

ACADEMIC ANNUAL REPORT 2016-17
College of Science – August 2017

COLLEGE-LEVEL PERFORMANCE

The College of Science's ultimate responsibility is building the global leaders who are the scientists and citizens of tomorrow—the women and men who will inherit the our most pressing challenges and who must be ready for that responsibility. We approach the task of educating tomorrow's leaders by helping them succeed, in their personal and professional lives. To build understanding, there is no substitute for experience. As this report illustrates, transformative experiences foster students' capacity for deep reflection and critical thinking on the decisions they make, the path they follow and the world around them. Our longstanding dedication to academic excellence grows stronger each year. Together, we will transform science.

Our College has achieved many extraordinary accomplishments in FY17 especially in student success, faculty research success, increased visibility and fundraising. Last year, we had most high-achieving students in our College, our highest six-year graduation rate in more than a decade, the third most degrees awarded at the university, 31% of our students from underrepresented minority populations, our second highest year for research funding since 2013, a landmark event with Crayola, Nike and others that generated 700 million impressions online, and a record-breaking year for fundraising with \$6.2 million in gifts, beating our strategic goal set for 2020. We have attracted the best and brightest minds in science who have been recognized with some of the most prestigious awards in higher education, including Fulbright, Goldwater, NSF CAREER, NSF GRFP and National Academy of Science just to name a few.

The College of Science leads the university with the most high-achieving students (56.6%), the highest in nearly 15 years and up about 6% from last year. This exceeds our 5-year strategic goal of 52% of incoming students be high achieving. Last spring, we had our highest six-year graduation rate—39.6%—in more than a decade, which is on par with OSU's graduation rate of 40.3% among students who graduate from the same college they started in. We graduated our largest class of mathematics students ever at 55. We were proud to see the graduation rate of students who leave our college but graduate from OSU rise to 67%, which meets our 5-year strategic goal and is above OSU's overall graduation rate of 63.3% (but not nearly good enough!) Since FY15, we have graduated 9.4% more students overall, awarding 6.3% more bachelor's degrees, 14.3% more master's and a staggering 48.6% more Ph.Ds. We awarded the third most degrees of any college, behind the Colleges of Engineering and Agricultural Sciences. In comparison, OSU graduated 12.4% overall in the same period, awarding 12.3% more bachelor's degrees, 12.5% more master's and 27% more Ph.Ds. This year we moved closer to our 5-year strategic goals by awarding 559 bachelor's degrees with a goal of 680, 56 master's degrees with a goal of 65 and 55 Ph.Ds. exceeding our goal of 38. Our 4-year graduation rate among junior transfer students in science is 49.2% from our College and 58.5% from OSU. That is on par or slightly above OSU's transfer student graduation rate of 50.8% from a unit and 57.1% from OSU.

As diversity is a core value in Sciences, our focus is on increasing the number of underrepresented minority students, which currently comprise 31.5% of our students, which is above OSU's 23.7%. We are on target to meet our strategic plan goal of 35% underrepresented students. We need to increase the number of international students in science, which, at 6.7%, is only about half the number at OSU (11.6%). Our strategic goal is to increase international students to 13% by 2020; this will be challenging in the current political and international environment.

To increase student recruitment among high-achieving students and to raise the visibility of Science at OSU to prospective students and influencers, we invested in strategic marketing campaigns—both digital media and email marketing—for a highly targeted, sophisticated and personalized approach to student recruitment. We implemented a two-pronged approach to target and engage STEM high school students from top schools in Oregon, California, Idaho and Washington: 1) Digital Media campaign with the Oregonian Media Group, and 2) A Personalized Email Campaign with customized microsites for each prospective student.



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The digital campaign with the Oregonian Media Group included mobile ads driven by geographical targeting based on location and online behavior, a [custom landing page](#) and a special [prospective student website](#) which were built by our marketing team. We planned to build on our success last year, which the Oregonian has held up as a national case study for college and universities. Our response rate was exceptional and we saw results as we representation in the Honors College climbed from 25% to 30% in just one year. This year there was a technical error on the part of the Oregonian and they did not deliver the reach and impact that the campaign did last year. They are continuing to compensate us for their error and have addressed the breakdown. We were pleased to maintain our fall enrollment levels while also gaining valuable data on high schools that perform well for us to further target our recruitment efforts.

The personalized email campaign launched with an external vendor focused on attracting, learning about, and responding to applicants with relevant content for each student during each phase of the recruitment cycle. We employed this approach to gain the expertise of a vendor with proven success and extensive experience running hundreds of highly targeted and integrated campaigns. They monitored results at every touch point and made adjustments on the fly. This highly personal approach is needed because today's students prefer to respond and research online using a personalized microsite with relevant content and offers high responsiveness. This approach also gave us a one central point for tracking results and delivering relevant responses to prospective science students. The campaign targeted accepted high achieving science students with seven email waves, personal websites tailored with relevant content, advisor phone calls and text messages. We had extraordinary response to the emails (overall 54% open rate vs 20-25% national average), high engagement on the personal websites and learned where students who declined admission are going, factors that influenced their decision and strong forecasting for students who committed to enrolling in science at OSU. We had 252 students say they planned to enroll, 213 undecided and 273 said no. We attribute these marketing campaigns to helping us maintain a steady enrollment and boosting the visibility of science to our key audiences.

However, we faced a few challenges in other areas of student success.

Undergraduate enrollment for fall remains flat, up 0.5% or 3,174 total students since FY15. OSU's enrollment increased by 6% for the same time period. Nationwide, college enrollment has declined, so OSU's growth is noteworthy. Our graduate enrollment is trending up about 3% since FY15, compared to OSU's slight increase of 1.3% overall. Our newly launched online master's degree and graduate certificate in data analytics has had a strong start, with the potential for high growth in one of the fastest growing careers in the nation. We are hiring a Director of Data Analytics to accelerate the growth of this program. We also see our Accelerated Master Platform (4+1 program) offered in all departments as a strategy to drive graduate enrollment.

Two key areas where we need to focus are increasing both student retention and student credit hours that we teach, which are both declining substantially. Our first-year retention rate was 60.4% within our College, a drop of nearly 5% since FY15, but was 81.1% among science students who remained at OSU after leaving our College. This concerning trend seems to be happening across STEM colleges at OSU with the exception of Engineering. OSU's overall retention rates are 65.1% in a college and 83.4% at the university. Both have remained flat or dropped slightly in the past decade.

Our top priority is to enhance student success through recruiting, mentoring, retaining and graduating our students. In turn, these efforts will address our decreasing student credit hours, particularly in science and math courses we teach. Our student credit hours (SCHs) are down about 5.4% overall, down nearly 8% in lower division courses but up 1% in upper level courses. In contrast, OSU student credit hours are up 3.5% overall, down 1% in lower division courses and up 10% in upper level courses. Our graduate credit hours are up slightly at 0.7% compared to the OSU's increase of 2.4%. We are working to understand the decline in student credit hours. Our hypothesis is that the following are contributors: More students are taking lower division requirements elsewhere and transferring them to OSU, other colleges across campus are changing curriculum requirements that impact our SCHs, more units are enforcing a grade of C- or above in prerequisite courses so students are not retaking our courses which of course is a

good thing for student success, the elimination of the tuition plateau nearly two years ago has prevented students from taking unlimited course credits, and the Oregon Promise grants are encouraging students to go to community colleges. We have implemented several student success initiatives, such as the Math Summit, Learning Assistants, additional tutoring help, more proactive advising and others, to decrease DFW rates in our courses, which thereby reduces the need to repeat courses.

To boost our retention rates, we implemented a proactive advising approach at the departmental level and through new Peer Advising and STAR advising. These efforts help students who are on academic warning or probation in many ways: provide a welcoming and inclusive place for first generation and underrepresented minority students, support women in STEM, integrate professional development opportunities into courses, connect students with research opportunities, incorporate adaptive learning methods into courses among others.

To improve four-year graduation rates, we are emphasizing proactive advising and have launched professional and career development programs to motivate students to complete their degrees to embark on satisfying careers in science. These programs will also decrease attrition, prepare career-ready graduates, promote internship opportunities by connecting students with our 28,000+ alumni, and market career development opportunities to students to foster networking. For the second year, we hosted the Math Professional Development Night which drew more than 30 students and faculty to the event featuring career-related presentations on the academic, actuarial, and industry/lab paths, resume fine-tuning and mock interviews, as well as Skype-visits with alumni. We partnered with the Career Development Center and are developing a strategic plan for career development activities.

To address flat enrollment and to attract top students, the College again invested in a digital marketing campaign with Oregonian Media Group that targeted high-achieving students in science and parents/influencers in Oregon, Washington, Idaho and northern California. This initiative advanced one outcome of our strategic plan: to recruit high-achieving students. See above summary for more details.

To mitigate our "Summer Melt"—a phenomenon that refers to the increasing trend of students who leave high school with college plans yet never make it to campus—we launched a marketing campaign to target science students who have been admitted and/or who have even paid their deposit. The Oregonian provided this campaign to us free of charge since they made the error for the spring recruitment campaign to increase our fall yield. Data suggests that 10–40% of low-income students melt nationally with low-income and first-generation college students most at risk. They lose momentum when they leave the support system of high school. We are finalizing the data, but early indicators look very promising with a click-through rate of 0.8%, 10 times the national average of 0.08%. The digital ads drove students to a landing page where they could register for one of [three webinars in July](#) hosted by our College and the Offices of Admissions and Financial Aid to offer immediate, live help to students struggling with enrollment concerns. Attendance was low which may mean a webinar format is not the best way to communicate with this demographic, who prefer more dynamic and interactive platforms. We will align the targeted students with final fall enrollment numbers to determine what the campaign yielded, but preliminary enrollment for fall is showing a 10% increase from last year, based on attendance at our START sessions which has a high correlation to students who show up in the fall.

We have invested in one of our strategic goals to enhance the visibility of science to the public. We launched [SPARK](#), a yearlong celebration of the convergence of the arts and science to elevate the relationship between them and their critical interplay with each other. The initiative was a collaboration between the Colleges of Science, Education, Liberal Arts and Honors College, the Library and the Division of Outreach and Engagement. Together, we attracted about 6-8,000 people to more than 60 events, such as "Science Worth Spreading," workshops by science fiction writers and science writers, data visualization, and microbiome initiatives. One notable highlight was "[The Colorful World of Pigments](#)," a series of event that celebrated the fertile meeting point of science, art, color and cultural trends in chemist Mas Subramanian's groundbreaking YInMn blue pigment discovery. News of the pigment that made history as the first new inorganic blue pigment in more than 200 years went viral last summer. The signature event was a panel discussion featuring speakers from The Shepherd Color Company, who has an exclusive partnership with OSU to manufacture the blue pigment with its heat-reflecting properties; a conservation scientist from Harvard Art

Museums; CEO of Crayola Crayons; a color theorist from Nike; an HGTV Design star; and Mas Subramanian. At the event, [Crayola announced](#) a new blue crayon that would be inspired by OSU's YInMn blue. The event generated 700 million impressions for the story—and OSU—and over 90,000 unique name ideas were submitted in the nationwide contest to name the new blue crayon color. This was one of the university's top stories.

In terms of research funding, the College of Science received \$18.7 million in grants and awards where our faculty was the PI in FY17, the second highest year since FY13 and an increase of 54% from last year. Our research funding totals for FY17 jumped to \$24.5 million where our faculty are the PI or co-PI, which is notable given that funding agencies are promoting team research and collaboration with more researchers working across boundaries to explore complex problems. Our three-year moving average of awards shows a continued upward trajectory. The College received 3.7% more grants and contracts than in FY16. The majority of our funding came from federal agencies, with NSF awarding 61% of grants, NIH 4%, sub-awards contributing 8%, Department of Energy 7%, USDA 2%, U.S. Army 2% and other 16%. However, our research expenditures decreased this year to \$13.3 million; our strategic goal is to increase them to \$21 million by 2020.

Science research is central to the mission of OSU and must grow to ensure our path to global excellence. Last year we invested in grants support for faculty that we expect to increase both the quantity and quality of proposal submissions to ultimately result in increased research funding. We have made use of Bettye Maddux to provide grant processing and hired Donn Forbes to provide NSF CAREER grant writing training and to develop large center grants. We have seen this investment pay off. For instance, three physics faculty received significant 3-year grants in support of their research this year, which represent new funding since they arrived at OSU; another received bridge funding.

The College of Science is committed to advancing OSU's priorities of student success and equalization, a transformative educational experience and strengthening OSU's impact throughout Oregon and beyond. We invested in transformative educational experiences for science students, including undergraduate research, career development and internships opportunities, living learning communities, mentorship, experiential learning, community service and outreach. We have also invested in our faculty, the intellectual engine of our College, and we are committed to their success. We have highlighted examples of our collective achievements and their impact on students, OSU, Oregon, the nation and the world. This list represents just some of our successes this past year.

PROGRAMATIC ACHIEVEMENTS

I. Outcomes that contribute to a transformative educational experience for all learners (Goal 1)

The College enhanced the learning environment to raise and equalize student success in a number of ways. We launched new options in Microbiology—the Aquatic Microbiology option, which includes a unique laboratory experience where students spend a day aboard a ship collecting samples.

The College drastically reduced the DFW rate in general chemistry sequence courses for chemistry majors among underrepresented minority students by adding supplemental instruction. We had success with this strategy in a pilot program this past year. With partial support from the ESTEME WIDER grant from NSF, we increased the number of seats in our physics studio-based course sequence in Physics for Scientists and Engineers by 50% this year. Early indications suggest that students enrolled in the studio sections are more confident, much less likely to withdraw and less likely to receive a failing grade.

To further support student success, a physics instructor developed Project BoxSand courseware for the algebra-based sequence that has significantly reduced DFW rates for biological sciences students in the introductory physics sequence and has garnered several competitive development awards at OSU. BoxSand is an online learning environment containing links to videos, practice problems, open source textbooks, educational websites, simulations, and more tools for students. We redesigned physics courses that serve as an on-ramp for the intense junior year of the Paradigms in Physics experience. The courses launched this year and have increased retention rates by moving



two courses earlier in the sequence giving students more flexibility to fit in required courses in a dual major their senior year and graduate on time.

To further make high-impact learning a hallmark of undergraduate education we launched initiatives this past year to foster responsible citizenship and global competitiveness. As part of the SPARK initiative, we developed a new course, “The Art of the Microbiome: An Interdisciplinary Conversation” that enabled undergraduates to explore the intersection between the arts and science. We increased the number of chemistry students participating in high impact experiences, including undergraduate research and internships to 40-60 per year. We also had [mathematics and physics students](#) to participate in research internships in top national labs.

The College has implemented several initiatives this year to advance learning through course design, assessment and faculty development. One of our most notable accomplishments was redesigning all sections of the high enrollment College Algebra course to include includes Learning Catalytics, a web-based student response tool, and ALEKS, an adaptive courseware platform. The effort was led by a mathematics professor in collaboration with five instructors, a representative from the Equal Opportunities Program and four GTA’s. The efforts were supported in part by a \$515K Bill and Melinda Gates Foundation grant through the Association of Public and Land Grant Universities (APLU). Devoting more than 300 hours across several months to this effort, the team saw results that dramatically improved student success in developmental math by replacing the traditional classroom model with an online adaptive learning program. To ensure the use of best practices that lead to student success, the team worked closely with OSU’s Center for Teaching and Learning, Ecampus, Academic Technologies and the Academic Success Center, and engaged with instructors in the Integrative Biology, Physics and Chemistry Departments. They are also utilizing strategies such as a mathematical modeling project, to give students a chance to analyze real-world data sets to understand the uses of specific algebraic functions and their practical relevance.

To further enhance student success, especially in math, we brought in William “Bus” Jaco from Oklahoma State University last fall to develop a three-year Math Summit plan with support from the Division of Undergraduate Studies. These efforts helped set the stage for discussions in the Mathematics Department and across campus to create alternative pathways to enhance learning outcomes. One such pathway was an alternative to Calculus and Probability courses for life sciences students (see page 5). We also brought in Brit Kirwan and Jim Gates, both national leaders on education reform and diversity (see page 11). We also consulted with Bill Velez, a national expert on minority recruiting from the University of Arizona; Physics Nobel Laureate Carl Wieman, who has conducted extensive experimental research in both atomic physics and science education at the university level. We invested in training for a mathematics instructor to attend specialized training at Stanford University with Dr. Wieman. We discussed implementing co-requisites in mathematics for improved student performance. In addition, we developed a quantitative literacy course in statistics as an alternative pathway to mathematics courses for students.

In collaboration with the Academic Success Center to train undergraduate learning assistants (LAs), we continued to expand the use of LAs in our high-enrollment courses, including anatomy and physiology series courses for majors and non-majors, the introductory Biology series and Vertebrate Biology and Paleobiology.

We continued to selectively add new programs to strengthen our core capabilities. To attract students, we launched two new online graduate programs in data analytics: an online Certificate in Data Analysis and an MS in Data Analytics. The multidisciplinary programs were developed in collaboration with the School of Electrical Engineering and Computer Science. Faculty developed five new online courses for this program with plans to create four additional statistics courses this coming year. We had an average of 14 students in our online classes during the first year. With targeted marketing and strong faculty support, these programs have unlimited potential to attract hundreds of students.

We also launched a new Mathematical Biology option for math majors and a new sequence that serves as an alternative to Calculus and Probability courses for Life Sciences students and is more relevant and approachable for them while improving their quantitative skills and ultimately student success. These courses are a result of the



Provost's Initiative Hire for Student Success. We developed a new Marine Biology and Ecology minor related to the Marine Studies Initiative and two new MSI courses including Marine Biology, designed for early-career science majors and other non-science majors to aid with student retention. Our Biochemistry and Molecular Biology major launched last fall has been popular among undergraduates, with more than 30 students changing to this new major. We also launched innovative new courses such as Emerging Infectious Diseases, where faculty taught scientific communication skills by having students read papers from the 1800s, determine which scientific breakthroughs were discussed in the paper, and write a current press release as if these breakthroughs had been made recently at OSU.

We launched a three-year plan to equalize access and student success, develop alternative pathways for mathematics students at OSU and to attract more students into STEM fields. In our lower division courses statistics courses, we successfully reduced DFW rates for statistics students to levels lower than scores before 2013, thanks to the addition of a weekly one-hour recitation. We also enhanced and expanded the Mathematics and Statistics Learning Center to create extra space dedicated to testing and a more welcoming and active learning experience.

The College created an innovative and unique Integrated Professional Development Program designed to promote student success and engagement during and after the undergraduate education. The program seeks to build essential professional skills that are career competencies but that are often not taught in higher education. In the spring, we launched a pilot program in the Department of Integrative Biology that integrates professional skill building into first-year experience courses through personal, interpersonal and career development. Student satisfaction has been extremely positive, with comments like "This course enables OSU students to push the boundaries of what can come out of an education," "I've always been a good student but my definition has changed due to this class and what it has taught me about the balance between academics and professionalism. We are rolling the course out more broadly this year. Physics students will now receive training to prepare internship applications in courses, which helps them complete the senior thesis requirement.

We expanded access to undergraduate opportunities for our students. For example, microbiology majors presented their research results at three departmental colloquia this year and received valuable faculty feedback on their presentation skills and research interpretation. Mentorship can transform the undergraduate experience for many students. This year, we had numerous science faculty serve as mentors through OSU's NSF-funded STEM Leaders Program, LSAMP, Honors College, BioResource Research Program and REU (Research Experience for Undergraduates) programs as well as providing students valuable laboratory experiences. The College continues to invest and promote the successful LSAMP program to recruit and retain diverse students. LSAMP students attend bridge programs in the summer to become acclimated and build community before fall term begins, giving them a strong base of support.

This year, thanks to the generous philanthropic support from our alumni and friends, the College increased funding for the 31 undergraduate students as part of our [SURE Science program](#). This year the College provided enhanced support of \$5,500 for 31 students to conduct summer research across campus to foster meaningful connections with faculty early in their academic careers. With an overall funding rate of 54%, SURE Science supported an extremely diverse group of students, about 65 percent are minority and first-generation college students.

As the College with the most high-achieving students, we are proud that two science students received [Goldwater Scholarships](#), the top undergraduate award in the country for sophomores and juniors in STEM fields; and three science students and alumni received prestigious Fulbright Awards. One of the physics Goldwater scholars ventured all the way to the Weizmann Institute in Israel for a summer research internship. We had a record-breaking total of scholarships—more than \$7.5 million—for current and incoming science students. This amount has tripled since 2015. The dramatic increase is due to a number of factors including more students who qualified, more students who accepted scholarship offers and a substantial increase in university scholarship funding, thanks to generous donor support. We offered more support to students this year and contributed to emergency scholarship funding from OSU.

We enhanced the diversity of many of our graduate programs. We recruited a diverse cohort of 20 mathematics graduate students, including seven women and one self-identified transgender student as well as eight



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underrepresented minorities with Hispanic, Indian, Asian and African American heritage. Faculty participated at the Preparing Undergraduates through Mentoring towards Ph.Ds (PUMP) at Cal State Northridge. PUMP is a program aimed at mentoring students from underrepresented minorities in STEM fields.

A Ph.D. student in biochemistry and biophysics was selected as a STEM Chateaubriand Fellow, awarded to strengthen the cooperation between France and the United States in science and technology. An [African American graduate student](#) was awarded a 12-week summer internship with the U.S. Fish and Wildlife Service Fisheries Fellow working in Idaho working on a salmon health and she was named the Western Region representative to the National Black Graduate Student Association. A statistics graduate student won first place at a national competition hosted by the U.S. Census Bureau for developing a Shiny App to help non-profits with planning and fundraising.

To grow online education and explore new pedagogical models, five chemistry faculty participated in the NSF Wider grant to implement pre- and post-assessment methodology in general chemistry courses. In conjunction with Ecampus and Smart Sparrow, an adaptive learning and instructional design company, we are launching a major redevelopment of virtual chemistry lab tools in general chemistry course sequences for non-science majors. Faculty will be able to design their own, scientifically meaningful, wet lab experiments that can serve as stand-alone experiences, be used to reinforce material or prepare students for on-campus lab work.

To ensure enhance and ensure the success of international students, we are focused on expanding our international graduate students. Building on the successful recruiting of international graduate students in chemistry, which now comprise 50%, we are launching the INTO Graduate Pathways Program in chemistry to attract and strengthen our numbers of international students to enhance and enrich our community.

The College is expanding its strategies to recruit diverse and high-achieving students. In chemistry, we graduated our first students from our "Masters in 4," an accelerated program designed to streamline students' education saving them valuable time and money. Targeted to high achieving students, the program supports them by placing them in a lab their freshman year and by monitoring their progress closely to keep them on track to complete their bachelor's degree in three years and their master's degree in one year.

We advanced student success in other ways such as reaching out to biology students, which constitute the majority of science students, each term using Student Success Collaborative data when students time out and do not register or with first- or second-year students who receive poor grades in foundational courses like biology and chemistry. Our advisors worked collaboratively to examine predictors of success for biology students in introductory courses to develop new placement guidelines that will enhance students' success.

II. Demonstrating leadership in research, scholarship and creativity while enhancing preeminence in the three signature areas of distinction. (Goal 2)

Ultimately, it is our people who perpetuate positive change through science. We continue to seek out the most promising faculty who engage in leading research, are committed to teaching and inspiring students and share our core values. The College has been successful in attracting and recruiting many high-quality faculty in the past couple of years. We successfully recruited Maude David, a French researcher at Stanford University and cofounder of the bioremediation company ENOVEO, as a Complex Systems provost hire. David will join us in early 2018 and brings vast expertise in the human microbiome and bioinformatics. We attracted Maca Franco and Alvaro Estavez as dual career hires in the area of neuroscience. We hired top faculty this year with a professor of statistics, a chemistry instructor, We also invested in the College's leadership team hiring Staci Simonich from the College of Agricultural Sciences as associate dean for academic and student affairs and Matt Andrews from the University of Minnesota-Duluth as our new Associate Dean for Strategic Initiatives and Administration. We made several dual career hires, one of which brought Andrew Thurber from the College of Earth, Oceanic and Atmospheric Sciences.

The College made tremendous strides in increasing the quality, capacity and impact of our graduate programs. We had three Ph.D. students in life sciences receive prestigious NSF Graduate Research Fellowship Program (NSF GRFP) awards and another received an NSF NRT Fellowship in Risk & Uncertainty Quantification in Marine Science this year. The GRFP students were three of seven students selected for the fellowships at OSU and among the 2,000-plus students selected from more than 13,000 applicants nationwide. NSF's GRF Program is the oldest graduate fellowship of its kind, and recognizes master's and doctoral students who have demonstrated high potential in STEM disciplines very early in their graduate training. A graduate student was one of 14 around the world to receive the Association for Computing Machinery Society/Intel Computational & Data Science Fellowship with three years of funding supporting data analysis of the gut microbiome.

The following is a partial list of notable faculty achievements.

We helped expand and cultivate transdisciplinary research on campus and beyond through the launch of the [Oregon State Microbiome Initiative \(OMBI\)](#), with its first national meeting that attracted hundreds of researchers to campus to share ideas about how microbiomes interact with their environment. This virtual center for microbiome research and education comprises OSU researchers from diverse disciplines who work together towards shared goals. This spring and summer, OMBI a hands-on training workshop on microbiome research techniques, a public lecture by award-winning British science writer Ed Yong, author of a *New York Times* bestseller on microbiomes, and a Microbiome Research Forum for researchers and students to discuss the state and future of microbiome research.

Last fall, the College opened the enhanced [OSU NMR Facility](#) with its new, 800 MHz Nuclear Magnetic Resonance instrumentation. A biochemistry and biophysics faculty is the single PI on a 5-year, \$1 million NSF grant to support the new high-powered NMR instrument. We also hired a full-time [NMR Facility Director](#) to manage the facility, promote its data analysis services and position it as a regional spectroscopy center.

Statistics and Microbiology faculty jointly hosted a [Research Experience for Undergraduates Program \(REU\)](#) offering students the opportunity to analyze gut microbiome DNA sequences and to use statistical methods to infer how bacteria influence human health. Funded by a grant from the American Statistical Association, the REU provided students an \$8,000 stipend for the 10-week REU, which reached capacity. We also hosted a Research for Undergraduates Summer Institute of Statistics program that new statistics professor Javier Rojo transferred to OSU. This program focuses on recruiting, training and guiding underrepresented minority and economically disadvantaged students towards advanced degrees in statistics. Now in its 30th year, this year's REU Program in Mathematics supported 10 students from across the country with an emphasis on underrepresented students.

The College is committed to advancing our leadership in research, scholarship and creativity. Our faculty continue to garner recognition across the state, nation and world. For example, a chemistry professor received the Oregon Academy of Science's Educator Award in higher education for the second consecutive year. Mathematics faculty received the Society of Industrial and Applied Mathematics Geoscience Career Prize for substantial global impact in computational geosciences, the Mathematical Association of America's 2017 Deborah and Franklin Tepper Haimo Award for Distinguished University teaching of mathematics, the Alder Award for Distinguished Teaching by a Beginning University Mathematics Faculty Member from the Mathematical Association of America, and a Digital Learning Innovation Award by the Bill and Belinda Gates Foundation for work in developmental math courses. A team of graduate students and mathematics faculty received the best paper award at the Research on Undergraduate Mathematics Education conference. Science faculty received Phi Beta Kappa student awards for best instructor, best mentor and honorary member as well as an Honors College Eminent Professor award. Distinguished Professor Jane Lubchenco received the Oregon History Makers medal, the National Academy of Sciences Public Welfare Medal, the Linus Pauling Legacy Award and delivered a talk "Scientists Making Waves and Bringing Hope" at the World Science Festival. She and former Dean Pantula were named Honorary Members of OSU's chapter of Phi Beta Kappa. He also received the Paul Minton Service Award from the Southern Regional Council On Statistics. Distinguished Professor of Chemistry Douglas Keszler received the American Chemical Society's National Award in the Chemistry of Materials. The Head of our Microbiology Department received a distinguished service award by the American Fisheries Society—

its highest honor—for her accomplishments in the field of aquatic animal. A zoology professor received a Fulbright scholarship to conduct research and teach in the Department of Experimental and Clinical Physiology at the University of Warsaw in Poland. A biology professor serves OSU as president of the Faculty Senate.

Science faculty received major National Science Foundation awards. For example, Integrative Biology researchers received a \$2 million grant from the David and Lucile Packard Foundation to support [PISCO](#) to increase the consortium's global impact by training the next generation of interdisciplinary marine scientists and by continuing to build a database that is accessible to marine researchers worldwide. Our Head of Integrative Biology was awarded a [\\$1.88M NSF grant](#) that is part of a collaborative, new \$14M NSF program for enabling discovery through genomic tools. She was one of eight researchers nationwide selected for the program. Two microbiologists are collaborating on a DOE Joint Genome Institute-funded study on the mechanisms that produce pan-genome diversity in globally abundant bacteria. One of them also received a 3-year \$752K NSF grant to develop analytical methods to examine the evolutionary ecological distribution of microorganisms with a collaborator at the University of Illinois. Statistics professors were co-PIs on a 5-year \$3 million multidisciplinary NSF Research Traineeship program to advance graduate education training in STEM fields and a 5-year \$4 million NSF grant supporting research on genetically engineered crops. Two women mathematics faculty received new NSF awards, including a Career Award—the first in our Mathematics Department—and an EAGER grant to train graduate teaching assistants to be effective teachers in an active learning environment. A microbiologist developed a [new weapon](#) in the battle against antibiotic-resistant germs—a molecule that neutralizes the bugs' ability to destroy antibiotics, generated worldwide attention and media coverage.

The College invested in expanding and increasing high-profile programs in the arts and humanities by significantly raising the visibility of the arts and science at OSU through [SPARK](#). The yearlong celebration of the convergence of these two disciplines helped elevate the relationship between the arts and science and their critical interplay with each other. Our Microbiology Department developed a groundbreaking microbiome-related art exhibit as part of [SPARK](#), "[To See the Unseen](#)," which explored how microbiota influence life within ourselves and on our planet. The show reached over 3,000 members of the public through numerous outreach events to artists and grade schoolers.

III. Strengthening the impact and reach of OSU throughout Oregon and beyond. (Goal 3)

A microbiology advisor received the Educational Resource Excellence Award for developing an open source textbook used in an upper level course that is taught on campus and online. The textbook and in class learning activities increased post-assessment scores for the course. Biochemistry and Biophysics faculty completed a comprehensive *Biochemistry Free for All* textbook as an Open Education Resource for full-length biochemistry courses, which served nearly 800 OSU students this year. We continued to provide learning tools and resources online to promote access for students: Biochemistry and Biophysics' YouTube channel surged to 600,000 views this year and 4.1 million in total and its iTunes U free courses have 49,000 total registered students.

To enhance the quality, capacity and impact of our graduate programs, we implemented an NSF Research Traineeship in Innovations in Graduate Education (IGE) that is supported by a \$500K grant. The innovative educational platform—"[Research to Innovation to Society](#)"—seeks to develop STEM professionals with the research and leadership skills while cultivating their passion and acumen to innovate. The program will pilot and test [Lens of the Market](#)[®], a team-based, experiential curriculum at OSU that guides basic scientific research to address market needs and provides students with professional skill development and practice. If successful, the pilot program will lay the foundation for institutionalizing this approach by graduate programs in STEM nationwide.

Our graduate students were active in professional conferences and workshops. For example, mathematics graduate students attended MATHFEST, the Institute of Advanced Studies workshop, a regional American Mathematical Society meeting in Utah, the Max Planck Summer School, conferences at Simon Fraser University in Canada and at University of Texas, a workshop at the University of Virginia, and a workshop organized by the Mathematical Sciences Research Institute in Berkeley.



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The College hosted and sponsored many outreach events to raise the visibility of science, including two STEM Academy Camps for middle schoolers last summer, Discovering the Scientist Within, [Mi Familia](#) Weekend with bilingual events for Hispanic students and their families, [Discovery Days](#) that drew more than 3,000 elementary students to campus last year, [Juntos Family Day](#) that attracted 1,400 Latino 8-12th graders and family members to campus, Salmon Bowl high school competition; the statewide Science Olympiad for K-12, Academy for Lifelong Learning, our Earth Day event [Science Worth Spreading](#) that featured a series of TEDx-style talks from OSU scientists, partnering with Honors College for a student art exhibit and talent show that drew nearly 300 parents and students as part of OSU's Spring Family Weekend; participated in a successful Marine Science Day at Hatfield Science Center that attracted over 2,000 visitors; and others.

The College hosted local, national and international conferences, workshops and events to position OSU's outreach and engagement programs as learning laboratories that promote high-impact learning and effectively utilize university research. This year we hosted the 3rd Annual Western States Chemistry Education Group conference and the Northwest Regional American Chemical Society Meeting, which drew more than 400 chemists to campus. We hosted the Representations of Riemannian Geometry at St. Joseph's University; an Aperiodic Patterns in Crystals, Number and Symbols at the University of Leiden in The Netherlands; the first [Ambitious Math and Science Summer Institute](#), an NSF program which attracted more than 50 math and science teachers and educators to campus to learn to foster a teaching and learning environment that enhances understanding and student success in mathematics and science; organized the 2017 Annual Meeting of the [Oregon Academy of Science](#) on campus to convene Oregon's scientific community; first international [Genetic Code Expansion Conference](#) and Workshop that brought global leaders together and helped the field mature. Our physics faculty hosted [FOE Fifty-One Erg](#), an international workshop on the physics and observations of supernovae, supernova remnants and other cosmic explosive phenomena. The event attracted nearly 30 astrophysicists from seven different countries, including Denmark, Japan, Ireland, Britain and Italy.

A statistics professor taught a class in Data Science in R as part of the new MS in Analytic program at the Universidad de los Andes, in Bogota, Columbia. Other statistics faculty visited the National University of Singapore on a collaborative project on modeling nucleotide-level RNA-seq data, spoke at an invited session at the 2016 International Biometrics Conference and at the Department of Statistics and Actuarial Science at Hong Kong University and collaborated with researchers at Pontifical Catholic University of Chile. This past year, the College also hosted many visiting professors and international guests from Israel, China, South Korea, Japan, Spain and others.

Science faculty help drive economic development in the region. One of our Distinguished Professors in biochemistry launched a spin-off company [e-MSion](#) is focused on new mass spectrometry technology invented at OSU and is building momentum and winning SBIR grants. Another faculty researcher is pursuing commercial development of a new technology for linking proteins to surfaces.

We established awards to reward faculty achievement and innovation: the Impact Award, Dean's Early Career Impact Award and [College of Science Faculty Scholars for Teaching Excellence Award](#). The latter is a newly endowed, three-year faculty scholar position supporting excellence and innovation in teaching, with flexible funds \$12,500/year.

IV. Summary of key initiatives that align with OSU commitments. (Goal 4)

The College engaged in a number of initiatives that enhance diversity. We hosted the International Indian Statistical Association 2016 conference that attracted over 200 statisticians to campus from around the world. We also hosted the 37th Oregon Invitational Mathematics Tournament that attracted more than 150 high school students from Oregon, their families and other faculty. Many of our faculty participated in training to deepen their understanding and commitment to enhancing diversity in our College in order to equalize access and student success. For example, faculty attended the two-weeklong ADVANCE workshops, the Institute for Advanced Study – Park City Workshop on Increasing Minority Participation in Undergraduate Mathematics. In the School of Life Sciences, we deployed a climate survey to assess the level of support among faculty for promoting diversity, equity and inclusion.



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We hosted the first-ever overnight [Juntos Chemistry Camp](#), which drew more than 20 high school students from across Oregon. The event was part of the OSU Juntos Program, which empowers Latino families around education and college-readiness for 8-12th grades. The goal of the project is to immerse Latino students interested in STEM fields in hands-on lab work, give them a taste of campus life and encourage them to invest in higher education and envision their own path in a STEM career.

We hosted many prominent speakers to educate our faculty as well as our campus community about diversity, equity and inclusion and why this makes for excellence science. Dr. Sylvester James “Jim” Gates, the National Medal of Science recipient and Professor of Physics at the University of Maryland, presented our Spring Distinguished Lecture and discussed, [“Why Diversity Makes For Excellent Science.”](#) He is the first African American to hold an endowed chair in physics at a major U.S. research institution. William “Brit” Kirwan, a nationally recognized authority on mathematics reform and Chancellor Emeritus of the University System of Maryland, presented a lecture on [how universities can enhance and equalize student success](#) to prepare them for the 21st century. Carl Wieman, a Stanford physicist, Nobel Laureate and Corvallis native, presented our Fall Distinguished Lecture on [“Taking a scientific approach to learning and teaching science \(and most other subjects\).”](#)

To engage alumni and to raise the visibility of our faculty, students and donors, the College developed alumni newsletters in collaboration with the departments. Our marketing and communications team continued to produce engaging stories of our students, faculty and alumni with nearly 200 stories posted on our website. We also posted these stories and others on social media and in our alumni magazine and faculty newsletters. The College continues to have one of the strongest social media presences on campus and about half of our departments are also using social media to raise the visibility of science at OSU.

In terms of enhancing resources through philanthropy, the College had a record-breaking year in fundraising with \$6.2 million in gifts, pledges and private grants, including a \$2 million grant from the Packard Foundation to support research for PISCO. This year helped us meet our strategic goal of \$6 million in fundraising by 2020. This is also a strong indicator of the support from our loyal alumni and friends who continue to learn about science through our outstanding newsletters and events, and continue to invest in our faculty and student success and who value science. The increasing generosity of our donors enables our College to create more research opportunities for faculty and students and to attract the most prominent professors and thought leaders—the men and women who provide an outstanding science education.

V. Appendix – Annual Academic Program Review 2016-17 charts

Oregon State University
College of Science
 Annual Academic Program Review 2016-17

PART 1

	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	% Change '15 - '17
Faculty FTE																
Professional	178.3	161.9	169.3	181.0	179.3	176.2	175.9	180.6	175.5	181.1	164.0	179.1	178.4	184.5	180.5	1.2%
Non-Professional	121.3	130.3	115.1	124.0	124.6	116.8	115.2	108.1	108.3	110.3	111.6	99.2	94.6	77.7	91.3	-3.5%
Total Faculty FTE	299.6	292.2	284.4	305.0	303.9	293.0	291.1	288.7	283.8	291.4	275.6	278.3	273.0	262.2	271.8	-0.4%
E&G Tenured/Tenure Track	124.8	108.2	116.0	121.2	124.8	119.6	117.4	118.1	113.6	109.6	98.1	106.2	108.3	112.1	109.7	1.3%
Faculty Headcount																
Professional	195	182	189	199	197	193	194	195	187	201	178	194	193	200	191	-1.0%
Non-Professional	137	153	131	141	141	132	130	124	122	121	121	105	98	82	98	0.0%
Total Faculty Headcount	332	335	320	340	338	325	324	319	309	322	299	299	291	282	289	-0.7%
E&G Tenured/Tenure Track																
0% E&G Funded	4	5	3	3	1	2	2	1	3	2	1	1	1	1	1	0.0%
1%-33% E&G Funded	5	1	1	1	0	1	1	2	0	0	0	0	0	0	1	-
34%-66% E&G Funded	21	16	12	11	10	11	12	10	10	8	9	11	8	10	8	0.0%
67%-99% E&G Funded	7	7	7	11	12	13	13	15	11	7	5	5	8	12	8	0.0%
100% E&G Funded	113	99	110	112	116	109	105	108	104	105	95	100	102	101	104	2.0%
Total Tenured/Tenure Track	150	128	133	138	139	136	133	136	128	122	110	117	119	124	122	2.5%
SCH (Academic Year)																
Undergraduate	184325	181272	179484	172925	174148	173031	174085	190600	207588	214214	206204	213535	206144	198967	195109	-5.4%
Lower Division	125084	120302	119328	115053	118049	118391	119382	131565	143967	146395	142256	147717	146621	139216	135004	-7.9%
Upper Division	59241	60970	60156	57872	56099	54640	54703	59035	63621	67819	63948	65818	59523	59751	60105	1.0%
Graduate	23519	22980	21117	21340	20944	19517	19745	20390	22937	21255	18035	19320	18821	18545	18960	0.7%
First Professional	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Other	0	0	0	24	0	0	0	0	0	0	0	0	0	0	0	-
TOTAL SCH	207844	204252	200601	194289	195092	192548	193830	210990	230525	235469	224239	232855	224965	217512	214069	-4.8%
Duplicated Major Count																
Undergraduate	2457	2465	2919	2837	2795	2826	2906	3217	3387	3501	3163	3233	3158	3216	3174	0.5%
Graduate	472	468	501	500	502	471	465	502	604	545	372	411	408	413	420	2.9%
First Professional	4	2	2	0	0	0	0	0	0	0	0	0	0	0	0	-
TOTAL Major Count	2933	2935	3422	3337	3297	3297	3371	3719	3991	4046	3535	3644	3566	3629	3594	0.8%

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PART 2

	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	% Change '15 - '17
Resources (Fiscal Year)																
E&G - Ending Budget (\$)	26,690,011	26,157,427	27,429,022	28,130,958	29,354,078	31,156,931	32,679,104	34,375,566	40,563,955	45,934,926	43,359,297	46,698,527	47,334,026	48,909,202	48,570,342	2.6%
Total R&D Expenditures (\$)	17,979,903					19,003,468	26,647,805	22,738,479	17,851,429	21,470,620	18,088,503	17,469,689	16,003,186	16,842,001	FEB 2018	-
Awards from Grants and Contracts* (#)	166	192	214	205	220	203	177	219	185	112	67	76	90	83	40	-55.6%
Awards from Grants and Contracts (\$)	11,787,630	18,476,111	44,056,984	18,424,301	15,073,815	20,669,413	26,486,458	24,269,628	16,783,617	24,834,234	8,106,951	9,924,152	26,752,292	12,390,241	18,587,071	-30.5%
Private Giving (\$)							9,454,867	9,611,775	9,069,498	8,378,666	5,313,501	4,294,554	6,102,681	2,937,602	4,957,984	-18.8%

Strategic Planning Metrics 2016-17

	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Goal 2. Demonstrate Leadership in Research, Scholarship and Creativity while enhancing preeminence in the three signature areas of distinction															
2.1 Total R&D Expenditures	see APR data above														
Goal 3. Strengthen Oregon State's Impact and Reach throughout the state and beyond.															
3.5 Annual Private Giving	see APR data above														

* From 2000-01 to 2007-08, the number of grant/contract awards is based on the accounting transactions from the College's award index, rather than the actual number of awards received by the college.

Oregon State University
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 Annual Academic Program Review 2016-17

PART 3

	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	% Change '15 - '17
Degrees (academic year)																
Bachelor	469	455	491	531	490	492	471	506	483	426	448	532	543	572	577	6.3%
Master	83	103	112	123	110	107	79	80	100	42	48	52	49	45	56	14.3%
Doctorate	47	36	44	42	48	51	34	42	45	42	35	28	37	39	55	48.6%
First Professional	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Total Degrees	597	594	645	695	647	649	585	628	634	510	530	612	629	656	688	9.4%

Strategic Planning Metrics 2016-17

	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Goal 1. Provide a Transformative Educational Experience for all Learners.															
1.1 Degrees Awarded-Total	see APR data above														
Goal 2. Demonstrate Leadership in Research, Scholarship and Creativity while enhancing preeminence in the three signature areas of distinction															
2.3 PhD's Awarded	see APR data above														