

**ACADEMIC ANNUAL REPORT, 2015-16**  
**College of Science – September 2016**

**COLLEGE-LEVEL PERFORMANCE**

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The College of Science continues to lead the university in percentage of high achieving students with 50.7% (excluding Honors College) and one of the highest 6-year graduation rates from the university, although not necessarily all from the College of Science, at 66%, on par with the Colleges of Engineering and Agricultural Sciences. This compares to OSU's graduation rate of 64.3%. We are proud of our success and attribute it to our excellence and our deep commitment to building a strong, inclusive and diverse OneScience community. However, we have work to do with our 6-year graduation rate for science students, which dropped 3.2% since FY14, with just 33% of students starting and graduating in Science.

The College continues to struggle with declining enrollment with undergraduate, master's and doctoral students, of 6.8%, 5.8% and 9.2% respectively since FY14. However, given the declining number of college-aged students in Oregon and OSU's decision to admit the majority of its students who are Oregon residents, we may have to enhance our undergraduate student recruitment strategies to augment the efforts of central Admissions.

The College of Science contributed to OSU's SP 3.0 goal of improving degree completion, awarding 7.2% more degrees since FY14, slightly above OSU's growth (6.8%) during the same period. We also awarded the highest number of bachelor's degrees in more than a decade—at 572. We have seen strong growth in the number of graduates earning a B.S. in math, which increased by nearly 33% since FY2014. We saw the highest number of chemistry graduates at the undergraduate level, with 56. We also had steady increase in Ecampus revenue with a 6% increase.

In terms of graduate degrees, doctorate degrees are up 39.3% since FY14 while master's degrees declined 13.5% that same period, compared to OSU's growth of 4.5 and about 10% respectively. Regarding completion rates for doctoral students, our analysis of our PhD program in biology over the last 15 years reveals that 98% of students entering our program completed their degrees, compared to 63% in biology programs nationally. Although national reports indicate Ph.D.s have high unemployment rates, our analysis of a 6-year career path for biology Ph.D.s indicated that 45% of our graduates from 2007-2009 are in tenure-track positions, compared to 15% in biology programs nationally.

The continuing decline of master's degrees is a concern of the College. We are exploring ways to selectively increase the quality, capacity and impact of our graduate programs, while improving retention and student success in our newly launched 5-year strategic plan. Nearly 38% of master's graduates were in math. To increase the number of graduate students, we developed an Accelerated Master Platform (4+1 program) for Mathematics. This fall, we are launching a completely online master's degree and graduate certificate in data analytics, one of the fastest growing careers in the nation. Early enrollment looks promising. We are also introducing a biochemistry and molecular biology major to provide in-depth training in molecular and computational biology to prepare students for success in a wide variety of careers as modern molecular biologists. The revolution in molecular biology in the past 40 years has been spectacular, bringing major advances in understanding the molecular mechanisms supporting living cells and the development of therapies to promote health, combat disease and improve quality of life.

We must do better in these areas. The College will identify strategies to address student success and tactics to improve retention and graduation rates in our 2015-2020 Strategic Plan that we launched this past year. The College is making significant investment in student success, especially the success of our underrepresented student populations. Recently, we hired a new female Head Advisor who is Hispanic. She brings a passion and commitment to student success and diversity as well as specific expertise working with transfer student populations, which represents a substantial segment of our students.

We also created a new Advisor position for STAR (Students Taking Academic Responsibility) students, which are those on academic probation, have received academic warnings or are otherwise at risk academically. To further enhance student success and provide strong transformative experiences for our students, we invested in a new position, Director of

Partnerships and Industrial Programs, who will bring together industry-specific technical content coupled with in-depth professional and soft skill development through internship opportunities for our students.

While our College trails other colleges across campus in OSU's SP 3.0 metrics, we are trending in a positive direction and making slow steady progress. Since last year, our 6-year retention rate and our junior transfer 4-year graduation rate both increased about 1.5%.

We are committed to preparing our science graduates for a 21<sup>st</sup> century workforce. Our 2015 biology graduates scored in the 83<sup>rd</sup> percentile on the Educational Testing Service Biology Major Field Test. This year, we welcomed a career development advisor for science students through the Career Development Center. She conducts individual counseling and group training to develop career skills as well as hosts career conferences, networking events and alumni career lunches for our students. We received a \$100K Scaled Learning Innovation Grant for the proposal "Training to Bridge the STEM Professional Innovation Gap." This program will create new BRIDGE undergraduate curriculum to develop T-shaped skills (providing depth in a subject area and breadth to communicate and work across disciplines), and enhancing internship opportunities for students. This will be an important part of our revenue model going forward.

Undergraduates and graduate enrollment continues to be a concern for our College. The College saw a 6.6% drop in student credit hours, with a 9% dip in upper division courses and a 5.8% drop in lower division courses since FY14. The declines did not parallel OSU as a whole, which saw undergraduate credit hours grow 3.2%. Graduate credit hours decreased 4%, compared to 2.8 growth for the university. Fall enrollment looks fairly flat for undergraduate and graduate credit hours compared to OSU's overall enrollment growth of nearly 6%.

In terms of research funding, the College of Science received \$12.4 million in grants and awards in FY16, fueling strong growth of 25% compared to OSU's growth of 10% since FY14. We were down 53.5% from last year, however. The College trailed OSU in terms of the number of grants and contracts awarded since FY14, with a 9% increase compared to OSU's 32%. We had a 7.8% decline from last year. Most of the College's research funding for FY16 was from federal agencies, with the National Science Foundation awarding 50% of the grants, the National Institutes of Health 20%, sub-awards contributing 9%, U.S. Army 8%, other 8% and Department of Energy 5%.

Research is central to the mission of the College and must grow to ensure our path to global excellence in science. With government funding for science research limited and competition fierce, the College is making adjustments and investments in grant support for faculty and examining a model for supporting research funding through strategic relationships with foundations, donors, state agencies, and industry. We are investing in a grant coordinator to offer stronger administrative support of large-scale research proposals in order to submit more high quality proposals that will yield greater funding success.

To raise the visibility of our College and our faculty, students and alumni, the College has communicated our extraordinary stories and accomplishments to our key audiences in print, online, via faculty newsletters and on social media. With design and editorial support from the College, five of our seven departments published alumni newsletters in an engaging, vibrant format that was mailed to select alumni. Last year, we published more than 130 stories on our blog and website, two alumni magazines and had an active social presence on Facebook, Twitter and Instagram. To raise the profile of our academic leadership, we sent announcement cards introducing new department heads in mathematics and in biochemistry & biophysics to those respective departments at universities across the country.

To address flat enrollment and to attract top students, the College 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. We saw impressive results and the Honors College acknowledged our role in helping them admit their largest cohort in its history: 366 students. With 79% more science students than last year, our College now presents nearly a third of the students there, up from about a quarter in FY15. Our applicant pool to the Honors College increased 22% from last year, and our yield in

Honors College students increased 10%. We look forward to partnering with them and University Marketing in FY2017 for a broader approach to recruit talented students to OSU.

To support recruitment efforts, we began conducting daily information sessions for prospective students in biology, which OSU Admissions reports the most effective way to recruit students. We are thrilled to have more prospective students in integrative biology than any other major on campus. We plan to expand this high-touch recruiting to other life science majors. To support student success, we helped students establish an undergraduate mentoring program in biology, our largest major, and created a new student lounge to build community, camaraderie and connections.

The College of Science is committed to advancing the university priorities of student success and equalization, a transformative educational experience and strengthening OSU's impact throughout Oregon and beyond. We continue to be a campus leader in promoting student abroad, with more biology students participating in global education experiences than any other major. The College is investing in transformative educational experiences like these for science students as well as in undergraduate research, career development, internships, living learning communities, mentorship, experiential learning and outreach. We have highlighted examples of our collective achievements and the 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 of Science made solid progress in providing transformative experiences for our students that supports their future success. To expose underrepresented minorities and women to professional opportunities and diverse science leaders, the Department of Physics hosted the American Physical Society Conference for Undergraduate Women in Physics for the Pacific Northwest. The three-day conference attracted about 140 undergraduate women in physics who presented their research, participated in workshops, and networked with women professionals and with their peers. The incoming graduate physics students increased its percentage of women from 13% to 30%. We expect continued success recruiting more women in our graduate programs given that most attendees were juniors last year.

The College is committed to closing the gaps in student success and helping all of our students thrive. This is one of the things that matter most in our College. We realize that some of our mathematics and chemistry courses that make the top 20 list on campus for having high DFW rates are also the ones that have the greatest predictive ability for students to graduate. Our courses serve an important foundation for many majors outside our College, so our work in this area is closely linked to the university's success. To that end, we are taking a more proactive approach and pay closer attention to student performance by applying innovative pedagogical methods and approaches.

We renewed efforts to work with the head advisors in the Colleges of Engineering and Business to redesign math courses with high DFW rates to better satisfy the specific needs of their students. This effort led to improved grades in those courses and we will continue to collaborate with them to review calculus courses, which also have traditionally high DFW rates. We established learning communities for instructors and graduate teaching assistants in precalculus and calculus courses. This has proven very effective, and we will expand this approach to improve teaching methods and share best practices among more of our faculty.

To support student success and graduation rates, faculty with joint appointments in math and integrative biology—one was a Provost's Initiative for Student Success Hire—collaborated to develop alternative pathways for students in the Life Sciences. For example, we developed a new course in mathematical biology. Integrative Biology and Chemistry faculty collaborated to examine predictors of success for biology students on General Chemistry courses and developed new placement guidelines and resolved access issues.

The College is incorporating more high-impact learning approaches and activities in our courses to produce responsible citizens and enhance global competitiveness. With support from NSF's ESTEME WIDER grant, we were able to increase capacity in our studio-based Physics for Scientists and Engineers course sequence by 50%. This spring, nearly 600 students participated in weekly studio sessions where they engaged in active learning in small groups. Preliminary assessment indicates that students enrolled in the studio sections are more confident, much less likely to withdraw and less likely to fail the course. With unmet demand for these courses, we hope to expand them.

To incorporate more high-impact learning in our science programs, we now require additional laboratory experience for biology majors. We are offering new/enhanced experiential learning courses in laboratory and field environments in courses. Students with a Marine Biology option are now required to spend at least one term at Hatfield Marine Science Center to gain a more meaningful and transformative learning experience.

Featured in the Chronicle of Education's Scholarly Teaching blog, our integrative biology faculty discussed their innovative approach to "Promoting Engagement in the (Sometimes Very) Large Lecture Classroom," detailing specific ways to encourage the greatest possible learning and support student success. They adapted a model of a Learning Assistant (LA) program first developed at UC-Boulder, where trained undergraduates LAs facilitate peer discussions and in-class activities. Our Academic Success Center trains LAs in pedagogy and peer facilitation to help faculty implement active learning in high-enrollment courses like anatomy and physiology. This year, we hosted a workshop that trained more than 20 participants from across Oregon. Currently, we have 25 LAs in courses that impact more than 2,500 students at OSU.

As part of the Provost's Initiative for Student Success, we are developing new calculus courses that will be offered in the Department of Mathematics but taught by Integrative Biology faculty. The goal is that these new courses will be more relevant and accessible to life sciences students and will enhance quantitative skills and ultimately improve student success.

Building on our legacy of innovative, evidence-based advances in teaching physics, we will expand our upper division Paradigms in Physics program, which has been nationally recognized as the standard for excellence in physics education for more than a decade, to Paradigms 2.0, an NSF funded reevaluation of the program. This will improve our undergraduate curriculum in the form of redesigned courses that will serve as an effective "on-ramp" to better prepare physics students for the rigor and intensity of the junior year Paradigms experience. As part of the Provost's Student Success initiative, we hired a new physics faculty who specializes in physics education research and brings substantial experience in student cognition and in serving underrepresented populations.

To advance learning, we developed a 15-week, online General Chemistry course to appeal to students at semester schools. We are using 3D printers to bring physical models into chemistry courses focused on biomolecular structure.

The College is deeply committed to recruiting diverse and high achieving students. Faculty designed a new microbiology module and developed curriculum on foodwebs for OSU's SMILE program to better prepare minority, historically underrepresented and underserved students from rural areas to graduate from high school and succeed in higher education, particularly in STEM fields. We increased the number of underrepresented students participating in the summer Research Experience for Undergraduates program in mathematics by 50% this year. In addition, microbiology faculty received a \$100K NIH grant to promote diversity in health-related research.

In our graduate programs, we are making steady progress toward increasing diversity. With women being a grossly underrepresented minority in STEM fields, we are thrilled to welcome the most diverse graduate cohort in

mathematics ever—more than half are women and a quarter are underrepresented minorities. We also successfully recruited a class of microbiology graduate students that is more than half women and an all-female incoming class of Ph.D. biochemistry students this fall.

The College continues to have impressive numbers of ESTEME@OSU Action Research Fellows to foster educational innovation through action research. We had 11 of 12 faculty in the 2015-16 cohort and will be well represented again with seven of 12 in the 2016-17 cohort. With a deep commitment to professional development, faculty can better apply education research to classroom learning, and the College will be better able to provide a transformational educational experience for our students, ultimately raising and equalizing student success.

**II. Demonstrating leadership in research, scholarship and creativity while enhancing preeminence in the three signature areas of distinction.**

The College of Science promoted/granted tenure to 15 faculty this year, recognizing their outstanding accomplishments. Both faculty and staff continue to receive national and international recognition for their outstanding scholarship, teaching, research and leadership.

Enhancing OSU's Marine Studies Initiative, math faculty are co-PIs on a \$3 million NSF grant for a "Risk and Uncertainty Quantification in Marine Sciences" project, a transdisciplinary project to develop Research Traineeships that use Big Data to analyze effects of human activities and climate change on oceans. The program admits its first cohort of students—the next generation of scientists to manage ocean systems—this fall.

To advance leadership in research, scholarship and creativity, science faculty continue to demonstrate excellence and outstanding leadership in their respective disciplines. For example, a biology faculty released a paper on the unprecedented number of juvenile sea stars recently observed off the Oregon coast – just two years after one of the most severe marine ecosystem epidemics in recorded history. Another is co-chairing a 20-member panel of leading West Coast ocean scientists who recently presented a comprehensive report recently outlining a series of recommendations to address the increase in ocean acidification and hypoxia. The report urged the governments of Oregon, California, Washington and British Columbia to take actions now to offset and mitigate the effects of global carbon dioxide emissions. Another faculty and her team discovered that pavement sealcoat products used widely around the nation on thousands of asphalt driveways and parking lots are significantly more toxic and mutagenic than previously suspected. A biologist created quite a stir with her study suggesting an outright ban on the common use of plastic "microbeads" from products that enter wastewater is the best way to protect water quality, wildlife, and resources used by people. The study was the number three science story in the world September 18 on Google News with coverage from *The Washington Post*, *Newsweek*, *Huffington Post*, and others.

The excellence of our faculty continues to attract national and international recognition for OSU. Our faculty have received numerous awards for their expertise and leadership, including an NSF CAREER award for developing new battery technology; 2016 Outstanding Educator in Science and Mathematics and Oregon Scientist of the Year from the Oregon Academy of Sciences; World Academy of Sciences Medal; U.S. Science Envoy; Fellow of the American Physical Society; Society of Systematic Biology President's Award for Lifetime Achievement; international Robin Hochstrasser Young Investigator Award recognizing young scientists in chemical physics; OSU's Promising Scholar Award and Impact Award for Outstanding Scholarship; first place for interactive data visualization project in an international competition; 2015 Young Investigator Award in Theory and Methods by International Indian Statistical Association; Fellow for the American Association for the Advancement of Science. Our faculty have received many more national and global awards and honors for their excellence in teaching, research, mentoring and science communication.

The College is committed to attracting and retaining extraordinary faculty. We successfully recruited talented faculty in key areas of distinction. For instance, we recruited two outstanding data science, including a tenured

faculty diversity hire for our Statistics department. We also hired an assistant professor in CEOAS as part of a dual-career retention package with a joint appointment. He will help establish an aquatic microbiology option that connects to degree programs in Fisheries and Wildlife, Integrative Biology, and OSU's Marine Studies Initiative. We also hired the first Vietnamese-American professor in chemistry.

Our faculty are expanding and cultivating transdisciplinary research on campus and through partnerships. For instance, to educate the next generation of teachers in STEM fields in Oregon, faculty are leading a six-year, \$1.39 million NSF grant through the Robert Noyce Teacher Scholarship with the College of Education. The project, Ambitious Math and Science Teaching Fellows program, will provide training and support for 16 teaching fellows to complete a Master's degree program in secondary mathematics or science education at OSU. The project provides research-based teacher preparation courses and clinical experiences, professional development and support during the first four years of teaching in high need school districts. The project also seeks to promote teacher learning instructional practices that support *every* student, across racial, ethnic, gender, and linguistic boundaries.

The STEM Leaders program continues to flourish with other colleges joining, and this fall we will welcome the largest group yet.

In another partnership, a microbiologist and his global research team received a \$6M grant to study microbial communities of the Sargasso Sea over the next five year. The North Atlantic Aerosols and Marine Ecosystems Study is examining plankton blooms and their impacts on clouds and climate. Our faculty are coordinating the genomic sequencing efforts and bioinformatic data processing. A recent microbiology study revealed that significant outbreaks of viruses may be associated with coral bleaching events, especially as a result of multiple environmental stresses. In addition, researchers concluded that an unsuspected bacterial infection, rather than a viral disease, was associated with the stranding and death of seven harbor seals on the California coast in 2009.

To deepen OSU's expertise in data science, our Strategic Plan's Working Group in Data Science developed recommendations of graduate programs, certificates and workshops to address workforce needs in data analytics in Oregon and around the world as well as Baccalaureate Core and other courses and programs in statistical, mathematical and computational sciences to better prepare undergraduate students in science and other programs for a computational and data-enabled world. The working group identified specific tactics to develop a research hub in data sciences that is: 1) a source for fundamental research and 2) serves OSU's need for data analytics research. The multidisciplinary team included representatives from across the Colleges of Science, Engineering, Agricultural Sciences, Forestry, Business, Public Health, CEOAS and COSINE, the College of Science's IT unit.

To enhance OSU's expertise in biohealth science, biochemistry faculty conducted some of the most compelling research ever produced in the quest for a therapy for ALS when they essentially stopped the progression of ALS for nearly two years in mice. The groundbreaking research has garnered worldwide excitement and attention. They received significant funding from the U.S. Department of Defense and the ALS Association to pursue additional studies to advance understanding and treatment of Lou Gehrig's Disease (ALS), while moving closer toward clinical trials.

To raise the visibility of OSU's expertise in biohealth science, a microbiologist was the lead author on OSU's response to the White House Office of Science and Technology Policy's call for new commitments on microbiome research and represented the university at the announcement of the National Microbiome Initiative at the White House.

Faculty advanced science in many ways this past year: researchers found genetic proof that wild and hatchery fish are different at the DNA level, biologists discovered a new species of insect found only on Mary's Peak,

biochemists learned it may be possible to slow age-related disease with new types of treatments by tracking the syndromes associated with aging to their biochemical roots, and a biologist's joint project with University of Washington was named project of the year by the U.S. Department of Defense's environmental science and technology program. A chemist's research overturned a scientific dogma by showing that potassium can work with graphite in a potassium-ion battery, a discovery that may offer a sustainable alternative to the widely used lithium-ion battery.

To raise the visibility of Oregon State science internationally, science faculty participated in international outreach activities, including collaborating on a project focused on modeling nucleotide-level RNA-seq data with the Department of Statistics and Applied Probability at National University of Singapore; collaborated with statisticians in Sri Lanka and Chile; and teaching a course, Data Science in R, a 10-hour module that is part of the MS in Data Analytics program at Universidad de los Andes, Bogotá, Colombia. Dean Pantula was a special guest and keynote speaker at the 2nd International Conference on Theory and Application of Statistics in Dhaka, Bangladesh.

In a global partnership that will lay the foundation for mathematics of the 21st century, a math professor collaborated with an international team of more than 70 mathematicians from 12 countries and more than a dozen research areas to launch a massive online database. The 6-year project yielded the L-Functions and Modular Forms Data Base, which catalogs objects of central importance in number theory and maps out the intricate connections between them, serving as an atlas of mathematical functions and revealing deep relationships in the abstract universe of mathematics.

To raise the visibility of Oregon State science locally and regionally, science faculty hosted numerous outreach events to engage the campus and local communities and get them excited about science. Events included Da Vinci Days, Discover the Scientist Within, Mi Familia, Science Olympiad, Discovery Days, Science Nights and our annual Chemistry is Awesome event. Graduate students and faculty led STEM Academy summer camps for students in grades 7-9, including Computational Biology Camp and Biochemistry Camp. We also celebrated the 25th anniversary of the John L. Fryer Salmon Disease Lab, renamed the John L. Fryer Aquatic Animal Health Center with an outdoor event attracting more than 150 alumni, donors and friends from the region and across the country.

We continue to increase the quality, capacity and impact of our graduate programs. Our Zoology graduate program ranked #2 in the nation and in the 95<sup>th</sup> percentile in its discipline based on FSPI analysis using Academic Analytics. We launched two new online graduate programs: a Certificate and an MS in Data Analytics. Both programs are multidisciplinary in collaboration with the School of Electrical Engineering and Computer Science. As demand for professionals who can interpret large quantities of data continues to grow, we anticipate growth in these programs that develop the critical skills that are vital for scientific advances and business success in the 21<sup>st</sup> century. Graduate students in biochemistry organized a Graduate Student Association to help improve the program and to cultivate professional development opportunities.

Graduate students continued to attract national and global recognition for their academic excellence. A total of five science Ph.D. students received prestigious NSF Graduate Research Fellowship Program awards in 2016 that enabled them to conduct international research, including going to Nepal with the Smithsonian Institute to study viral diseases of elephants. One student participated on the North Atlantic Aerosols and Marine Ecosystems Study research cruise, one of four, targeted ship and aircraft measurement campaigns aimed at improving predictive capabilities of Earth system processes and inform ocean management and assessment of ecosystem change. Three students traveled to Asia on NSF East Asia and Pacific Summer Institute Fellowships—one student went to Shanghai to study microbes in marine sediments, another developed technology to track resource incorporation into single cells in a lab in Japan and another studied metabolites produced by transgenic plants expressing an Agrobacterium effector protein in Singapore. A microbiology graduate student traveled on a research cruise to the Sargasso Sea, another traveled the globe studying coral reef microbiology. Statistics students attended the 2016

International Biometric Conference/ Western North American Region in Victoria, Canada, and the Summer Institute in Statistics for Big Data at the University of Washington. A statistics graduate student received a national award for best poster in survey methods by the American Statistical Association at their annual meeting. Two doctoral students won OSU Graduate School's Yerex and Bayley Awards and another received the OSU Life Sciences Distinguished Dissertation award in 2016.

Our undergraduate students continue to receive recognition, awards and experiential learning opportunities around the country and the world, including the prestigious Budapest Semester in Mathematics; Los Alamos National Lab; Jefferson Lab in Virginia; undergraduate research programs at Northwestern University, UC Davis and OHSU; and the Volcano Conference in Chemical Biology in Washington.

### **III. Strengthening the impact and reach of OSU throughout Oregon and beyond.**

The College hosted the Pacific Northwest Number Theory Conference attracting participants from Canada and across the nation; the Northwest regional meeting of the Mathematical Association of America and the Northwest Undergraduate Mathematics Symposium. We also hosted the first Genetic Code Expansion Workshop with 20 students across the country who were able to learn the new technology while working on their own project.

To promote OSU around the world, science faculty engaged in many international activities, such as collaborating with the Max Planck Institute in Germany via summer sabbaticals with the Nidaria Technology, a biotech company in Israel that used marine stinging cells to develop a sunscreen for jellyfish protection. We hosted visiting professors and postdoctoral researchers from Brazil, China, Canada, Israel, Mexico, Myanmar, New Zealand, South Korea and Spain. A physics professor was elected vice chair of the Commission on Particles and Fields within the International Union of Pure and Applied Physics.

Wielding influence as a seminal scientific thought leader, Jane Lubchenco was one of the OSU ecologists who argued in an op-ed piece in *Nature Geoscience* that scientific "business as usual" will fall far short of what is needed to achieve the 17 Sustainable Development Goals the United Nations General Assembly is considering.

Science faculty participated in outreach and engagement programs that promoted high-impact learning and effectively utilize university research. For example, faculty developed an interactive outreach activity allowing youth to identify the responsible microbial pathogen. Our outreach programs in physics, fueled by robust efforts from faculty, undergraduate and graduate students, have attracted nearly 1,000 people at schools throughout the Willamette Valley. We conducted teacher workshops on climate change and on advances in epigenetics and genomics at four area high schools.

Science faculty have extended OSU's impact and reach throughout Oregon and beyond in many ways this past year. In a stunning new wave of international acclaim, chemist Mas Subramanian's 2009 discovery of a new inorganic blue pigment—the first in more than 200 years—has gone viral. YinMn appeared everywhere from *Cosmopolitan*, *Slate*, *New York Magazine*, *Good Morning America*, *NPR*, *TIME* magazine and *The Huffington Post* to *The Daily Mail*, *India Today*, *Mid-Day* (Mumbai), *BBC/Mundo* and more. The story has reverberated across the Internet with more than 12 million shares and counting. Recently, the pigment made its prestigious debut into the art world after being added to the *Forbes Pigment Collection* at the Harvard Art Museums, which serves as the world's history of color with pigments dating to the Middle Ages.

Our College advanced OSU's impact and reach in other ways. We hosted Rice University Mathematics Professor Richard Tapia, the first Latino to win a National Medal of Science and an internationally recognized leader in diversity in STEM. He presented a lunch seminar for faculty and administrators where he shared insight into creating a welcoming and supportive environment for Latino and other represented students. We also leveraged connections with minority-serving Institutions, hosting Patricia Hale, a visiting faculty from Cal Poly Pomona, who helped us recruit two incoming Latino graduate students.



To extend OSU's reach, the College continued to promote open access to science worldwide. Faculty developed a new full-length textbook for a global audience, *Biochemistry Free for All* as an Open Education Resource to make materials for full-length biochemistry courses more accessible to students. The book features interactive learning modules, a comprehensive glossary, a summary of key points, links to free online video lectures, and dozens of verses and recordings of Metabolic Melodies biochemistry songs. The biochemistry YouTube and iTunes U presence continues to soar with over 3.5 million views and more than 40,000 registered students respectively. The iTunes U course has been the #1 course in Health and Medicine twice this year and consistently ranks in the Top 4.

We are committed to improving access by expanding online course offerings. We introduced an online course in Differential Equations; applied bioinformatics; our first three online physics courses, including astronomy, which has high appeal among young women. With funding from the university's Open Oregon State office, math instructors developed course materials that used a free textbook, saving students the cost of the expensive standard textbook. By offering our general microbiology course online three times a year rather than one, we tripled our enrollment from 30 students to 90. Faculty developed an open source textbook and added innovative learning activities, which increased post-assessment scores in this course. Instructors of our new introductory biology course received the Vice Provost Awards of Excellence for Online Teaching Innovation this year. Structured around case studies, this series was developed with a high-quality, hands-on laboratory component to address specific needs of more applied life science majors who have traditionally underperformed in the course series. We have seen a surge of 38% in Ecampus student credit hours in integrative biology courses.

Our Strategic Planning Working Group in Distance Education analyzed current course offerings in our College, identified those with highest impact for development, and recommended key actions and policies to facilitate distance education development in our College by incenting faculty to create online courses and programs. The group collaborated with Katie Linder, director of the research unit for Ecampus, and Mike Bailey, director of online operations for EECS in the College of Engineering.

We continue to engage alumni and other external partners to advance OSU's goals. For example, we utilized alumni speakers at our orientation course to inform new students what they can do with a science degree. Our statistics and microbiology departments launch alumni newsletters to engage alumni and donors about student and faculty accomplishments. We offer college and departmental annual alumni awards ceremonies to honor alumni excellence, service, scholarship and leadership.

The College hosted dozens of events to build community and engagement among alumni and friends, faculty and students. The College honored three distinguished individuals at our 2015 Alumni Awards: David Vernier for the Distinguished Alumni Achievement Award; Christine Vernier for the Distinguished Service Award, and Stephen Meyers for the Young Alumni Award. We featured Peter Bickel, an internationally renowned statistician and Emeritus Professor of Statistics at the Univ. of California, Berkeley, at the 2015 Milne Lecture, where he discussed, "Statistics: The transfer science, Big Data and an experience with ENCODE." We hosted a fall 2015 Distinguished Lecture featuring a chemistry alumna and drew a crowd of about 200 from the campus and Corvallis communities. Our spring Distinguished Lecture featured Shirley Malcolm from the American Association for the Advancement of Science, who spoke on the importance of diversity in STEM.

We also invited influential guests from federal agencies to meet our faculty students and leaders. We hosted Chaitan Baru, Senior Advisor for Data Science for the CISE at NSF for a seminar on current NSF Big Data and Data Science programs and activities; NSF Division Director of Graduate Education Dean Evasius who spoke with science faculty; Kei Koizumi, Asst. Director for Federal Research and Development at the White House Office of Science and Technology Policy, who presented science & technology policy workshop; and Michael Vogelius, an NSF Division Director of Mathematical Sciences, who met with mathematics and statistics faculty as well as with OSU's Office of Research.

**IV. Summary of key initiatives that align with OSU commitments.**

We are committed to creating a OneScience community, an inclusive, welcoming and intellectually stimulating environment for a diverse community. We launched our first formal, five-year strategic plan: *LEAD—Learn, Engage, Achieve, Discover: A Path to Global Excellence in Science*. This plan will not only advance science and build the next generation of diverse leaders and innovators in science, but it will also enhance diversity, deepen OSU's areas of distinction, expand access and develop academic programs to increase enrollment. Centered around our people, our planet and our shared prosperity, the plan focuses on three goals: To build a diverse and inclusive Science community focused on excellence, to be a global leader in scientific research and scholarship for a better world, and to excel in outreach, engagement, visibility and economic development.

We held a launch event to engage faculty, OSU leadership as well as some donors and alumni that featured OSU leaders and a COS board member. We also developed a website and brochure to promote our efforts, goals and metrics. We made solid progress on our plan, forming Working Groups of science faculty, staff, and students in the areas of diversity, data science and distance education. Their reports outlined recommendations tactics to advance the plan's goals and strategies. We will launch new working groups this fall.

Our College enhanced diversity in a number of ways this year. Our Diversity Working Group identified recommended programs and partnerships to help the College recruit and retain graduate students from underrepresented groups and to enhance professional development for students, advisors, faculty, and staff in support of diversity and inclusion that would extend or enhance existing OSU programs. This group comprised of science and liberal arts faculty collaborated with Angela Batista, OSU Interim Chief Diversity Officer, and Suzanne Estes, LSAMP Director and Associate Professor in the Department of Biology at Portland State University.

Faculty enhanced diversity by proactively inviting seminar speakers from diverse backgrounds around the country and the world. Faculty and students participated in Mi Familia Weekend, LGBTQ events, and SACNAS's national conference, one of the largest gatherings of minority scientists in the country. Our Associate Dean accompanied the OSU chapter of SACNAS—Society for Advancement of Chicanos/Hispanics and Native Americans in Science—to the 2015 National Conference in Washington, D.C. where the chapter accepted the Outstanding Development and Outreach Role Model Award, one of 13 chapters recognized for outstanding achievement.

To build an inclusive environment for students of diverse backgrounds, the College enhanced its partnership with LSAMP to mentor and integrate students into Science to foster their growth and success. This year, we awarded 30 students—20% more than last year—2016 SURE Science scholarships a total of \$165,000 to conduct research this summer. We are thrilled that 33% of SURE Science scholarships went to underrepresented minorities, extending the power of transformative research experiences and make a difference in their education. To attract international students, we launched an INTO Graduate Pathways program in chemistry that begins this fall.

To contribute to work-life balance, we promoted a sense of community among School of Life Sciences faculty with a Science Trivia Night that raised over \$9,000 for OSU's February food drive.

In terms of stewarding resources, our College enhanced resources through private philanthropy. We are grateful to our alumni, friends and the OSU Foundation for their generous support of student and faculty success and for making it another productive year of fund/friend-raising. We had a successful year of fundraising based on OSU Foundation data with \$4.78 million in total gifts and pledges from our alumni and friends, exceeding our goal by 155%. However, OSU's College Metrics and Academic Program Review Data, based on CAE numbers, suggest we only raised \$2.94 million in private gifts in FY16, representing a 31.6% decrease from FY14. While the CAE data present an accounting perspective, they may not reflect an accurate year-over-year comparison for tracking actual progress. It seems the data are tracking different things. We recruited two new College of Science Board of Advisors this year to provide support for our faculty ad students.

Through the generous support of the Vernier Family Foundation, we remodeled classroom space in Kidder Hall to facilitate more interactive teaching for students in the Elementary and Secondary teaching program. The enhanced connectivity and power supplies plus better soundproofing contributed to more effective learning. The Sheila Van Zandt Student Research Experience scholarship supports a collaborative research project between a graduate and undergraduate microbiology student. We awarded the inaugural Bert and Emelyn Christensen Professorship in Chemistry to a rising stars internationally in computational organic and materials chemistry; this professorship served as part of a retention package. We established a new endowed scholarship for biochemistry and biophysics undergraduates by a distinguished alumna, the Paul A. and Mary Ann Roberts Fellowship for students pursuing a master's or doctoral degree in zoology and the John and Gretchen Morris Cell Biology Scholarship Fund. Alumna Karen Nickel also created a scholarship in biochemistry and biophysics. A biology alumnus endowed a distinguished lectureship in honor of his mentor, Robert Storm. This spring's inaugural lecture held featured alumnus Dr. Edmund Brodie, another Storm advisee and attracted more than 100 friends and alumni.

Through our partnership with the ARCS Foundation (Achievement Rewards for College Scientists) Portland Chapter, we received four new ARCS Fellowships to help us recruit top graduate students. ARCS Foundation is a distinguished national non-profit volunteer women's organization dedicated to advancing our nation's competitiveness in scientific and technological innovation.

To streamline and share relevant information for more effective decision making, we invested in information technology that enabled educational innovation. We upgraded infrastructure and invested in new networking equipment to provide more redundant power and fast, reliable connections. We also enhanced our datacenter infrastructure and updated nodes in our virtualization server cluster, which is more cost effective, efficient and reduces energy usage. In order to teach graduate students in math how to run computations in a GPU environment, we purchased a new GPU-enabled cluster for our High Performance Computing Cluster that will also support future research in the College. To leverage technology as a strategic asset, the College has upgraded statistical software in Introduction to Statistical Methods courses taken by students across OSU. All course illustrations and laboratory assignments will be converted to R software, the most powerful and widely used statistical software. The free software will save students money and increase access.

To enhance research and instructional support, COSINE collaborated with the NMR facility to redefine workflows and data storage so researchers at OSU and external to the university would have a supported IT environment. Our IT unit also successfully implemented OSU Account Unification so science faculty and staff have one account for IT services and Cloud software. Many department websites were upgraded to the current OSU content management system for a more consistent user experience, stability and increased functionality.

To support OSU's innovation and economic prosperity, faculty have leveraged research and innovation through their leadership with spin-off companies. For example, Inpria, which is pioneering new photoresist technology for the manufacture of semiconductors, completed a \$10M fundraising campaign this year. VallisCor, which provides high-value fluorinated building blocks for the pharmaceutical industry, was awarded the Oregon Manufacturer of the Year, the Corvallis Entrepreneur of the Year and Willamette Angels Conference Entrepreneur of the Year for groundbreaking advances in fluorination technology. Their lead product bromofluoromethane is used to manufacture the active ingredient in Flonase and Advair, a \$20B per year drug globally. After 10 years of development at OSU, biochemistry faculty founded the spin-off company e-MSion this year to market new mass spectrometry technology invented at OSU that analyzes complex molecules with unprecedented speed and accuracy at a lower cost, paving the way for better medical tests and environmental monitoring. The news was well received at a recent major Mass Spec annual meeting and orders are already coming in. Biochemistry faculty also patented a new glutathione derivative with potential breakthrough uses in probing redox processes in cells, treating ALS and Parkinson's disease and reducing declines in mitochondrial functioning that come with age.

## **V. Appendix – Annual Academic Program Review 2015-16 charts**

Oregon State University  
**College of Science**  
 Annual Academic Program Review 2014-15

**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	% Change '14 - '16
<b>Faculty FTE</b>															
Professorial	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	3.0%
Non-Professorial	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	-21.7%
<b>Total Faculty FTE</b>	<b>299.6</b>	<b>292.2</b>	<b>284.4</b>	<b>305.0</b>	<b>303.9</b>	<b>293.0</b>	<b>291.1</b>	<b>288.7</b>	<b>283.8</b>	<b>291.4</b>	<b>275.6</b>	<b>278.3</b>	<b>273.0</b>	<b>262.2</b>	<b>-5.8%</b>
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	5.6%
<b>Faculty Headcount</b>															
Professorial	195	182	189	199	197	193	194	195	187	201	178	194	193	200	3.1%
Non-Professorial	137	153	131	141	141	132	130	124	122	121	121	105	98	82	-21.9%
<b>Total Faculty Headcount</b>	<b>332</b>	<b>335</b>	<b>320</b>	<b>340</b>	<b>338</b>	<b>325</b>	<b>324</b>	<b>319</b>	<b>309</b>	<b>322</b>	<b>299</b>	<b>299</b>	<b>291</b>	<b>282</b>	<b>-5.7%</b>
E&G Tenured/Tenure Track															-
0% E&G Funded	4	5	3	3	1	2	2	1	3	2	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	-
34%-66% E&G Funded	21	16	12	11	10	11	12	10	10	8	9	11	8	10	-9.1%
67%-99% E&G Funded	7	7	7	11	12	13	13	15	11	7	5	5	8	12	140.0%
100% E&G Funded	113	99	110	112	116	109	105	108	104	105	95	100	102	101	1.0%
<b>Total Tenured/Tenure Track</b>	<b>150</b>	<b>128</b>	<b>133</b>	<b>138</b>	<b>139</b>	<b>136</b>	<b>133</b>	<b>136</b>	<b>128</b>	<b>122</b>	<b>110</b>	<b>117</b>	<b>119</b>	<b>124</b>	<b>6.0%</b>
<b>SCH (Academic Year)</b>															
Undergraduate	184325	181272	179484	172925	174148	173031	174085	190600	207588	214214	206204	213535	206144	198967	-6.8%
Lower Division	125084	120302	119328	115053	118049	118391	119382	131565	143967	146395	142256	147717	146621	139216	-5.8%
Upper Division	59241	60970	60156	57872	56099	54640	54703	59035	63621	67819	63948	65818	59523	59751	-9.2%
Graduate	23519	22980	21117	21340	20944	19517	19745	20390	22937	21255	18035	19320	18821	18545	-4.0%
First Professional	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	-
<b>TOTAL SCH</b>	<b>207844</b>	<b>204252</b>	<b>200601</b>	<b>194289</b>	<b>195092</b>	<b>192548</b>	<b>193830</b>	<b>210990</b>	<b>230525</b>	<b>235469</b>	<b>224239</b>	<b>232855</b>	<b>224965</b>	<b>217512</b>	<b>-6.6%</b>
<b>Fall Enrollment by Major</b>															
Undergraduate	2457	2465	2919	2837	2795	2826	2906	3217	3387	3501	3163	3233	3158	3216	-0.5%
Graduate	472	468	501	500	502	471	465	502	604	545	372	411	408	413	0.5%
First Professional	4	2	2	0	0	0	0	0	0	0	0	0	0	0	-
<b>TOTAL Enrollment</b>	<b>2933</b>	<b>2935</b>	<b>3422</b>	<b>3337</b>	<b>3297</b>	<b>3297</b>	<b>3371</b>	<b>3719</b>	<b>3991</b>	<b>4046</b>	<b>3535</b>	<b>3644</b>	<b>3566</b>	<b>3629</b>	<b>-0.4%</b>

Oregon State University  
**College of Science**  
 STRATEGIC PLANNING METRICS 2014-15

**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
<b>Goal 1. Provide a Transformative Educational Experience for all Learners.</b>														
<b>1.3</b> First Year Retention Rate (College/University)	62.6/ 78.2	64.0/ 81.0	65.6/ 79.5	63.3/ 81.4	65.3/ 82.2	62.8/ 83.5	64.6/ 82.2	63.7/ 80.1	62.7/ 83.8	61.4/ 81.6	66.8/ 84.6	66.0/ 86.3	63.8/ 84.5	65.2/ 84.3
<b>1.4</b> 6-Year Graduation Rate (College/University)	34.6/ 59.6	35.8/ 57.4	36.0/ 62.7	37.7/ 57.4	39.6/ 61.3	35.4/ 57.9	36.0/ 60.1	35.8/ 57.3	36.1/ 59.6	35.5/ 61.8	34.3/ 61.7	36.2/ 62.6	36.9/ 62.6	33.7/ 66.0
<b>1.5</b> Junior Transfer 4-Year Graduation Rate (College/University)	58.4/ 69.7	59.8/ 67.6	56.7/ 70.1	57.5/ 69.0	49.4/ 55.7	51.1/ 61.4	52.3/ 62.4	43.0/ 53.5	57.4/ 71.3	49.4/ 59.5	48.4/ 60.0	34.3/ 53.1	39.2/ 63.2	40.8/ 60.4
<b>1.6</b> % US Minority Students	12.2%	14.1%	18.1%	19.5%	19.4%	20.4%	20.6%	21.1%	23.5%	25.6%	28.9%	28.9%	32.0%	31.3%
<b>1.7</b> % International Students	6.0%	5.0%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	7.0%	6.0%	6.0%	6.2%
<b>1.8</b> % High Achieving Oregon High School Graduates	-	43.4%	44.2%	42.5%	40.6%	40.2%	40.7%	39.9%	40.3%	46.2%	46.2%	45.7%	51.3%	50.7%
<b>Goal 3. Strengthen Oregon State's Impact and Reach throughout the state and beyond.</b>														
<b>3.2</b> Invention Disclosures	7	5	5	11	13	13	10	8	6	18	14	14	9	11

Oregon State University  
**College of Science**  
 Annual Academic Program Review 2015-16

**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	% Change '14 - '16
<b>Resources (Fiscal Year)</b>															
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	4.7%
<b>Total R&amp;D Expenditures (\$)</b>	<b>17,979,903</b>					<b>19,003,468</b>	<b>26,647,805</b>	<b>22,738,479</b>	<b>17,851,429</b>	<b>21,470,620</b>	<b>18,088,503</b>	<b>17,469,689</b>	<b>16,003,186</b>	<b>FEB 2017</b>	-
Awards from Grants and Contracts* (#)	166	192	214	205	220	203	177	219	185	112	67	76	90	83	9.2%
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	24.8%
<b>Private Giving (\$)</b>							<b>9,454,867</b>	<b>9,611,775</b>	<b>9,069,498</b>	<b>8,378,666</b>	<b>5,313,501</b>	<b>4,294,554</b>	<b>6,102,681</b>	<b>2,937,602</b>	<b>-31.6%</b>

Strategic Planning Metrics 2015-16

	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
<b>Goal 2. Demonstrate Leadership in Research, Scholarship and Creativity while enhancing preeminence in the three signature areas of distinction</b>														
2.1 Total R&D Expenditures	see APR data above													
<b>Goal 3. Strengthen Oregon State's Impact and Reach throughout the state and beyond.</b>														
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  
**College of Science**  
 Annual Academic Program Review 2015-16

**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	% Change '14 - '16
<b>Degrees (academic year)</b>															
Bachelor	469	455	491	531	490	492	471	506	483	426	448	532	543	572	7.5%
Master	83	103	112	123	110	107	79	80	100	42	48	52	49	45	-13.5%
Doctorate	47	36	44	42	48	51	34	42	45	42	35	28	37	39	39.3%
First Professional	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
<b>Total Degrees</b>	<b>597</b>	<b>594</b>	<b>645</b>	<b>695</b>	<b>647</b>	<b>649</b>	<b>585</b>	<b>628</b>	<b>634</b>	<b>510</b>	<b>530</b>	<b>612</b>	<b>629</b>	<b>656</b>	<b>7.2%</b>

Strategic Planning Metrics 2015-16

	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
<b>Goal 1. Provide a Transformative Educational Experience for all Learners.</b>														
1.1 Degrees Awarded-Total	see APR data above													
<b>Goal 2. Demonstrate Leadership in Research, Scholarship and Creativity while enhancing preeminence in the three signature areas of distinction</b>														
2.3 PhD's Awarded	see APR data above													