

Exploration



Engineering Students Explore the World Through

*Research Programs • Recreational Activities • Intercultural Living
Service Projects • Internship Opportunities • Study Abroad*



COLLEGE OF ENGINEERING

**Colorado
State
University**

Developing New Computer Models to Preserve “the View from the Top”

The 1997 Kyoto Protocol altered Takanobu Yamaguchi's plans. As the Earth's climate system changed and scientists grappled with understanding what was driving that change, Tak's interest in the environment grew. No longer satisfied with a career in theoretical physics, Tak began exploring environmental fields. He thought that he could expand on his physics training to understand the Earth system and global changes in the weather, and whether we are causing some of those changes. A physics professor convinced him that atmospheric science was the advanced degree he was looking for.



Since joining Professor David Randall's research group, Tak has focused his interest on improving computer models of the planetary boundary-layer, as well as our understanding of the physical phenomena of stratocumulus clouds. Stratocumulus clouds are important for the Earth's energy budget because they are bright and reflect a large portion of the solar radiation, which is the primary source of the energy driving the atmospheric and oceanic circulations.

When he's not unraveling the puzzle of climate change, Tak is working on a different kind of puzzle as he negotiates uncharted territory in the national parks of Colorado, Utah, and Wyoming. “Whenever I have free time, I go to the gym or climb outdoors. There is a puzzle aspect to rock climbing that I like. You have to keep balanced as you reach for different rock holds, trying to get the balance correct, and you have to think each time where to put each hand and foot.”

And rock climbing gives Tak a chance to appreciate the environment that he is helping preserve through his global climate studies. “When I am climbing, I always feel that nature lets me climb. This feeling makes me think about the environment and want to treat the environment ethically. And the view from the top is very nice.”

Tak gets a view from the top at Moab, Utah.

Fort Collins Recreational Facts

Fort Collins has over 44 public parks, five public golf courses, three swimming pools, an ice skating center, a 60-mile recreational trail system, and over 3,600 acres of preserved open space/natural areas for hiking, climbing, camping, jogging, cycling, horseback riding, fishing, rafting, and kayaking. The 6.5-mile Horsetooth Reservoir, located minutes away in the foothills west of Fort Collins is popular for fishing, boating, and camping. Many popular ski areas lie within a two to four hour drive.

Altitude: 4,984 ft.

Fort Collins recreational accolades include:

- One of Ten New American Dream Towns, *Outside Magazine*, 2005
- “Bicycle Friendly Community” national award, League of American Bicyclists, 2005
- *Runner's World Magazine* 25 best running cities in America, 2005

On average Fort Collins experiences 300 days of sunshine per year, low humidity, and moderate winters. Check out the conditions from the atmospheric science webcam at www.atmos.colostate.edu/webcam/index.php

Atmospheric Science Student Facts

Number of undergraduate ATS students: 0
(there is no undergraduate program)

Number of ATS graduate students: 93

Home states represented in atmospheric science: 16

(In order of number: CO, MD, PA, CA, HI, KS, KY, MN, MO, NC, NE, OK, OR, TN, TX, WI)

Home countries represented: 8

(In order of number: United States, China, Italy, Canada, Costa Rica, Germany, Japan, United Kingdom)

Entering graduate students typically have a B.S. degree in atmospheric science, meteorology, physics, geophysics, mathematics, chemistry, engineering, or a related field.

Active academic and research programs are offered in the fields of dynamic meteorology; general circulation and climate modeling; tropical meteorology and tropical cyclones; mesoscale meteorology; cloud and precipitation physics; atmospheric electricity; cumulus convection and cloud dynamics; atmospheric chemistry and air quality; satellite meteorology; theoretical and dynamic meteorology; atmospheric radiation; remote sensing; radar meteorology; global, regional, and local climatology; land surface-atmosphere interactions and mountain meteorology.



Brazilian Graduate Student Immerses Herself in Culture and Research



Carla Lacerda's explorations have taken her from a small industrial town in Brazil, to language schools in England and France, and finally to the U.S. for her master's and doctoral degrees in chemical engineering.

Carla chose Professor Ken Reardon as her adviser because of his work in proteomics and its potential as a tool to improve biological waste treatment. Proteomics analysis provides

information about the function of an organism by examining changes in thousands of proteins simultaneously. When microorganisms are exposed to changing environmental conditions, such as the presence of pollutants, different proteins are expressed. Using proteomics, these proteins can be identified, yielding functional information about the community that in turn could facilitate improved design and control of environmental bioprocesses. Carla is one of the first in the world to demonstrate the potential of environmental proteomics and her work has already sparked several other projects.

After graduation, Carla intends to enter academic life again, only this time as a professor. Her international experience, U.S. education and teaching assistantship at Colorado State will have prepared her well to follow the path she has chosen.

In the meantime, Carla is taking advantage of all that CSU and Colorado have to offer. "One thing I like about this campus is the way apartment life works; they try to integrate all international students with special activities such as a night in each country. The Brazilian night was a total success! You learn so much about other people's cultures and it's fantastic! And I absolutely love Colorado and the size of Fort Collins; it's not too small, not too big. I like going downtown for the events like New West Fest, and going to Horsetooth Reservoir to relax and water ski."

Her advice to others who want to follow her path? "Learn as much as you can about the culture before you go and never stop learning once you are there. Communicate a lot; everything in life can be solved through communication."

In addition to her research work, Carla serves as a coordinator with the Intercultural Connections Community.



Intercultural Living and Learning Opportunities

The Engineering Academic Village is home to 240 engineering students and 180 honors students, but it is also home to Aaron Benally, director of the Women and Minorities in Engineering Program. Aaron lives in a faculty/staff house located on the first floor.

Braiden Hall, a suite style residence hall, houses the Global Village, home to domestic and international students who share an interest in world relations and building bridges of understanding between cultures. It's a fit for students interested in study abroad or in adding an international component to their lives. Many students from International Baccalaureate programs find the Global Village to be a desirable housing option.

The Intercultural Connections Community, in the university apartments system, is for undergraduate students interested in an international living experience. Residents represent varied national origins, races, ages, religions, sexual orientations, and abilities.

International House apartments is home to 200 students either 23-years-old or older or graduate students. 50% of the residents are international students from over 60 countries.

The Fort Collins International Center is a non-profit community organization devoted to promoting and improving international understanding, exchange, and friendship.

The center provides many activities and trips.

Chemical and Biological Engineering Student Facts

Number of undergraduate chemical and biological engineering students: 154

Number of chemical and biological engineering graduate students: 23

Number of transfer students entering last year: 7
Home states represented in chemical and biological engineering: 16

(In order of number: CO, AK, TX, NE, WI, AL, FL, IA, ID, ND, NM, NV, OH, UT, WA, WY)

Home countries represented: 11

(in order of number: United States, Saudi Arabia, China, India, Qatar, Taiwan, Brazil, Germany, Iran, Malaysia, Venezuela)

Entering undergraduates in the top 10% of their high school class: 33% Top quarter: 64%

Mean test scores of entering freshmen
ACT: 26.9 SAT: 1145

Number of American Institute of Chemical Engineers (AIChE) student chapter members at Colorado State: 25

Engineering on a Global Scale: EWB Has Worldwide Impact

“Every time I turn on the faucet I cannot help but remember that an extremely large number of people throughout the world do not have this luxury,” says Eric Hettler, civil engineering senior and president of CSU’s Engineers Without Borders (EWB) chapter.

When asked to comment about memorable EWB experiences, Eric recalls his first visit to La Laguneta and El Chile, El Salvadore. Each team member is encouraged to complete a task typically performed by women and children in the community. This was to carry a 55 pound container of water up a hill that rises vertically 120 feet at a 10 percent grade. While struggling to make the ascent with the container, a boy about 12 years old passed him easily with the same heavy jug. It was obvious that this child made many daily trips up and down that hill to gather water for his family. This experience gave Eric a strong appreciation for the time and effort required by these people just to have water to eat, clean, cook, and bathe.

Eric learned about Engineers Without Borders while he was a freshman. Impressed with the international development work being done by engineering students only a few years older than him, he became a member during his sophomore year.

Eric and other EWB members traveled to La Laguneta and El Chile to survey the topography of the communities in order to design future pipelines. They tested existing wells to determine the properties of the underground aquifer, and helped the community install an electric pump for one well. They also helped to design a concrete roof for an existing water tank, and helped the community research and understand the need for a chlorination system to treat their drinking water.

Eric says, “My fondest memory from La Laguneta and El Chile is the genuine kindness of the community. While we were investigating properties of the groundwater, we disrupted their daily water gathering. Although this was a huge inconvenience, they all remained incredibly grateful for the

work we were doing. The EWB trips provide a unique, authentic way to experience the people and places of a foreign country.”

CSU Students in El Salvadore, with Eric Hettler, second from the left.



Engineers Without Borders Facts

Number of EWB-CSU chapter members: 50-60
Countries where current projects are or have been located: India, Tanzania, Nepal, and two in El Salvador
Estimated number of people EWB-CSU current projects have affected: 15,000
Organizations/companies the chapter has collaborated with on projects: Peace Corps, Village Earth, St. Paul Partners, Rotary Clubs (local and international), and governmental and non-governmental organizations in the countries
Faculty advisers: Brian Bledsoe and Tom Sanders (civil engineering), Bill Sanford (natural resources), Bryan Willson (mechanical engineering)
Professional advisers: Fred Marinelli (Telesto Solutions, Inc.), Dan Hart (NRCE, Natural Resources, Consulting Engineers, Inc.), Keith Thompson (Tetra Tech), Gary Sammonds (Cornice Inc.), Dave Stewart (Stewart Environmental Consultants, Inc.), Curt Palin (Earth Environmental Services, Inc.)
Frequent flyer miles donated to the EWB-CSU chapter by alumni and friends: 24,000
Web address: www.engr.colostate.edu/ewb/

Civil and Environmental Engineering Student Facts

Number of undergraduate
civil engineering students: 312
environmental engineering students: 63
Number of civil engineering graduate students: 185
Number of transfer students entering last year: 17
Home states represented in civil and environmental engineering: 42
(In order of number: CO, AK, IL, TX, CA, WY, NV, HI, KS, MI, NE, PA, AZ, GA, MA, ME, AR, CT, DC, FL, IA, ID, MN, MO, MS, MT, NC, ND, NH, NJ, NM, OH, OK, OR, SC, SD, TN, UT, VA, VT, WA, WI)
Home countries represented: 25
(In order of number: United States, South Korea, China, India, Indonesia, Saudi Arabia, Brazil, Japan, Taiwan, Turkey, Colombia, Italy, Kuwait, Thailand, Vietnam, Argentina, Chile, France, Gaza Strip, Iran, Mexico, Nigeria, Russia, Venezuela, West Bank)
Entering undergraduates in the top 10% of their high school class: 35% Top quarter: 68%
Mean test scores of entering freshmen
ACT: 25.6 SAT: 1195
American Society of Civil Engineers (ASCE) student chapter members at Colorado State: 160

An International Twist to Internships: Senior Spends Summer in Germany

Connecting culturally and scientifically with people from different backgrounds and regions of the world, junior Ellen Zwickl, an engineering science student and triple major, will be interning among the international scientific community this summer in Duisburg, Germany.



Ellen in front of Deutsch Hauptbahnhof train station in Hanover.

Inspired by a study abroad experience in Hanover in the summer of 2004, Ellen returned to CSU not only an engineering student, but also a European studies and German language student. This summer, Ellen will be expanding her skills even further through an internship at the Institute for Combustion and Gas Dynamics at the University of Duisburg-Essen. Working alongside a Ph.D. student, Ellen will support research on measuring velocities and temperatures in boundary layer flows using laser-induced fluorescence. Ellen chose the internship not only due to her interest in the subject,

but as a means of improving her communication and German language skills.

Noting the advantages of an international internship, Ellen emphasizes, "Not only will I experience the history of churches and other historical monuments, but I will also be able to experience Germany's modern scientific community, and I think that it will be really interesting to see what advancements they have made compared to how we do things in America."

Combining her German, international studies and engineering backgrounds, Ellen intends to work and travel abroad for several years after college. Eventually she hopes to pursue a career in astronautics, serving as a mission analyst for NASA and working far beyond the confines of America, even the atmosphere. With internship opportunities this summer in Germany combined with her astronaut aspirations, Ellen Zwickl will undoubtedly make her mark on this planet, or the next!

Ellen is a member of CSU women's Ultimate Frisbee team, Hell's Belles.



Engineering Internship Facts

- Percentage of 2007 graduating engineering students completing engineering internships (that we know of): 60%
- Sampling of internship placements for summer 2007: Amgen, Accenture, Boeing, CH2M Hill, Hewlett-Packard, Hensel Phelps Construction Co., High Country Engineering, Inc., INTEL, John Deere, Kiewit Corporation, Lockheed Martin, Northrup Grumman, PBS&J, Parsons Brinkerhoff, Raytheon, Riverside Technologies, SA Miro, Terracon, Tetra Tech RMC, Wolf Robotics, Woodward Governor, U.S. Bureau of Reclamation, United Launch Alliance
- Number of engineering internship listings posted last academic year: 642
- Number of engineering companies attending career fairs at CSU that will consider placing students in internships: over 130



"Internships are vital for a complete engineering education. They allow you to witness how theory from the classroom is applied to a variety of situations. Internships also offer a smoother transition from academia to the working environment, reducing the learning curve. It also helps confirm that what you are studying is what you want to do."

Roberto Suarez (interned at Bechtel SAIC, Las Vegas)

Engineering Science Student Facts

- Five engineering science concentrations: engineering physics, international engineering and international studies, space engineering, teacher education, and the dual degree program in engineering and the liberal arts.
- Number of undergraduate engineering science students: 72
- Number of engineering science graduate students: 0 (there is no graduate program)
- Number of transfer students entering last year: 9
- Home states represented in engineering science: 10 (in order of number: CO, WA, KS, LA, MN, MT, NM, NV, TX, VA)
- Home countries represented: 3 (In order of number: United States, Kuwait, Thailand)
- Entering undergraduates in the top 10% of their high school class: 25% Top quarter: 56%
- Mean test scores of entering freshmen: ACT: 27.1 SAT: 1282

ECE Student Explores Light in an Optics Lab and from a Mountaintop

Engineering and a passion for light and physics have brought Klaus Hartinger, electrical and computer engineering doctoral student, not only to CSU but to America. As Assistant Professor Randy Bartels' first graduate student, Klaus is excelling both in and out of the classroom. Originally from a small village in Germany, Klaus is representative of a new wave of global engineers seeking international education and research opportunities worldwide. Through his research in ultrafast optics, involvement with the International House, and membership in the Fort Collins International Center, Klaus has not only shed light on the molecules he aims to control, but also the international community at Colorado State.

Klaus works in Colorado State's Laboratory for Ultrafast and Nonlinear Optics, where his research concentrates on the generation and control of short laser pulses and their use for the control of quantum dynamics – to precisely control the positions of atoms in molecules. For example, Bartels' research group is using this newly perfected control over matter to develop new technology to make optical clocks 10,000 times more precise than standard atomic clocks, to develop new molecular-specific imaging techniques that could be harnessed to study molecular function in cells in fundamentally new ways, and to drive chemical reactions with specially

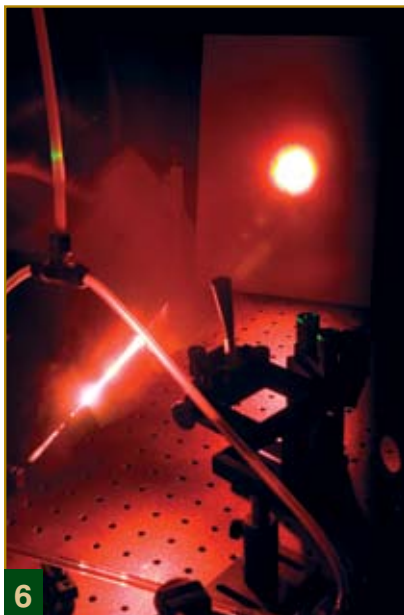


Klaus snowboarding at Vail.

shaped light pulses that enable the synthesis of chemical compounds not possible by any other techniques.

After completing his Ph.D., Klaus hopes to utilize his experience in working with lasers to combine other disciplines like biology and chemistry with ultrafast optics.

Klaus has integrated effortlessly into American culture and graduate life, partaking in snowboarding trips to Breckenridge, hiking and backpacking much of the state, and exploring many of the West's beautiful national parks. And during the week, Klaus helps other students in his group work with the laser equipment while simultaneously realizing his own leading-edge research.



Engineering Research Facts

2006-2007 research expenditures: \$52,784,082

2006-2007 average research expenditures per faculty member: \$549,834

Space devoted to engineering research in square feet: 791,545

Centers, institutes, and special research units: 105

CSU Programs of Research and Scholarly Excellence resident in the College of Engineering: the Department of Atmospheric Science, the Center for Extreme Ultraviolet Science and Technology, the Engines and Energy Conversion Laboratory, and the Environmental and Water Resource Engineering Program

CSU's National Science Foundation

Engineering Research Centers: Center for Extreme Ultraviolet Science and Technology and Center for Collaborative Adaptive Sensing of the Atmosphere; plus we lead the NSF Science and Technology Center for Multi-Scale Modeling of Atmospheric Processes

Mission of the College of Engineering: to engineer global solutions that contribute to the quality of life by educating for tomorrow's needs, advancing society, generating and applying new knowledge, and stimulating economic development

Electrical and Computer Engineering Student Facts

Number of undergraduate electrical and computer engineering students: 257

Number of electrical engineering graduate students: 103

Number of transfer students entering last year: 18

Home states represented in electrical and computer engineering: 22

(In order of number: CO, TX, CA, NM, AK, HI, IL, CT, MA, WY, FL, MN, NE, NH, NV, NY, OH, OK, PR, SD, WA, WI)

Home countries represented: 29

(In order of number: United States, Saudi Arabia, India, China, Qatar, United Arab Emirates, Malaysia, Argentina, Bangladesh, Brazil, Canada, Costa Rica, France, Germany, Indonesia, Iran, Ireland, Jordan, Kuwait, Mongolia, Peru, Poland, Russia, Sri Lanka, South Korea, Sweden, Thailand, Ukraine, Vietnam)

Entering undergraduates in the top 10% of their high school class: 18% Top quarter: 47%

Mean test scores of entering freshmen

ACT: 26.6 SAT: 1188

Number of Institute of Electrical and Electronics Engineers (IEEE) student chapter members at Colorado State: 85

Immersion in Eastern European Cultures: A Training Ground for Biomedical Engineering

“I can’t remember if I saw it or smelled it first, but up over the hill came the shabbiest, dirtiest, loudest, and smokiest green behemoth I have ever seen. My first reaction was to point and laugh at the dilapidated bus, but that smile quickly turned to a frown when the bus slowed down and pulled up in front of Platform



25. Disheartened, but slightly amused, we boarded our valiant steed and began lurching towards Cesky Krumlov,” sophomore mechanical engineering student Daniel Wilson recounts of one of many adventures since his arrival in the Czech Republic in January. Studying abroad at Charles University in Prague, Daniel has been able to experience many new countries and cultures on a weekend whim.

From the gardens of Gregor Mendel to Krakow’s abandoned Jewish quarter, Daniel has immersed himself in Eastern Europe and its people, not to mention its goulash! Since arriving in Prague, Daniel’s perceptions of Eastern Europe and life itself have all been “pulled, stretched, kneaded, and tossed about by the great hands of a new culture” much like, as he notes, the bread the Czech Republic is so famous for. In reflection upon his trip to date, Daniel concludes, “Although I cannot clearly see how I will be changed, I know that the person who returns to Colorado in August will not be the same as the one who left in January.”

Upon returning to the States after a semester of study and a summer of travel, Daniel hopes to finish his engineering degree and begin his graduate studies focusing on human orthopedics. With great communication and people skills, undoubtedly enhanced by a semester overseas, Daniel



hopes to find himself in a fun and engaging engineering position, ideally owning his own consulting firm in the future.

Daniel at Valley of the Swords in Cappadocia, Turkey.

Study Abroad Facts

Countries where engineering students studied last year: Argentina, Australia, Chile, Czech Republic, Germany, Hungary, Japan, Spain, United Kingdom

Typical duration of program: one semester during sophomore or junior year

Study abroad programs coordinated at CSU: Argentina, Australia, Belgium, Brazil, Canada, Caribbean, Chile, China, Costa Rica, Czech Republic, Dominican Republic, France, Germany, Ghana, Hungary, India, Ireland, Italy, Japan, Jordan, Korea, Mexico, Netherlands, New Zealand, Poland, Russia, Senegal, South Africa, Spain, Taiwan, Thailand, Turkey, United Kingdom, Vietnam, plus students may participate in programs run by other institutions



“My study abroad experience gave me the confidence to adapt to learning in a different educational system with different methods of teaching and learning. I not only continued my engineering curriculum, taking engineering and math courses, but I learned a tremendous amount about the culture and myself. “

Liz Kidner (studied at Queensland University of Technology, Brisbane, Australia)

Mechanical Engineering Student Facts

Number of undergraduate mechanical engineering students: 574

Number of graduate students: 117

Number of transfer students entering last year: 14

Home states represented in mechanical engineering: 35

(in order of number: CO, CA, NM, TX, OR, ID, IL, SD, HI, NV, KS, NE, NH, OH, AK, LA, MA, MN, MO, OK, UT, WA, WY, CT, FL, MD, ME, MI, MT, NC, ND, NY, TN, VA, WI)

Home countries represented: 15

(In order of number: United States, Saudi Arabia, India, China, Nepal, Qatar, Thailand, United Arab Emirates, Japan, Mexico, Mozambique, Oman, Romania, Taiwan, Turkey)

Entering undergraduates in the top 10% of their high school class: 20% Top quarter: 61%

Mean test scores of entering freshmen

ACT: 26 SAT: 1177

Number of American Society of Mechanical Engineers (ASME) student chapter members at Colorado State: 115



Join Us . . .

for *Engineering Exploration Days* (held each October and February) to learn more about our undergraduate programs or *Engineering Graduate Student Visit Day* (held in March) to learn more about graduate studies at Colorado State.
Call (970) 491-6220 for more details.

**Colorado
State
University**

COLLEGE OF ENGINEERING
1301 Campus Delivery
Fort Collins, Colorado 80523-1301