

Creating Futures

UNIVERSITY OF COLORADO

Jennie Smoly Caruthers Biotechnology Building

A Colorado home for bioscience and engineering



A New Environment for Science and Engineering

The high-tech advances of the last 50 years have allowed us to better understand biological processes, and to translate that knowledge into powerful solutions that improve human life and welfare. This new knowledge also requires us to create a new kind of scientific environment: one that empowers researchers from many different fields to work together, across the boundaries of traditional academic structures.

The Jennie Smoly Caruthers Biotechnology Building on the University of Colorado Boulder East Campus is designed to be just such an environment. When completed in 2012, this building will host bioscience and engineering researchers from the Biofrontiers Institute, the Department of Chemical and Biological Engineering, and the Division of Biochemistry, and provide the resources and tools they need to make a difference in the lives of people everywhere.



University and project leaders bury a time capsule at an event commemorating a Caruthers Biotechnology Building construction milestone.

A Crossroads of Discovery

The Jennie Smoly Caruthers Biotechnology Building will be a central location for “productive collisions” among high-tech faculty from across the CU-Boulder campus, other CU campuses, and beyond. Scientists and engineers working together at the new building have been chosen for their shared research goals and their ability and desire to collaborate across disciplines. Faculty members include a Nobel Laureate; several National Academy members; Howard Hughes Medical Institute investigators, professors, and scholars; and National Science Foundation CAREER award honorees.

Uncommon Life, Uncommon Gift

Jennie Smoly Caruthers had a broad career that included research and teaching in the biological and biochemical arenas, and work in patent law that took advantage of her biotechnology industry expertise. Jennie published significant research in mitochondrial electron transport and on neurobiochemistry while at Harvard Medical School and CU-Boulder.

Jennie is the late wife of CU-Boulder Distinguished Professor **Marvin Caruthers**, who made a gift to name the building in her honor—the largest CU-Boulder donation ever made by a faculty member. A biotechnology pioneer who co-founded many biotechnology companies, including Amgen and Applied Biosystems, Marv has been a CU professor since 1973 and has, along with his wife, been a steady and generous supporter of the university.



Distinguished Professor Marvin Caruthers

Staking a Claim for Biotech Leadership in Colorado

Colorado is positioned to become a biotechnology industry leader. A highly educated workforce and lower cost of living than many metropolitan locations makes our state a major destination for biotechnology businesses.

Increased research and funding will nurture an already-strong culture of bioscience innovation. Highlights include:

- More than 60 Colorado-based life science entities qualified for and received nearly \$25 million in Therapeutic Discovery Grant awards, with amounts ranging from \$60,000 to more than \$1.4 million.
- Six leading venture firms invest in Colorado bioscience: Morgenthaler Ventures, Sanderling Ventures, Sequel Venture Partners, Tango/High Country Venture, Boulder Ventures, and Aweida Venture Partners.
- In 2009, Colorado ranked second nationally in Small Business Innovation Research (SBIR) funding—a key indicator of technological sophistication.
- The CU system ranked among the top 10 public universities for science and engineering research spending in 2009, with a total of \$648 million.

Source: Colorado BioScience Association

The University of Colorado is committed to being a leader in research and education in the biosciences. When fully built out, the Fitzsimons Life Science District and the Anschutz Medical Campus in Aurora will be one of the largest academic biomedical developments in the United States. The Caruthers Biotechnology Building brings CU-Boulder personnel and resources together with colleagues at the Anschutz Medical Campus and at the University of Colorado Colorado Springs to collaborate on bioscience solutions. Together, these initiatives will help Colorado rise to the top of the ranks in our nation’s biotechnology efforts.

Biofrontiers Institute: The Future of Academic Research

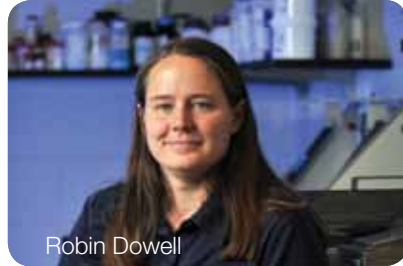
Scientists and engineers will be more successful working together across disciplines. Home to the Biofrontiers Institute, the Caruthers Biotechnology Building represents the future of academic scientific research, and of teaching the next generation of scientists and engineers.

With this new vision, CU-Boulder has successfully recruited young, high-caliber scientists who are working collaboratively on solutions to far-reaching problems.



Leslie Leinwand, MCDB professor of distinction and Biofrontiers chief scientific officer

An assistant professor in molecular, cellular and developmental biology and Biofrontiers faculty member, **Robin Dowell** is also an affiliated faculty member of the computer science department and a core faculty member of the Computational Bioscience Program at CU Denver.



Robin Dowell

One of the first scientists to hold the title of Boettcher Investigator, Robin's research includes assessing more accurately how drug treatments will work for each individual patient. Using genome sequencing, she hopes to expand the role of bioinformatics to create unique, personalized medicine solutions.

From macroevolution to mathematical patterns in terrorism and war, the research of Biofrontiers and computer science assistant professor Aaron Clauset spans many academic areas. Applying his knowledge of computer science, statistical forecasting, physics, data management, and complex networks, Aaron also is a scientific and technical consultant for the pharmaceutical, financial, and intelligence industries.



Aaron Clauset

Although well known for studying the mathematics of terrorism, Aaron also is working to extract meaning from the structures of networks. His algorithms are giving scientists insight into a variety of biochemical and social networks, from protein interactions to Facebook.

Chemical and Biological Engineering

The Department of Chemical and Biological Engineering will relocate to the Caruthers Biotechnology Building in spring 2012. The building's collaborative environment will help this department expand its considerable research program and recruit high-level students and faculty.

With research centers in biorefining and biofuels, membranes, pharmaceutical biotechnology and photopolymerization, the department has much to share with and gain from collaborating with talented faculty within the University of Colorado Biofrontiers Institute and the Division of Biochemistry.



Focusing on Tomorrow's Discoveries

Multidisciplinary research is at the foundation of the Caruthers Biotechnology Building, and will enable the training of new scientists and engineers emerging into academia and industry.

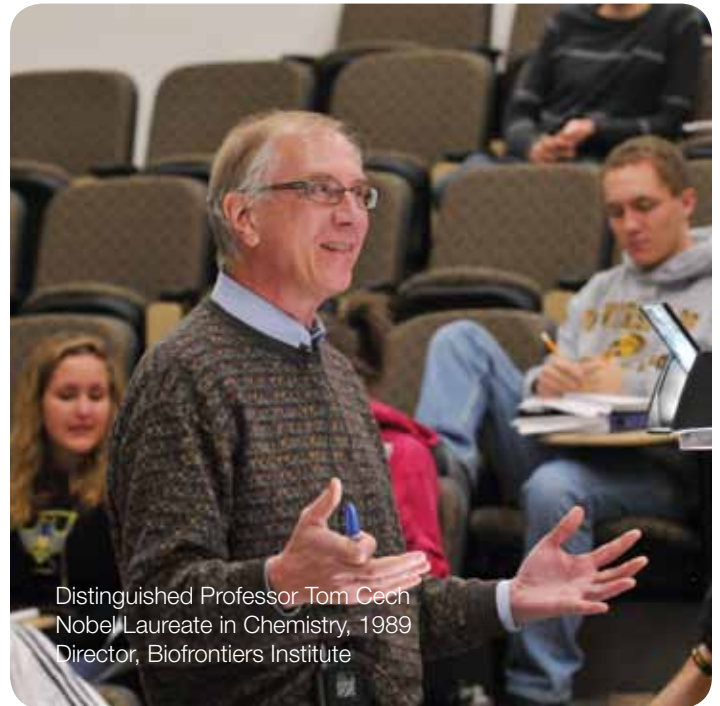
The Chemical Engineering Teaching Lab has been named by Chevron, and the Bioengineering and Biochemistry teaching labs have each been named by the Broida Family. These teaching spaces will offer students the opportunity to collaborate and learn in an environment that places value on working across academic boundaries, while providing them with the basic skills needed for their respective degree program. The first class of students from the new Interdisciplinary Quantitative Biology (IQ Biology) PhD certificate program will pave the way for more students to learn in this collaborative environment.

Regenerative Medicine

Kristi Anseth, distinguished professor in the Department of Chemical and Biological Engineering and Biofrontiers faculty member, works at the crossroads of engineering and biology, designing materials that imitate living tissues and help the body heal itself. These polymers act as structures upon which cells can build to replace damaged or diseased joints, cartilage, and even heart valves.



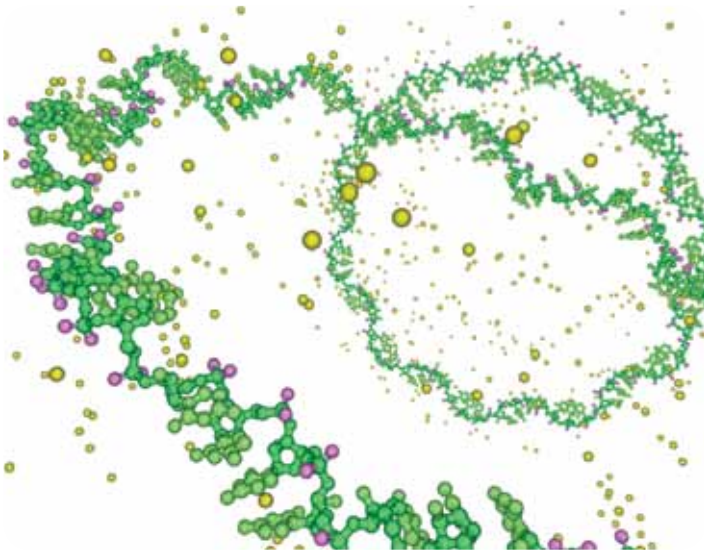
In 2003, Kristi successfully developed the first injectable and biodegradable scaffold for the regeneration of cartilage. This treatment is now being tested for a variety of applications and holds great opportunities for the treatment of arthritis, joint injuries and congenital cartilage defects.



Distinguished Professor Tom Cech
Nobel Laureate in Chemistry, 1989
Director, Biofrontiers Institute

Division of Biochemistry

The Division of Biochemistry will be housed in the Caruthers Biotechnology Building and will operate several research labs. Placing 15th in *U.S. News and World Report's* 2010 ranking of top biochemistry graduate programs, the division's focus covers a wide range of fields, including RNA structure and function, signal transduction, and structural biology.



One Location, Better Communication

CU-Boulder researchers are already collaborating across academic boundaries to solve biological challenges. Creating a space that empowers better communication between their labs will strengthen these bonds, and set an example for future generations of scientists and engineers.

Biofrontiers faculty member **Stephanie Bryant** (Chemical and Biological Engineering) is an expert at designing environments for cell culture and tissue regeneration. Biofrontiers faculty member **Amy Palmer** (Chemistry and Biochemistry) excels at designing a suite of protein-based fluorescent biosensors. Together, these two researchers are working to understand calcium's role in cellular processes such as tissue development and gene regulation, which they hope will lead to a better model of disease progression.

In the Caruthers Biotechnology Building, Stephanie and Amy will have labs on the same floor rather than across campus, facilitating their collaborative work and expanding its potential for transformative impact across multiple bioscience and bioengineering disciplines.

Supporting Drug Discovery

Traditional pharmacological therapies for pain are not workable for many patients—and they come with negative effects like opioid tolerance and addiction. Biofrontiers and biochemistry faculty member **Hubert Yin** (at right) is working to identify a new solution for the treatment of pain.

Glial cells are a promising area of focus for pain management. Hubert is working toward a way to inhibit the activation of these cells so that patients continue to see the benefits of their pain medication without the negative effects of drug dependence and loss of respiratory function.





One of the laboratory spaces in the Caruthers Biotechnology Building

Unparalleled Research Resources

The Caruthers Biotechnology Building's design emphasizes openness and connectedness. Engineers will have labs next to virologists. Computer scientists will be neighbors to molecular biologists. Those close proximities will lead to enhanced communication between many of CU's premier faculty members, and ultimately to new collaborations that increase knowledge of and applications for human welfare.

In addition, the building will provide the resources these scientists and engineers need for their research. These facilities will also be open to industry at competitive rates, extending the collaborative impact of this facility throughout Colorado and beyond.

The Caruthers Biotechnology Building will house the following technological resources:

- Next-generation DNA sequencing and bioinformatics
- Nuclear Magnetic Resonance
- Biomolecular mass spectrometry and proteomics
- Flow cytometry
- Electron paramagnetic resonance
- Tissue culture and bioimaging
- X-Ray crystallography
- Vivarium
- Chemical and biological engineering machine room
- Electrical shop

Donors make the difference!

In 2008, CU-Boulder alumni **Jack and Jeannie Thompson** donated \$2 million to fund the Vaccine Development Research Neighborhood, to house diverse researchers focused on developing vaccines and new delivery technologies.

Jeannie's 12 years in medical research, including at the National Institutes of Health and the University of Colorado Hospital, sparked the couple's interest in donating to the research lab. "We're excited about supporting research that's personally meaningful and holds so much potential," said Jeannie, who announced their gift at the outset of her term as CU Foundation board chair.

"I am a firm believer in leading by example."



Jack and Jeannie Thompson

Charlie Butcher was a successful businessman with a passion for science and a vision for CU as a leading research institute. With links to CU-affiliated scientific startup companies spanning more than 30 years, including Clonetics and NeXagen, Charlie often played leading roles as advisor and investor.

Jane Butcher, who received a bachelor's degree in 1966 from CU-Boulder, honored her late husband with a major gift toward the Caruthers Biotechnology Building. The Butchers have given substantially to biotechnology efforts at CU-Boulder.

In collaboration with Butcher's gift, biotech industry pioneer **Larry Gold**—a biology professor at CU-Boulder since 1970 and the current CEO of biotech firm SomaLogic—is directing a previously undesignated gift toward the biotechnology building to honor Charlie Butcher. In recognition of these gifts, the building's auditorium and adjacent foyer will be named in honor of Charlie Butcher.



Charlie and Jane Butcher

"I would love this to become an internationally recognized center for biotech. I think we have the perfect ingredients," Jane said. "Charlie was a big thinker, and he thought CU was the place this should all happen."

John and Anna Sie have a strong commitment to eradicating the ill effects of Down syndrome: a condition that affects one in 733 babies in the U.S., including their granddaughter, Sophia. Their gifts established the Linda Crnic Institute for Down Syndrome (LCI) at the University of Colorado Anschutz Medical Campus, the first center in the nation to comprehensively address basic research, clinical research, and clinical care under one umbrella.

A leading desire of the Sies is to undertake substantial research, in partnership with the LCI and in conjunction with the Biofrontiers Institute, at the Boulder campus. In recognition of the high caliber of research moving to the Caruthers Biotechnology Building, they have made a landmark commitment toward the building's construction and ensuing programmatic endeavors that will allow close collaboration with the LCI. A challenge gift from the Sies is matching funding from the state of Colorado and gifts from other donors to the building and program.



Anna and John Sie

In addition to the research neighborhoods, the Caruthers Biotechnology Building also offers shared spaces that allow building residents to gather and exchange information. Teaching spaces, meeting rooms, and a large café will bring students, faculty, and staff together regardless of their academic affiliation.

In 2010, **Jim and Patience Linfield** made a gift to name the colloquium room in the building. This special space will be a hub for faculty members to share research findings and brainstorm new efforts.

“My passion is to advance bioscience research that can help solve some of the significant unsolved problems in human health,” Jim said. “This is a great way to invest in the next generation of business and scientific leaders.”



Jim Linfield



Building a Research Community

The goal of this building is to create a culture of collaboration that spans disciplines and departments. To help generate community, the building is comprised of neighborhoods connected by “main street” hallways.

Rather than putting all labs from a single discipline in one wing, different labs and expertise are intermixed throughout the floors. A central café, as well as teaching areas of varied sizes, further promote “productive collisions” among scientists, engineers, students, and staff.

Support from ConocoPhillips

ConocoPhillips is supporting the Caruthers Biotechnology Building with a vision to bring together scientists and engineers to work toward solutions to energy challenges.



In 2011, the Houston-based energy firm announced a commitment of \$3.5 million toward an area of the building to be called the ConocoPhillips Center for Energy Innovation, which will house members of the Department of Chemical and Biological Engineering. The innovations that these funds will support include:

- More efficient biofuels production using novel microbial technologies
- Improved transfer of biomass into synthetic fuels
- Increased efficiency of the capture of carbon at energy plants using liquid membrane technology

This commitment will bring together select researchers from two research programs at CU-Boulder: the Colorado Center for Biorefining and Biofuels (C2B2) and the Renewable and Sustainable Energy Institute (RASEI). ConocoPhillips currently sponsors more than \$2 million in faculty research contracts at CU-Boulder for 2011 through 2013, and is a leadership council member of RASEI.



Outstanding Momentum

The University of Colorado Biofrontiers Institute, the Division of Biochemistry, the Department of Chemical and Biological Engineering, and the Caruthers Biotechnology Building are supported by forward-thinking investors dedicated to seeing scientists and engineers working collaboratively toward solutions that help us live longer, better, and more in harmony with our planet.

We could not have made the progress we have made already without our committed supporters. A full list is available at biofrontiers.colorado.edu/about/investors-1

Naming Opportunities

Because of the wide variety of work to be done in the Caruthers Biotechnology Building, there are ample opportunities to become a part of this great effort.

Naming opportunities for lab, teaching, and public spaces are still available. For an updated list of these spaces, please visit biofrontiers.colorado.edu/about/investors-1

Industry participation is also welcome, from partnering with our faculty to the use of our core facilities.



For additional information about the Caruthers Biotechnology Building, or to learn how you can make an impact on this exciting project, contact:

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“This is new to me, and this is new to the world. The people in this building span an incredible range of backgrounds and experiences. They are here to discover, to solve diverse problems, to educate the next generation of scientists, and to build a community.”

Tom Cech

Director, Biofrontiers Institute



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