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 23-mile recreational trail system, and over 3500 acres of preserved open space/natural areas for hiking, climbing, camping, jogging, cycling, horseback riding, fishing, rafting, and kayaking. Many popular ski areas lie within a two to four hour drive.

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.php.

Atmospheric Science

Student Facts

Number of undergraduate ATS students: 0 (there is no undergraduate program)
Number of ATS graduate students: 94
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: 10
- (In order of number: United States, China, Germany, Japan, Australia, Brazil, Canada, Costa Rica, Italy, 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.
Intercultural Living and Learning Opportunities

Braiden Hall, a suite style residence hall, houses the Global Village, home to both domestic and international students from diverse backgrounds who share an interest in world relations and building bridges of understanding between cultures. It is perfect for students interested in studying abroad or in adding an international component to their studies. Many students from International Baccalaureate programs find the Global Village to be the next step in their journey.

The Intercultural Connections Community, in the university apartments system, is for students aged 23 and younger 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: 104
Number of chemical and biological engineering graduate students: 21
Number of transfer students entering last year: 2
Home states represented in chemical and biological engineering: 16
(Phal order of number: CO, AK, TX, NE, WI, AL, FL, IA, ID, ND, NM, NV, OH, UT, WA, WY)
Home countries represented: 8
(in order of number: United States, Saudi Arabia, Taiwan, Brazil, India, Kenya, Mexico, Thailand)
Undergraduates in the top 10% of their high school class: 39%
Top quarter: 78%
Mean test scores of entering freshmen
ACT: 28.1 SAT: 1229
Number of American Institute of Chemical Engineers (AICHe) student chapter members at Colorado State: 15

Chemical & Biological Engineering

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.”
Civil & Environmental Engineering

Engineers Without Borders Facts

Number of EWB-CSU chapter members: 50-60
Countries where current projects are located: India, Tanzania, Nepal, and two in El Salvador
Estimated number of people EWB-CSU current projects will affect: 15,000
Organizations/companies the chapter is working 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: 322
environmental engineering students: 55
Number of civil and environmental engineering graduate students: 192
Number of transfer students entering last year: 22
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: 27
(In order of number: United States, South Korea, India, China, Colombia, Kuwait, Indonesia, Taiwan, Brazil, Japan, Mexico, Saudi Arabia, Thailand, Turkey, Vietnam, Argentina, Canada, Chile, Egypt, Germany, Italy, Jordan, Morocco, Nigeria, West Bank, Spain, Sweden)
Undergraduates in the top 10% of their high school class: 34% Top quarter: 63%
Mean test scores of entering freshmen ACT: 26.2 SAT: 1188
American Society of Civil Engineers (ASCE) student chapter members at CSU: 160

Engineering on a Global Scale: EWB Has Worldwide Impact

“Engineers Without Borders is not about laying the pipe in the ground, but seeing the smile on the child’s face as he watches the water flow through the pipe.” Thus, graduate student Gabriel Miller recounts a fellow volunteer’s observation of the profound impacts this growing program is having on the citizens of developing countries, and on the volunteers working with them. Gabe, a student of civil engineering and now president of CSU’s Engineers Without Borders (EWB) chapter, has played a vital, hands-on role in the implementation of EWB’s first project in El Salvador. El Salvadorian families live on a mere 5-10 gallons of water per day, in comparison to families in Fort Collins that utilize upwards of 125 gallons. EWB plans to access a local aquifer with a number of drilled wells to address extreme water shortage and water quality issues in the area.

Although challenges are inherent to any project, Gabe emphasizes, “It is facing these challenges and hurdles that make our projects exciting and interesting.” Not only in the villages themselves, but here at Colorado State, Gabe daily faces challenges securing funding for projects and generating support from faculty, staff, and professionals, as well as finding the time as a full-time student to run such a large organization.

With great challenges come great rewards, not only for the people touched by EWB but also for the volunteers themselves. In lieu of his experience, Gabe emphasizes, “Participating in international engineering projects has deeply broadened my perspective on life and left me with a passion for trying to help people in developing countries who are living without basic necessities. It’s wonderful to know that, as a student, you can really make a difference in people’s lives and put your engineering knowledge to practical use.”

Basket making in Purulia, India

CSU Students and villagers carrying water in El Chile, El Salvador. Gabe Miller is pictured at front right.

Basket making in Purulia, India
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.

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 in front of Deutsch Hauptbahnhof train station in Hanover

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

Engineering Internship Facts

- Percentage of CSU 2005 graduating engineering students completing engineering internships (that we know of): 55%
- Sampling of companies where engineering students will hold internships in summer 2006:
  - Amgen, Accenture, Hewlett-Packard, Hach Company, Hensel Phelps Construction Co.,
- Number of engineering internship listings posted in the last ten months: 218
- 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 provide the experience of witnessing 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 is also important to make sure that what you are studying is what you want to do.”

Roberto Suarez (interned at Bechtel SAIC Company in Las Vegas the last three summers)

Engineering Science Student Facts

- Number of undergraduate engineering science students: 66
- Number of engineering science graduate students: 0 (there is no graduate program)
- Number of transfer students entering last year: 18
- Home states represented in engineering science: 10
  - (in order of number: CO, WA, KS, LA, MN, MT, NM, NV, TX, VA)
- Home countries represented: 6
  - (in order of number: United States, Australia, Japan, Kuwait, United Arab Emirates, Trinidad and Tobago)
- Undergraduates in the top 10% of their high school class: 31%
  - Top quarter: 62%
- Mean test scores of entering freshmen
  - ACT: 26.3
  - SAT: 1247
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 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.
Immersion in Eastern European Cultures: A Training Ground for Biomedical Engineer

“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.

“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: 526
Number of graduate students: 94
Number of transfer students entering last year: 20
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: 10
(In order of number: United states, India, Saudi Arabia, United Arab Emirates, China, Mexico, Oman, Nepal, Romania, Thailand)
Undergraduates in the top 10% of their high school class: 19% Top quarter: 52%
Mean test scores of entering freshmen
ACT: 25.8 SAT: 1183
Number of American Society of Mechanical Engineers (ASME) student chapter members at Colorado State: 90

Study Abroad Facts

Countries where engineering students studied last year: Australia, Chile, Czech Republic, Germany, Hungary, Ireland, Italy, Japan, Mexico, New Zealand, Semester at Sea, Spain
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

“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)
Our students do incredible work in and out of the classroom. We are very proud of the quality of our programs and the accomplishments of our students, faculty, staff, and alumni. In these pages, we have assembled a few stories about our undergraduate and graduate students as well as data from 2005-2006 regarding our departments and opportunities available to students.

The College of Engineering has made international programs a priority. We are expanding opportunities and experiences for our students and faculty to better prepare our graduates to work internationally and to conduct research with global impact that will affect global quality-of-life issues.

We believe that the excellence of the engineering education at Colorado State is reflected in the accomplishments and interests of its students. I hope you will enjoy reading just a few of our stories.

Sandra Woods

High school students, their parents and community members can explore engineering majors and careers at Engineering Exploration Days on October 14, 2006, and February 10, 2007. If you or someone you know would like to learn more about engineering at Colorado State, call (970) 491-6220 for program information.