



Innovation at Work



CSU**VENTURES**

2012 ANNUAL REPORT

About Us

CSU Ventures brings innovations and technologies discovered at Colorado State University into the marketplace for the benefit of society. With specialized expertise in patenting, licensing, and entrepreneurship, we serve as a resource not only to faculty and researchers, but also to industry, entrepreneurs, and investors seeking to engage with the University. Since 1963, our organization has helped license and commercialize solutions to some of the world's biggest challenges in areas such as infectious disease, cancer, clean energy, water, weather, animal health, and agriculture. CSU Ventures is a non-profit corporation and a wholly-owned subsidiary of Colorado State University Research Foundation (CSURF).

CSU Ventures...

- Connects business and industry with CSU's researchers;
- Protects and licenses marketable University intellectual property;
- Fosters new business formation to enhance regional economic vitality.

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Executive Summary

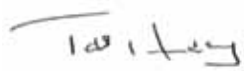
In June of 1963, Colorado State University Research Foundation (CSURF) officially established itself as the technology transfer office for the University and received its first invention disclosure. Fifty years later, the technology transfer office – now known as CSU Ventures – is proud to have worked on 1,659 invention disclosures, trademarks, and copyrights through the end of fiscal year 2012. During this evolution, we've worked diligently to fulfill our mission of bringing CSU's innovative research into the marketplace to benefit society.

We are fortunate to work with the outstanding faculty and researchers at CSU, a top-ranked research university that, in spite of ongoing federal and state funding challenges, still held its place as one of the top performing research institutions in the nation, growing annual research spending to about \$340 million in fiscal year 2012.

Five Year Growth

- The number of invention disclosures, patent applications, license agreements, and new startup companies **more than doubled** between 2007 and 2011, compared to the previous five year period.
- CSU's growth in each these metrics ranked above the 85th percentile among universities with more than \$125M in research expenditure; it was one of only two institutions to achieve this level of growth.
- Licensing revenue nearly doubled from the preceding five year period, increasing from \$4.42M to \$8.22M.
- More than **650 CSU researchers** disclosed inventions between 2007 and 2011; this was approximately twice the number that participated in the previous five year period.

Many thanks to all our directors, staff, academic partners, and business colleagues for their participation in the roles of innovation, technology transfer, and collaborative partnerships. You are vital to our success and the future impact of CSU research commercialization and entrepreneurship.



Todd Headley
President
CSU Ventures

Other Highlights & Achievements

- CSURF and CSU Ventures consolidated their technology transfer and business enterprise arms under **ONE** name — CSU Ventures. A new brand identity, website, and marketing materials were created for CSU Ventures.
- 1+1 = Infinite possibilities. CSU Ventures partnered with **Innovation Center of the Rockies** to speed up the creation of new businesses by matching top CSU faculty and researchers with ICR's network of more than 1,000 mentors and advisors, one of the largest entrepreneurial support systems in the country.
- CSU Ventures' first **Startup Guide** was published. We improved and enhanced startup company formation by identifying services, advisors, legal, and financial resources.
- **Two** CSU spinoffs, **VetDC** and **KromTiD** were selected as finalists in the prestigious Biowest Venture Showcase. VetDC won the \$7,500 competition.
- The White House honored **Professor Amy Prieto** with a Presidential Early Career Award for Scientists and Engineers for her innovations in battery technology.
- **\$348,952** in proof-of-concept research funding awarded to five projects through the state's Bioscience Discovery Evaluation Grant Program, now in its fifth year.

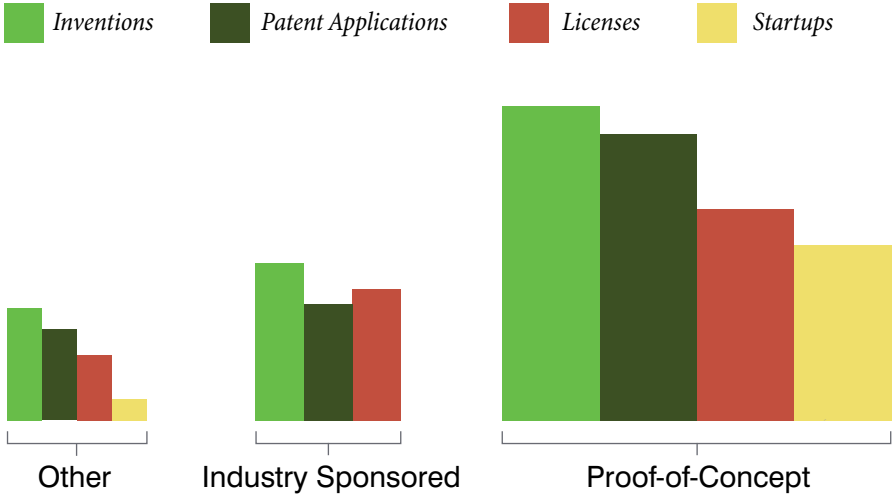
**CSU Ventures is a 501(c)(3) not-for-profit organization, a subsidiary of Colorado State University Research Foundation (CSURF) and an affiliate of Colorado State University.*

Proof of Concept Research

CSU Ventures strives to enable researchers to evaluate the technical and commercial feasibility of their innovations through proof of concept (POC) funding. The CSU Supercluster® grants provide funding to advance commercially promising research projects in the areas of cancer, infectious disease, and clean energy. CSU Ventures works to translate the development of funded projects into meaningful new products and/or companies. In addition, the Colorado Office of Economic Development and International Trade apportions money to CSU Ventures each year through its Bioscience Discovery Evaluation Grant Program (BDEGP) to be allocated to promising proof of concept (POC)-stage bioscience research projects.

POC programs at CSU have commercialized more university innovations and produced more new invention disclosures, patent applications, licenses, and startup companies per dollar spent than traditional funding sources (see diagram). More information: www.csuventures.org

Outcomes Per Sponsor Research Dollar

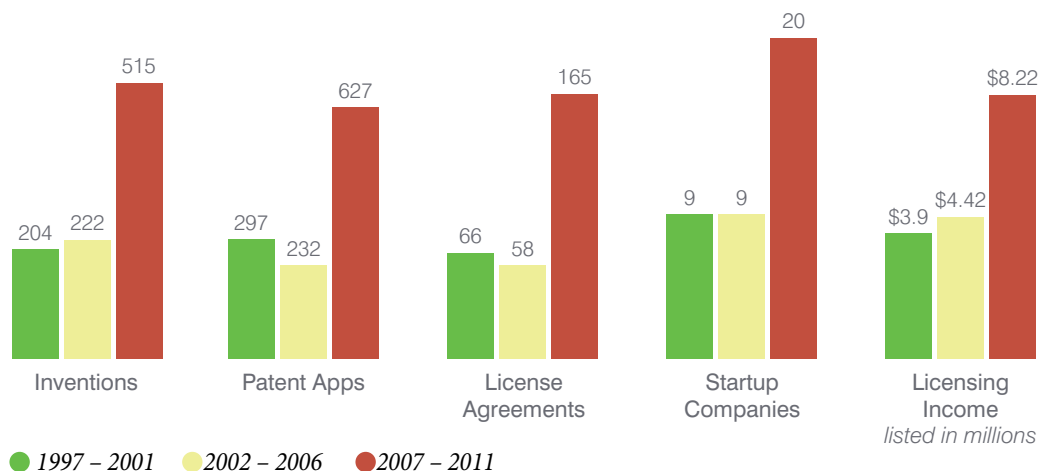


Box areas are drawn to be proportional to per research dollar totals for each category.

Industry Engagement

CSU Ventures actively assists CSU to develop collaborative university-industry partnerships. Opportunities exist for industry partners to leverage CSU's outstanding faculty, state-of-the-art facilities, and analytical equipment. Industry involvement early in the research and development process can produce more commercially relevant results in a reduced timeframe. For industry partners interested in sponsoring research at the university, CSU Ventures can help the university to match sponsors with appropriate faculty. Private companies can leverage CSU's POC funding programs by providing matching funds to a BDEGP or Supercluster® grant award, thus increasing the impact of their contributions.

CSU Ventures Impact 5 Year Comparison



Highlights

- Net product sales for CSU Ventures licensees totaled over \$60 million for FY2011.
- CSU Ventures startups contributed over \$7.5 million to CSU's research expenditure between 2007 and 2011 – a 450% increase from the previous five years total.
- CSU Ventures awarded \$348,952 in proof-of-concept research funding to 5 projects through Colorado's Bioscience Discovery Evaluation Grant Program.

Performance Metrics

METRICS	FY2012	LAST 5Y
Inventions Disclosed	117	552
Patent Applications	157	710
Patents Issued	12	56
Licenses Executed	38	182
Startup Companies	6	21
Licensing Income	\$1.06M	\$7.12M

Snapshot

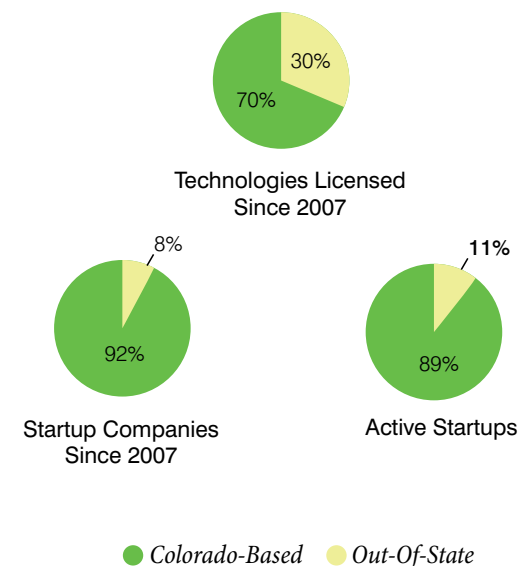
AS OF JULY 1ST 2012

Active Invention Disclosures	528
Active Patents	621
Active Licenses	126
Active Startup Companies	32

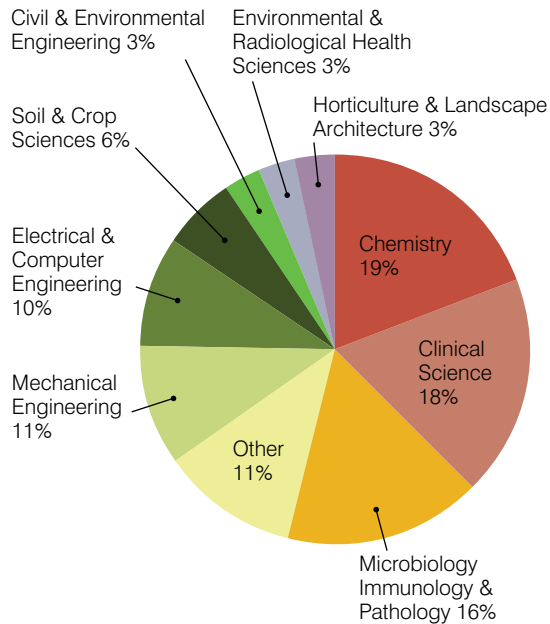
Colorado Impact

Colorado-based CSU startup companies have:

- Raised approximately \$650 million in private equity.
- Procured approximately \$80 million in government/non-government funding.
- Created approximately 1,250 peak new jobs.

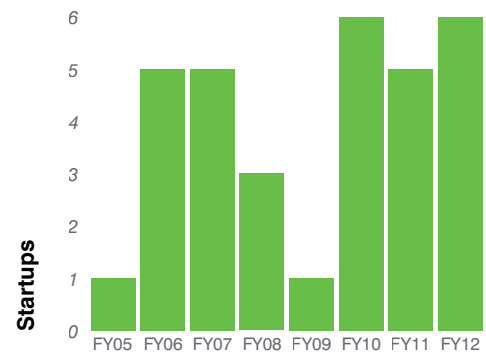
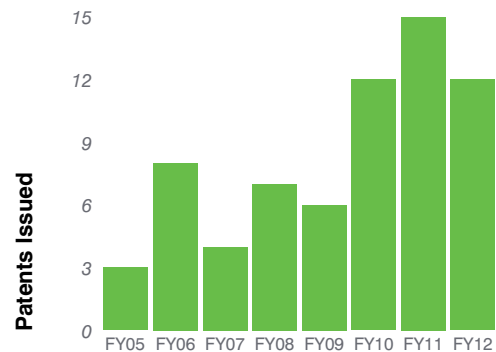
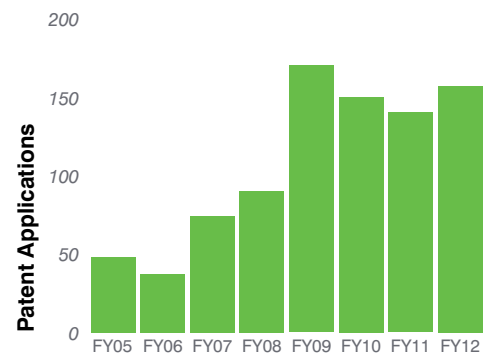
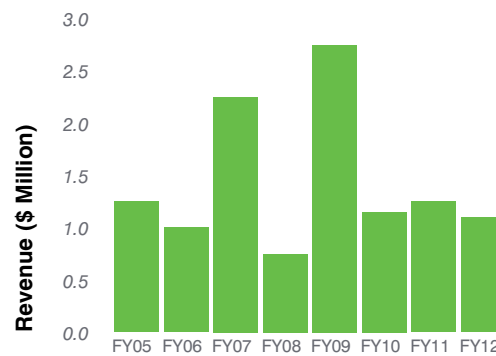
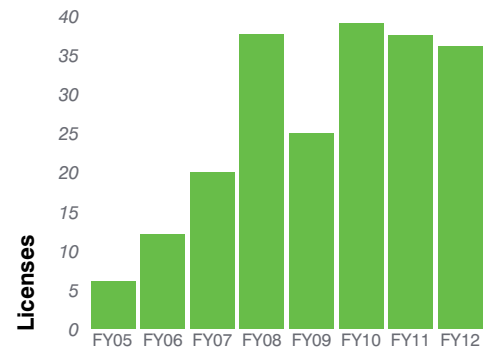
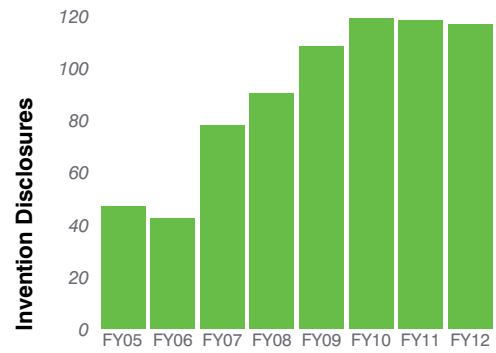


2012 Invention Disclosures by Department



Since 2007, over 650 CSU researchers from seven CSU colleges and more than 30 departments have disclosed inventions to CSU Ventures.

Historical Snapshot



By the Numbers

Creating Sustainable Plastics

Inventors: Eugene Chen, Ph.D., Professor, Dept. of Chemistry, Yangjian Hu, Ph.D. Dept. of Chemistry, and Yuetao Zhang, Ph.D., Dept. of Chemistry

Chemistry Professor Eugene Chen and his researchers have developed several patent-pending chemical processes that could create sustainable bioplastics from nonedible biomass for use in everything from optical fibers and contact lenses to furniture and automobile parts. These plastics are excellent candidates to displace petroleum-based poly(methyl methacrylate) – better known as Plexiglas® or Lucite® – wherever performance and/or sustainability are paramount.

Chen's team has developed two bioplastic producing processes. The first uses commercially available organic catalysts to create a rapid and efficient reaction that achieves completion in less than a minute and utilizes non-toxic materials.

The second utilizes a metal-based catalyst system that produces stereoregular polymers. These plastics are highly robust and more resistant to heat, solvents, and scratches.

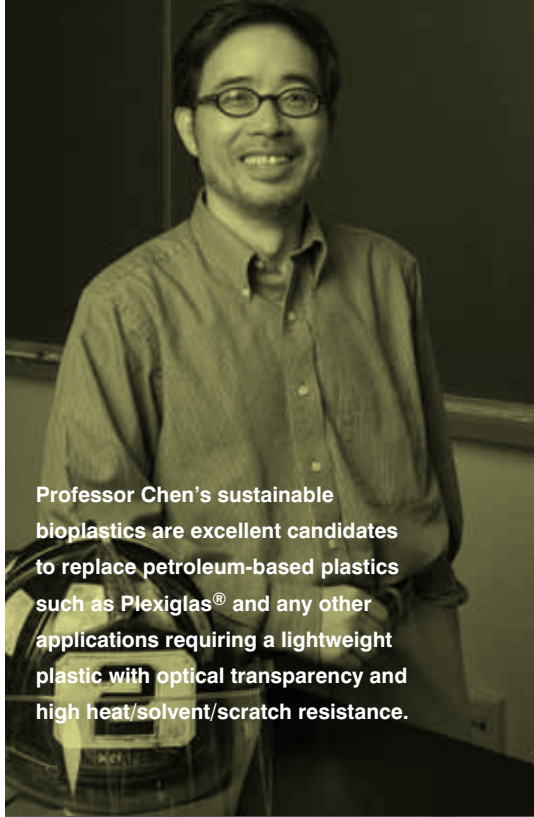
Monitoring Nanoparticles

Inventors: John Volckens, Ph.D, Assoc. Professor, Dept. of Environmental and Radiological Health Sciences, Anthony Marchese, Ph.D, Assoc. Professor, Dept. of Mechanical Engineering, and Daniel Miller-Lionberg, M.S., Dept. of Mechanical Engineering


Engineered nanoparticles are tiny particles that are designed on the molecular scale for use in many products: from fuels to clothing to foods, drugs, and cosmetics. They possess unique properties like high reactivity and the ability to penetrate cells, which present potential health risks to workers who manufacture and consumers who are directly or inadvertently exposed to them.

Monitoring personal exposures is necessary to evaluate potential risks because many engineered nanoparticles have not existed long enough that their impacts are known.

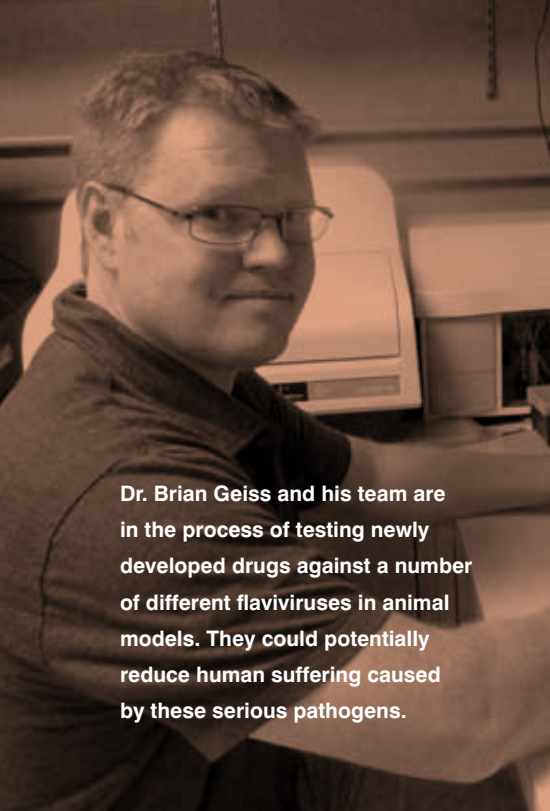
John Volckens and his research team, in collaboration with a commercial engineering company, have developed a personal aerosol sampler that captures nanoparticles onto an electron microscope substrate for physical and chemical analyses. The establishment of exposure guidelines based on measurements by this device could contribute greatly to the safety of manufacturers and consumers of products containing engineered nanoparticles. Volckens' team plans to distribute the aerosol monitors to researchers so they can be tested in various environments.



Professor Chen's sustainable bioplastics are excellent candidates to replace petroleum-based plastics such as Plexiglas® and any other applications requiring a lightweight plastic with optical transparency and high heat/solvent/scratch resistance.



People working in an environment that exposes them to nanoparticles can wear this device and have their exposure monitored, leading to the establishment of exposure guidelines and ultimately greater safety.



Dr. Brian Geiss and his team are in the process of testing newly developed drugs against a number of different flaviviruses in animal models. They could potentially reduce human suffering caused by these serious pathogens.

Treating West Nile and Related Viruses

Inventors: *Brian Geiss, Ph.D., Assistant Professor, Dept. of Microbiology, Immunology and Pathology and Susan Keenan, Ph.D., Associate Professor and Director of the School of Biological Sciences at the University of Northern Colorado*

Brian Geiss and Susan Keenan are developing drugs to treat mosquito borne flaviviruses. The National Institutes of Health considers many flaviviruses to be priority pathogens because they cause life-threatening illness, have few drugs or vaccines available, and have potential as biological weapons. More than two billion people are at risk globally of infection by dengue virus, and West Nile virus is endemic in 47 of the 48 lower United States.

Geiss and Keenan are developing drugs that bind to a protein critical for viral replication. The researchers screened chemical libraries and used computer modeling to identify molecules that inhibit their target. One of the molecules was able to reduce virus replication in cells by more than 1,000-fold.



Beans appear to be safe for dogs and have been incorporated into a number of homemade canine diets. Early studies indicate this novel food source may contribute to better overall health for companion animals by reducing weight and increasing activity levels.

Can Beans Improve Dog Health?

Inventors: *Elizabeth Ryan, Ph.D., Assistant Professor, Dept. of Clinical Sciences and John Bauer, Ph.D., Dept. of Veterinary Small Animal Clinical Sciences (Texas A&M)*

Researchers at CSU and Texas A&M are developing novel dog food formulations, utilizing dry bean powder as a major protein source. Beans are naturally high in protein, low in fat, cholesterol free, and rich in B vitamins and minerals such as iron, calcium, potassium, and magnesium. Moreover, early clinical studies have shown that canine diets using beans as the primary protein source resulted in greater regulation of metabolic status during weight loss compared to control diet fed dogs.

The navy and black bean based diets were safe and showed no evidence of adverse effects when fed to a wide variety of dog breeds as either a healthy weight maintenance diet or weight loss diet. As obesity continues to rise in dogs, this novel food source may contribute to better overall health for chronic disease prevention in companion animals by regulating metabolism and increasing activity levels.

Revolutionizing Battery Power

Prieto Battery Inc.

Founder: *Amy Prieto, Ph.D., Associate Professor, Dept. of Chemistry*

Today's growing need for energy storage in everything from portable electronics to electric/hybrid vehicles to military applications drives the requirement for a radical change in battery design and production. In order to achieve the transformational increases required in lithium-ion battery performance, Amy Prieto and her team at Prieto Battery seek to further develop their revolutionary three-dimensional battery architecture.

Prieto's novel structure brings a new dimension, literally, to the traditional 2D planar design of commercially available Li-ion batteries. Its advanced Li-ion battery technology based on a 3D architecture and solid-state polymer electrolyte will be more powerful, safer to use, less toxic to produce, and cost effective. Prieto Battery believes it is on the threshold of a major breakthrough and will commercialize the battery within the next several years.

Founded in 2009, the company now has nine employees, and is overseen by a five-person Board of Directors. Prieto Battery is backed by a group of private and strategic investors.
www.prietobattery.com

Real-time, Continuous Measurement of Chemicals

OptiEnz Sensors LLC

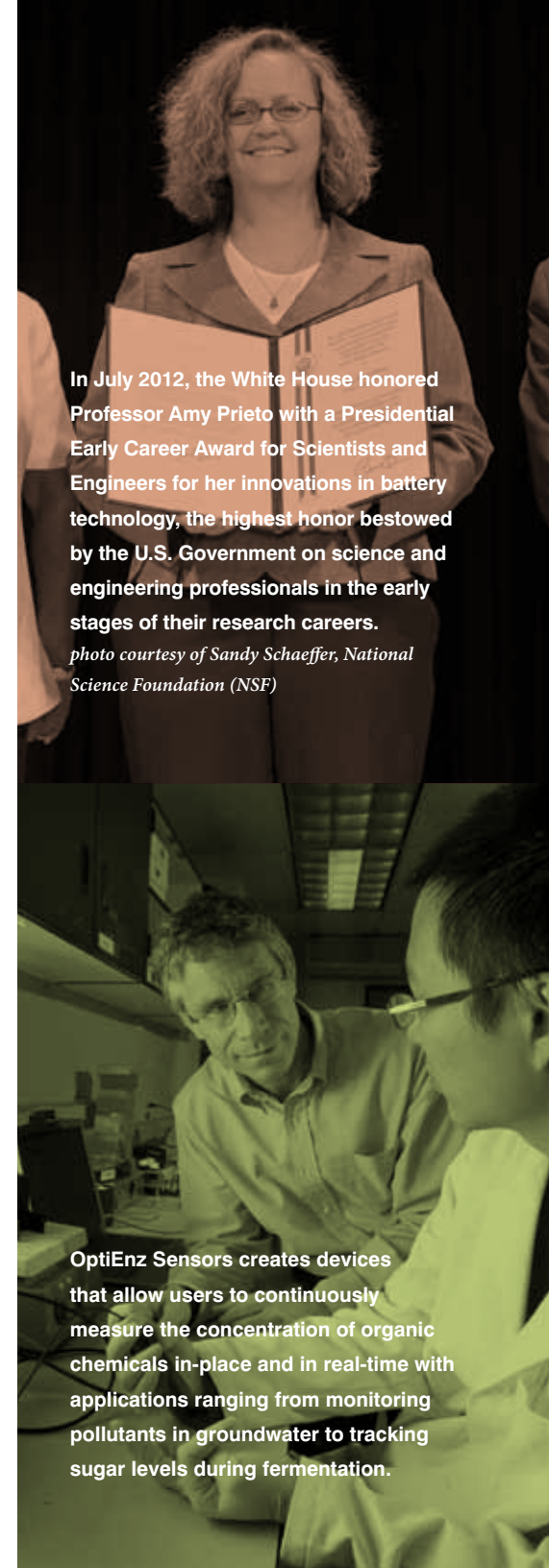
Founder: *Ken Reardon, Ph.D., Professor, Dept. of Chemical and Biological Engineering*

OptiEnz Sensors LLC makes optical enzymatic biosensors capable of providing real-time, online detection and analysis of a wide array of chemicals including hydrocarbons, chlorinated solvents, pesticides, and organophosphates, as well as sugars and ethanol.

The OptiEnz solution consists of a small hardware unit combined with quick-connect consumable sensor tips that use enzymes and fiber optic technology.

The ability to measure continuously and in real time provides companies with bottom-line benefits through process and quality control management, optimized plant and equipment utilization, and environmental liability mitigation.

The company is testing its prototype in a variety of settings and is working on a next-generation handheld version for on-site assays. OptiEnz is housed in the Rocky Mountain Innosphere, a Fort Collins startup incubator.
www.optienzensors.com



In July 2012, the White House honored Professor Amy Prieto with a Presidential Early Career Award for Scientists and Engineers for her innovations in battery technology, the highest honor bestowed by the U.S. Government on science and engineering professionals in the early stages of their research careers.

photo courtesy of Sandy Schaeffer, National Science Foundation (NSF)

OptiEnz Sensors creates devices that allow users to continuously measure the concentration of organic chemicals in-place and in real-time with applications ranging from monitoring pollutants in groundwater to tracking sugar levels during fermentation.



Professor Melissa Reynolds tests a proprietary natural therapeutic coating on a cardiac stent. Medical implants manufactured with this coating could help prevent infection, device failure, and complications.

Making Surgery Safer

Diazamed Inc.

Founders: *Melissa Reynolds, Ph.D., Assistant Professor, Dept. of Chemistry and Ben Reynolds, M.S., Undergraduate Lab Coordinator, Dept. of Chemistry*

Diazamed Inc. is a privately held biotechnology company located in Fort Collins, Colorado based on work developed in Prof. Melissa Reynolds' biomaterials research laboratory at CSU.

Clotting and biofouling (impairment or degradation) of cardiovascular implants continues to lead to device failure and complication in patients. Preventing these complications and failures in medical devices would address an unmet clinical need.

The technology platform integrates a natural therapeutic agent onto the surfaces of medical devices. The agent aids in the prevention of biofouling wherever the device makes contact in the body by working in synergy with natural processes. These biointeractive materials and coatings for medical devices have several advantageous features, including controllable durations, reduction in rates of infection and inflammation, and improvements in natural wound healing processes.

www.diazamed.com



LDI's technologies aim to make food and water safer for people to consume. This technology uses small resin-based beads to concentrate and capture viruses and bacteriophage from liquids.

Preventing and Detecting Foodborne Illnesses

Lumiere Diagnostics Inc.

Founder: *Lawrence (Larry) Goodridge, Ph.D., Professor, Dept. of Animal Sciences*

Lumiere Diagnostics Inc. is a Colorado corporation founded to advance innovations in food and water safety from the Goodridge laboratory at CSU. The company's principle technology, a pathogen concentrating device that reduces the sampling volume to a testable size, allows detection of pathogens at very low levels from a large volume of liquid. This is particularly important in food and water pathogen testing, since these types of bacteria and viruses can cause serious illness at very low concentrations. The concentration technology is compatible with current detection technologies.

Lumiere is also developing downstream diagnostic technologies to integrate with the pathogen concentrator and as stand-alone tests. The tests range from streamlined kits to make molecular diagnosis easier, to paper-based diagnostics and lateral flow devices.

www.lumierediagnosics.com

Bringing Human Medical Advancements to Pets

VetDC

Steven Roy, President and CEO

VetDC is a private Colorado-based company, founded on the principle that companion animals should have greater access to novel, innovative medical advancements. Adapting human technologies specifically for veterinary use could extend the lives of pets and improve their quality of life.

This innovative approach leverages substantial amounts of existing animal data to de-risk VetDC programs – increasing the probability of success in the veterinary setting and decreasing time to market. Working closely with Colorado State University’s top-ranked Veterinary Teaching Hospital and Animal Cancer Center, VetDC has access to state-of-the-art R&D resources as well as leading veterinary specialists to rapidly identify, evaluate, and develop novel technologies for commercialization. By selecting programs that are no longer advancing towards the human marketplace, VetDC maintains flexibility to price its products to accommodate the cost-sensitive veterinary community.

The company won the prestigious 2012 BioWest Venture Showcase – an annual competition that highlights Colorado’s best startup bioscience companies. VetDC is currently pursuing a novel, targeted anti-cancer drug, VDC-1101, for canine lymphoma and is looking to build a portfolio of promising technologies to treat companion animal cancer.

www.vet-dc.com

Improving Severe Weather Detection, Saving Lives

Ridgeline Instruments Inc.

Founders: Francisc Junyent and Luko Krnan, Dept. of Electrical and Computer Engineering

Francisc Junyent and Luko Krnan founded Ridgeline Instruments (RLI) based on their research experience acquired under the direction of Professor V. “Chandra” Chandrasekar, Ph.D. in CSU’s Department of Electrical and Computer Engineering. Chandra has earned international acclaim for his innovative research in weather radars and severe weather detection.

RLI offers hardware and software solutions for general instrumentation with specific emphasis on complete systems for remote sensing applications such as networked weather radar.

The short-range, low power X-band radars that RLI specializes in are becoming increasingly popular for their localized, high space- and time-resolution weather monitoring and have already been deployed in several radar testbeds around the globe.

www.rli-radar.com



VetDC licenses and develops innovative, underutilized human technologies for use in companion animals.



Ridgeline Instruments is now collaborating with Professor V. Chandrasekar to supply weather radars to an urban testbed in the Dallas-Fort Worth metro area that will validate a university consortium-developed radar network.



Carbo Analytics' licensed "lab-on-a-chip" technology allows streamlined sugar analysis for sugar-related industries.

Portable Analysis for Beverage, Biofuel, and Pharmaceutical Industries

Carbo Analytics Inc.

Founder: Dale Willard

Carbo Analytics is a startup company based on an innovative lab-on-a-chip technology developed at CSU. This technology streamlines the identification and analysis of carbohydrates, amino acids, and alcohols in the beer, wine, food, pharmaceutical, and biofuel industries.

Today's sugar-related production facilities essentially operate in reactive mode, obtaining sugar analysis after batch processing. Carbo Analytics creates fully automated in-line or semi-automated benchtop instruments with consumable chips that allow for proactive production control and adjustment. This increased efficiency could potentially add \$1 million annually to the bottom line of a facility.

Carbo Analytics is supported by the U.S. Department of Agriculture and the Colorado Office of Economic Development and International Trade. They are the recipient of the Outstanding Venture 2012 award from the Industry Growth Forum and a semi-finalist in the 2012 Clean Tech Open. www.carboanalytics.com



Food Friends Inc. focuses on educational programs that encourage better eating habits and exercise in young children.

Creating Healthy Kids

Food Friends Inc.

Founder: Jennifer Anderson, Ph.D., Professor, Dept. of Food Science and Human Nutrition

Food Friends Inc. creates educational tools that promote healthier eating and activity behaviors in preschool age students, 3 to 5 years of age. The company supports two main programs entitled Food Friends: Fun with New Foods® and Food Friends: Get Movin' with Mighty Moves®.

Fun with New Foods is a 12-week program taught by preschool teachers designed to generate a willingness to try new foods and overcome picky eating. Get Movin' with Mighty Moves is an 18-week program that aims to increase gross motor skills and physical activity. Together, the programs address key components in childhood obesity by increasing dietary variety and quality and enhancing movement.

Featured in the First Lady's White House blog entitled, "Let's Move," both programs have been highlighted by the Secretary of Education, the USDA, and the U.S. Surgeon General. www.foodfriends.org

Helping the World Breathe Easier

Envirofit International

Founders: *Nathan Lorenz and Tim Bauer, M.Sc., CSU Mechanical Engineering Graduates; Paul Hudnut, Instructor, College of Business; and Bryan Willson, Ph.D., Director Engines and Energy Conversion Laboratory at CSU*

Every day nearly half the world's population cooks over fires that use wood, charcoal and other biomass for fuel according to the Global Alliance for Clean Cookstoves. As a result millions of people are exposed to carbon monoxide, black carbon and a host of other life-threatening toxins.

In 2006, several CSU students and faculty established Envirofit International, a non-profit company, to develop and promote technology solutions to global air pollution issues and eventually developed a cleaner burning cookstove, now sold in more than 40 countries.

Envirofit's cleaner burning cookstoves are helping the world breathe easier by reducing smoke and harmful gasses emitted during cooking, using less fuel and reducing cooking times. The company was recently featured in the Association of University Technology Managers annual "Better World Report." www.envirofit.org

Securing the Future

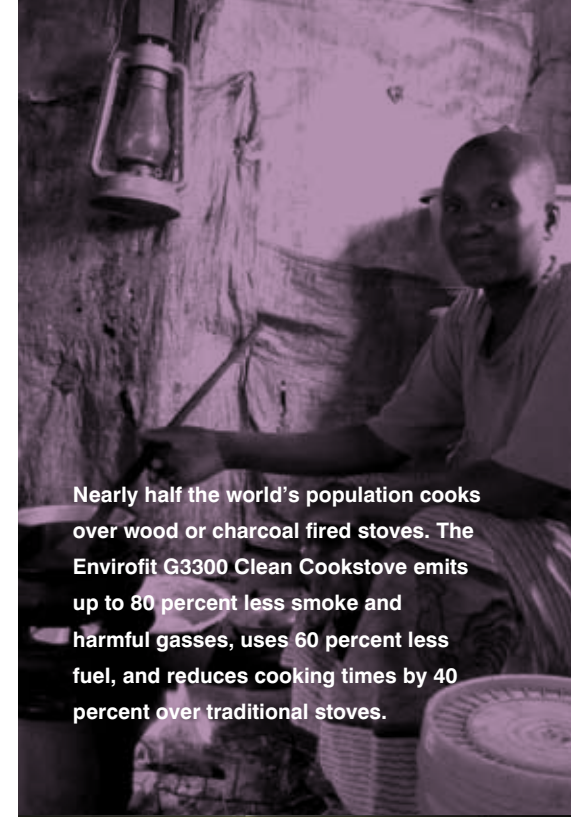
Numerica Corporation

Founder: *Aubrey B. Poore, Ph.D., Professor Emeritus, Applied Mathematics*

Numerica Corporation, founded in 1996, is one of the earliest startup companies to originate from CSU. The company is led by its original founder Aubrey Poore, a CSU professor of applied mathematics, and his son Jeff Poore, a CSU alumnus.

Numerica is an R&D leader developing advanced algorithms and software for tracking targets, fusing data, managing uncertainty, and integrating networks.

The company provides state-of-the-art solutions in the areas of air and missile defense, space situational awareness, sensor resource management, cyber security, intelligence, surveillance and reconnaissance, unmanned aircraft systems, chemical detection, data compression, and analytics. Numerica employs more than 50 people, including 13 CSU alumni, and has won more than 30 million in Small Business Innovation Research (SBIR) government contracts. In 2009, Numerica was recognized as a Colorado Company to Watch – an award that celebrates growing businesses that positively transform the nation's economy. www.numerica.us



Nearly half the world's population cooks over wood or charcoal fired stoves. The Envirofit G3300 Clean Cookstove emits up to 80 percent less smoke and harmful gasses, uses 60 percent less fuel, and reduces cooking times by 40 percent over traditional stoves.



Numerica's technology translates and manages complex data streams from a variety of sensors into real-time, actionable information for military, government, and commercial applications.



The company's first product, the BioPoly RS Partial Resurfacing Knee Implant System, is already being used successfully in Europe. The self-lubricating and wear-resistant surface replaces only the damaged cartilage, thus decreasing the overall recovery time while allowing patients to continue a highly active and pain-free lifestyle.

Helping Patients Get Back on their Feet

BioPoly LLC

Founders: *Herbert Schwartz, Ph.D., President and CEO, Schwartz Biomedical LLC and Inventor Susan James, Ph.D., Professor and Department Head, Mechanical Engineering*

Established in 2006, BioPoly LLC designs, develops, manufactures and markets orthopedic implants for use in human joints using a biologically enhanced implant material created by CSU Professor Susan James and BioPoly. This patented material combines an ultra-high molecular weight polyethylene with hyaluronic acid to generate a surface that closely mirrors natural joint material and mimics the stiffness and hydrophilic properties of cartilage better than other orthopedic materials.

BioPoly is a subsidiary of Schwartz Biomedical Company and holds the license for the resurfacing technology. Schwartz Biomedical intends to further its research into additional orthopedic applications and aims to develop similar materials for cardiovascular usage.

www.biopolyortho.com

Detecting Cancer with Paints

KromaTiD Inc.

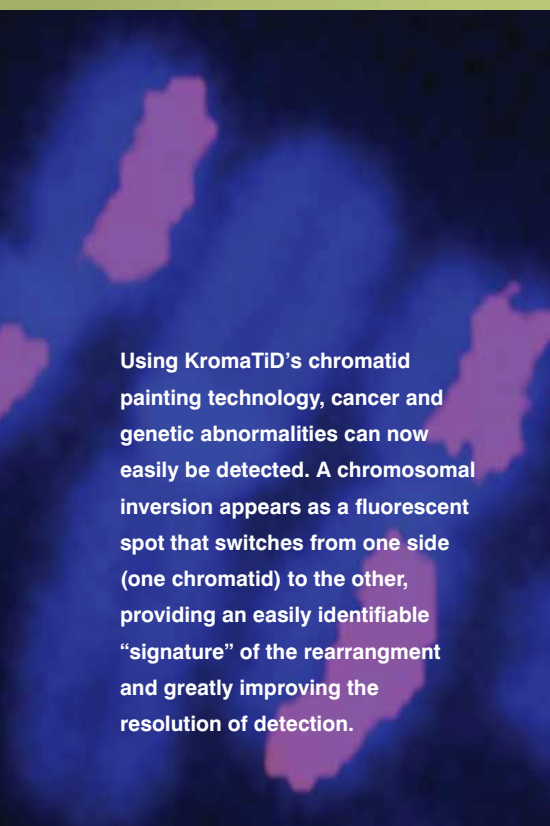
Founders: *Susan Bailey, Ph.D., Associate Professor, Environmental and Radiological Health Sciences; Joel Bedford, Ph.D., Professor, Environmental and Radiological Health Sciences; Andrew Ray, Ph.D., Associate Professor, Environmental and Radiological Health Sciences; Ed Goodwin Ph.D., KromaTiD Inc.; Michael Cornforth, Ph.D., Professor, Dept. of Radiation Therapy, UTMB, Galveston*

KromaTiD Inc. is advancing knowledge of genetic abnormalities and diseases by developing the next generation of molecular cytogenetics assays, reagents, and kits for use in research and clinical laboratories. Established in 2007, KromaTiD developed proprietary chromatid painting technology that greatly improves detection of chromosomal inversions, which historically has posted a significant challenge for researchers and clinicians.

Chromosome rearrangements have been associated with a variety of disease processes like cancer, as well as a number of genetic abnormalities that underlie neurological and developmental disorders including autism.

KromaTiD's proprietary technology opens the door to discovery and diagnosis of new chromosomal alterations. KromaTiD has received funding from NASA through SBIR grants, was selected by CID4 to receive investment and operational support, and was chosen as a finalist to compete in the 2012 BioWest Venture Showcase.

www.kromatid.com



Using KromaTiD's chromatid painting technology, cancer and genetic abnormalities can now easily be detected. A chromosomal inversion appears as a fluorescent spot that switches from one side (one chromatid) to the other, providing an easily identifiable "signature" of the rearrangement and greatly improving the resolution of detection.



Our Agricultural Roots

A Land-Grant Institution – Celebrating the 150th Anniversary of the Morrill Act of 1862

President Abraham Lincoln signed the Morrill Act 150 years ago granting federal land to each state to subsidize colleges to educate people in agriculture, engineering, and home economics. This act helped establish the Agricultural College of Colorado in 1870, which later evolved into Colorado A&M and eventually became the major research university we know today, Colorado State University.

Agricultural Innovations

While some land-grant universities have reduced their focus on agriculture over the years, Colorado State University has become a world leader in agricultural sciences. In fact, during the last 20 years, enrollment in the CSU College of Agricultural Sciences has grown more than 60 percent. CSU's wheat and potato breeding science programs reap some of the greatest benefits for the University, creating a regional and even global impact while bringing a significant source of revenue back for further research.

Potatoes

Located in the San Luis Valley of Colorado, CSU's Potato Breeding and Selection Program focuses on developing "grower-friendly" potatoes with traits like pest resistance, improved storage characteristics, and reduced water usage. The program also works to develop potato varieties with human health benefits, including lower glycemic impacts and higher antioxidant levels.

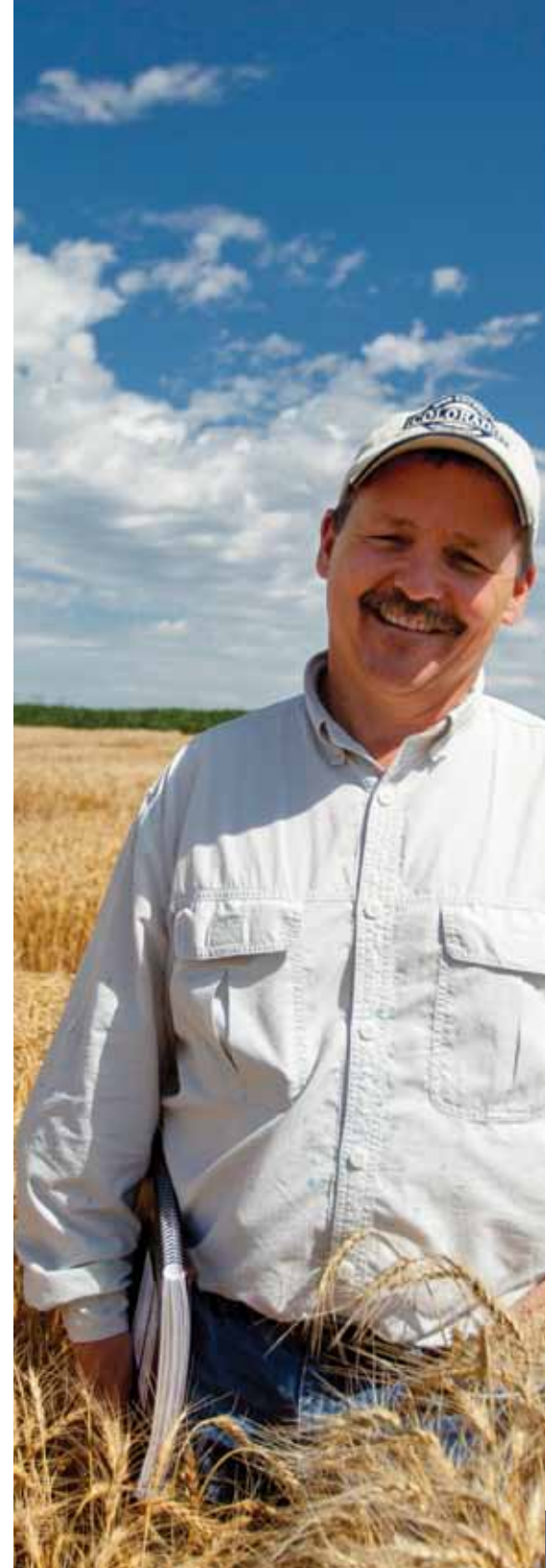
- CSU's Potato Breeding and Selection Program developed over 60 percent of the potato varieties that are planted in Colorado fields.
- Colorado is the 5th largest producer of potatoes in the United States.
- Potato growers understand the importance of their relationship with CSU, and contribute over \$250,000/year in research funding to CSU researchers.
- Colorado potato sales totaled nearly \$250 million in 2011, making potatoes tops among all fruits and vegetables in Colorado and the state's No. 7 commodity.

Wheat

Since its inception in 1963, the Colorado Wheat Breeding and Genetics program at CSU has developed more than 30 improved wheat varieties that thrive in Colorado's challenging growing conditions, which include drought, extreme temperatures, and emergent pests and crop diseases. CSU researchers develop varieties capable of delivering unprecedented yields to wheat farmers across the state and the entire High Plains region.

- Wheat is grown in 40 of the 64 counties in Colorado and supports over 15,000 jobs in the state.
- More than 80 percent of the annual wheat crop is exported out of the state, making its way to over 60 different countries worldwide.
- In 2012, more than 60 percent of the 2.5 million winter wheat acres in Colorado were planted with CSU-developed wheat varieties that produce higher yields and quality baking flour.
- Wheat producers and the Colorado seed industry support the CSU Wheat Breeding and Genetics program through a small royalty. To date, more than \$1.8 million in royalty funds has been returned to CSU to support further research under the Colorado Wheat Research Foundation program.

In keeping with a land-grant mission that began with the Morrill Act 150 years ago, CSU continues to advance agriculture with its teaching, research, and outreach.



Issued Patents

- US 8,164,512 **Gaussian Model Adaptive Processing in the Time Domain**
C. Venkatachalam, C. Nguyen
- US 8,153,684 **Use of Equol for Treating Androgen Mediated Diseases**
E. Lephart, T. Lund, K. Setchell, R. Handa
- JP 4889944 **Use of Equol for Treating Androgen Mediated Diseases**
E. Lephart, T. Lund, K. Setchell, R. Handa
- US 8,148,605 **Biological Systems Input-Output: Response System & Plant Sentinels**
J. Medford, M. Antunes, K. Morey, H. Hellinga, J. Smith
- US 8,133,168 **Remediation of Functional Cardiac Mitral Valve Regurgitation**
E. Monnet, E.C. Orton, S. James, K. Ordway
- US 8,116,566 **Unknown Pattern Set Recognition**
M. Kirby, J.R. Beveridge, J. Chang, B. Draper, H. Kley, C. Peterson
- US 8,097,432 **Method for Diagnosing Hemangiosarcoma in Canine Using Detection of Thymidine Kinase Activity**
D. Thamm, R. Ringold, R. Parker
- US 8,080,421 **Improved Method for Determining Crystallization Parameters & Apparatus for Use with the Same**
L. DeLucas, W. Wilson, C. Henry, L. Nagy, D. Johnson
- US 8,077,074 **Networked Waveform System**
C. Venkatachalam, N. Bharadwaj
- US 8,046,200 **Non-Linear Function Approximation Over High-Dimensional Domains**
M. Kirby, A. Jamshidi
- US 8,012,328 **Non-Fluidic Micro-Detection Device & Uses Thereof**
C. Henry, C. Garcia
- US 7,991,488 **Apparatus and Method for Use in Computational Fluid Dynamics**
M. Viele

2012 Award for Innovative Excellence

Professor V. “Chandra” Chandrasekar received the Award for Innovative Excellence at CSU Ventures’ Technology Transfer Awards Ceremony in February 2012. A professor of electrical and computer engineering, Chandra is internationally known for his work in weather radar technology and has collaborated with researchers, faculty, and students from CSU and other universities to develop a series of small radars that detect tornadoes and potential flooding earlier than current systems. He has received nine patents and has 25 patent applications pending.



Colorado State University Superclusters®

A Supercluster® is a multidisciplinary alliance that integrates experts from many fields with the goal of improving quality of life – by taking research innovations to the global marketplace more efficiently and at an accelerated pace.

Colorado State University coined the term “Supercluster” to describe an alliance of interdisciplinary experts that aims to foster innovative research outcomes and intellectual property for society’s benefit.

Colorado State’s academic Superclusters are built on a foundation of scholarly excellence in core disciplines and focus on the great global challenges of cancer, clean energy and infectious disease. CSU Ventures supports CSU’s academic Superclusters by providing commercialization expertise that promotes new business ventures to advance commercial applications of technologies developed in the Superclusters, as well as opportunities for industry partnering.

Cancer

The Cancer Supercluster is a collaboration of several CSU colleges ranging from the College of Veterinary Medicine and Biomedical Sciences to the College of Engineering. This multidisciplinary approach, along with numerous partnerships with the world’s top cancer research centers, position the University to make a tremendous impact in the fight against cancer by developing novel drugs and techniques to better detect, treat and prevent the disease in both humans and animals.

Clean Energy

Faculty members in all colleges at Colorado State – from Liberal Arts to Engineering – are developing market-driven energy solutions in the areas of biofuels, solar energy, wind power and clean-burning engines through more effective partnering with the clean energy industry, governments, investors, and the public. Its mission also fits with the state of Colorado’s efforts to lead the nation in creating clean and renewable energy technology and training the “green-collar” workforce.

Infectious Disease

The mission of the Infectious Disease Supercluster is to develop and implement effective interventions for human, animal, and plant infectious diseases of global importance. It aims to enhance the overall infectious disease research, training, and service capacity at CSU and accelerate development and application of infectious disease solutions worldwide by partnering with industry, government, foundations, and other entities.

For more information on the Superclusters, visit www.superclusters.colostate.edu

Innovations in Cancer

- KromaTiD advances the discovery and diagnosis of genetic abnormalities and associated diseases by using its propriety chromatid painting technology in developing the next generation of molecular cytogenetics assays, reagents and kits for use in research and clinical laboratories.
- VetDC aims to extend the lives of pets and improve their quality of life by adapting underutilized human medical technologies specifically for veterinary use. The company works closely with CSU’s Veterinary Teaching Hospital and Animal Cancer Center to fulfill its mission.

Innovations in Clean Energy

- Eugene Chen, Ph.D., is developing nanoparticle catalysts that efficiently convert biomass into a platform chemical that can be used to manufacture other useful chemicals, including replacements for ethanol, jet, and diesel fuels.
- Amy Prieto, Ph.D., is developing a specialized plastic to be used as an electrolyte in her novel 3D battery architecture, which will enable her company, Prieto Battery, to fully realize the potential of this revolutionary new battery architecture.

Innovations in Infectious Disease

- Jeffrey Wilusz, Ph.D., is developing a series of drug discovery screens for compounds active against innate immune pathways that viruses evade. The compounds could act as broad spectrum anti-viral agents against the dengue virus, hepatitis C, and rabies.
- Nick Fisk, Ph.D., is designing phage molecules using synthetic biology techniques that act as diagnostic probes. These probes can detect molecules that antibodies do not and have multiple binding sites.



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