



Student Center Research Wall pictured above was designed by John Gravidal, CSU Art & History Professor.



2015 ANNUAL REPORT

Executive Summaries



CSU Ventures is dedicated to the business of technology transfer and commercialization at Colorado State University. Our annual report is an opportunity to share innovation and commercialization highlights from the past year.

In 2015, we continued to enjoy significant engagement with CSU's faculty and staff as well as record interactions with industry. This past year, we saw annual technology transfer metrics equal or exceed previous records, including number of patents awarded (49), intellectual property licensing agreements signed with industry (43), and revenue received (\$4.8M). In the past 5 years we have completed nearly 200 licensing agreements with industry, and 30 new startup companies have formed from Colorado State University developed intellectual property.

We were active in supporting proof-of-concept projects to advance technologies toward commercial viability via both internal and State of Colorado programs, with grants of nearly \$500K awarded to 12 projects in 2015.

As an affiliate of a renowned land-grant institution, CSU Ventures strives to put the results of CSU's academic research to use and ensure that these innovations impact people's lives locally, nationally, and globally.

Sincerely,
Todd Headley
President



In 2015, Fort Collins was chosen as one of six Places of Invention by the Smithsonian Institution. Colorado State University played a significant role in seeding inventions and innovators in this designation. Working with global partnerships in industry, governments and universities, we move our discoveries into intellectual property and assets into practice and influence. This annual report tells a great story about the productivity of Colorado State's faculty and the importance of their work on some of the most pressing global challenges.

In Fiscal Year 2015, Colorado State's innovation efforts yielded 92 invention disclosures, 49 patents issued and 5 new startup companies. We also established an FDA approved cGMP biomanufacturing facility (BioMARC) that facilitates commercialization of needed medical countermeasures. CSU also negotiated 43 agreements with diverse companies to license CSU innovations.

Colorado State is proud of these achievements – and proud to serve as a driver of innovation. In that spirit, we are excited to share the 2015 CSU Ventures annual report.

Sincerely,
Dr. Alan S. Rudolph
Vice President for Research

Innovation begins with a bright idea

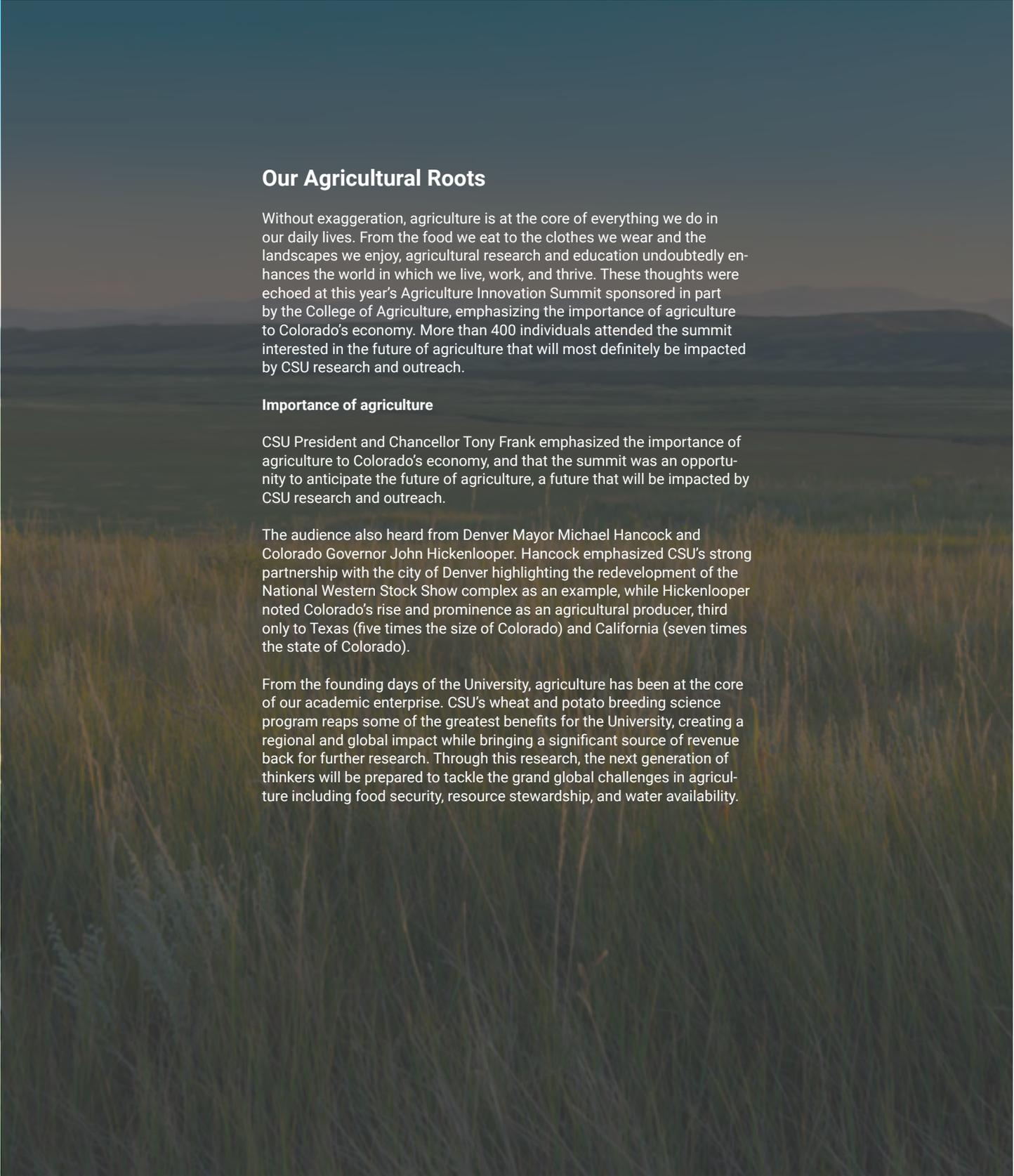
Innovation begins with a bright idea but even the brightest idea isn't guaranteed success. That's why we exist. We provide the environment for ideas to grow, engage the resources for ideas to evolve, and develop the partnerships for ideas to become a force.

Simply put, we roll up our sleeves and help bright ideas become great innovations. Innovations that help the world become a better place.

CSU Ventures is dedicated to the business of technology transfer and commercialization at Colorado State University. We bring innovations and technologies discovered at CSU into the marketplace for the benefit of society.

With our expertise in intellectual property, licensing, partnership-building, and entrepreneurship, we protect, manage and transfer CSU innovations by connecting individuals and companies with University researchers.

CSU Ventures serves as a resource not only to CSU faculty and researchers, but also to industry, entrepreneurs, and investors seeking to further research or commercialize a technology. Results are new products, businesses, and jobs that positively impact people's lives.



Our Agricultural Roots

Without exaggeration, agriculture is at the core of everything we do in our daily lives. From the food we eat to the clothes we wear and the landscapes we enjoy, agricultural research and education undoubtedly enhances the world in which we live, work, and thrive. These thoughts were echoed at this year's Agriculture Innovation Summit sponsored in part by the College of Agriculture, emphasizing the importance of agriculture to Colorado's economy. More than 400 individuals attended the summit interested in the future of agriculture that will most definitely be impacted by CSU research and outreach.

Importance of agriculture

CSU President and Chancellor Tony Frank emphasized the importance of agriculture to Colorado's economy, and that the summit was an opportunity to anticipate the future of agriculture, a future that will be impacted by CSU research and outreach.

The audience also heard from Denver Mayor Michael Hancock and Colorado Governor John Hickenlooper. Hancock emphasized CSU's strong partnership with the city of Denver highlighting the redevelopment of the National Western Stock Show complex as an example, while Hickenlooper noted Colorado's rise and prominence as an agricultural producer, third only to Texas (five times the size of Colorado) and California (seven times the state of Colorado).

From the founding days of the University, agriculture has been at the core of our academic enterprise. CSU's wheat and potato breeding science program reaps some of the greatest benefits for the University, creating a regional and global impact while bringing a significant source of revenue back for further research. Through this research, the next generation of thinkers will be prepared to tackle the grand global challenges in agriculture including food security, resource stewardship, and water availability.



Places of Invention' exhibit at Smithsonian highlights Fort Collins entrepreneurs and innovators. CSU startup company, Prieto Battery is recognized for its revolutionary battery technology.

CSU part of Smithsonian's 'Places of Invention' exhibit

When "Places of Invention," the latest exhibition from the Smithsonian's Lemelson Center for the Study of Invention and Innovation, opened at the National Museum of American History on July 1, 2015 Fort Collins was one of six communities representing what can happen when the right mix of inventive people, resources and inspiring surroundings come together and spark invention and innovation.

Of the six people from Fort Collins whose work is highlighted, all have ties to CSU, one being Amy Prieto, a professor of chemistry at CSU and the creator and founder of CSU startup company Prieto Battery. Prieto focuses on new battery technology to revolutionize electric vehicles. At Prieto Battery, new materials and electroplating methods are eliminating toxic substances from rechargeable batteries and decreasing charging time and production costs.

By tackling environmental problems and creating clean, sustainable alternatives to existing energy sources, Colorado State University, the city and Northern Colorado business community are actively pursuing collaborations that result in local innovations with global impact. That makes the City of Fort Collins the newest Place of Invention.

Located in Washington, D.C., the exhibit will be in place through 2020 and allows visitors to discover, explore and discuss the stories of people who lived, worked, played, collaborated, adapted, took risks, solved problems, and sometimes failed — all in the pursuit of something new.



Dr. Dean Hendrickson and Dr. Fausto Bellezzo earn 2015 CSUV award for innovative excellence.

Veterinary professors earn award for innovative excellence

The CSU Ventures Award for Innovative Excellence is presented to a researcher who is not only an innovator, but someone whose innovations have been transferred to industry and are exhibiting strong potential for commercial success. With this Award, CSU Ventures seeks to recognize research excellence and acknowledge the impact that a researcher's innovation has outside of the University on the lives of many people around the world.

Dr. Dean Hendrickson and Dr. Fausto Bellezzo, both professors of veterinary medicine, received this year's award for Innovative Excellence. Their research has led to the development of a startup company, SurgiReal, where life-like simulated tissue pads are created to aid students in learning procedures like suturing and incision-making.

Students at CSU and 140 other medical, nursing and veterinary schools nationwide train with patented SurgiReal body wall models. SurgiReal products allow students to practice and refine surgical skills on realistic models instead of the old standbys – carpet scraps, orange peels and cadaver specimens, chiefly pigs' feet. Unlike those crude substitutes, SurgiReal training models have multiple layers and exude fake blood, allowing students studying veterinary and human medicine to more effectively learn how to cut through layers of skin, stanch blood, stitch up wounds and remove sutures.

SurgiReal started out as the simple idea of making learning easier, more convenient and efficient. Now the company has created better training methods, better education, better outcomes and excellence in surgical training.



CSU inventors John Williams, Leslie Stone-Roy and JJ Moritz demonstrate a retainer that acts as a hearing device, essentially putting 'words in the mouth'.

Words in the mouth

In the future, those with substantial hearing loss may no longer need a doctor to surgically implant a cochlear device into their ear to restore their sense of sound. Soon they may just pop a retainer into their mouths.

The team of engineers and neuroscientists are developing a hearing device that bypasses the ear altogether and puts words in the mouth. The technology relies on a Bluetooth-enabled earpiece to detect sound and send electrical impulses to an electrode-packed retainer that wearers press their tongue against to "hear."

The notion that the human brain is "set" by adulthood and therefore, unable to change how it receives information is being challenged. In the future, those with substantial hearing loss may no longer need a doctor to surgically implant a cochlear device into their ear to restore their sense of sound.

Finding his tongue

John Williams first conceived the idea for the device during what he calls a "research midlife crisis." The mechanical engineer professor has spent much of his career designing and building electric-propulsion systems for space travel. Though he loves the work and still conducts research in that area, Williams says many of the challenges have been overcome.

Williams, along with veterinary medicine professor, Leslie Stone-Ray and graduate student, JJ Moritz wanted to expand this research and became interested in neuroscience and sensory substitution – training the brain to receive information from another source. (American Sign Language and Braille are both examples of sensory substitutes.)

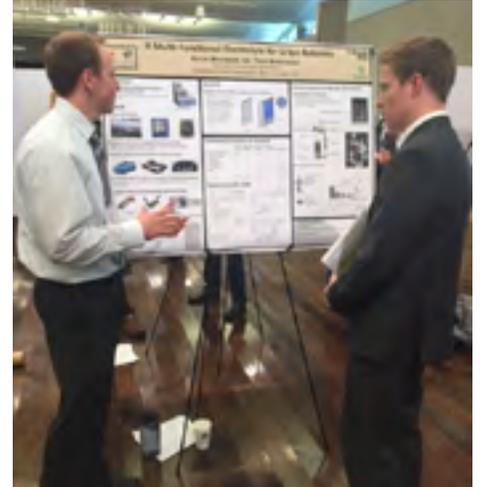
Hearing with your tongue

Unlike hearing aids, which amplify sound, cochlear implants circumvent damaged areas of the ear and stimulate the auditory nerve directly.

Microphones outside the ear detect sounds and send them to a speech processor, which analyzes the information and transmits it to a receiver where it is converted into electric impulses. The implant sends those impulses directly to the auditory nerve. With training, the brain learns to recognize these impulses as useful sound information.

The CSU device operates very similarly except electric impulses are sent via Bluetooth to a retainer-like mouthpiece packed with electrodes. When users press their tongue against the device, they feel a distinct pattern of electric impulses as a tingling or vibrating sensation.

The idea is that, with training, the brain will learn to interpret specific patterns as words, thus allowing someone to "hear" with their tongue.



CSUV Ambassadors host third annual Innovation Symposium, an event for campus researchers that features a poster session and table talks with industry leaders.

Ambassadors shine light on promising research at CSU

To better serve the CSU research community, CSUV developed the Graduate Student Ambassador Program that enhance the presence aimed at enhancing the vital connection between CSU researchers and CSUV. By engaging graduate students to serve as Ambassadors on campus, the program strengthens the visibility and presence of CSUV among the research community. In its third year of existence, ten students served as ambassadors to assist and aid in the development of innovative strategies which enhance the presence of research, intellectual property and commercialization on campus.

Staying true to the goal of serving the research community, the ambassador team coordinates a yearly outreach event, the Innovation Symposium held in the spring, which attracts more than 300 researchers, graduate students and faculty. The annual showcase event is intended to shine a light on what's being researched on the university campus with keynote talks, a poster session and snapshot talks from key faculty members. The much-anticipated annual event also provides a chance to network with like-minded individuals from departments across campus.

This past year 35 individuals presented posters representing various departments from civil engineering to biomedical sciences to health and human sciences. The top researchers in each category were invited to present a five-minute pitch before a panel of judges with the winners receiving cash prizes.



Educator's Game Design Toolkit designed by CSU English professor Antero Garcia.

Gaming in the classroom

When we think of resources available in the traditional classroom, what comes to mind? Textbooks? Computers? iPads? Pens, pencils, glue, tape and scissors? For each person it's different. And for CSU English professor, Antero Garcia, incorporating games into the classroom can provide a pathway to abundant learning for teachers and students alike. How we teach depends on what's available to us, and Garcia only has one simple request for teachers: play more games.

Garcia and co-inventor Chad Sansing have developed a Game Design Tool Kit that isn't a typical resource for professional development, but instead offers an interactive guidebook aimed at leading and facilitating teacher inquiry around specific game-like principles through playful nature. The guide is aimed at mediating and creating gaming experiences for a professional learning community, and then teaching teachers how to use the same practices in their own classrooms.

For instance, one of their modules, called "Psychic Dungeon," is a thought experiment, where the idea is to imagine yourself in the worst dungeon possible. Then, challenge yourself to transform those obstacles into things that would make it the best dungeon ever. The dungeon can take on many forms: the office, the classroom, a cafeteria, etc. As a teacher, you can use this transformational design with your students. For instance, when stuck in an unhelpful disciplinary cycle with a student, try having her run a station or part of class each day. Stop seeing what you can't control, and instead think about what you can. The creators suggest teachers begin looking at games and play as "equal partners to textbooks and worksheets in the quest for academic, personal, and communal success."

After receiving a creative works grant in the inaugural year of the grant program, Garcia and Sansing launched the gaming tool kit in several school systems. They are currently collecting feedback and results to further enhance and develop the toolkit for widespread use and will be included in a future online marketplace with CSU Ventures.

Year in Review

Economic Development

- CSU startup companies currently employ nearly 500 people, with most of these in Colorado. - CSU startup companies currently employ nearly 500 people, with most of these in Colorado.
- CSU Ventures works closely with Innosphere, a local technology incubator, and the Innovation Center of the Rockies, which maintains a large network of technical and business experts, to provide support for CSU startups.

Funding

- CSU Ventures awarded nearly \$450,000 to eight projects under the State of Colorado's Bioscience Discovery Evaluation Grant Program and Advanced Industry Accelerator Proof of Concept Program.
- An additional four awards totaling \$40,000 were made to CSU faculty under the Creative Works Program.
- Faculty from five different colleges and nine different departments received awards under these three programs to advance their research towards commercialization.

Achievements

- CSU innovations resulted in a record number of licenses with industry (43) and generated a record amount of licensing revenue (\$4.8M) in 2015 compared to previous years.
- The number of patents issued on CSU innovations tied a previous record (49).

Aggregate US Technology Transfer Numbers

- In 2014, nearly 7,000 new licenses or options were signed to enable the commercialization of innovations from US universities.
- 914 new startup companies were formed around US university technologies in 2014, and nearly 5,000 university startup companies were operating.
- Nearly 1,000 new commercial products reached the public in 2014 as a result of US university technology transfer.
- 6,363 US patents were issued to US universities in 2014.
- In 2014, net product sales related to commercialized innovations from US universities were approximately \$28 billion.



Chris White and Jeremy Podany redesign the career services web portal that offers students more searchable and sortable resources.

On-campus entrepreneurs create a portal for innovative ideas

In the 21st century, not all technological innovations come from scientists working on grant-funded projects. More and more, innovation comes from people looking for a better way to do their everyday jobs – and technology makes it possible for them to share their new ideas.

Take Jeremy Podany, for example. The director of the Career Center at Colorado State University knew, from his decade and a half in career services, that there had to be a more efficient way for students to learn about and, more importantly, use the wealth of services offered by his center.

The website offered 30 to 40 resources that were hard to find and hard to define. There was no way for students to easily discern what resources were right for them. As a result, Podany brought an idea to the Career Center's web and app developer Chris White and rethought the entire process.

They determined that students needed a way to type in what they were looking for and the site would search and sort according to those keywords, similar to cars.com. You should be able to enter as many keywords as you want and then be able to go directly to the resource once the results are returned. Sounds so simple now, but in 2012 there was nothing like that in university career advising. That year, the Career Center's 40 online resources received a total of about 2500 clicks, with some getting less than 10 clicks annually.

With the Career Tools redesign, the site now offers students 480 searchable and sortable resources which receive 13,000+ page views annually.

Support from CSU Ventures

Based on feedback from around the nation, Podany knew that Career Tools had some commercial potential, so in 2013 he and White built a version to export to other career centers. It wasn't created to make money, they just wanted to serve students better.

While Podany had no desire to start running his own company to market Career Tools, he did want to make it available to others in his field – and making some money that could go back into the Career Center would be an extra bonus. He turned to CSU Ventures for help.

But Podany's product was a different animal. The product was already developed, and it was selling itself to its own very important but narrow market. To make it more widely available he and White created the site Campuscareerinnovations.com for other university career advising professionals, and CSU Ventures hosts it.

By the Numbers

New this Fiscal Year

92 Inventions

563 over the last 5 years

146 Patent Applications

747 over the last 5 years

43 Licenses

198 over the last 5 years

49 Issued Patents

152 over the last 5 years

5 Startups

30 over the last 5 years

\$4.78M Revenue

\$9.59M over the last 5 years

Active Portfolio

654 Inventions

368 in 2010 | 83% Growth

663 Patent Applications

493 in 2010 | 34% Growth

279 Licenses

136 in 2010 | 105% Growth

305 Issued Patents

124 in 2010 | 146% Growth

52 Startups

22 in 2010 | 136% Growth

Highlights

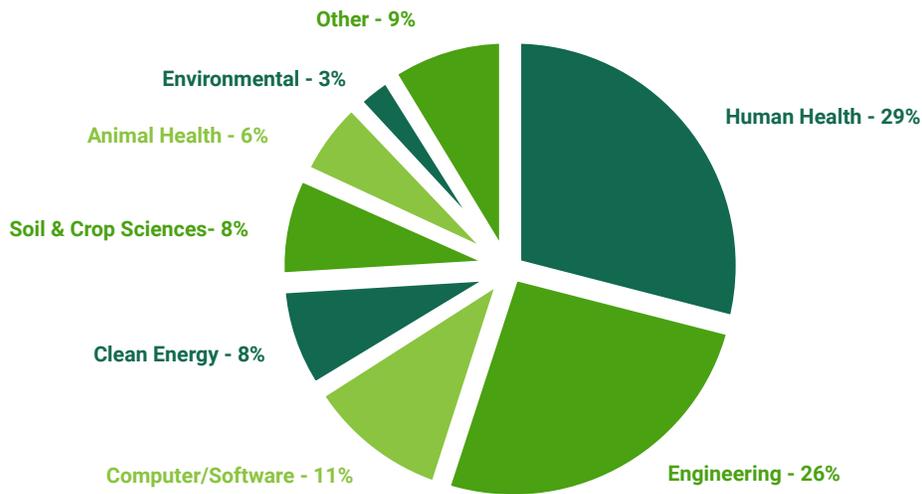
In FY2015, CSU met or exceeded previous annual records for licenses, issued patents, and revenue.

CSU awarded nearly \$500K of funding to CSU researchers through the Advanced Industries Accelerator Proof of Concept Program, the Bioscience Discovery Evaluation Grant Program, and the CSU Creative Works Program

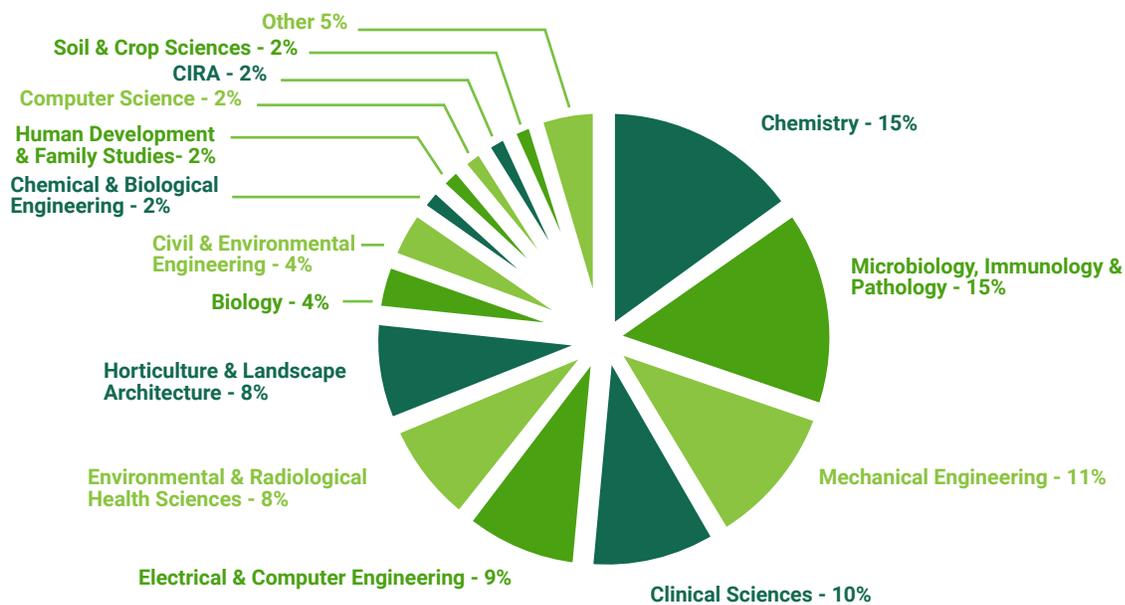
New Startups

Microchemica | Growcentia LLC | Nexus Bioenergy | Sapien LLC | Sathi LLC

2015 Inventions by Field



2015 Inventions by Department





CSUVENTURES

Innovation at Work



Student Center Research Wall pictured above was designed by John Gravidal, CSU Art & History Professor.

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