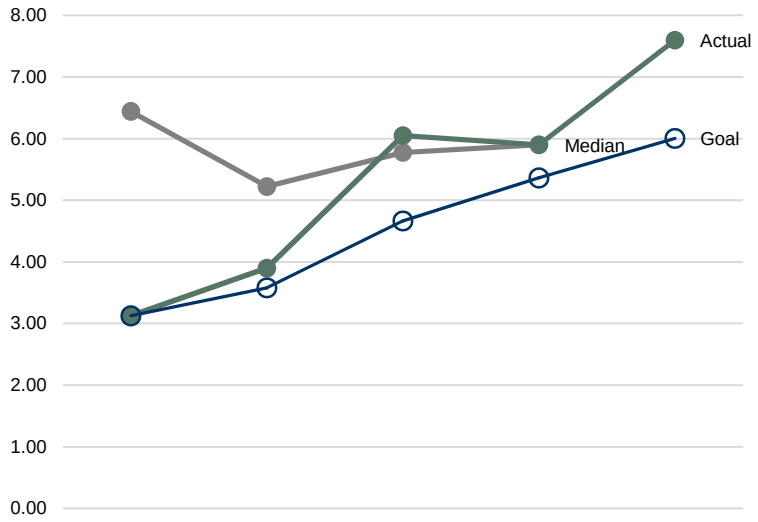


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	9	12	17	18	24
Goal	9	11	15	18	21
Difference	0	1	2	0	3

ABOR Peer Group	Med. Sch.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Akron			38	82	63	69		1
University of Alabama			31	30	36	48		2
Ohio University	X				30	26		3
Old Dominion University						20		4
Northern Arizona University			9	12	17	18	24	5
University of North Carolina - Greensboro			12	30	24	18		5
Northern Illinois University			11	7	12	8		7
Bowling Green State University			9	2				
George Mason University			61	46	28			
Georgia State University								
Kent State University - Kent			15	18				
Southern Illinois University - Carbondale	X			25	21			
University of Maine								
University of Nevada - Las Vegas								
Western Michigan University								
Wichita State University								
Median			14	25	26	20		

Discovery and Scholarly Impact

Invention Disclosures Transacted per $10 Million in Total Research Expenditures

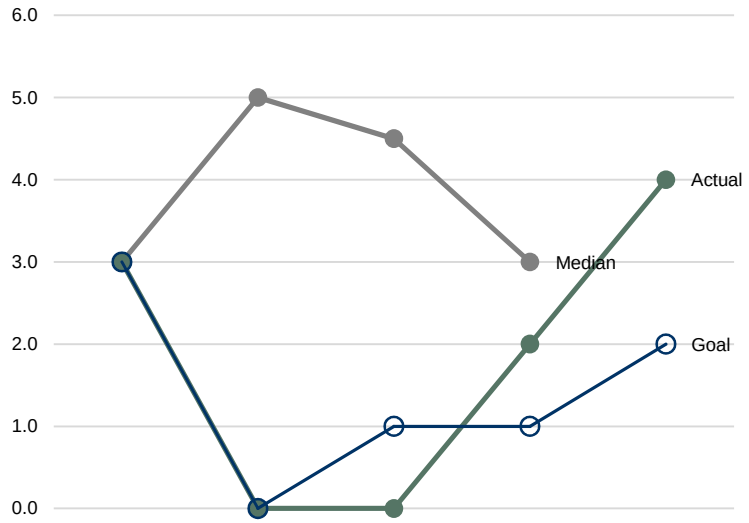


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	3.1	3.9	6.0	5.9	7.6
Goal	3.1	3.6	4.7	5.4	6.0
Difference	0.0	0.3	1.4	0.5	1.6

ABOR Peer Group	Med. Sch.	NSF Adj.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of North Carolina - Greensboro				5.3	11.5	12.6	10.8		1
University of Akron				7.2	12.5	9.5	9.9		2
University of Alabama				7.6	5.6	6.4	8.7		3
Northern Arizona University				3.1	3.9	6.0	5.9	7.6	4
Ohio University	X					5.2	4.4		5
Northern Illinois University				4.1	3.2	5.5	3.5		6
Old Dominion University							2.0		7
Bowling Green State University				11.1	2.2				
George Mason University				7.3	5.2	3.1			
Georgia State University									
Kent State University - Kent				5.7	6.6				
Southern Illinois University - Carbondale	X				3.5	3.0			
University of Maine									
University of Nevada - Las Vegas									
Western Michigan University									
Wichita State University									
Median				6.4	5.2	5.8	5.9		

Discovery and Scholarly Impact

U.S. Patents Issued

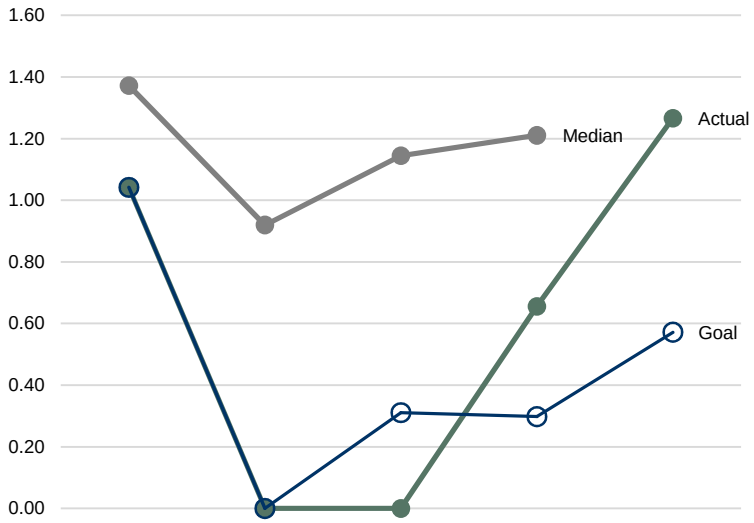


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	3	0	0	2	4
Goal	3	0	1	1	2
Difference	0	0	-1	1	2

ABOR Peer Group	Med. Sch.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Akron			9	10	16	21		1
Ohio University	X				9	13		2
Old Dominion University						12		3
Northern Illinois University			1	2	5	3		4
Northern Arizona University			3	0	0	2	4	5
University of Alabama			1	3	4	2		5
University of North Carolina - Greensboro			0	0	1	1		7
Bowling Green State University			3	5				
George Mason University			24	29	22			
Georgia State University								
Kent State University - Kent			8	10				
Southern Illinois University - Carbondale	X			5	4			
University of Maine								
University of Nevada - Las Vegas								
Western Michigan University								
Wichita State University								
Median			3	5	5	3		

Discovery and Scholarly Impact

U.S. Patents Issued per $10 Million in Total Research Expenditures



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	1.0	0.0	0.0	0.7	1.3
Goal	1.0	0.0	0.3	0.3	0.6
Difference	0.0	0.0	-0.3	0.4	0.7

ABOR Peer Group	Med. Sch.	NSF Adj.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Akron				1.7	1.5	2.4	3.0		1
Ohio University	X					1.6	2.2		2
Northern Illinois University				0.4	0.9	2.3	1.3		3
Old Dominion University							1.2		4
Northern Arizona University				1.0	0.0	0.0	0.7	1.3	5
University of North Carolina - Greensboro				0.0	0.0	0.5	0.6		6
University of Alabama				0.2	0.6	0.7	0.4		7
Bowling Green State University				3.7	5.6				
George Mason University				2.9	3.3	2.4			
Georgia State University									
Kent State University - Kent				3.0	3.6				
Southern Illinois University - Carbondale	X				0.7	0.6			
University of Maine									
University of Nevada - Las Vegas									
Western Michigan University									
Wichita State University									
Median				1.4	0.9	1.1	1.2		

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NORTHERN ARIZONA UNIVERSITY

Economic Development

Public Service. An important aspect of Northern Arizona University's contribution to economic development in Arizona is the direct impact of public service activities on communities across the state. In FY2014, NAU was awarded $17.5 million in external funds to conduct public service activities, including $4.6 million from the U.S. Department of Education for the university's Gear Up program, $2.8 million from the Environmental Protection Agency for support of the annual National Tribal Forum on Air Quality and $1.5 million from the Corporation for National & Community Service for the continuing NAU Foster Grandparent Program. NAU's commitment to public service is demonstrated through numerous sponsored projects such as these, aimed at helping the state's K-12 system through teacher professional development, technology access and other partnerships, at fulfilling our commitment to the Native American communities across the state, and to facilitating quality of life for aging and disabled Arizonans, just to name a few. These public service dollars, just like research dollars, contribute to the "bottom line" of the university's direct impact as an economic entity—an impact that is all the more important to the rural regions and small metropolitan areas we serve.

NAU's American Indian School Leadership Project continues to prepare participants for administrative roles in Indian-serving schools.

Intellectual Property Income and Start-up Companies. The translation of university innovations into commercial products/services and business activity is another important element of the university's economic impact. We are pleased to report that NAU met its 2020 enterprise goal for intellectual property income generated in FY2014.

However, for NAU, the most challenging 2020 enterprise goal associated with technology transfer is the formation of start-up companies. Flagstaff's small size and remote location, and the university's relatively recent move towards hiring high productivity researchers, challenges us to generate new companies. In FY2014, we did not meet our goal for this metric. However, through the FY2014 Arizona Furnace program, we did generate an exclusive license to one of the "winners" of the FY2014 Furnace—our first "start-up" company since FY2012.

Doctoral Degrees Granted

Northern Arizona University offers six PhD-granting degree programs, and numbers of doctoral graduates are therefore modest relative to most of our peer institutions. The university did, however, meet its goal for number of PhD degrees granted in FY2014, improving our performance over FY2013. Meanwhile, in addition to the interdisciplinary PhD program in earth and environmental science implemented during FY2011, we are actively planning to develop doctoral programs in Astronomy and Bioengineering in the coming years and anticipate that graduates of these programs will help us reach our annual 2020 enterprise goals beginning in FY2015-16.

Governor recognizes NAU Center at Economic Development Conference. NAU's Center for American Indian Economic Development (CAIED) received recognition from Arizona Governor Jan Brewer at her Economic Development Conference in Flagstaff. The Center earned the Future Leaders Award for the Seven Generations Money Management Game, which instills financial responsibility in Native American youth. "Here in Arizona, there are a handful of tribes whose members receive tribal trust funds when they turn 18, or sometimes 21," said Levi Esquerra, CAIED program director. "They can be pretty sizable, and at that age, they might not spend it wisely. The goal is to teach them that this is a great opportunity; spend it wisely."

NAU receives grant to advance career and educational pathways in geospatial technology. Northern Arizona University has been awarded a $448,000 grant from the National Science Foundation to support career and educational pathways in geospatial technology (GST). NAU will partner with Mesa Community College to increase awareness of and training for GST-related careers through internships, outreach and industry involvement, and provide sustained professional development in GST skills for high school, community college and university faculty. Assistant professor Mark Manone, who directs NAU's Geospatial Research and Information Laboratory, points to the wide-ranging application of GST skills. It's not just hard-science jobs that are out there, Manone said. The technology is being used in "anything that deals with location-based information," from city planning to business marketing. "It's an emerging field that's going to provide for career paths in diverse areas," he said.

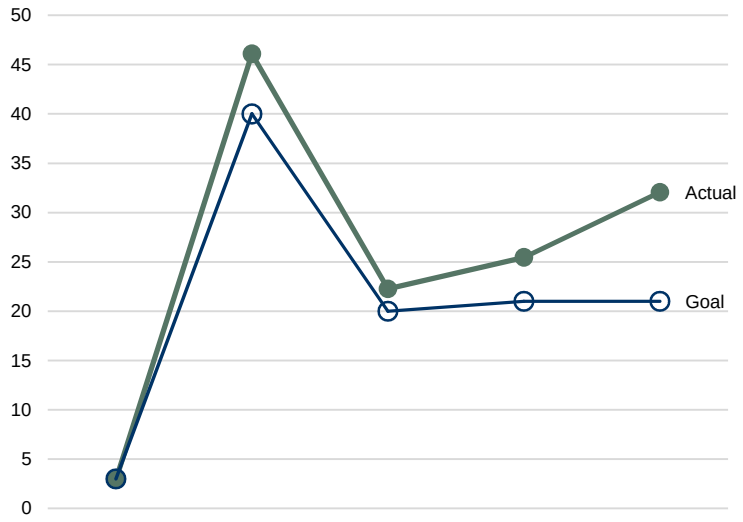
NAU President John Haeger and Bill Bradel, Northern Arizona Healthcare president and CEO, signed a memorandum of understanding to work collaboratively as part of the Translational Health Research Initiative, or THRIVE.

New partnership makes community health care research a priority. Northern Arizona University and Northern Arizona Healthcare have solidified a formal relationship designed to improve the health of communities in the region. The partnership outlines NAU and NAH's agreement to work collaboratively as part of the Translational Health Research Initiative, or THRIVE. Through THRIVE, the two organizations will conduct health care research in the areas of population and community health, precision and personalized medicine, and translational and biomedical health. The diverse populations of northern Arizona will be the focus of the partnership.

NAU receives grant to train American Indian educators for top positions. Northern Arizona University has received a $1 million grant from the Department of Education to prepare American Indian educators for principalships in Indian-serving schools. The four-year grant will provide additional funding for NAU's American Indian School Leadership project, an initiative designed to train American Indian teachers and improve schools on Indian reservations.

Economic Development

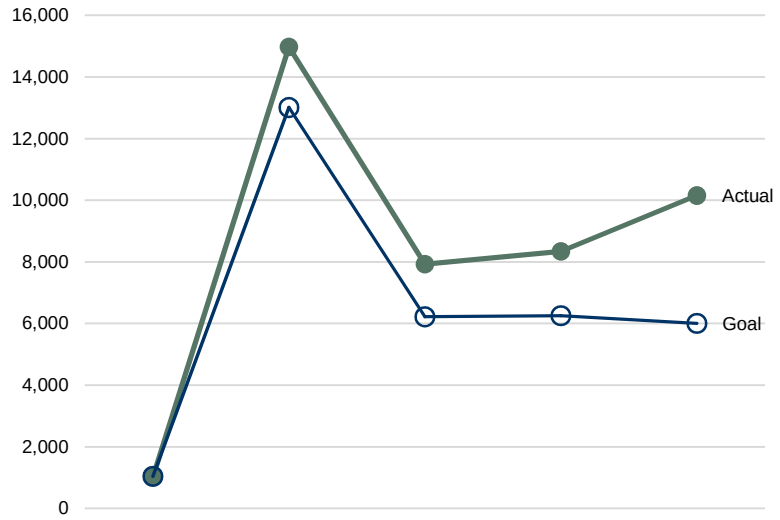
Intellectual Property Income (in Thousands)



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	3	46	22	25	32
Goal	3	40	20	21	21
Difference	0	6	2	4	11

Economic Development

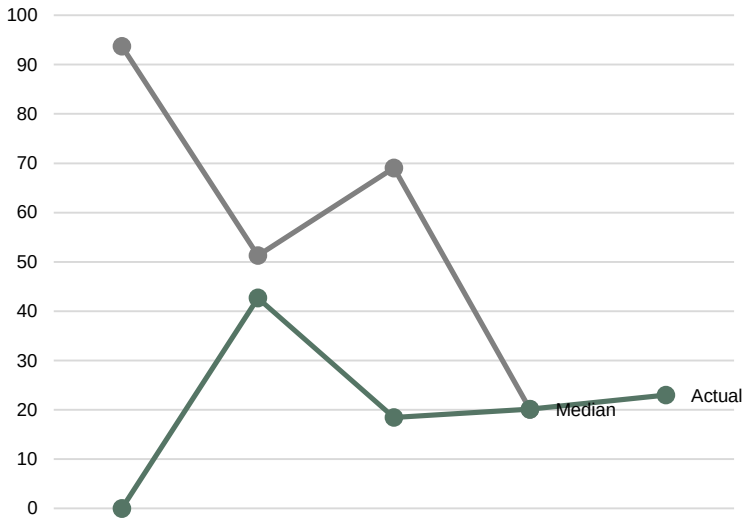
Intellectual Property Income per $10 Million in Total Research Expenditures



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	1,018	14,974	7,928	8,344	10,154
Goal	1,042	13,008	6,219	6,256	6,004
Difference	-24	1,966	1,709	2,088	4,150

Economic Development

Licenses and Options Income (in Thousands)

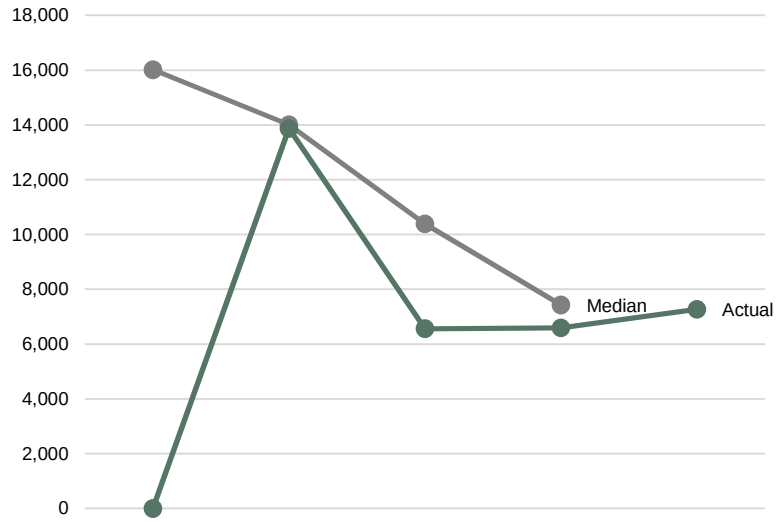


	2010	2011	2012	2013	2014	
Actual	0	43	18	20	23	

ABOR Peer Group	Med. Sch.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
Ohio University	X				9,400	9,926		1
University of Akron			202	279	336	226		2
Northern Illinois University			10	30	16	24		3
Northern Arizona University			0	43	18	20	23	4
Old Dominion University						19		5
University of North Carolina - Greensboro			121	51	14	12		6
University of Alabama			77	9	18	8		7
Bowling Green State University			6	2				
George Mason University			110	123	120			
Georgia State University								
Kent State University - Kent			401	360				
Southern Illinois University - Carbondale	X			677	711			
University of Maine								
University of Nevada - Las Vegas								
Western Michigan University								
Wichita State University								
Median			94	51	69	20		

Economic Development

Licenses and Options Income per $10 Million in Total Research Expenditures

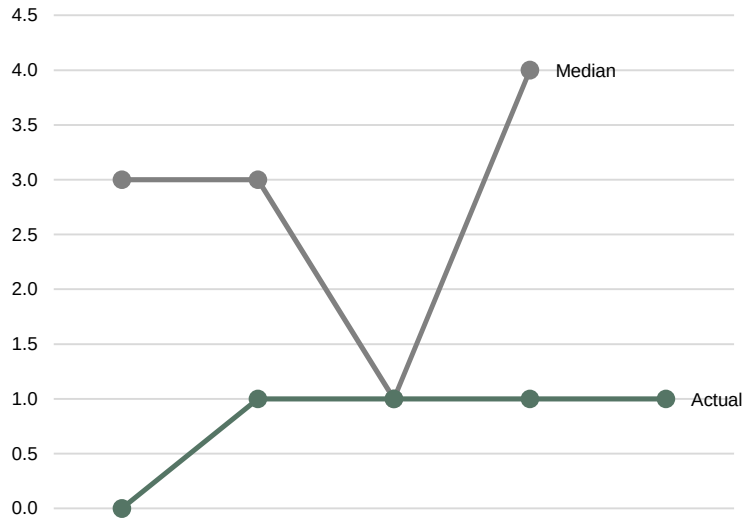


	2010	2011	2012	2013	2014	
Actual	0	13,865	6,562	6,592	7,273	

ABOR Peer Group	Med. Sch.	NSF Adj.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
Ohio University	X					1,643,270	1,661,700		1
University of Akron				38,240	42,518	50,616	32,469		2
Northern Illinois University				3,839	13,966	7,273	10,305		3
University of North Carolina - Greensboro				53,719	19,629	7,517	7,427		4
Northern Arizona University				0	13,865	6,562	6,592	7,273	5
Old Dominion University							1,866		6
University of Alabama				18,903	1,602	3,274	1,531		7
Bowling Green State University				7,798	2,545				
George Mason University				13,121	14,005	13,263			
Georgia State University									
Kent State University - Kent				152,380	131,137				
Southern Illinois University - Carbondale	X				95,207	99,988			
University of Maine									
University of Nevada - Las Vegas									
Western Michigan University									
Wichita State University									
Median				16,012	14,005	10,390	7,427		

Economic Development

Licenses and Options Executed

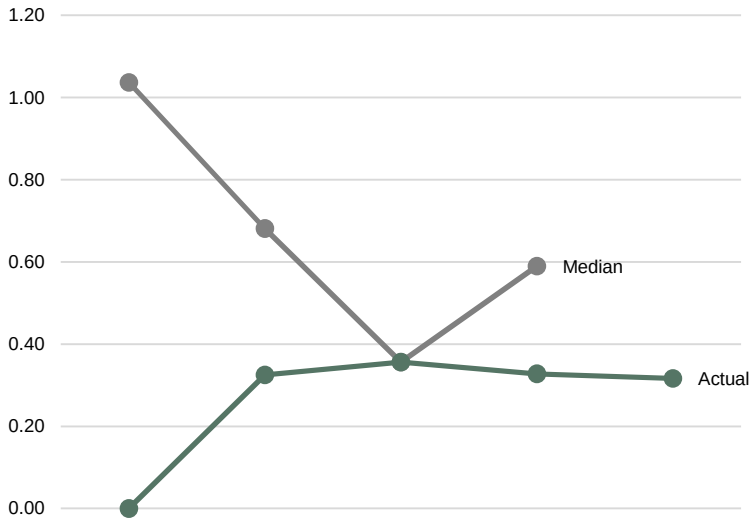


	2010	2011	2012	2013	2014
Actual	0	1	1	1	1

ABOR Peer Group	Med. Sch.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of North Carolina - Greensboro			3	3	2	10		1
Old Dominion University						6		2
University of Akron			10	5	6	4		3
University of Alabama			3	3	4	4		3
Northern Arizona University			0	1	1	1	1	5
Northern Illinois University			0	0	0	1		5
Bowling Green State University			2	0				
George Mason University			6	6	1			
Georgia State University								
Kent State University - Kent			8	3				
Ohio University	X							
Southern Illinois University - Carbondale	X			5	0			
University of Maine								
University of Nevada - Las Vegas								
Western Michigan University								
Wichita State University								
Median			3	3	1	4		

Economic Development

Licenses and Options Executed per $10 Million in Total Research Expenditures

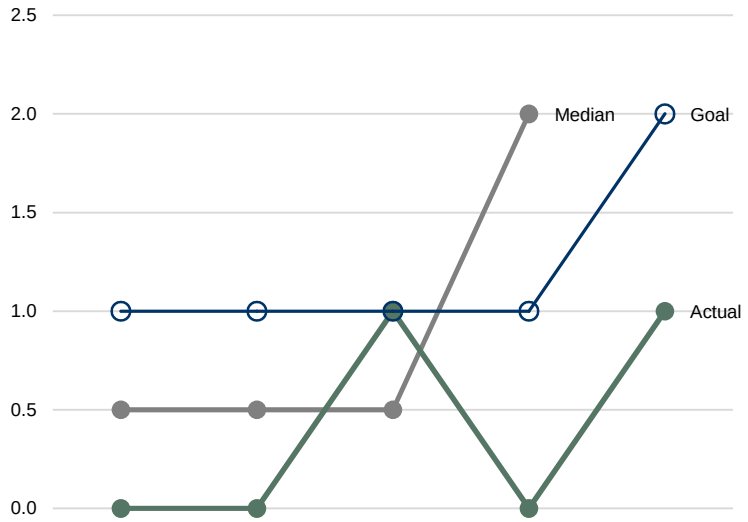


	2010	2011	2012	2013	2014	
Actual	0.0	0.3	0.4	0.3	0.3	

ABOR Peer Group	Med. Sch.	NSF Adj.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of North Carolina - Greensboro				1.3	1.1	1.0	6.0		1
University of Alabama				0.7	0.6	0.7	0.7		2
Old Dominion University							0.6		3
University of Akron				1.9	0.8	0.9	0.6		4
Northern Illinois University				0.0	0.0	0.0	0.4		5
Northern Arizona University				0.0	0.3	0.4	0.3	0.3	6
Bowling Green State University				2.5	0.0				
George Mason University				0.7	0.7	0.1			
Georgia State University									
Kent State University - Kent				3.0	1.1				
Ohio University	X								
Southern Illinois University - Carbondale	X				0.7	0.0			
University of Maine									
University of Nevada - Las Vegas									
Western Michigan University									
Wichita State University									
Median				1.0	0.7	0.4	0.6		

Economic Development

Startup Companies

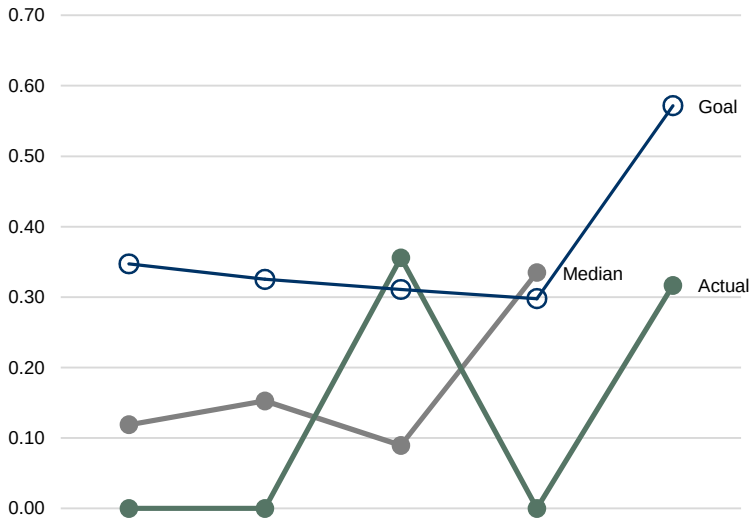


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	0	0	1	0	1
Goal	1	1	1	1	2
Difference	-1	-1	0	-1	-1

ABOR Peer Group	Med. Sch.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Akron			2	2	2	6		1
Ohio University	X				4	2		2
Old Dominion University						2		2
University of Alabama			0	0	1	2		2
University of North Carolina - Greensboro			1	1	0	1		5
Northern Arizona University			0	0	1	0	1	6
Northern Illinois University			0	0	0	0		6
Bowling Green State University			1	0				
George Mason University			2	4	0			
Georgia State University								
Kent State University - Kent			0	2				
Southern Illinois University - Carbondale	X				0			
University of Maine								
University of Nevada - Las Vegas								
Western Michigan University								
Wichita State University								
Median			1	1	1	2		

Economic Development

Startup Companies per $10 Million in Total Research Expenditures

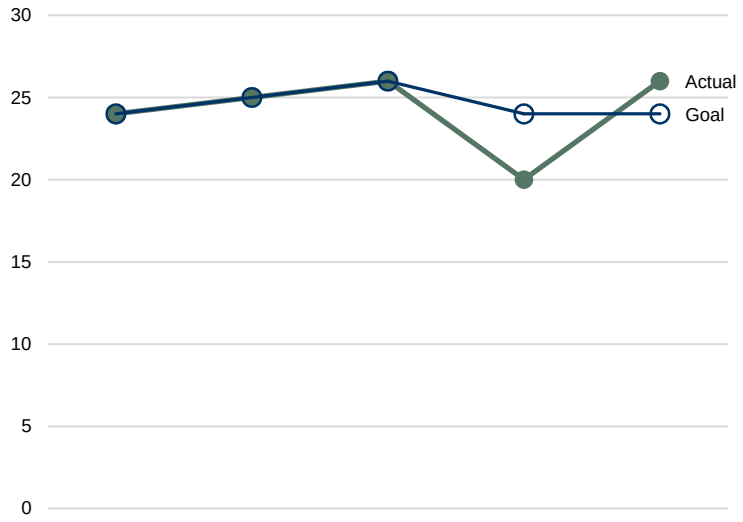


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	0.0	0.0	0.4	0.0	0.3
Goal	0.3	0.3	0.3	0.3	0.6
Difference	-0.3	-0.3	0.0	-0.3	-0.3

ABOR Peer Group	Med. Sch.	NSF Adj.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Akron				0.4	0.3	0.3	0.9		1
University of North Carolina - Greensboro				0.4	0.4	0.0	0.6		2
University of Alabama				0.0	0.0	0.2	0.4		3
Ohio University	X					0.7	0.3		4
Old Dominion University							0.2		5
Northern Arizona University				0.0	0.0	0.4	0.0	0.3	6
Northern Illinois University				0.0	0.0	0.0	0.0		6
Bowling Green State University				1.2	0.0				
George Mason University				0.2	0.5	0.0			
Georgia State University									
Kent State University - Kent				0.0	0.7				
Southern Illinois University - Carbondale	X					0.0			
University of Maine									
University of Nevada - Las Vegas									
Western Michigan University									
Wichita State University									
Median				0.1	0.2	0.1	0.3		

Economic Development

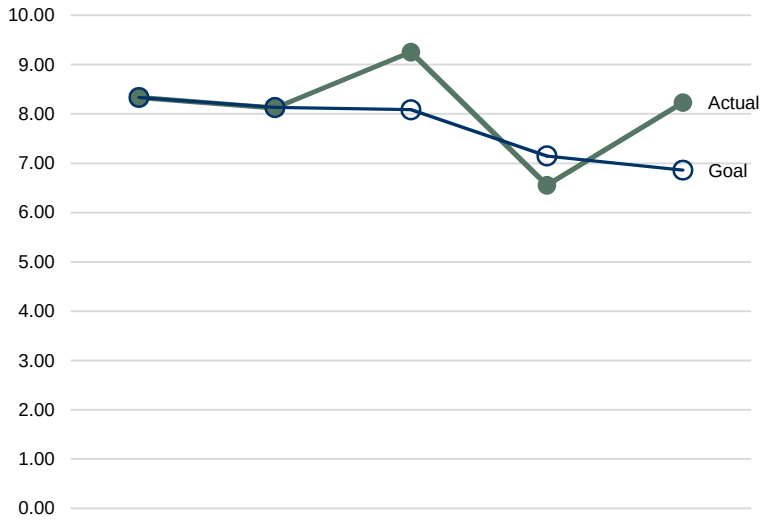
Ph.D. Degrees Conferred



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	24	25	26	20	26
Goal	24	25	26	24	24
Difference	0	0	0	-4	2

Economic Development

Ph.D. Degrees Conferred per $10 Million in Total Research Expenditures



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	8.3	8.1	9.3	6.6	8.2
Goal	8.3	8.1	8.1	7.1	6.9
Difference	0.0	0.0	1.2	-0.6	1.4

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NORTHERN ARIZONA UNIVERSITY

Leadership and Recognition

Northern Arizona University seeks to provide regional, national and international leadership through the activities and outcomes of its researchers. The metrics typically used by the nation's largest research institutions rarely provide useful insights for our peer group; ultimately, publication and citation by the research community and awards bestowed upon our researchers are as important as research funds in reflecting the quality and impact of university scholarship.

National Academy Members

As reported last year, we do not currently have members of the National Academies of Science or of Engineering on our faculty. This is the case for most of our peer group as well. Still, the university is home to a number of distinguished and accomplished faculty researchers. National and international recognition of our faculty contributes to our continued success in competing for funding, as well as enhancing the quality of the student experience. Our faculty (even the "stars") virtually all maintain active teaching roles and incorporate many undergraduate students into their research groups; undergraduates frequently report how motivating and helpful it is for their own development to work directly with individuals they know to be "leaders" in the field.

Asteroid named for NAU Astronomer. Nadine Barlow, NAU Professor of Astronomy, was honored by the International Astronomical Union by having an asteroid named for her. The asteroid, 15466 Barlow, was discovered at the Anderson Mesa Station in 1999, but it wasn't until 2014—at the Lunar and Planetary Science Conference in Houston, that she received her official plaque commemorating the honor. The naming originated as a way to acknowledge Barlow's place as one of the world's foremost experts on Martian impact craters. "What I think is really cool is that it was discovered here in Flagstaff at Lowell Observatory," Barlow said. "It's a very nice recognition of the work I've done, and the fact that my colleagues recognize [my work] and are happy with it."

Cable TV show features NAU forensics research. In December, several Northern Arizona University professors made cameo appearances on the Cable TV show, "STEM Journals". The educational program, sponsored by Science Foundation Arizona and the Arizona SciTech Festival, is aimed at inspiring middle and high school students to enter the fields of science, engineering, math and technology. Featured in the forensics episode from NAU's Center for Microbial Genetics and Genomics are: Paul Keim, director and NAU Regents Professor; Joseph Busch, assistant director; Christopher Allender, senior research specialist and biology doctoral student; and biomedical science, chemistry and health pre-professional majors Christian Hochhalter and Sally Statham. Christopher Mann, associate professor of physics and astronomy, and Glenn Pagano, graduate teaching assistant and master's student in applied physics, discuss advances in ballistics identification that uses 3D imaging and algorithms to help solve crimes.

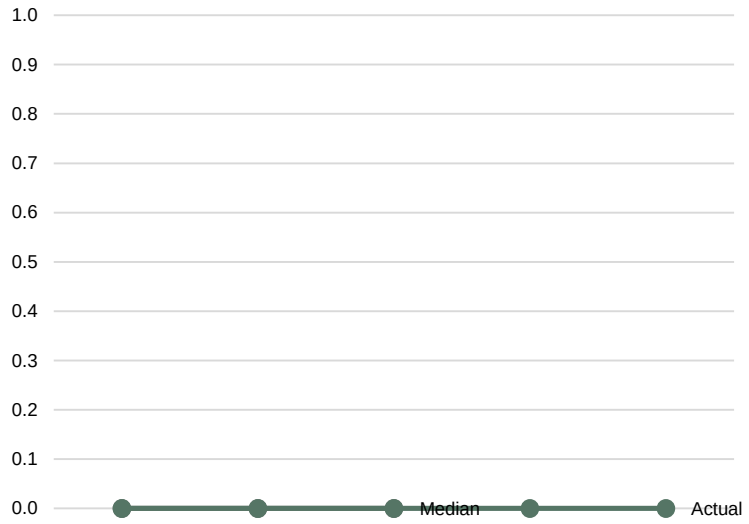
Other Notable Accomplishments in FY2014:

- **Kathleen J. Ferraro**, chair and professor of sociology and social work, received the 2013 Lee Founders Award from the Society for the Study of Social Problems. The award recognizes significant achievements that, over a distinguished career, have demonstrated a longtime devotion to the humanistic tradition of sociology.

- **Paul Gremillion**, associate professor of environmental engineering, was responsible for producing and participated in the signing of an international agreement at the general conference of the International Atomic Energy Agency. Chad, Egypt, Libya and Sudan signed the Strategic Action Programme, which aims to optimize the equitable use of the Nubian Sandstone Aquifer System, a huge water resource that lies beneath the four nations. The agreement also commits the countries to strengthen and build upon a previously existing regional coordination mechanism, in part by establishing a new Joint Authority for the Nubian Aquifer System.

Leadership and Recognition

National Academy Members

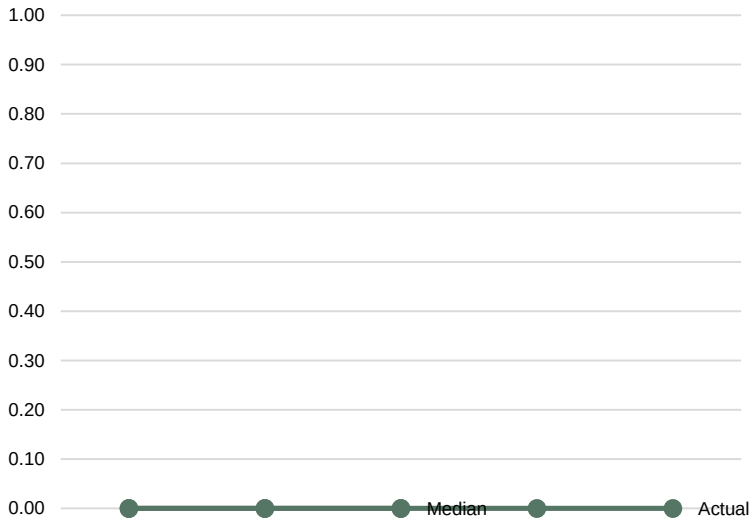


	2010	2011	2012	2013	2014
Actual	0	0	0	0	0

ABOR Peer Group	Med. Sch.	2010	2011	2012	2013	2014	Rank
George Mason University		2	2	2			1
University of Akron		2	2	2			1
Kent State University - Kent		1	1	1			3
University of Maine		2	2	1			3
Bowling Green State University		0	0	0			5
Georgia State University		0	0	0			5
Northern Arizona University		0	0	0	0	0	5
Northern Illinois University		0	0	0			5
Ohio University	X	0	0	0			5
Old Dominion University		0	0	0			5
Southern Illinois University - Carbondale	X	0	0	0			5
University of Alabama		0	0	0			5
University of Nevada - Las Vegas		0	0	0			5
University of North Carolina - Greensboro		0	0	0			5
Western Michigan University		0	0	0			5
Wichita State University		0	0	0			5
Median		0	0	0			

Leadership and Recognition

National Academy Members per $10 Million in Total Research Expenditures



	2010	2011	2012	2013	2014
Actual	0.0	0.0	0.0	0.0	0.0

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
Kent State University - Kent			0.4	0.4	0.4			1
University of Akron			0.4	0.3	0.3			2
George Mason University			0.2	0.2	0.2			3
University of Maine			0.2	0.2	0.1			4
Bowling Green State University			0.0	0.0	0.0			5
Georgia State University			0.0	0.0	0.0			5
Northern Arizona University			0.0	0.0	0.0	0.0	0.0	5
Northern Illinois University			0.0	0.0	0.0			5
Ohio University	X		0.0	0.0	0.0			5
Old Dominion University			0.0	0.0	0.0			5
Southern Illinois University - Carbondale	X		0.0	0.0	0.0			5
University of Alabama			0.0	0.0	0.0			5
University of Nevada - Las Vegas			0.0	0.0	0.0			5
University of North Carolina - Greensboro			0.0	0.0	0.0			5
Western Michigan University			0.0	0.0	0.0			5
Wichita State University			0.0	0.0	0.0			5
Median			0.0	0.0	0.0			

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NORTHERN ARIZONA UNIVERSITY

Technology Transfer

Northern Arizona University faculty, staff and students transform creativity and discovery into knowledge and innovations in ways that benefit the region and the state. Through its technology transfer program, NAU aims to foster a university-wide entrepreneurial spirit in research and technology, and best leverage its research assets to contribute to innovation and economic development.


A backpack with piezoelectric material generates energy from the motion of a bird's wings in flight. (Photo courtesy of Michael Shafer)

Technology transfer benefits the NAU research enterprise in a number of ways. At NAU, researchers can receive funding to help develop ideas that may lead to commercially valuable outcomes. Often, these funds allow researchers to involve graduate and undergraduate students in meaningful research activity. Relationships built with potential licensees can facilitate industry support of continuing research. In addition, revenues received from the commercialization of IP developed by researchers are shared with those researchers, and some funds that the university retains goes back to the academic units to support other research and development.

Commercialization of research outcomes is also an important mechanism through which we disseminate research results—by providing goods and services through the commercialization of intellectual property. In fact, technology licensing and commercialization is sometimes the best method for sharing knowledge with society. In instances where revenues are earned through commercialization, income is returned to the university and is invested back into the university's research enterprise.

In FY2014, we met our technology transfer enterprise metrics for invention disclosures transacted, patents issued, and intellectual property income received. While our goal was to generate two start-up companies in FY2014, we did not meet this goal. However, we are excited at having licensed an NAU-created technology to one start-up company in FY2014 and to have the opportunity to support their efforts to commercialize this technology.

Intellectual property created by NAU faculty, staff, and students are assets of the university and State of Arizona that represent the fruits of valuable investments and research efforts. As a public institution, NAU has an obligation and responsibility to manage these assets in the best interest of the State and for the benefit of all Arizonans.

Technology Transfer

Statistical Exhibits

NORTHERN ARIZONA UNIVERSITY

Technology Transfer Activities	2010	2011	2012	2013	2014
Invention Disclosures Transacted	9	12	17	18	24
Invention Disclosures Transacted Year/Year Percentage Change		33%	42%	6%	33%
New Patent Applications	5	5	2	2	7
New Patent Applications Year/Year Percentage Change		0%	-60%	0%	250%
U.S. Patents Issued	3	0	0	2	4
U.S. Patents Issued Year/Year Percentage Change		-100%			100%
Licenses and Options Executed	0	1	1	1	1
Licenses and Options Executed Year/Year Percentage Change			0%	0%	0%
Other Major Agreements			0	0	0
Other Major Agreements Year/Year Percentage Change					

Licensing and Other Revenue	2010	2011	2012	2013	2014
Licensing Revenue (Including Options)	0	42,684	18,439	20,115	22,975
Licensee Legal Reimbursements	2,931	3,414	3,838	5,347	9,100
Other Revenue	0	0	0	0	0
Total	2,931	46,098	22,277	25,462	32,075

Sponsored Research Facilitated	2010	2011	2012	2013	2014
Total	0	0	0	599,804	0

Royalty Distribution	2010	2011	2012	2013	2014
Inventors	0	0	0	0	0
Laboratories and Units	0	0	0	0	0
University	0	0	0	0	0
Undistributed	0	0	0	0	0

US 8,480,377 B2, "Integrated Electro-Magnetohydrodynamic Micropumps and Methods for Pumping Fluids". Issued July 9, 2013. This patent protects a highly-efficient miniaturized pump, designed with enhanced performance capabilities, that can be used to move a wide range of fluids in any of a wide range of micro-fluidic applications, ranging from portable fuel cells to drug delivery systems to microelectronic cooling systems, just to name a few.

US 8,541,006 B2, "Methods and Devices for the Detection of Biofilm". Issued September 24, 2013. This patent protects methods and kits for biofilm detection. This patent is jointly owned by the University of Maryland, Baltimore.

US 8,697,375 B2, "In Vivo Biofilm Infection Diagnosis and Treatment". Issued April 15, 2014. Biofilm infections (such as methicillin-resistant Staphylococcus aureus or MRSA) are often associated with indwelling medical devices, such as catheters, endotracheal tubes, surgical sutures, hip and knee joint prostheses and dental implants. This patent protects a non-invasive, non-toxic method for detecting and diagnosing biofilm infections residing in a mammal. This patent is jointly owned by the University of Maryland, Baltimore.

US 8,722,335, "Methods and Kits Used in the Detection of Fungus". Issued May 13, 2014. This patent protects methods of using quantitative Polymerase Chain Reaction (PCR) to detect fungal organisms in clinical and environmental samples and to generate standards that allow the quantification of fungal organisms in these samples. This patent is jointly owned by Translational Genomics Institute (TGen).

SCORE Algae

Solar Crude Oil Renewable Energy (SCORE) [from] Algae is a start-up company based in Scottsdale, Arizona. Their goal is to commercialize a process that "cooks" algae from lakes, streams and waste water into crude oil by using solar energy. SCORE entered into an exclusive license for a device and method for the cultivation and harvest of algae after winning an award of $25,000 through the Arizona Furnace. The founder of SCORE is a graduate student, Mady Tyson, who is obtaining her doctoral degree in Sustainability at Arizona State University.

SCORE Algae

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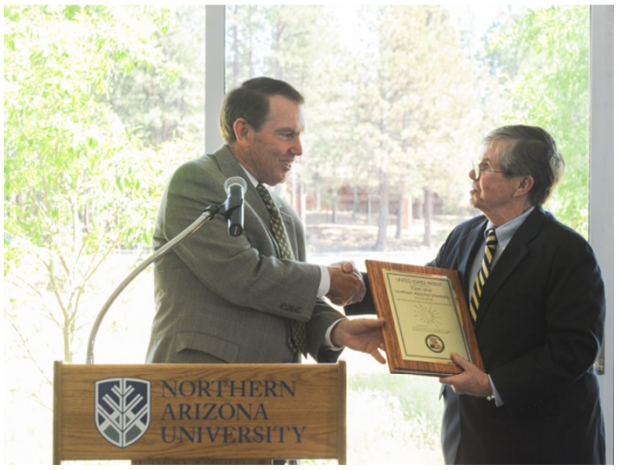
Northern Arizona University and the Translational Genomics Research Institute (TGen) signed a five-year agreement to promote innovation and quality research benefiting Arizona. The agreement, signed in May, allocated $3 million annual state funding, directed by Governor Jan Brewer and the Arizona Legislature, in recognition of the positive dividends from a viable, competitive bioindustry in Arizona.

NAU and TGen celebrate the issuance of their first jointly-owned patent. In May, 2014, U.S. Patent No. 8,722,335, "Methods and Kits Used in the Detection of Fungus" was issued, representing the first patent issued jointly to the institutions under their years-long research partnership. The tests were developed by a team from NAU and TGen that included Paul Keim, director of TGen North and a Regents Professor at NAU.



At right: Jeffrey Trent, TGen president and research director, presents joint US patent to NAU President John Haeger.

Northern Arizona University's IP receives second National Innovation Award
NAU won its second National Innovation Award at the Tech Connect National Innovation Summit and Showcase for *MoMeCCA*, Moist membranes for the Cultivation and Collection of Algae. Development of this patent-pending invention was funded through the Technology & Research Initiative Fund (TRIF).

TechConnect
Innovation Awards

NAU teams up with ASU, Dignity Health and others to push out university-developed technologies and catalyze new Arizona start-up companies
In FY 2014, NAU once again participated in the running of the Arizona Furnace program, a technology-based business accelerator, founded by ASU and funded by the Arizona Commerce Authority and Bioaccel. The Furnace offers selected technologies and IP developed at Arizona research institutions, including Northern Arizona University, for licensing to entrepreneurs with the intent of forming new high-potential start-ups. In this second round, one of the successful applicants, SCORE Algae, pitched the commercialization plan for NAU's MoMeCCA, Moise membranes for the Cultivation and Collection of Algae. SCORE received $25,000 from the Furnace and signed an exclusive license with NAU for MoMeCCA in May.

FURNACE

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NORTHERN ARIZONA UNIVERSITY

Strategic Initiatives

Health Research Initiatives

Arizona is emerging as one of the nation's top contributors in the biosciences—biomedical jobs are growing at a rate three times faster than the national average and research and development expenditures have increased by 55% to a total of $452 million. In FY2014, Northern Arizona University (NAU) took steps to strengthen its position to support this state-wide expansion. "Our goal is to further health research efforts at NAU and throughout Northern Arizona through collaborative partnerships and to position NAU as a regional anchor for the northern end of Arizona's biomedical corridor," says Robert Trotter II, NAU Regents Professor in Anthropology and NAU's Associate Vice President for Health Research Initiatives (HRI). "NAU and Northern Arizona have reached a level of maturity in relation to healthcare and healthcare relationships. We are at an important launching point to move things forward. We have the faculty and administration that give us the infrastructure to do something important."

NAU's Health Research Initiative is broad in scope—encompassing projects ranging from genomics to geriatrics and from childhood obesity reduction to precision population health management and health promotion. "We are looking to the Northern Arizona community and HRI partners to establish the highest priorities," notes Robert Trotter, NAU's Associate Vice President for Health Research Initiatives.

THRIVE

HRI's first formal community partnership, called THRIVE (Translational Health Research Initiative), is with Northern Arizona Healthcare (NAH). This highly integrated and collaborative endeavor encourages and supports innovative health research to improve health outcomes for all of the communities across Northern Arizona. It is focused on the broad areas of translational research, behavioral medicine, health disparities research, biomarkers research, health informatics, precision and personalized medicine, ecological health, and clinical practices and intervention research.

Research projects carried out under THRIVE will address translational healthcare issues now rising to the forefront as the healthcare industry works through both the expectations and the challenges of the emerging area of population medicine and the restructuring of the US healthcare system. Such opportunities include developing effective practices for chronic disease care, studying behavioral and cultural factors impacting improved healthcare delivery, and clinical research studies involving microbiome analyses—just to name a few. All THRIVE research is outcome-oriented and evidence-based.

One THRIVE project that is funded by the NAH Foundation is called "Shi'Hooghan" ("My Home"). It is designed to help improve transitional care for patients who have returned home to the Navajo reservation after a stay at the Flagstaff Medical Center. This project involves both NAU faculty and students in the development of a mobile device app that will allow hospital staff to link patients with the closest healthcare providers, pharmacies, home healthcare resources, transportation, and other community resources, regardless of the patient's location in rural Northern Arizona. This project is led by Dr. John Georgas (NAU) and Dr. Mark Carroll of NAH.

Another THRIVE project was funded through a 2013 Flinn grant, "Precision Population Health Management: Integrated Paired Proposals for Personalized Transitional Medicine for Native American, Hispanic, and Anglo Populations in Northern Arizona," which was awarded to NAU and NAH to study healthcare practices to reduce preventable readmissions of cardiac patients after they have been discharged from the hospital. Lead by NAH researchers Dr. Mark Carroll and Dr. Cynthia Beckett as well as NAU's own Robert Trotter, the grant has led to expanded discussions about other collaborations between NAU and NAH. "It is a wonderful foundation for the future," notes Trotter.

"Northern Arizona Healthcare is committed to improving the health of the patients and populations we serve. In partnership with medical practices and health systems in the region, we are working to enhance care practices so that patients and families receive the right care, at the right time, and in the right setting," says Steve Lewis, M.D., NAH Senior Vice President for Population Health Management. "The THRIVE collaboration represents a unique opportunity to translate evidenced-based learning and innovation into everyday care and service delivery."

Acknowledgement: The Office of the Vice President for Research would like to acknowledge the important contributions of NAU News and the Office of Public Affairs to this annual report.

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Annual Research Report - FY2014

Introductory Letter

THE UNIVERSITY OF ARIZONA

It is with great pleasure that I bring you this report on the University of Arizona's research activity in fiscal year 2014. In this report we present key highlights of the UA research enterprise, as well as specific performance metrics.

We are proud of our accomplishments – excelling in a fiscally trying year. Even with tightening federal and state dollars, the UA continues to lead the way in innovative research and continues to find answers to the grand challenges. Our goals, as laid out in our strategic plan, are to increase research dollars, provide opportunities throughout the state by helping to launch new companies with UA research as the foundation and develop solutions that have a public impact to make our community – and our state – a better place to live.

In fiscal year 2014, we continued to work under the University of Arizona's *Never Settle* strategic academic and business plan. One of the main pillars of this plan is *Innovation,* which includes **building on our research strengths** to reach a goal of doubling research expenditures, strengthening our infrastructure, **boundlessly collaborate** to enhance our faculty's creativity and productivity, and **improve the infrastructure** to create exciting research developments into products and services that improve the quality of life for Arizonans.

In FY2014, the UA remained among the top public institutions for research and development expenditures with $587M covering 3,270 active research projects. Those projects included implementing a new phase of the iPlant cyberinfrastructure, optimizing algal biofuels and bio-products, studying the impact of school asthma treatment programs and training the next generation of researchers.

Astronomy and Planetary Science continue to be one of the nation's top ranked programs in research expenditures. Our faculty continue to garner prestigious awards, including two UA professors – Drs, Jonathan Overpeck and Mary C. Steiner – being named Regents' Professors of the Year.

We saw significant growth in new awards and our partnering with industry. In FY2014, we had 198 new awards with industry – an increase of 27 percent from FY2013. In total new research awards, we climbed 53 percent from FY2013 to $310M. At Tech Launch Arizona, we also saw great gains with an increase in new patent applications and invention disclosures.

Research undertaken at the University of Arizona furthers and fulfills the mission of the University of Arizona "to provide a comprehensive, high-quality education that engages our students in discovery through research and broad-based scholarship." Please enjoy the following pages with additional information on the bold research being undertaken at the University of Arizona.

Kimberly Andrews Espy, Ph.D.
Senior Vice President for Research, University of Arizona

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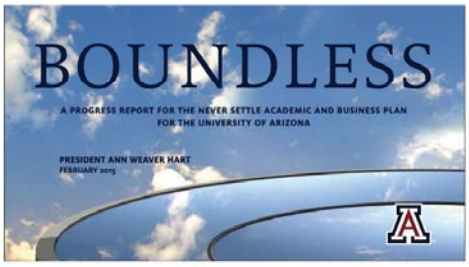
Enterprise Size

The University of Arizona continued to build on our outstanding research and development expenditures. With shrinking federal resources and the tightening of state dollars, FY2014 proved to be a challenging year with a nominal decrease in total expenditures. However, there were increases in a number of our research sectors.

We saw significant growth in new awards and our partnering with industry. In FY2014, we had 198 new awards with industry – an increase of 27 percent from FY2013. In total new research awards, we climbed 53 percent from FY2013 to $310M. The total UA research expenditures in fiscal year 2014 with $587M covering 3,270 active research projects. We also saw a gain in revenue from licensing and other revenue in our tech transfer to $1.6M, up from $1.3M in FY2013.



UA continues to focus on research as a main pillar of the university's **Never Settle** strategic plan. Seven areas were targeted in the Never Settle plan for doubling research expenditures: water and the arid environment; space sciences; defense and security; population health and health outcomes; healthcare disparities; precision health; and neuroscience.

Our goals, as laid out in our strategic plan, are to increase research dollars, provide opportunities throughout the state by helping to launch new companies with UA research as the foundation and develop solutions that have a public impact to make our community – and our state – a better place to live.

In February, SVP for Research, Dr. Kimberly Andrews Espy, gave an update on the research enterprise to the Arizona Board of Regents. Dr. Espy outlined a number of successes and strategies moving forward as we look to double our research expenditures. Highlights included:

- The **establishing of the Defense and Security Research Institute** to help facilitate and identify mutually beneficial partnerships with the UA and industry
- **The renewal of a $50M NSF grant** for UA's iPlant initiative, a multi-collaborative project that let's researchers around the world work collaboratively
- Bolstering the Office for Research and Discovery's Research Development Services to **assist researchers with funding opportunities and grant proposals**

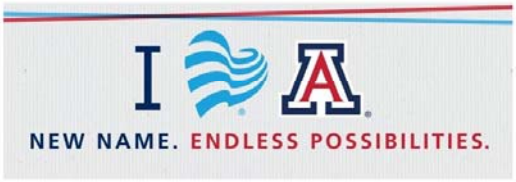
Dr. Espy also highlighted some core strategies to achieve the goal, including:

- **Promoting core strengths** to address grand challenges
- **Boundlessly collaborating** to increase local-to-global impact
- **Improving institutional infrastructure** to speed discovery, knowledge and application

Although the total number of faculty is low at UA compared to its ABOR peer institutions, our total research expenditures per faculty is at the median, and shows that our faculty are already very good at attracting and expending research dollars.

To achieve our ABOR goals, the Never Settle plan calls for the hiring of 350 high-achieving faculty who will not only bring strong research programs but catalyze existing faculty to enable large and complex projects.

- The purchase of the **UA Health Network by Banner Health** is one of the most recent pivotal outcomes of Never Settle, the UA's strategic plan. This partnership is expected to transform the health care landscape in Arizona and is considered a new model for providing medical services, research and education.



- UA is leading the **$8 million Regional Algal Feedstock Testbed (RAFT) program**, funded by DoE, which will engage industrial, government and academic partners to tackle the problem of large-scale production of algae for fuels, food, and high-value products. "Our job is to figure out how we take algae and turn it into biofuels, bioproducts and feed in an economically sustainable way. We want to make a biofuels industry in America," said Dr. Kimberly Ogden, professor of chemical and environmental engineering and the UA's primary investigator on the RAFT project.

- A **$50 million contribution to the University of Arizona Foundation from the Haury Estate** will be used to establish a program focused on environment, society, and the Southwest. This gift is one of the largest in the history of the foundation and the University and pushed the $1.5 billion Arizona NOW fundraising campaign past the billion-dollar threshold.

- **The iPlant Collaborative has been awarded a second 5-year, $50M project phase from NSF**, bringing the total investment in the project to $100 million. The original five-year, $50-million project, initiated in 2008, was the largest grant ever awarded by the NSF in the biological sciences, and three times larger than any NSF grant received by an institute in the state of Arizona at the time. This program leveraged TRIF funding and the BIO5 Institute to bring together experts from the worlds of biology, bioinformatics and computer science to create a global cyberinfrastructure to process the immense data sets needed to advance life science research.

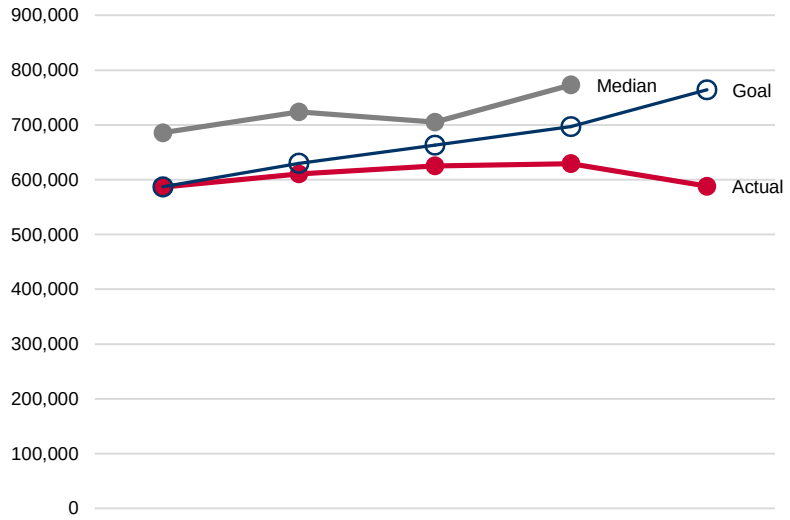
- The UA established the **new Defense and Security Research Institute** to build and strengthen mutually beneficial partnerships between the UA and industry. Director Austin Yamada brings more than 35 years of experience in national security in government, industry and academia to the UA. He will lead the DSRI to achieve three major objectives: to help identify and coordinate significant defense and security research opportunities; to help UA faculty and research teams obtain new sources of funding through interdisciplinary collaborations and public and private partnerships; and to serve as the UA's front door to the external defense community.

- UA's **Steward Observatory Mirror Lab** was awarded $15M to construct a 6.5 meter telescope mirror for the University of Tokyo Atacama Observatory. This infrared telescope will be installed in the Atacama desert in northern Chile at an elevation of 5,640m – the highest elevation of any of the world's telescopes.

- Architects, planners, preservationists, social scientists at UA worked with their counterparts in the Middle East thanks to a grant from the US State Department. Through workshops and technical assistance, counterparts in Iraq & Kurdistan are **learning how to preserve and care for their historic artifacts** so that future generations can enjoy them, too.

Enterprise Size

Total Research Expenditures (in Thousands)

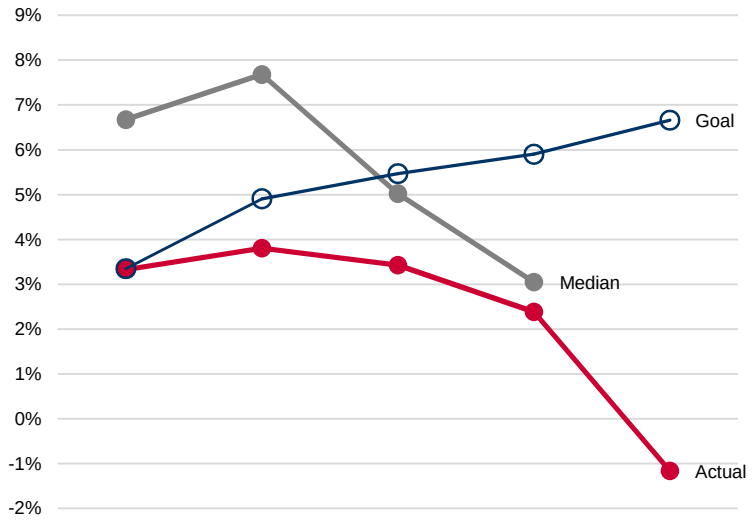


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	586,647	610,565	625,365	629,466	588,088
Goal	586,932	630,000	663,000	697,000	764,000
Difference	-285	-19,435	-37,635	-67,534	-175,912

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X		1,022,740	1,148,533	1,109,008	1,192,513		1
University of Wisconsin - Madison	X		1,029,295	1,111,642	1,169,779	1,123,501		2
University of North Carolina - Chapel Hill	X		755,284	869,174	884,791	973,007		3
University of California - Los Angeles	X		936,995	982,357	1,003,375	966,659		4
University of Minnesota - Twin Cities	X		786,074	847,419	826,173	858,378		5
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X		770,449	794,846	797,679	837,880		6
Texas A&M U. - College Station and Hlth. Science Ctr.	X		689,624	705,720	693,421	820,015		7
The Ohio State University	X		755,194	832,126	766,513	793,373		8
University of California - Davis	X		679,915	707,896	713,292	752,734		9
University of Illinois - Urbana - Champaign			515,133	545,669	583,754	743,487		10
University of Florida	X		681,548	739,931	696,985	695,063		11
University of Texas - Austin			589,502	632,171	621,538	634,132		12
The University of Arizona	X		586,647	610,565	625,365	629,466	588,088	13
Michigan State University	X		431,373	454,248	507,061	515,707		14
University of Maryland - College Park			451,415	495,382	502,406	491,998		15
University of Iowa	X		444,034	443,893	446,429	435,377		16
Median			685,586	723,914	705,139	773,054		

Enterprise Size

Average Growth Rate in Total Research Expenditures Over 3 Years

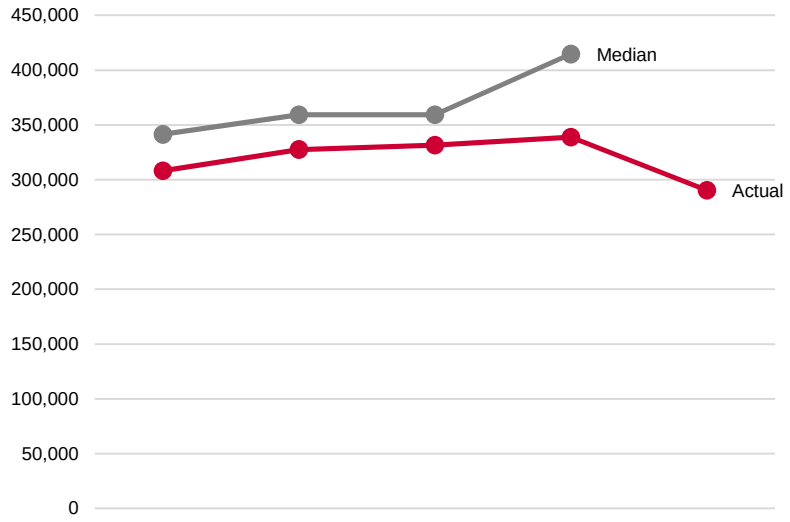


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	3.3%	3.8%	3.4%	2.4%	-1.2%
Goal	3.3%	4.9%	5.5%	5.9%	6.7%
Difference	0	0	-2.0%	-3.5%	-7.8%

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Illinois - Urbana - Champaign			3.2%	3.3%	1.4%	13.4%		1
University of North Carolina - Chapel Hill	X		16.7%	18.3%	11.3%	8.9%		2
Texas A&M U. - College Station and Hlth. Science Ctr.	X		8.2%	6.7%	3.3%	6.3%		3
Michigan State University	X		6.4%	8.5%	10.8%	6.2%		4
University of Washington - Seattle	X		11.4%	15.1%	13.4%	5.5%		5
University of California - Davis	X		4.3%	3.3%	1.5%	3.5%		6
University of Wisconsin - Madison	X		7.0%	8.0%	7.1%	3.1%		7
University of Minnesota - Twin Cities	X		8.0%	7.5%	3.8%	3.1%		8
University of Maryland - College Park			7.9%	7.9%	7.2%	3.0%		9
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X		5.7%	4.3%	1.9%	2.9%		10
University of Texas - Austin			9.8%	8.8%	7.3%	2.5%		11
The University of Arizona	X		3.3%	3.8%	3.4%	2.4%	-1.2%	12
The Ohio State University	X		1.6%	5.9%	2.6%	1.9%		13
University of California - Los Angeles	X		4.4%	4.1%	4.1%	1.1%		14
University of Florida	X		5.0%	8.3%	6.0%	0.8%		15
University of Iowa	X		9.3%	15.6%	11.7%	-0.6%		16
Median			6.7%	7.7%	5.0%	3.0%		

Enterprise Size

Federally Financed Research Expenditures (in Thousands)

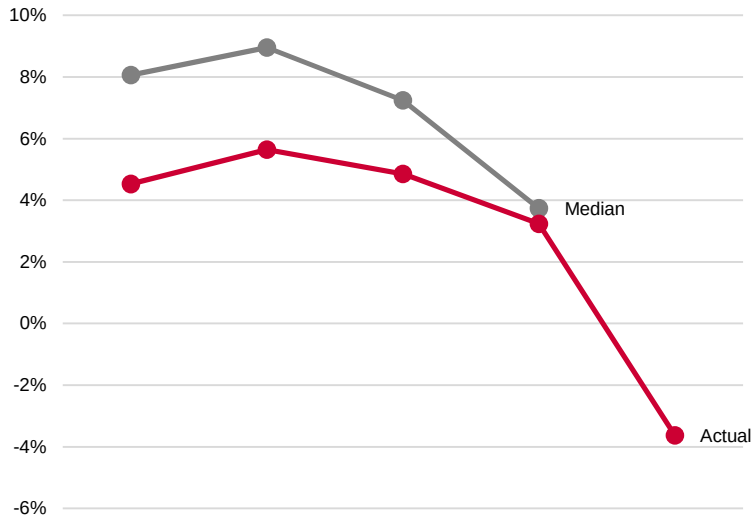


	2010	2011	2012	2013	2014
Actual	308,157	327,565	331,578	338,790	290,370

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X		829,885	948,976	909,652	928,193		1
University of North Carolina - Chapel Hill	X		545,993	600,843	606,348	623,237		2
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X		464,750	468,705	531,421	558,871		3
University of Wisconsin - Madison	X		545,189	593,633	580,661	555,875		4
University of California - Los Angeles	X		538,521	563,560	539,054	501,368		5
University of Minnesota - Twin Cities	X		426,359	489,480	485,462	494,206		6
University of Illinois - Urbana - Champaign			303,852	323,454	359,989	468,798		7
The Ohio State University	X		399,942	493,130	445,635	456,590		8
University of Texas - Austin			350,308	355,437	354,873	372,633		9
University of California - Davis	X		332,325	362,976	358,577	347,038		10
University of Maryland - College Park			297,896	338,780	340,180	342,778		11
The University of Arizona	X		308,157	327,565	331,578	338,790	290,370	12
Texas A&M U. - College Station and Hlth. Science Ctr.	X		288,173	291,812	269,460	314,104		13
University of Florida	X		279,649	306,349	305,067	296,199		14
Michigan State University	X		214,134	240,837	268,952	260,610		15
University of Iowa	X		282,465	283,627	269,734	255,329		16
Median			341,317	359,207	359,283	414,612		

Enterprise Size

Average Growth Rate in Federally Financed Research Expenditures Over 3 Years

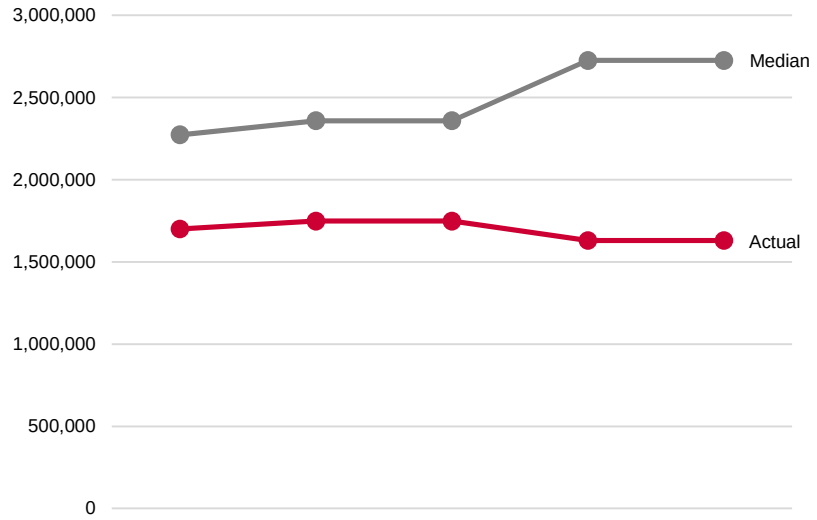


	2010	2011	2012	2013	2014
Actual	4.5%	5.6%	4.9%	3.2%	-3.6%

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Illinois - Urbana - Champaign			6.2%	6.6%	7.7%	16.0%		1
Michigan State University	X		9.2%	16.8%	18.2%	7.0%		2
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X		7.8%	4.9%	6.7%	6.5%		3
The Ohio State University	X		8.7%	14.1%	10.5%	5.4%		4
University of Minnesota - Twin Cities	X		8.1%	10.4%	7.7%	5.3%		5
University of Maryland - College Park			11.0%	12.9%	11.6%	5.0%		6
University of North Carolina - Chapel Hill	X		16.6%	17.4%	12.5%	4.6%		7
University of Washington - Seattle	X		11.3%	16.4%	14.7%	4.1%		8
Texas A&M U. - College Station and Hlth. Science Ctr.	X		8.1%	6.0%	1.3%	3.4%		9
The University of Arizona	X		4.5%	5.6%	4.9%	3.2%	-3.6%	10
University of Texas - Austin			6.9%	3.4%	4.9%	2.1%		11
University of Florida	X		5.6%	10.2%	9.8%	2.1%		12
University of California - Davis	X		9.0%	10.5%	6.8%	1.6%		13
University of Wisconsin - Madison	X		5.2%	7.8%	4.7%	0.8%		14
University of California - Los Angeles	X		3.6%	6.3%	5.2%	-2.2%		15
University of Iowa	X		8.3%	7.4%	2.5%	-3.3%		16
Median			8.1%	9.0%	7.2%	3.7%		

Enterprise Size

Net Assignable Square Feet

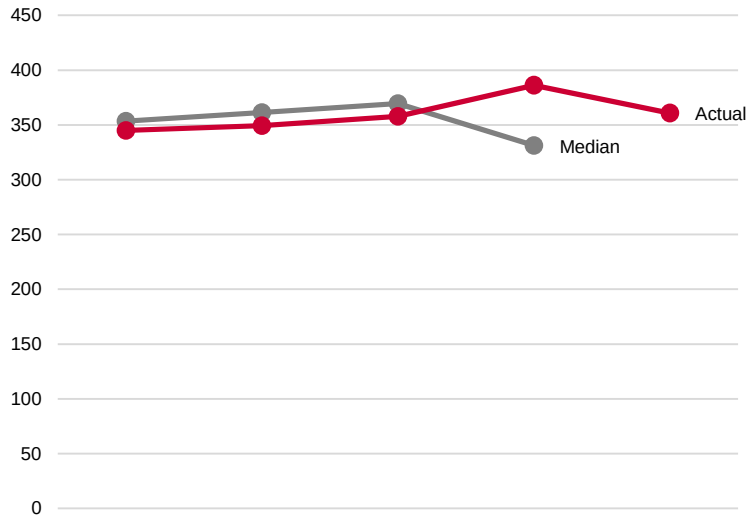


	2010	2011	2012	2013	2014
Actual	1,700,749	1,748,035	1,748,035	1,629,764	1,629,764

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Minnesota - Twin Cities	X		3,684,378	3,531,048	3,531,048	3,672,847	3,672,847	1
University of Florida	X		3,081,524	3,038,164	3,038,164	3,109,643	3,109,643	2
University of Illinois - Urbana - Champaign			4,561,500	4,631,400	4,631,400	3,108,558	3,108,558	3
The Ohio State University	X		1,487,468	1,447,310	1,447,310	2,973,355	2,973,355	4
University of California - Davis	X		2,660,052	2,927,180	2,927,180	2,930,437	2,930,437	5
Texas A&M U. - College Station and Hlth. Science Ctr.	X		2,222,041	2,443,234	2,443,234	2,895,450	2,895,450	6
University of Wisconsin - Madison	X		2,844,272	2,935,571	2,935,571	2,774,278	2,774,278	7
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X		2,997,579	2,929,245	2,929,245	2,733,125	2,733,125	8
University of California - Los Angeles	X		2,496,563	2,632,450	2,632,450	2,717,533	2,717,533	9
Michigan State University	X		2,324,423	2,274,375	2,274,375	2,253,911	2,253,911	10
University of Washington - Seattle	X		1,795,359	1,874,449	1,874,449	1,796,285	1,796,285	11
The University of Arizona	X		1,700,749	1,748,035	1,748,035	1,629,764	1,629,764	12
University of Texas - Austin			1,480,462	1,478,523	1,478,523	1,455,474	1,455,474	13
University of North Carolina - Chapel Hill	X		1,662,923	1,223,219	1,223,219	1,294,963	1,294,963	14
University of Maryland - College Park			712,085	769,581	769,581	769,581	769,581	15
University of Iowa	X		616,700	659,913	659,913	700,757	700,757	16
Median			2,273,232	2,358,805	2,358,805	2,725,329.0	2,725,329.0	

Enterprise Size

Total Research Expenditures per Net Assignable Square Foot

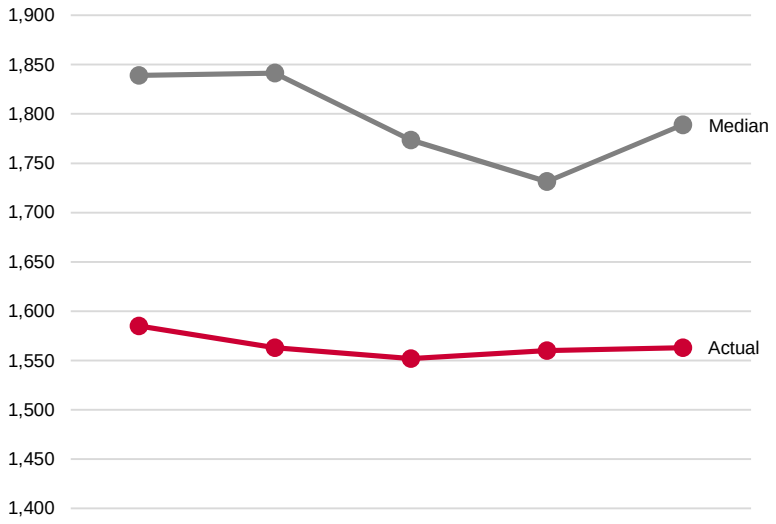


	2010	2011	2012	2013	2014
Actual	345	349	358	386	361

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of North Carolina - Chapel Hill	X		454	711	723	751		1
University of Washington - Seattle	X		570	613	592	664		2
University of Maryland - College Park			634	644	653	639		3
University of Iowa	X		720	673	676	621		4
University of Texas - Austin			398	428	420	436		5
University of Wisconsin - Madison	X		362	379	398	405		6
The University of Arizona	X		345	349	358	386	361	7
University of California - Los Angeles	X		375	373	381	356		8
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X		257	271	272	307		9
Texas A&M U. - College Station and Hlth. Science Ctr.	X		310	289	284	283		10
The Ohio State University	X		508	575	530	267		11
University of California - Davis	X		256	242	244	257		12
University of Illinois - Urbana - Champaign			113	118	126	239		13
University of Minnesota - Twin Cities	X		213	240	234	234		14
Michigan State University	X		186	200	223	229		15
University of Florida	X		221	244	229	224		16
Median			353	361	369	331.1		

Enterprise Size

Total Faculty Population

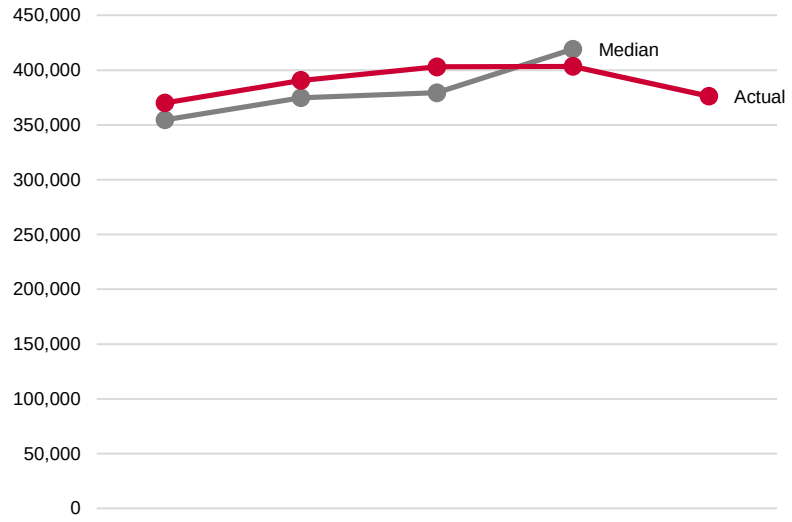


	2010	2011	2012	2013	2014
Actual	1,585	1,563	1,552	1,560	1,563

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
The Ohio State University	X		2,602	2,560	2,511	2,489	2,508	1
University of Florida	X		2,696	2,701	2,647	2,493	2,439	2
University of Minnesota - Twin Cities	X		2,319	2,277	2,251	2,412	2,408	3
University of Wisconsin - Madison	X		2,047	2,057	2,014	2,067	2,082	4
University of Texas - Austin			1,981	1,954	1,910	1,910	1,898	5
University of North Carolina - Chapel Hill	X		1,833	1,861	1,876	1,948	1,852	6
Texas A&M U. - College Station and Hlth. Science Ctr.	X		1,838	1,871	1,771	1,710	1,838	7
Michigan State University	X		1,948	1,906	1,883	1,732	1,825	8
University of Illinois - Urbana - Champaign			1,856	1,778	1,707	1,710	1,753	9
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X		1,748	1,759	1,763	1,731	1,741	10
University of California - Los Angeles	X		1,840	1,822	1,776	1,747	1,725	11
The University of Arizona	X		1,585	1,563	1,552	1,560	1,563	12
University of Iowa	X		1,572	1,527	1,538	1,576	1,551	13
University of Washington - Seattle	X		1,548	1,536	1,525	1,487	1,498	14
University of Maryland - College Park			1,472	1,463	1,501	1,483	1,476	15
University of California - Davis	X		1,498	1,467	1,421	1,423	1,417	16
Median			1,839	1,842	1,774	1,732	1,789	

Enterprise Size

Total Research Expenditures per Faculty

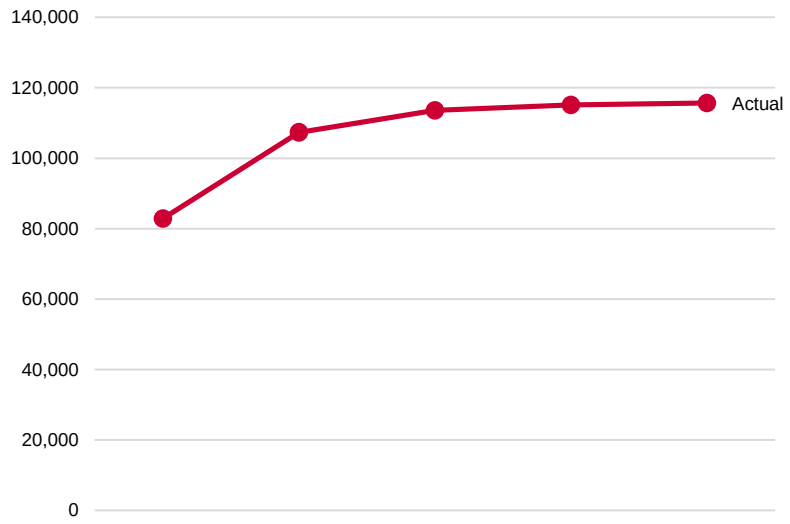


	2010	2011	2012	2013	2014
Actual	370,124	390,637	402,941	403,504	376,256

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X		660,685	747,743	727,218	801,959		1
University of California - Los Angeles	X		509,236	539,164	564,963	553,325		2
University of Wisconsin - Madison	X		502,831	540,419	580,824	543,542		3
University of California - Davis	X		453,882	482,547	501,965	528,977		4
University of North Carolina - Chapel Hill	X		412,048	467,047	471,637	499,490		5
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X		440,760	451,874	452,455	484,044		6
Texas A&M U. - College Station and Hlth. Science Ctr.	X		375,203	377,189	391,542	479,541		7
University of Illinois - Urbana - Champaign			277,550	306,900	341,977	434,788		8
The University of Arizona	X		370,124	390,637	402,941	403,504	376,256	9
University of Minnesota - Twin Cities	X		338,971	372,165	367,025	355,878		10
University of Texas - Austin			297,578	323,527	325,413	332,006		11
University of Maryland - College Park			306,668	338,607	334,714	331,759		12
The Ohio State University	X		290,236	325,049	305,262	318,752		13
Michigan State University	X		221,444	238,325	269,284	297,752		14
University of Florida	X		252,800	273,947	263,311	278,806		15
University of Iowa	X		282,464	290,696	290,266	276,254		16
Median			354,548	374,677	379,283	419,146		

Enterprise Size

Other Sponsored Project Expenditures (in Thousands)



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	82,855	107,365	113,559	115,105	115,666

Enterprise Size

Average Growth Rate in Other Sponsored Project Expenditures Over 3 Years

ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	5.7%	13.9%	13.6%	12.2%	2.5%

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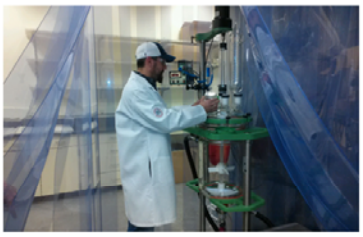
Discovery and Scholarly Impact

UA is committed to not only generating new knowledge, but also sharing discoveries with Arizona and the world where they will improve well-being. From published findings to national broadcasts, UA scholars and researchers are having their work showcased around the globe.

Researchers have engaged with industry, foundations, governmental organizations, and citizen to assess needs, generate novel ideas and solutions, develop technology, and assess effectiveness.

As a first step, to be effective, **discoveries must be communicated** to wide public, professional, and research audiences. To that end, the University of Arizona utilizes a number of vehicles to share the news about UA discoveries. From social media to television news, our discoveries are part of a national dialogue.

Faculty members have always communicated their research results in professional publications. The National Taiwan University Performance Ranking of Scientific Papers for 2014 places UA #73 in the world, and #39 in the US, normalized for faculty size.



Beyond publication of results, **inventions must be put to practical and beneficial use** through technology transfer and commercialization. As stated in the *Never Settle* plan, UA will advance research that innovates, engages students to increase recruitment and retention, and partners with our local and global community to address social, cultural, and economic needs.

Through Tech Launch Arizona, inventions, technologies and intellectual property are moved from the laboratory out into the marketplace. TLA brings together the faculty and researchers of the UA with the business community to maximize the impact of our research and innovation efforts, as well as to optimize the benefits gained from our tech parks resources.

One benchmark of our success in impacting the greater community is the number of **invention disclosures and patents** made by our researchers. Disclosures in FY2014 totaled 188 – up from 44 in fiscal year 2013, and the number of patents issued was 24.

UA is also **leading the conversation** on many of the world's grand challenges. Earlier this year, more than 50 researchers, industry leaders and government officials from throughout the US met at the Biosphere 2 to take part in a workshop that looked at the nexus of food, energy and water in the future. Funded by the National Science Foundation, the workshop brought together researchers to tackle pressing global questions. The workshop, among the first in a series of meetings across the country to address the critical intersection of resources, was funded by the National Science Foundation and was designed to foster national and international collaborations. The NSF had asked members to emphasize the issue as a way of finding solutions to a booming global population.

- Two UA faculty members have been conferred with the prestigious rank of **Regents' Professor: Jonathan Overpeck and Mary Stiner**. Dr. Overpeck is a professor of Geosciences with a joint appointment in the Department of Atmospheric Sciences. He is also the lead investigator at CLIMAS (Climate Assessment for the Southwest). Dr. Overpeck has written over 100 publications on climate and ecosystem variability, and was founding co-chair of both international and U.S. CLIVAR-PAGES working groups. Dr. Stiner is a professor in the Department of Anthropology, and Curator of Zooarchaeology at the Arizona State Museum of the University of Arizona. Stiner has done archaeological fieldwork at Paleolithic, Mesolithic and Neolithic sites in Italy, Israel, Turkey, Portugal, Greece, and France, and sites of diverse ages in the United States.

- A foundational gift of **$9 million from the Kemper and Ethel Marley Foundation** will support the state's first public veterinary medical and surgical program to train Doctors of Veterinary Medicine at the University of Arizona.

- **UA researchers have led international teams** of researchers to unravel the genetic code of two important plants, African rice and rapeseed (whose seeds are made into canola oil). These fundamental discoveries will help scientists and agriculturalists increase production and yield and develop new varieties that are more resilient to environmental change. The computational power and cyberinfrastructure for running the analyses was provided by the iPlant Collaborative, a $100 million project funded by the NSF and headquartered in the UA's BIO5 Institute.

- UA Geosciences associate professor **Joellen Russell was awarded $2.36 million from the National Science Foundation's Division of Polar Programs** (with additional support from NOAA and NASA) to study the Southern Ocean's role in climate regulation and ocean health.This grant is part of a $21 million multi-institutional effort.

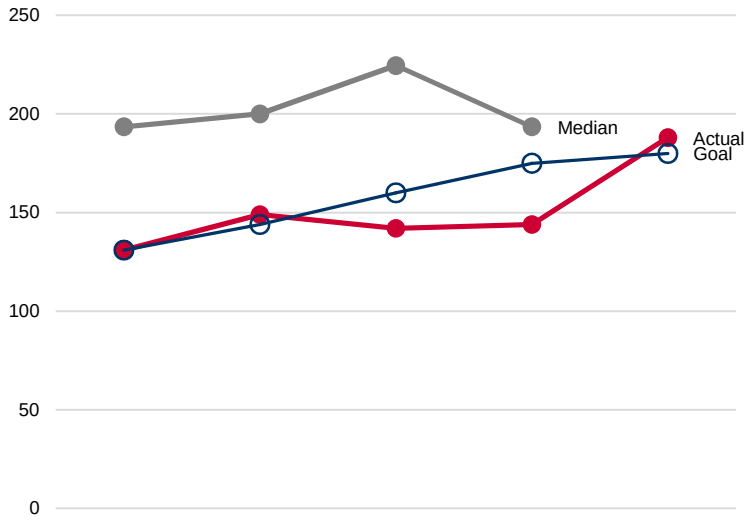
- The National Institutes of Health **awarded $1.8 million each to UA researchers Felicia Goodrum and Samuel Campos,** who investigate two common but devastating viruses that affect millions of people worldwide: human cytomegalovirus (CMV) and human papillomavirus (HPV)

- More than 2,000 adults and children crowded the campus in downtown Phoenix on Saturday, March 31st for Connect2STEM, which served as **the official kickoff for the 2015 Arizona SciTech Festival, a statewide celebration of science, technology, engineering and math** held annually in February and March. Connect2STEM, the result of a partnership between the University and Cox Communications, involved 65 interactive tables and 140 volunteers. Exhibits focused on various aspects of science, including the creation of a video game and the effects of concussions.

SCITECH

Discovery and Scholarly Impact

Invention Disclosures Transacted

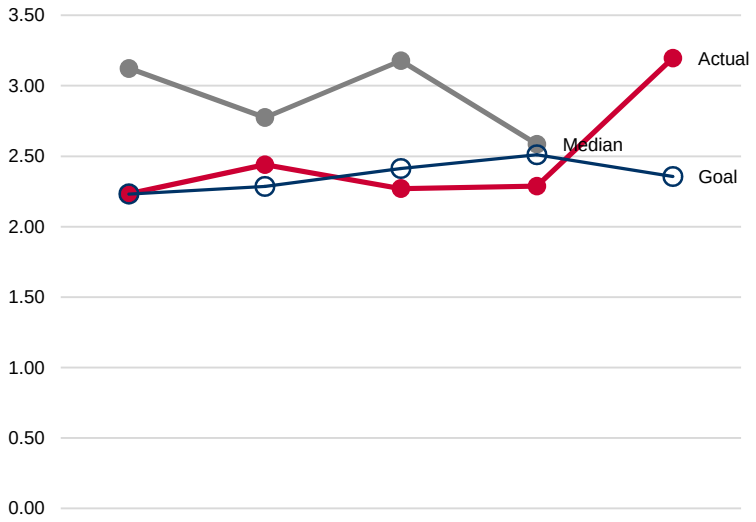


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	131	149	142	144	188
Goal	131	144	160	175	180
Difference	0	5	-18	-31	8

ABOR Peer Group	Med. Sch.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X		354	356	462	410		1
University of Wisconsin - Madison	X		356	357	373	386		2
The Ohio State University	X		173	216	319	384		3
University of California - Los Angeles	X		379	299	343	359		4
University of Florida	X		295	322	345	335		5
University of Minnesota - Twin Cities	X		255	250	321	331		6
University of California - Davis	X		245	184	226	206		7
University of Illinois - Urbana - Champaign			180	182	223	181		8
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X		133	144	132	159		9
Texas A&M U. - College Station and Hlth. Science Ctr.	X		207	284	212	159		9
The University of Arizona	X		131	149	142	144	188	11
University of North Carolina - Chapel Hill	X		125	142	160	138		12
Michigan State University	X		116	110	127	122		13
University of Iowa	X		70	68	102	96		14
University of Maryland - College Park								
University of Texas - Austin								
Median			194	200	225	194		

Discovery and Scholarly Impact

Invention Disclosures Transacted per $10 Million in Total Research Expenditures

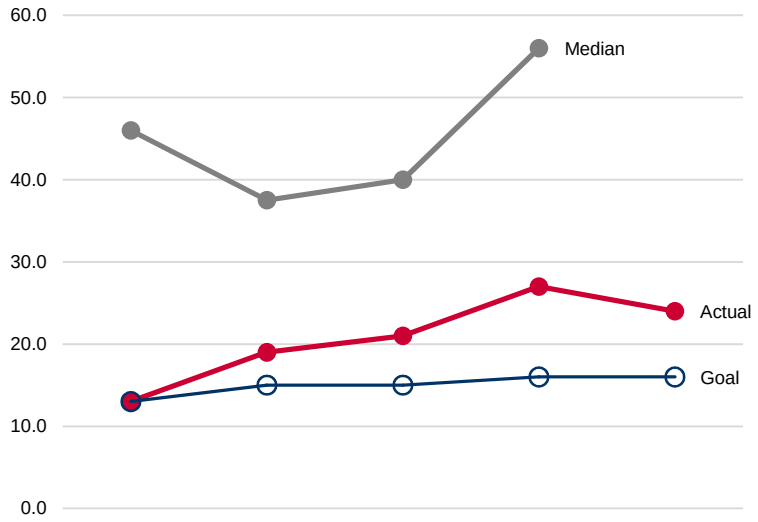


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	2.2	2.4	2.3	2.3	3.2
Goal	2.2	2.3	2.4	2.5	2.4
Difference	0.0	0.2	-0.1	-0.2	0.8

ABOR Peer Group	Med. Sch.	NSF Adj.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
The Ohio State University	X			2.3	2.6	4.2	4.8		1
University of Florida	X			4.3	4.4	4.9	4.8		2
University of Minnesota - Twin Cities	X			3.2	3.0	3.9	3.9		3
University of California - Los Angeles	X			4.0	3.0	3.4	3.7		4
University of Washington - Seattle	X			3.5	3.1	4.2	3.4		5
University of Wisconsin - Madison	X			3.5	3.2	3.2	3.4		6
University of California - Davis	X			3.6	2.6	3.2	2.7		7
University of Illinois - Urbana - Champaign				3.5	3.3	3.8	2.4		8
Michigan State University	X			2.7	2.4	2.5	2.4		9
The University of Arizona	X			2.2	2.4	2.3	2.3	3.2	10
University of Iowa	X			1.6	1.5	2.3	2.2		11
Texas A&M U. - College Station and Hlth. Science Ctr.	X			3.0	4.0	3.1	1.9		12
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X			1.7	1.8	1.7	1.9		13
University of North Carolina - Chapel Hill	X			1.7	1.6	1.8	1.4		14
University of Maryland - College Park									
University of Texas - Austin									
Median				3.1	2.8	3.2	2.6		

Discovery and Scholarly Impact

U.S. Patents Issued

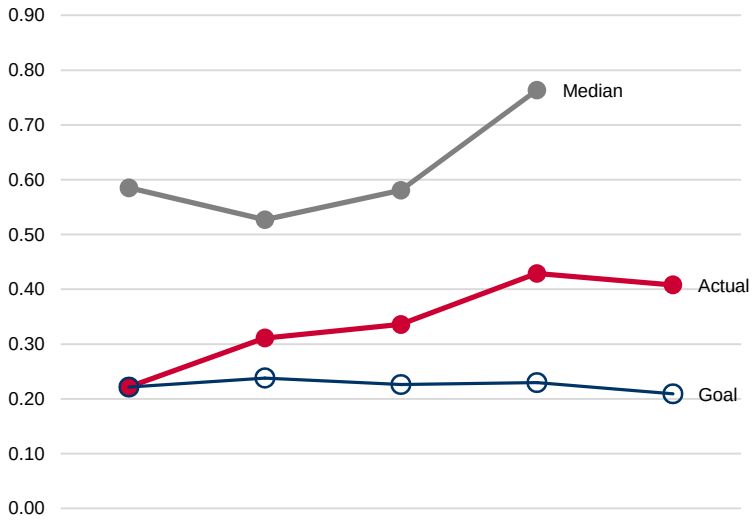


ABOR Enterprise Plan	2010	2011	2012	2013	2014	
Actual	13	19	21	27	24	
Goal	13	15	15	16	16	
Difference	0	4	6	11	8	

ABOR Peer Group	Med. Sch.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Wisconsin - Madison	X		133	156	153	157		1
University of Florida	X		59	86	60	107		2
University of California - Los Angeles	X		47	56	74	95		3
University of Washington - Seattle	X		69	70	61	94		4
University of Illinois - Urbana - Champaign				68	76	72		5
University of Minnesota - Twin Cities	X		46	41	59	64		6
The Ohio State University	X		38	30	41	62		7
Texas A&M U. - College Station and Hlth. Science Ctr.	X		33	18	29	50		8
Michigan State University	X		52	38	31	46		9
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X		54	37	39	41		10
The University of Arizona	X		13	19	21	27	24	11
University of North Carolina - Chapel Hill	X		27	33	31	25		12
University of Iowa	X		32	31	31	24		13
University of California - Davis	X		29	23	26	22		14
University of Maryland - College Park								
University of Texas - Austin								
Median			46	38	40	56		

Discovery and Scholarly Impact

U.S. Patents Issued per $10 Million in Total Research Expenditures



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	0.2	0.3	0.3	0.4	0.4
Goal	0.2	0.2	0.2	0.2	0.2
Difference	0.0	0.1	0.1	0.2	0.2

ABOR Peer Group	Med. Sch.	NSF Adj.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Florida	X			0.9	1.2	0.9	1.5		1
University of Wisconsin - Madison	X			1.3	1.4	1.3	1.4		2
University of California - Los Angeles	X			0.5	0.6	0.7	1.0		3
University of Illinois - Urbana - Champaign					1.2	1.3	1.0		4
Michigan State University	X			1.2	0.8	0.6	0.9		5
University of Washington - Seattle	X			0.7	0.6	0.6	0.8		6
The Ohio State University	X			0.5	0.4	0.5	0.8		7
University of Minnesota - Twin Cities	X			0.6	0.5	0.7	0.7		8
Texas A&M U. - College Station and Hlth. Science Ctr.	X			0.5	0.3	0.4	0.6		9
University of Iowa	X			0.7	0.7	0.7	0.6		10
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X			0.7	0.5	0.5	0.5		11
The University of Arizona	X			0.2	0.3	0.3	0.4	0.4	12
University of California - Davis	X			0.4	0.3	0.4	0.3		13
University of North Carolina - Chapel Hill	X			0.4	0.4	0.4	0.3		14
University of Maryland - College Park									
University of Texas - Austin									
Median				0.6	0.5	0.6	0.8		

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Economic Development

The University of Arizona serves as a major economic driver and exerts a profound impact on the indicators of economic well-being for the region. The University's research strengths drive economic development activities through leading edge research initiatives, new inventions, technology commercialization, and innovative public-private partnerships.

Through the *Never Settle Strategic Plan,* the University of Arizona is continuing to rework the process for recognizing interdisciplinary research in the promotion and tenure process. With revised processes and guidelines, the UA recognizes and values engagement in partnerships with industry and community-based research and knowledge application, and Tech Launch Arizona is fulfilling a central role in the UA's overall mission of creating a positive impact on the Tucson and Southern Arizona economies.

Tech Parks Arizona Impact

THE UNIVERSITY OF ARIZONA TECH PARKS ARIZONA

Tech Parks Arizona is a significant economic engine for Tucson, Pima County, and the state of Arizona. Further it helps to attract new businesses and grow existing ones, launch new companies, commercialize new technologies and create high-paying jobs. In FY 2014, the UA Tech Park generated a total economic impact of more than $2.33 billion in Pima County. The Tech Park is home to 45 tenant companies from over 15 industries that employ nearly 6,500 people; created 8,095 regional jobs with an average annual salary of $91,145, compared to the Pima County average of $46,363; and generated $42.5 million in regional tax revenues.

Wheelhouse Network

In FY 2014, TLA continued to grow its domain expert network, which connects UA investigators and their inventions with specific interested, informed, committed individuals who are drawn on to advance technology opportunities. The network underpins commercialization capabilities by extending the expertise base from a limited staff to a virtually limitless community. This reach is necessary to be prepared to assess the vast range of UA science. The network has grown over the past year, and now has over 1000 qualified domain experts and relevant business and community members. Connections are based on common interests, shared expectations, and understanding of goals. Network members help assess, understand, and position technologies based on commercial and social relevance. As a largely alumni represented network, the reach is global—but with deep regional roots.

SBIR/STTR Competitiveness Initiative — SBIR/STTR Tech House

During FY 2014, TLA evolved the foundational work completed during FY 2013 to establish the Commercialization Network Alliance with the City of Tucson, launching the SBIR/STTR Competitiveness Initiative – called "SBIR/STTR Tech House." Through the initiative, TLA and its community partners assist UA faculty and local small- and medium-sized businesses to identify and pursue opportunities offered through federally funded efforts designed to stimulate small business growth and economic development: the Small Business Innovation Research program and the Small Business Technology Transfer program. SBIR/STTR Tech House also engages with large companies and other entities that comprise topic definition for SBIR/STTR solicitations, and forges deep relationships with agency-specific representatives and proposal preferences. Under TLA's Tech House leadership, the UA has set a goal to increase competitiveness and become one of the top 10 regions for SBIR/STTR funding per capita in the nation.

Workforce Development

TLA continued collaboration on key, regional workforce development initiatives:

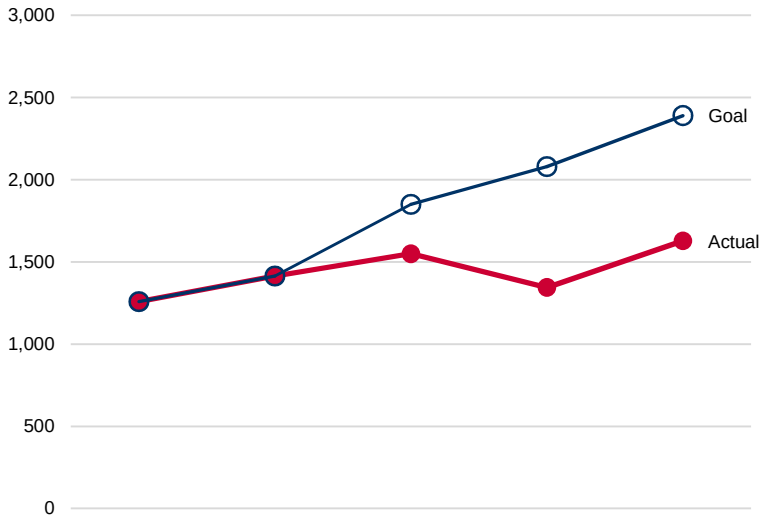
- **BESST (Building Experiential Skilled Student Talent):** In cooperation with the Sunnyside School District, the Tech Parks Arizona is in the second year of BESST, a program designed to prepare students for employment with area technology companies. The program has two components: the fall semester students participate in a series of "soft-skill" workshops taught by TPA staff and are placed in internships with area technology companies in the spring.

- **Innovation Frontier Southwest:** TPA received a grant from the Economic Development Administration, US Department of Commerce to develop a strategy for advanced manufacturing in the region. TPA has developed Innovation Frontier Southwest (IFS), which is a region extending along the US Mexico border from Yuma, Arizona to Las Cruces, New Mexico and extends up to Casa Grande in Pinal County. IFS is a collaboration of municipalities, economic development organizations, universities and workforce entities. To date, the group has completed mapping of innovation assets and the supply chain as it relates to security and defense in the region.

- **New Companies Recruited to the UA Tech Park:** The Tech Park was successful in recruiting two new companies this year. The first, Cleveland Electric Laboratories, is conducting a demonstration of a new technology developed by its engineers at the Solar Zone. The company is also working with the Department of Mining and Geological Engineering to evaluate application of its technology in the UA student mine. The second company is Thompson-Wimmer, which provides consulting and management services for unmanned air systems (UAS).

Economic Development

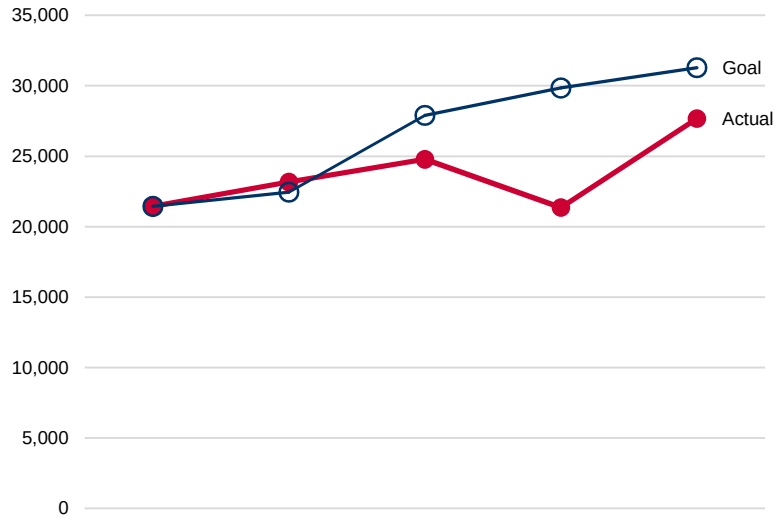
Intellectual Property Income (in Thousands)



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	1,258	1,414	1,550	1,345	1,628
Goal	1,258	1,414	1,850	2,080	2,390
Difference	0	0	-300	-735	-762

Economic Development

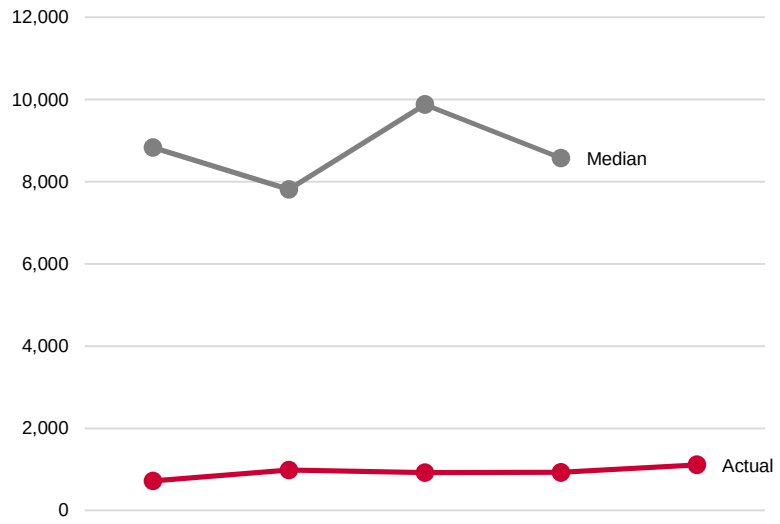
Intellectual Property Income per $10 Million in Total Research Expenditures



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	21,450	23,164	24,778	21,364	27,675
Goal	21,439	22,449	27,903	29,842	31,283
Difference	10	715	-3,125	-8,479	-3,608

Economic Development

Licenses and Options Income (in Thousands)

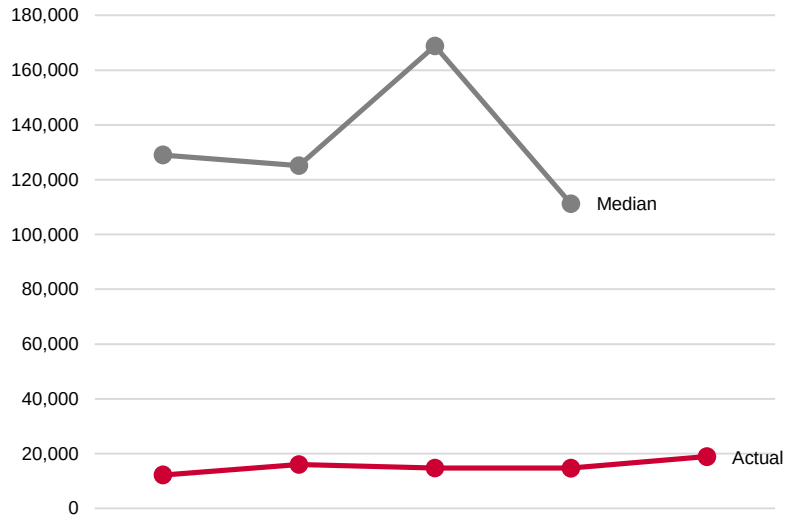


	2010	2011	2012	2013	2014	
Actual	718	981	922	926	1,112	

ABOR Peer Group	Med. Sch.	AUTM Adj.	2,010	2,011	2,012	2,013	2,014	Rank
University of Washington - Seattle	X		69,032	67,362	76,956	99,491		1
University of Wisconsin - Madison	X		54,300	57,730	41,100	94,170		2
University of Minnesota - Twin Cities	X		83,906	10,079	45,652	38,030		3
University of Florida	X		29,235	29,494	33,922	28,068		4
University of California - Los Angeles	X		27,485	16,153	17,833	23,423		5
Texas A&M U. - College Station and Hlth. Science Ctr.	X		8,621	9,264	13,074	12,826		6
University of California - Davis	X		9,048	10,233	12,525	12,241		7
University of Illinois - Urbana - Champaign			6,126	6,363	6,410	4,914		8
University of North Carolina - Chapel Hill	X		2,598	1,483	2,414	3,784		9
Michigan State University	X		4,017	3,616	3,704	3,302		10
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X		2,271	2,947	3,095	2,267		11
The Ohio State University	X		1,907	1,420	2,170	2,105		12
University of Iowa	X		26,991	6,285	7,234	1,205		13
The University of Arizona	X		718	981	922	926	1,112	14
University of Maryland - College Park								
University of Texas - Austin								
Median			8,835	7,813	9,880	8,577		

Economic Development

Licenses and Options Income per $10 Million in Total Research Expenditures

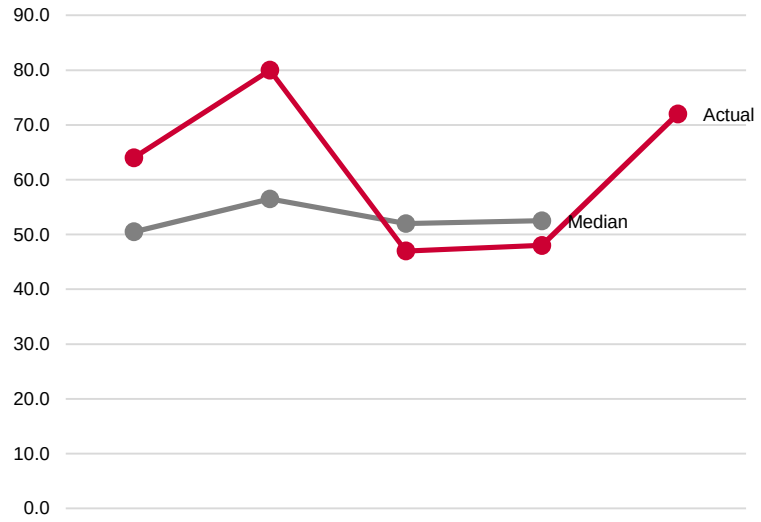


	2010	2011	2012	2013	2014
Actual	12,240	16,075	14,743	14,711	18,914

ABOR Peer Group	Med. Sch.	NSF Adj.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Wisconsin - Madison	X			527,546	519,322	351,348	838,183		1
University of Washington - Seattle	X			674,971	586,506	693,916	834,298		2
University of Minnesota - Twin Cities	X			1,067,406	118,932	552,566	443,050		3
University of Florida	X			428,950	398,598	486,700	403,819		4
University of California - Los Angeles	X			293,331	164,431	177,730	242,309		5
University of California - Davis	X			133,075	144,555	175,594	162,621		6
Texas A&M U. - College Station and Hlth. Science Ctr.	X			125,010	131,271	188,538	156,417		7
University of Illinois - Urbana - Champaign				118,925	116,601	109,813	66,088		8
Michigan State University	X			93,121	79,596	73,041	64,035		9
University of North Carolina - Chapel Hill	X			34,398	17,057	27,286	38,885		10
University of Iowa	X			607,859	141,587	162,043	27,685		11
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X			29,476	37,080	38,800	27,057		12
The Ohio State University	X			25,252	17,065	28,304	26,534		13
The University of Arizona	X			12,240	16,075	14,743	14,711	18,914	14
University of Maryland - College Park									
University of Texas - Austin									
Median				129,043	125,101	168,819	111,253		

Economic Development

Licenses and Options Executed

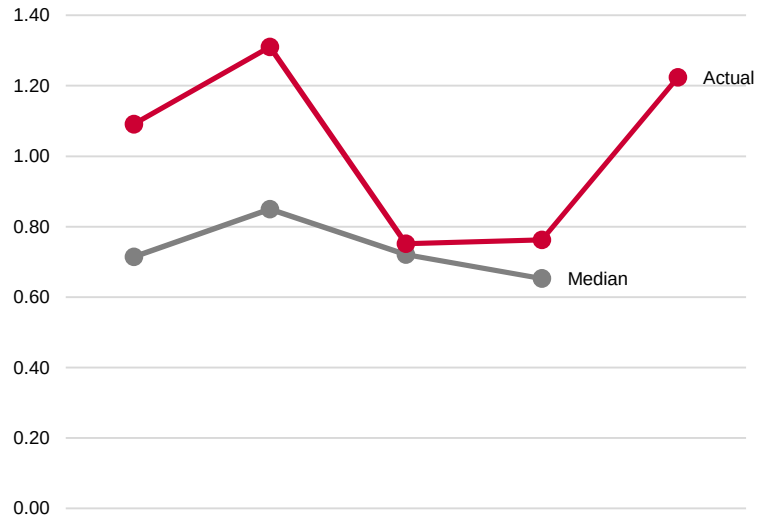


	2010	2011	2012	2013	2014
Actual	64	80	47	48	72

ABOR Peer Group	Med. Sch.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X		196	194	209	260		1
University of Florida	X		92	131	129	140		2
University of Minnesota - Twin Cities	X		73	113	75	91		3
University of California - Davis	X		67	58	57	68		4
University of Wisconsin - Madison	X		62	62	60	63		5
University of North Carolina - Chapel Hill	X		39	45	61	56		6
Texas A&M U. - College Station and Hlth. Science Ctr.	X		49	67	71	55		7
The Ohio State University	X		35	25	33	50		8
The University of Arizona	X		64	80	47	48	72	9
University of Illinois - Urbana - Champaign			40	55	46	46		10
University of California - Los Angeles	X		52	46	34	43		11
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X		24	23	21	36		12
Michigan State University	X		31	40	32	33		13
University of Iowa	X		21	24	21	29		14
University of Maryland - College Park								
University of Texas - Austin								
Median			51	57	52	53		

Economic Development

Licenses and Options Executed per $10 Million in Total Research Expenditures

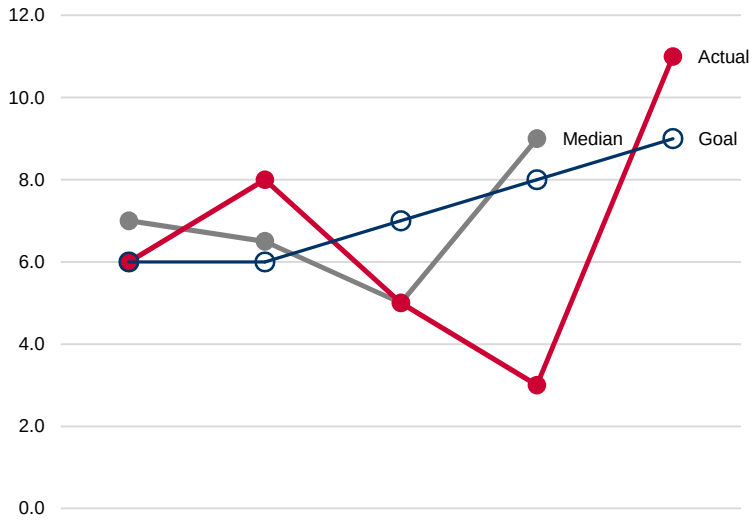


	2010	2011	2012	2013	2014	
Actual	1.1	1.3	0.8	0.8	1.2	

ABOR Peer Group	Med. Sch.	NSF Adj.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X			1.9	1.7	1.9	2.2		1
University of Florida	X			1.3	1.8	1.9	2.0		2
University of Minnesota - Twin Cities	X			0.9	1.3	0.9	1.1		3
University of California - Davis	X			1.0	0.8	0.8	0.9		4
The University of Arizona	X			1.1	1.3	0.8	0.8	1.2	5
Texas A&M U. - College Station and Hlth. Science Ctr.	X			0.7	0.9	1.0	0.7		6
University of Iowa	X			0.5	0.5	0.5	0.7		7
Michigan State University	X			0.7	0.9	0.6	0.6		8
The Ohio State University	X			0.5	0.3	0.4	0.6		9
University of Illinois - Urbana - Champaign				0.8	1.0	0.8	0.6		10
University of North Carolina - Chapel Hill	X			0.5	0.5	0.7	0.6		11
University of Wisconsin - Madison	X			0.6	0.6	0.5	0.6		12
University of California - Los Angeles	X			0.6	0.5	0.3	0.4		13
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X			0.3	0.3	0.3	0.4		14
University of Maryland - College Park									
University of Texas - Austin									
Median				0.7	0.8	0.7	0.7		

Economic Development

Startup Companies

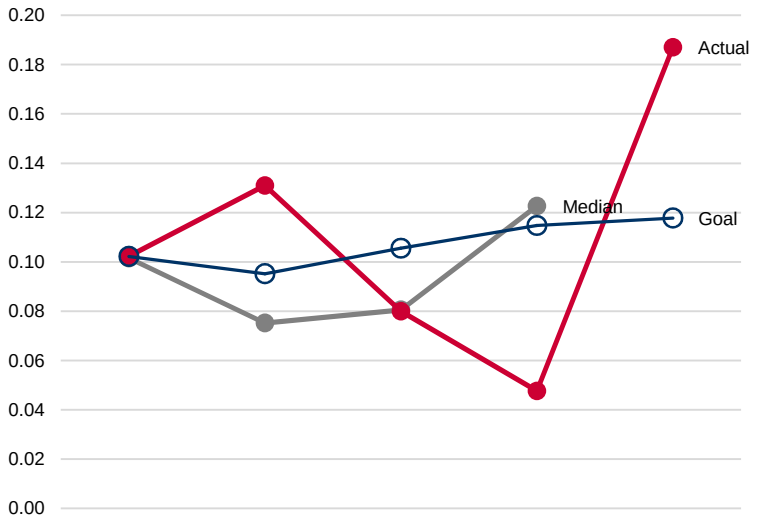


ABOR Enterprise Plan	2010	2011	2012	2013	2014	
Actual	6	8	5	3	11	
Goal	6	6	7	8	9	
Difference	0	2	-2	-5	2	

ABOR Peer Group	Med. Sch.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of California - Los Angeles	X		27	19	13	17		1
University of Washington - Seattle	X		7	9	9	17		1
University of Florida	X		9	12	15	16		3
University of Minnesota - Twin Cities	X		8	9	12	14		4
University of North Carolina - Chapel Hill	X		5	7	9	14		4
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X		5	5	5	10		6
The Ohio State University	X		8	6	5	10		6
University of California - Davis	X		9	5	2	8		8
University of Wisconsin - Madison	X		5	4	4	7		9
University of Illinois - Urbana - Champaign			5	12	5	6		10
University of Iowa	X		3	2	4	6		10
Texas A&M U. - College Station and Hlth. Science Ctr.	X		7	4	5	3		12
The University of Arizona	X		6	8	5	3	11	12
Michigan State University	X			1	3	1		14
University of Maryland - College Park								
University of Texas - Austin								
Median			7	7	5	9		

Economic Development

Startup Companies per $10 Million in Total Research Expenditures

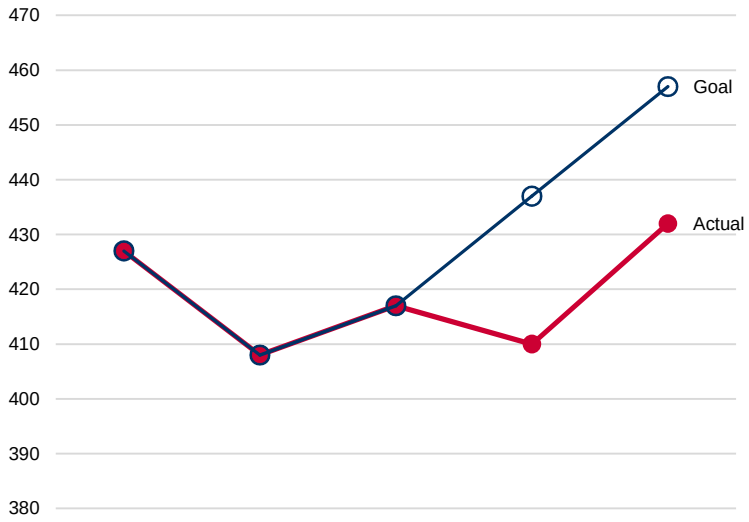


ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	0.1	0.1	0.1	0.0	0.2
Goal	0.1	0.1	0.1	0.1	0.1
Difference	0.0	0.0	0.0	-0.1	0.1

ABOR Peer Group	Med. Sch.	NSF Adj.	AUTM Adj.	2010	2011	2012	2013	2014	Rank
University of Florida	X			0.1	0.2	0.2	0.2		1
University of California - Los Angeles	X			0.3	0.2	0.1	0.2		2
University of Minnesota - Twin Cities	X			0.1	0.1	0.1	0.2		3
University of North Carolina - Chapel Hill	X			0.1	0.1	0.1	0.1		4
University of Washington - Seattle	X			0.1	0.1	0.1	0.1		5
University of Iowa	X			0.1	0.0	0.1	0.1		6
The Ohio State University	X			0.1	0.1	0.1	0.1		7
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X			0.1	0.1	0.1	0.1		8
University of California - Davis	X			0.1	0.1	0.0	0.1		9
University of Illinois - Urbana - Champaign				0.1	0.2	0.1	0.1		10
University of Wisconsin - Madison	X			0.0	0.0	0.0	0.1		11
The University of Arizona	X			0.1	0.1	0.1	0.0	0.2	12
Texas A&M U. - College Station and Hlth. Science Ctr.	X			0.1	0.1	0.1	0.0		13
Michigan State University	X				0.0	0.1	0.0		14
University of Maryland - College Park									
University of Texas - Austin									
Median				0.1	0.1	0.1	0.1		

Economic Development

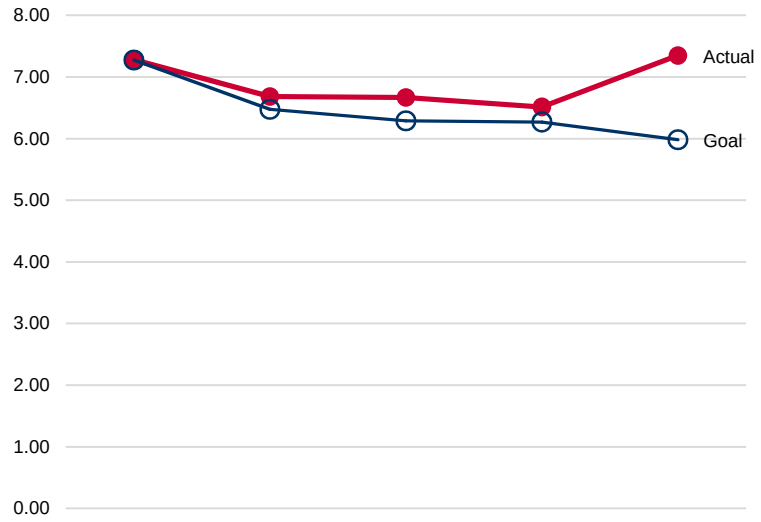
Ph.D. Degrees Conferred



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	427	408	417	410	432
Goal	427	408	417	437	457
Difference	0	0	0	-27	-25

Economic Development

Ph.D. Degrees Conferred per $10 Million in Total Research Expenditures



ABOR Enterprise Plan	2010	2011	2012	2013	2014
Actual	7.3	6.7	6.7	6.5	7.3
Goal	7.3	6.5	6.3	6.3	6.0
Difference	0.0	0.2	0.4	0.2	1.4

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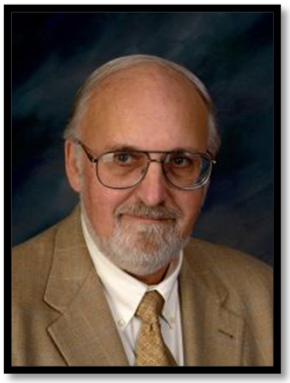
Leadership and Recognition

Recognition for leadership and innovation in knowledge discovery are among the highest accolades that a university can receive. International and national academic awards honor achievements that change how we view and make sense of the world. The Office for Research and Discovery promotes faculty members and students for recognition at the national and international levels.



Harrison Barrett, a UA Regents' Professor who has made groundbreaking advances in medical imaging, was elected as a member of the National Academy of Engineering.

Barrett is a Regents' Professor of Radiology, a Regents' Professor of Optical Sciences and a Regents' Professor of Applied Mathematics, and leads the UA Center for Gamma-Ray Imaging. He also holds an appointment of professor in the Program in Biomedical Engineering and the UA Cancer Center.

Election to the National Academy of Engineering is among the highest professional distinctions accorded to an engineer. Academy membership honors those who have made outstanding contributions to engineering research, practice or education, and to those who have pioneered new and developing fields of technology, made major advances in traditional fields of engineering, or developed or implemented innovative approaches to engineering education

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The University of Arizona is first in astronomy in a national ranking of 539 public and private universities for research expenditures and second in the physical sciences, according to data from the National Science Foundation **Higher Education Research and Development Survey**.

The report, which compares higher education institutions in terms of their research expenditures in astronomy including space exploration, physics and chemistry for the 2012 fiscal year, places only the California Institute of Technology higher than the UA in R&D expenditures overall.

NASA has selected an interdisciplinary research team led by the University of Arizona for a major grant in a new program focusing on the search for clues to life on faraway worlds. As part of this virtual institute — called Nexus for Exoplanet System Science, or NExSS — UA researchers will help understand how Earthlike planets form and which nearby stars are most likely to host Earth's twins. In bringing together the best and brightest, the NExSS team hopes to better understand the various components of exoplanets — planets around other stars — as well as how the parent stars and neighbor planets interact to support life.

- **Ana Zabludoff**, Professor of Astronomy, has been selected as a John Simon **Guggenheim Memorial Foundation Fellow**. Guggenheim fellowships are intended for men and women who have already demonstrated exceptional capacity for productive scholarship. Dr. Zabludoff's research is broadly distributed over extragalactic astronomy and observational cosmology.

- **John O'Keefe and Edvard and May-Britt Moser** (2014 shared Nobel Prize in Physiology or Medicine) and Eleanor Maguire (2003 Ig Nobel Prize for Medicine) described the University of Arizona "one of the centers of neuroscience" during their visit this year. This year marks the 25th anniversary of the UA Arizona Research Laboratories Division of Neural Systems—Memory and Aging, the 10th anniversary of the Evelyn F. McKnight Brain Institute at the UA, and the fifth anniversary of the UA School of Mind, Brain and Behavior. The McKnight Brain Research Foundation has contributed $11 million to the UA's institute since 2006, including a $5 million gift this year that launched a matching campaign.

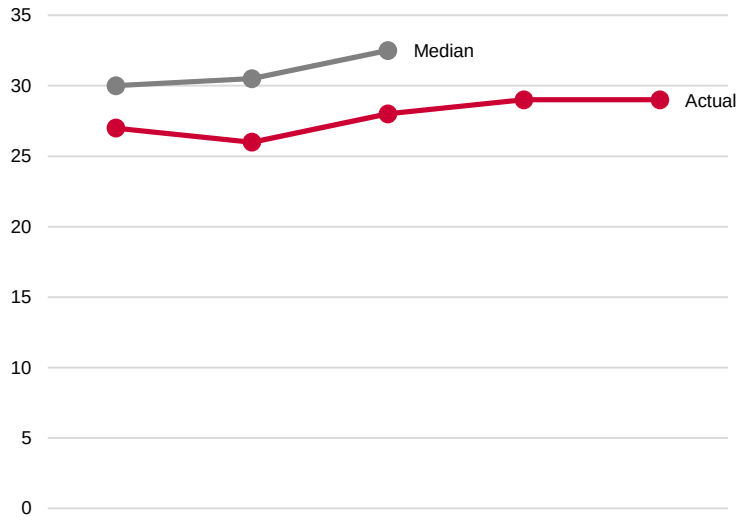
- **Bruce Tabashnik**, professor and head of entomology in the University of Arizona College of Agriculture and Life Sciences, has been awarded the 2015 Henry and Phyllis Koffler Prize for Research/Scholarship/Creative Activity, which honors a dedicated scientist, scholar and collaborator whose mission is to "conduct research to improve food production while preserving environmental quality."

- UA faculty regularly receive top awards in their disciplinary fields. **Diana Liverman**, co-director of the UA Institute of the Environment and Regents' Professor of Geography and Development, has received the Presidential Achievement Award from the Association of American Geographers. Serrine Lau, professor in the College of Pharmacy's Department of Pharmacology and Toxicology, has been elected 2015 chairwoman of the Division for Toxicology of the American Society for Pharmacology and Experimental Therapeutics. Brian Erstad, professor and head of the College of Pharmacy's Department of Pharmacy Practice and Science, was recently awarded the Presidential Citation for Outstanding Contributions by the Society of Critical Care Medicine. Erdogan Madenci, professor of aerospace and mechanical engineering in the UA College of Engineering, has been named a fellow of the American Society of Mechanical Engineers.

Elisa Tomat, assistant professor in the Department of Chemistry and Biochemistry received the 2014 National Science Foundation Career Award, the agency's most prestigious honor for junior faculty members. The awards are granted to scientists who demonstrate outstanding research, excellent education and have a particular skill at integrating both aspects.

Leadership and Recognition

National Academy Members

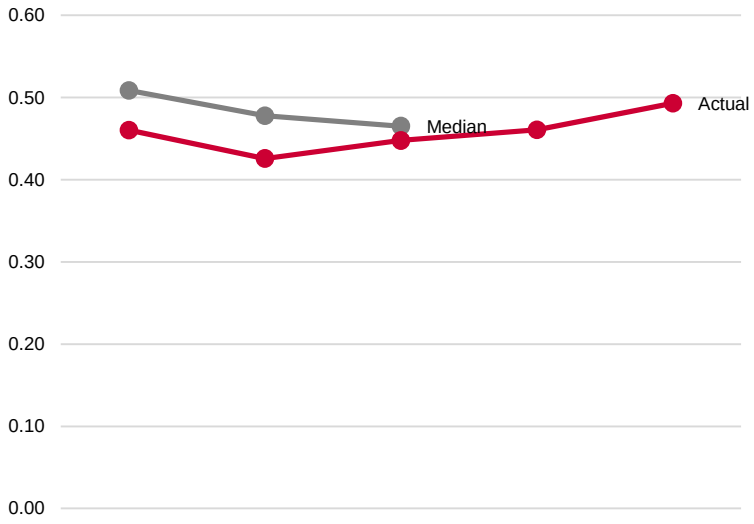


	2010	2011	2012	2013	2014
Actual	27	26	28	29	29

ABOR Peer Group	Med. Sch.	2010	2011	2012	2013	2014	Rank
University of Washington - Seattle	X	102	104	109			1
University of California - Los Angeles	X	91	95	94			2
University of Wisconsin - Madison	X	71	67	68			3
University of Texas - Austin		67	68	67			4
University of Illinois - Urbana - Champaign		59	57	55			5
University of California - Davis	X	36	39	41			6
University of Minnesota - Twin Cities	X	41	39	38			7
University of North Carolina - Chapel Hill	X	30	31	35			8
The Ohio State University	X	27	28	30			9
University of Maryland - College Park		30	30	30			9
The University of Arizona	X	27	26	28	29	29	11
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X	24	23	24			12
University of Florida	X	23	23	24			12
Texas A&M U. - College Station and Hlth. Science Ctr.	X	22	22	23			14
University of Iowa	X	22	22	21			15
Michigan State University	X	7	8	9			16
Median		30	31	33			

Leadership and Recognition

National Academy Members per $10 Million in Total Research Expenditures



	2010	2011	2012	2013	2014	
Actual	0.5	0.4	0.4	0.5	0.5	

ABOR Peer Group	Med. Sch.	NSF Adj.	2010	2011	2012	2013	2014	Rank
University of Texas - Austin			1.1	1.1	1.1			1
University of Washington - Seattle	X		1.0	0.9	1.0			2
University of Illinois - Urbana - Champaign			1.1	1.0	0.9			3
University of California - Los Angeles	X		1.0	1.0	0.9			4
University of Maryland - College Park			0.7	0.6	0.6			5
University of Wisconsin - Madison	X		0.7	0.6	0.6			6
University of California - Davis	X		0.5	0.6	0.6			7
University of Iowa	X		0.5	0.5	0.5			8
University of Minnesota - Twin Cities	X		0.5	0.5	0.5			9
The University of Arizona	X		0.5	0.4	0.4	0.5	0.5	10
University of North Carolina - Chapel Hill	X		0.4	0.4	0.4			11
The Ohio State University	X		0.4	0.3	0.4			12
University of Florida	X		0.3	0.3	0.3			13
Texas A&M U. - College Station and Hlth. Science Ctr.	X		0.3	0.3	0.3			14
Penn State Univ. - Univ. Park and Hershey Medical Ctr.	X		0.3	0.3	0.3			15
Michigan State University	X		0.2	0.2	0.2			16
Median			0.5	0.5	0.5			

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Technology Transfer

THE UNIVERSITY OF ARIZONA
TECH LAUNCH ARIZONA

When TLA began in 2012, the unit laid out a Roadmap with 55 objectives that would determine its direction and serve to measure success. The team achieved many of those goals faster and sooner than expected. At the same time, some took longer and were more challenging. It was also learned that some undertakings were no longer suited to TLA's evolving focus. Over the last year, TLA continued to integrate the functions of technology transfer, corporate and business relations, new venture development, commercialization networks and Tech Parks Arizona.

Team Growth and Leadership: While FY 2014 represented TLA's first operational year with a complete team, a number of new hires were necessary to meet the unit's needs:

Name	Title	Start Date
Sherry Jameson	Administrative Associate, TLA	7/1/2013
Linda Velazquez	Administrative Associate, Tech Transfer Arizona	7/22/2013
Rakhi Gibbons	Asst. Director, Biomedical and Life Sciences Licensing; Asst. Director, Arizona Center for Accelerated Biomedical Innovation (ACABI)	8/5/2013
Lewis Humphreys	Licensing Manager, IT & Software College of Eller Embed	8/5/2013
Emilia Fajardo	Administrative Associate, Patent Team	9/2/2013
Joann MacMaster	Venture Development Associate	9/9/2013
Samantha Bankston	Executive Associate, Planning / Project Management	10/7/2013
Jianling Liu	Business Analyst, Senior	10/7/2013
Paul Tumarkin	Marketing and Communications Manager	10/21/2013
Elisabeth Wagener	Licensing Manager, College of Medicine Embed	10/28/2013
Gus Loaiza	Accountant, TLA	3/10/2014
Oscar Parra	Wheelhouse Program Coordinator	3/31/2014
RD Castillo	Corporate Relations Associate	5/19/2014

During the report period, TLA accomplished the following: executed 72 licenses and options, including 39 exclusive licenses and options; continued service to the faculty to maintain increases in key metrics (including 188 invention disclosures and 24 patents issued) that fuel the technology transfer process; created 11 new companies based on UA technologies (for a total of 32 startups over the past five fiscal years).

Technology transfer statistics for the last five years are reflected in the table (following page) and in the charts earlier in this report (Discovery and Scholarly Impact; Economic Development).

Transactions
Licenses, options, and other major agreements represent key steps in the technology transfer pipeline of idea creation, technology translation, product realization, and royalty generation. In FY 2014, Tech Transfer Arizona executed 72 licenses and options, 39 of which were exclusive licenses, which involve considerable effort and produce the most impact. Conversely, nonexclusive licenses are typically executed for freedom to operate issues.

Technology Transfer

Statistical Exhibits

Technology Transfer Activities	2010	2011	2012	2013	2014
Invention Disclosures Transacted	131	149	142	144	188
Invention Disclosures Transacted Year/Year Percentage Change		14%	-5%	1%	31%
New Patent Applications	67	104	98	76	81
New Patent Applications Year/Year Percentage Change		55%	-6%	-22%	7%
U.S. Patents Issued	13	19	21	27	24
U.S. Patents Issued Year/Year Percentage Change		46%	11%	29%	-11%
Licenses and Options Executed	64	80	47	48	72
Licenses and Options Executed Year/Year Percentage Change		25%	-41%	2%	50%
Other Major Agreements	13	8	13	6	8
Other Major Agreements Year/Year Percentage Change		-38%	63%	-54%	33%

Licensing and Other Revenue	2010	2011	2012	2013	2014
Licensing Revenue (Including Options)	$718,027	$981,495	$921,965	$926,023	$1,112,331
Licensee Legal Reimbursements	$540,324	$432,790	$627,572	$418,743	$515,211
Other Revenue	$0	$0	$0	$0	$0
Total	$1,258,351	$1,414,285	$1,549,537	$1,344,766	$1,627,542

Sponsored Research Facilitated	2010	2011	2012	2013	2014
Total	$4,701,776	$5,918,193	$5,100,000	$1,677,000	$1,670,293

Royalty Distribution	2010	2011	2012	2013	2014
Inventors	-$248,107	-$346,698	-$322,687	-$271,071	-$364,627
Laboratories and Units	-$188,505	-$231,132	-$276,590	-$233,554	-$314,162
University	-$173,437	-$192,609	-$184,779	-$155,016	-$208,156
Undistributed	$107,977	$211,056	$137,909	$266,382	$225,026

In FY 2014, 24 patents were issued to the UA, and the UA filed 167 new patent applications representing a 55% increase from the previous fiscal year - a clear verification of the new approaches. Examples of the 191 patents that were granted or filed in FY 2014 include:

- **U.S. Patent issued No. 8,492,737 "Tunable Infrared Emitter"**

  Infrared sensors are important tools for monitoring environmental conditions, industrial and automotive safety, and homeland security. These sensors work by detecting narrow bands of infrared light from a small emitter and interpreting the results. However, most current emitters do not allow operators to tune the output band of light during operation, and many also lack sufficient power or structural stability to be useful in varying applications. Researchers at the University of Arizona have developed photonic structures that emit light between 3.9 μm and 4.5 μm. This innovative design enables real-time, low cost, narrow-band spectral tuning, high-emission output power, and an emitter structure that is stable for a wide variety of applications.

- **UA14-005 Provisional Patent Application - Electrostatic Coating with Metallic Nanoparticles**

  There is a need for a simple method to cover silica or glass in a thin metal layer, allowing insulator materials such as ceramics or polymers to be coated inexpensively with a thin layer of metal without the need for an applied voltage. This patent application relates to solving this need by allowing the formation of a thin layer of metal on non-metallic substrates (i.e. thermal silica or glass) from metal (i.e. copper) nanoparticles by only the electrostatic interaction between the nanoparticles and a suitably prepared substrate surface. Simulation results show orders of magnitude in improvement, as compared to traditional methods. Real results from data closely replicate the performance of simulations.

In addition to the startups discussed herein, a large portion of TLA's portfolio is licensed or optioned to a wide variety of companies, from large corporations such as Life Technologies and Hayden-McNeil, to smaller organizations such as The Burgundy Group Inc. Example innovations transferred under licenses or options include:

- **Smart Planner™**, licensed to **The Burgundy Group**, is a "bolt-on" to PeopleSoft Campus Solutions that will help student retention and satisfaction by easing the workload on advisors and students, allowing them to focus on student development and academic success. The system considers a student's currently existing transcript and applies the student's chosen degree requirements, automatically generating a recommended, multi-semester course sequence through graduation.

- **BugSeq: Bacterial Identification in Clinical Infections**, licensed to **Pharmacline Inc.**, is a technology that analyzes genomic sequences of all species in an infection, identifying and quantifying sequences that function as biomarkers for predicting clinical outcomes through correlation with prior clinical "phenotypes." This provides a potential for focus on greater accuracy and precision in diagnosis of clinical infections, and the ability to predict clinical outcomes.

- **Levels of Emotional Awareness Scale - Electronic Version (eLEAS),** licensed to **ReThink Group Inc**, is based on a performance measure that assesses an individual's ability to be aware of their emotions. Emotional awareness is conceptualized as a cognitive skill that varies between individuals in the degree to which it has developed, and people differ greatly from one another so this tool has many applications. The five levels of emotional awareness are: 1) physical sensations, 2) action tendencies, 3) single emotions, 4) blends of emotions, and 5) blends of blends of emotions. The questionnaire/scale poses evocative interpersonal situations to the user and elicits open-ended descriptions of the emotional responses of self and others that are scored using specific structural criteria applied to the emotion words used in the responses. Whether working with an individual client, a small clinical population, or a research sample of hundreds, test versions are readily selected and scores are available at the click of a button.

SinfoníaRx. ***Medication Management Center***. *Kevin Boesen, Pharm.D., CEO, Fletcher McCusker, Chief Executive Officer*
The award-winning medication management program was originally created by employees of the UA College of Pharmacy in 2006. The program delivers services to patients nationwide and includes direct pharmacist interactions with patients, their health care providers and community pharmacists to ensure optimal treatment. In 2013, the program was licensed to create a startup company, SinfoníaRx, a wholly-owned subsidiary of Sinfonía HealthCare Corp. The program's state-of-the-art software system proactively evaluates millions of prescriptions and medical claims annually to identify opportunities to reduce the risk of adverse events and drug interactions, improve medication adherence, and look for opportunities to reduce the cost of medication treatments. Today, the company is growing in multiple cities, using interns from the UA, and hiring UA graduates.

Acomni, LLC. ***Cost-limiting Temperature Controller***. *Electrical and Computer Engineering Associate Professor Jonathan Sprinkle*
Sprinkle and a team of researchers developed a monitor that works with a wi-fi enabled thermostat to automatically manage temperature settings based on how much consumers choose to spend on electricity, not just on how cool or warm they want to be at any given time. Unlike smart thermostats that expect consumers to reduce energy consumption by choosing set points using their intuition of savings, this technology translates thermostat changes into dollars before the electricity bill lands in the mailbox. TLA executed a contract that licenses the technology to the startup company, Acomni LLC. Now the company seeks investors and is partnering with utility companies and heating and cooling businesses to get the device into homes.

Dataware Ventures. ***Improved Big Database Performance.*** *Department of Computer Science Professors Saumya Debray and Richard Snodgrass, with Rui Zhang, Ph.D.*
This team developed *micro-specialization*, a technology that speeds up large database management systems. The group worked with the TLA tech transfer team to protect the intellectual property and the Wheelhouse team to create their startup, Dataware Ventures. They also were awarded Proof-of-Concept grant money to help develop their invention.

Technology Commercialization
In collaboration with the Faculty Senate, the UA completed the process of adding consideration for work in commercialization to the Promotion and Tenure review process. TLA also successfully worked to revise the UA Intellectual Property Policy to make it more understandable, and to bring policies more in line with general practice, ensuring that inventors involved in startups can appropriately benefit from both from royalties as well as from startup revenues.

Industry-sponsored Research
This year, TLA completed the business plan work on the Defense and Security Research Institute (DSRI) and initiated similar work on two additional prospective centers: the Arizona Center for Accelerated Biomedical Innovation (ACABI) and the Water and Energy Sustainable Technology (WEST) Center. TLA also identified top prospects in Phoenix for expanding research collaborations, and provided “front door” responses to over 50 inquiries from businesses wishing to engage with the UA.

Tech Parks Arizona
Tech Parks Arizona (TPA) generates, attracts and retains technology companies and talent in alignment with the research, mission and goals of the University of Arizona. TPA directs the UA Tech Park, the UA Tech Park – The Bridges, and the Arizona Center for Innovation (AzCI). The UA Tech Park on Rita Road is home to 45 companies employing nearly 6,500 individuals. The facility recently executed $3.25 million in improvements and expansions, and transformed its business model for AzCI, placing greater emphasis on product development, testing and evaluation. Tech Parks Arizona also successfully rebranded the Bio Park as the UA Tech Park – The Bridges, and financed and executed the land option to expand the park by 11 acres.

Proof-of-Concept
In FY 2014, TLA funded $416,091 in awards for POC projects. These funds were spread among projects coming from the College of Optical Sciences (40%), the College of Science (22%), AHSC (16%), the College of Engineering (12%), and the Eller College of Management (10%).

Catapult Corporation
TLA created the Catapult Corporation, or “Cat Corp,” a 501(c)(3) non-profit corporation – a seed venture capital investment company –to provide early-stage capital to the most promising startup companies emerging from the UA. Cat Corp is designed to be a self-sustaining investment corporation.

TLA Catapult Awards
TLA planned and hosted the first TLA Catapult Awards to recognize excellence in and commitment to University technology commercialization. Honors were given in categories including Chemistry & Physical Sciences, Biomedical & Life Sciences, Information Technology, Engineering, Industry & Corporate Partnership, and Ecosystem Impact.

Engagement Opportunities for Faculty, Researchers and Students
To continue its outreach to the UA community and engage faculty and researchers in the ecosystem of invention and commercialization, TLA offered a complete series of workshops and seminars over the course of the year. “Technology Commercialization” workshops, open to all, introduced the various processes and people involved in the commercialization ecosystem. “Idea-to-Asset” seminars provided audiences in specific colleges with real-life case studies about technologies that have been or are being protected and brought to market.

TLA also offers various engagement opportunities specifically for UA students, such as (but not limited to) internships with UA startups, Student Innovation Fellowships (sponsored by the Office of the CIO and the IT Student Advisory Board), and Technology Transfer Student Fellowships.

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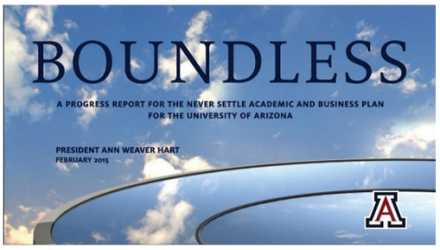
Strategic Initiatives

As mentioned throughout this report, Never Settle – the University of Arizona strategic plan – is our main blueprint for the way to achieve UA targets for increased research and development expenditures, create more opportunities by helping to launch new companies with UA research as the foundation and develop solutions that have a public impact to make our community – and our state – a better place to live.



The Never Settle strategic academic and business plan, spearheaded by UA President Dr. Ann Weaver Hart, was developed with extensive input from faculty, staff, students, business and community leaders The plan calls for doubling research expenditures by 2025. However, because of decrease federal agency R&D spending, state fiscal constraints and elements of the plan on hold, research expenditures were down in FY2014. Plans implemented now – focused on increasing external funding and reorganizing the research enterprise internally - will bear fruit in increased and accelerating research expenditures beyond fiscal year 2016. The major strategies in place for research are listed below.

1`. Increase research expenditures in strategic areas. We have selected seven areas where UA has the ability, desire, and potential resources to double research expenditures. These areas are cross-cutting, aligned with known research strengths, and tied to specific grant and contract opportunities. They are:

- Defense and Security- An area of strategic growth opportunity. UA has strengths in cybersecurity, space and optics, sensors and technology, and medical/ neurosciences, among others- areas, which will be focused and leveraged into increased research expenditures.
- Space Systems- UA's historical strength area. Target areas include ground-based observations and earth sensing.
- Water and the Arid Environment- There are additional opportunities to leverage UA's broad-based strengths in water and arid environments through international research consortia, public-private partnerships, and synergies with space and public health areas.
- Precision Health- UA's infrastructure in genomics and big data, as evidenced in the iPlant Collaborative, will be applied to research in precision health, also called personalized medicine. Focus areas will be in cancer genetics, pharmacogenetics, a rare disease clinic, and nanobiotechnology.
- Neurosciences- A strong basic research program in neurosciences will be expanded and translated to clinical use especially in the areas of aging and cognition, Alzheimer's disease, stroke, and neuromuscular disease.
- Population Health and Health Outcomes- UA is poised to excel in research for aging and rural populations, underserved communities, and to develop novel healthcare delivery models. Healthcare Disparities- Excellence in this area will be expanded upon, particularly in the UA strengths and the community concerns surrounding cancer, diabetes, Hispanic health disparities, and Native American women's health.

2. **Increase research infrastructure. UA will build capacity to make a large research engine even larger, foster a culture of collaboration, and create a support structure to improve our competitive advantage. This effort has already started with a number of units created or bolstered to give researchers the ability to spend more time on research.**

Our main goal to advance excellence in research by supporting our researchers in their research activities – from advising about future funding opportunities to helping our researchers secure those opportunities and then promoting our successes. The Office for Research and Discovery has become a more dynamic, diverse office with a "customer service" focus towards our researchers.
Among the goals we hope to achieve with this restructure

- Achieve faculty flexibility and accountability through flexible workload models, and the revised promotion and tenure guidelines as described earlier.
- Successfully compete for more large and complex awards by creating a research support office with personnel dedicated to facilitating faculty teams
- Continue to develop contracting and compliance protocols, to increase our competitive edge as responsive, responsible partners.
- Ensure that space is used efficiently by benchmarking productivity, and determining whether building or renovation is most effective in a growing research enterprise.
- Develop partnerships to finance large projects through public-private partnerships and shared investment in large projects.
- Ramp up our clinical trials infrastructure and increase partnering in biomedical areas.

3. **Boundlessly collaborate with internal and external partners and strengthen our ties with federal agencies**

Engaging new strategic partners in the research enterprise to accelerate innovation is one key pillar of our *Never Settle* efforts. It is also our goal to make the outstanding research and discovery activities at the UA more visible to potential partners so that we can continue to engage those we are with and also attract new ones. Part of that goal involves bringing in influencers. In the last fiscal year we have done a number of things to attract new partners and strengthen existing partnerships.

- NSF Director France Córdova was in Tucson for a two-day visit hosted by the Office for Research & Discovery and University Relations. She met with faculty, talked to students and visited some of the UA's world-renowned research facilities, including Biosphere 2, the Steward Observatory Mirror Lab and the Laboratory of Tree-Ring Research.
- Dr. Scott Fouse, VP of the Advanced Technology Center at Lockheed Martin, who directs the research arm at Lockheed and is responsible for providing technology into business lines to positively impact success, also toured the UA as a way to bolster ties between industry and UA.
- The Office for Research & Discovery also partnered with DC consultants, Lewis-Burke Associates to help expand relationships with UA faculty and federal agencies.
- A select group of representatives from academia, government and industry convened last week at the University of Arizona's Biosphere 2 facility to identify the top scientific questions surrounding the availability of energy, water and food for future generations. The workshop, funded by the NSF, was among the first in a series of meetings across the country to address the needs of future populations.
- A groundbreaking agreement between the University of Arizona Health Network and Banner Health was completed in FY2014, resulting in the Banner – University Medicine division, a comprehensive new model for academic medicine. The purchase of the University of Arizona Health Network by Banner Health, a partnership that is considered a new model for providing medical services, research and education. A result of the deal will include an expansion of medical center capabilities for complex academic/clinical programs, such as transplantation, neurosciences, genomic-driven precision health, geriatrics and pediatrics.