

# Barth Named CE-CERT Director



Barth

*Has Served as Interim Director for Three Years while leading Transportation Systems Research Group*

Matt Barth has been selected as CE-CERT's permanent Director. Reza Abbaschian, Dean of the Bourns College of Engineering, confirmed the appointment of Barth, who has been the Center's Interim Director for the past three years.

Barth, a Professor of Electrical Engineering at UC, Riverside, has been manager of CE-CERT's Transportation Systems and Vehicle Technology Research Laboratory

***For Dr. Barth's talk on his vision for the Center's future, see Page 3.***

since 1991. He took over as Interim Director after CE-CERT Founding Director Joseph Norbeck moved to initiate the campus' Environmental Research Institute in 2004.

"I'm grateful for the confidence the Dean has shown in me and in the direction and goals of CE-CERT. The research record the Center's people have built over the past 15 years in transportation systems, emissions, renewable fuels and understanding atmospheric processes speaks for itself. The Dean's and the University's commitment recognizes that level of excellence and demonstrates a commitment to the Center's future," said Barth.

Barth's research focuses on applying engineering systems concepts and automation technologies to transportation systems. With transportation growth and its negative environmental impacts rising in international importance, his research aims to make transportation more efficient, intelligent and environmentally friendly. His recent projects include an intelligent shared electric vehicle system for the UCR campus; characterizing the impacts

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## Center Funding Tops \$6m

Fiscal 2006-07 doubles year-earlier figure

Led by a \$1.5 million grant from the W.M. Keck Foundation, CE-CERT rang up over \$6.4 million in contracts and grants funding during fiscal 2006-07.

The amount was roughly twice the \$3.2 million raised in fiscal 2005-06. Totals fluctuate a great deal because commitments of staff and laboratory time from previous years' projects may inhibit accepting new projects.

The Keck grant paid for a new generation of instrumentation for CE-CERT's Atmospheric Processes Laboratory, which gave the lab unparalleled capacity to study the formation of ozone and particulate matter at real-world concentration

levels. Earlier generations of laboratories must use artificially high concentrations to get results and then must extrapolate their results back to real-world levels.

The second largest funding came to CE-CERT's Sustainable Energy Systems group, with funding from Viresco, Inc. for the group's process to convert carbonaceous feedstocks into sulphur-free diesel fuel. Viresco's funding totaled over \$1.4 million.

Other major funding came from the California Air Resources Board, the National Paint & Coatings Association and the federal and California Environmental Protection Agencies.

# News

## DARPA's Urban Challenge, and CE-CERT, Make TV



*Cameramen from Los Angeles television stations focus on the DotMobile-CE-CERT entry in the Defense Advanced Projects Research Agency's Urban Challenge. DARPA is trying to develop autonomous vehicles that can be used on military missions where the danger to humans is high.*

## Visitors from Tohoku U., and elsewhere

CE-CERT hosted visiting delegations from Tohoku University and COFCO (See p. 6) as well as holding its first Open House.

The Tohoku professors came after participating in a sister city program earlier this year. Tohoku is located in Sendai, Japan, which is Riverside's sister city. Tohoku is a research university focused on many of the same environmental issues as UC, Riverside and CE-CERT.

The Open House brought visitors from the California Department of Transportation and regional transportation planning agencies to the Center for research presentations and a tour.

## Grants and Contracts 2nd Quarter, 2007

Research grants and contracts totaled \$1,541,571 in the second quarter. The main contributor was the Sustainable Energy System's project for a pilot-scale plant for its process for converting carbonaceous materials into diesel fuel. The produced \$688,587 in two contracts for the design and engineering of the pilot-scale plant. The work is being led by Professors Joe Norbeck and Chan Seung Park

Dr. David Cocker of the Atmospheric Processes Group won a \$249,343 contract from the California Air Resources Board to update its inventory of solvent cleaning emissions and Dr. Charles Wyman, also of the Sustainable Energy Systems, earned a \$160,000 contract to continue his research on converting biomass to ethanol.

The second quarter figures brought the total for the first half of 2007 to \$1.88 million and finished a 2006-07 fiscal year in which contracts totaled over \$6 million. (See story, page 1).

## Freshman wins Research Award

Evan Davis, a freshman in CE-CERT's Research Advancement Program (RAP), won first place in his section at UCR's First Annual Symposium for Undergraduate Research, Scholarship and Creative Activity.

Davis, who plans to major in environmental engineering, is a student of CE-CERT Director Matt Barth. His talk was on "Real-World Hybrid Electric Vehicle Energy Efficiency Analysis."

Davis noted that the environmental and energy-efficiency benefits of hybrid vehicles are highly dependent on driving behavior. Davis' research found that real-world driving patterns produced lower than expected vehicle fuel economy ratings compared to those from federal methods because Southern California drive faster and more aggressively than the parameters of the federal test methods.

Earlier, this year, Davis won CE-CERT's Jim Guthrie Research Award.





# A Vision for CE-CERT's Future



Dr. Matthew Barth with some of the electric vehicles used in his research.

*As noted on our front page, Dr. Matthew Barth was confirmed as CE-CERT's permanent director recently. As part of the search process, he outlined his vision for CE-CERT's future, a vision presented here.*

By MATTHEW BARTH

Before I start with my vision of CE-CERT's future, I'd like to lay the foundation by reminding us all of the Center's past.

The Center was started 15 years ago by the then-dean of the College of Engineering – Susan Hackwood. Susan wanted to enrich UCR's program of undergraduate environmental engineering education by coupling it with a strong program of environmental engineering research. Susan, and early supporters such as Georgia Elliott, Jim Guthrie, Tom Mullen, and Alan Lloyd, helped recruit Joe Norbeck as the founding director.

Under Joe's leadership, the Center grew dramatically – from four people to over 100 in 7 years – with a central research theme of emissions and air qual-

ity. In general, this was done by hiring undergraduate students and engineers rather than faculty members and graduate students. This is what I call our "Growth Phase". During this phase, we focused on doing a variety of new projects and establishing ourselves. There wasn't a strong emphasis on academic publications.

From about 2000, we entered into our current period – which we might term the "Stabilization Phase".

The research theme was broadened to include all kinds of air-related environmental analysis under one roof, whether it was emissions measurement, traffic network simulation or atmospheric modeling. The hiring emphasis moved to graduate students and post docs rather than engineers and there was a much greater emphasis on academic publications. Because of the record created during CE-CERT's first phase, approximately 50% of our new projects were granted based on the Center's reputation. And, with the addition of faculty, independent research groups began to emerge.

We now have five Academic Senate faculty members, nine research and adjunct faculty members,



*“Several of CE-CERT’s groups have much to offer in examining the causes and cures of global climate change”*

and two cooperating faculty members. Currently, we are hosting four visiting professors/researchers and a similar number of postdoctoral scholars. We have 27 graduate students and 32 undergraduates working with us. During the past year, six Ph.D.s and four M.S. degrees were awarded to our students. The number of publications in peer-reviewed journals has hovered between 50 and 60 in recent years, two to three times what it was in 2000.

CE-CERT’s research support staff – development engineers, technicians and staff research associates – numbers 25 and another nine people serve on our administrative staff.

Our research dollar volume has grown steadily for the last three years, hitting \$5 million last year, while the number of contracts has dropped, indicating the higher dollar value of the contracts we’re winning. With the \$1.5 million grant we received from the Keck Foundation in 2006 to improve the instrumentation in the Atmospheric Processes Laboratory, foundation money made up 29% of our budget for that year. But our general pattern has been that federal, state and local, and private-sector sources each provide about a third of our research funding.

We have five active research groups:

**Emissions and Fuels Research**, our largest, works on measuring and characterizing emissions from both mobile and stationary sources, with an emphasis on measuring in real-world conditions rather than in laboratories. The group has become the leading center for research on pollution from seaports.

**Transportation Systems Research**, my own personal research area, works on intelligent transportation systems such as shared vehicles, autonomous vehicles, vehicle sensing and guidance, activity analysis and

integrated emissions modeling, all environmental impact of these tech

**Atmospheric Processes** uses our Atmospheric Processes Laboratory to study the formation of aerosols in the atmosphere as well as tracking dust thrown up by roads and doing other air sampling and monitoring.

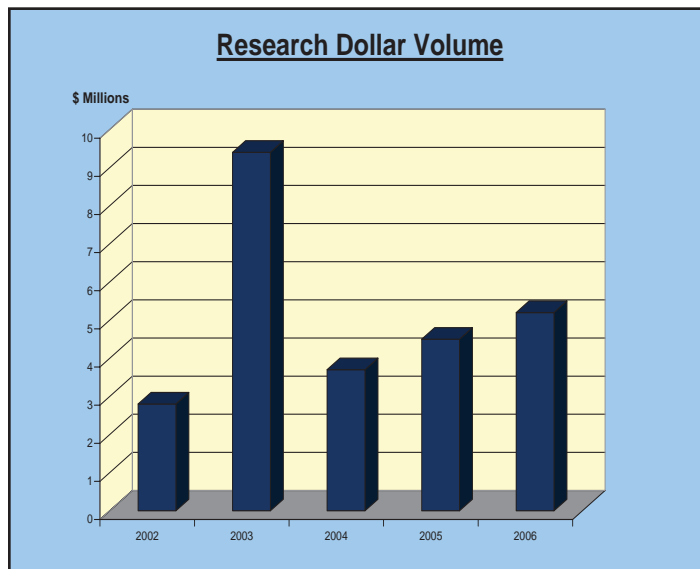
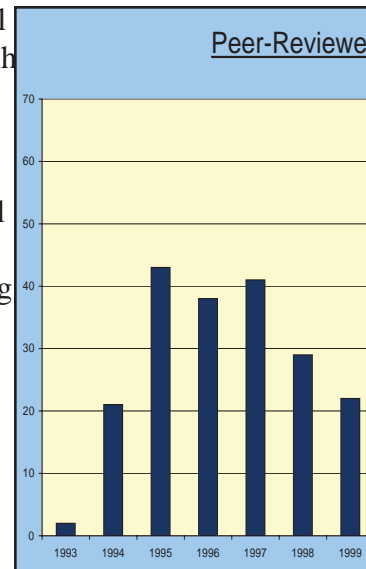
**Sustainable Energy Systems** is pursuing the improvement of two different technologies. One is to make sulfur-free diesel fuel from coal, wood waste, trash or any other carbonaceous material. The other is to make ethanol from cellulosic sources such as agricultural waste or low-value plants.

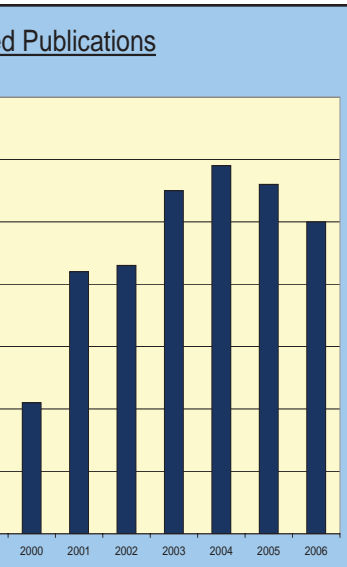
**Environmental Modeling** maintains research efforts to measure and simulate how pollution is dispersed across large geographic areas.

At the moment, we are in the initial stages of five new initiatives:

1--The designation of our Atmospheric Processes Laboratory as a national research facility, which would provide a budgetary floor for upgrades, maintenance and management while opening the chamber to national scholars. The lab would focus on issues relating to particulate matter, ozone and atmospheric transformations, modeling and monitoring, significantly reducing the unknowns in this area of science.

2--The expansion of our pioneering work on the pollution effects of ports into a program to measure the air-quality impacts of international trade. Both





Initiatives should lead to improved regulatory decision making, increased awareness of air quality effects on the natural world and better international cooperation between industry, academia and regulators.

3--Gaining Institute of Transportation Studies status within the University of California system. This initiative will integrate our research more closely with the other UC partners and allow our students to participate in transportation research on other UC campuses. It should also provide better opportunities to work with the California Department

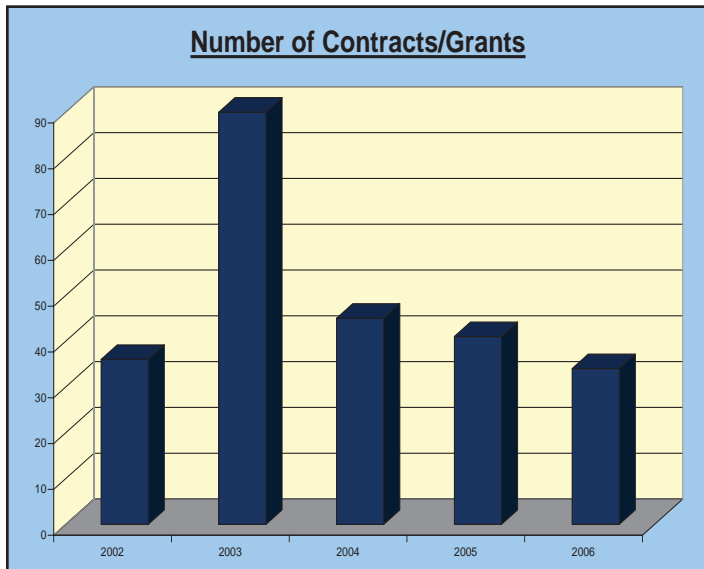
of Transportation.

4--Broadening our Sustainable Energy Systems Group into other potential technologies.

5--Expanding our Environmental Modeling Group work into a global climate-change research program. Recent efforts around the world, and especially within California, point to how important a research area this will be in coming decades. The UC system is putting together several multi-million dollar research proposals and UCR – and especially CE-CERT – will be part of this.

Several of CE-CERT’s groups have much to offer in examining the causes and cures of global climate change:

- Transportation accounts for a third of greenhouse gases and the Sustainable Energy Systems Group’s



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ethanol work promises a carbon-neutral fuel source.

- The Emissions and Fuels Group can quantify the emissions effects of different alternative fuels and vehicle technologies.
- The Transportation Systems Group is developing several methods of making current vehicles and transportation systems more efficient and using real-world testing and unique transportation and modeling tools to measure the efficiency gains.
- The Atmospheric Processes Group offers the promise of understanding what role particles play in atmospheric warming.

Five years from now, I can see a number of areas in which CE-CERT researchers will play a key role.

- Cellulosic ethanol and synthetic diesel fuel will remain key areas and we will move into how these fuels can aid in carbon sequestration, an area where we will need faculty.
- CE-CERT will be the “go-to” institution for quantifying greenhouse gas and pollutant emissions for mobile sources. The research will cover various fuels, engines, control technologies and transportation systems.
- New vehicle technology research will expand into plug-in hybrids, another area where faculty are needed. There should also be opportunities with the College of Engineering’s new emphasis on materials science.
- The improvements in the Atmospheric Processes Laboratory will lead to greater cooperation with national laboratories and other research institutions, and lead to great potential in “geo-engineering” experimentation to deal with solutions to global climate change.

To reach this potential, CE-CERT faces several institutional challenges – personnel, location, facilities, marketing and financial structure.

**Personnel** – We need to continue to hire academic and research faculty in the areas identified as possessing the greatest potential, while replacing retiring researchers. We need to have the funds to motivate our researchers to provide “service” tasks, such as managing groups and serving on committees, and to participate more in the defining the growth path of the Center. We need to make our technical support staff more flexible, to enable us to move them around projects as funding waxes and wanes.

**Location** – Too often, the message that CE-CERT wants to be part of campus gets lost. We need to minimize the headaches of getting back and forth to campus, 2.5 miles away. Unfortunately, our shared vehicle system’s support is going away and needs to be either funded or replaced by a shuttle or some other mechanism. Alternatively, it might make sense to have a CE-CERT office on campus (in addition to our current facilities). This is important because we need to increase collaboration with other campus research programs through open houses, workshops or possible financial incentives.

**Facilities** – We need to stabilize how we pay for

our facilities costs. The separate rate we have as an off-campus facility can raise the costs we must charge our customers, and gives a false incentive to researchers working with the on-campus rate.

**Marketing** – We need to do a better job of informing potential research funding sources about our skills, facilities and track record. We have improved our printed materials in the past year, but the website needs work and we need to attract more contributors to our Corporate Partners program. Funds to employ marketing staff would be a great help.

**Financial Structure** – CE-CERT’s debts remain substantial. I am hopeful that current discussions with Dean Abbaschian and the UCR administration will bring some relief. Too often, our endowment funds that ought to be used to bring in researchers in promising areas, pay for travel to conferences, do marketing and fund students, are instead used to pay the rent.

We need to make CE-CERT an “on-campus” facility, paying “on-campus” overhead rates, and in the interim, we need some bridge mechanism. We need the College’s help to get CE-CERT’s rented facilities donated to the University and to pursue naming opportunities for our current buildings. We need their help to augment the endowment. We need to market

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## 2007-08 Scholarship Winners Announced

Five CE-CERT students won scholarships for the 2007-2008 academic year.

Evan Davis was named winner of the 2007 Jim Guthrie Research Award in recognition of his work on “Real-World Hybrid Electric Vehicle Energy Efficiency Analysis,” and for his outstanding participation at CE-CERT while under the supervision of Dr. Matthew Barth. Davis, a sophomore, will receive \$500 toward his education.

CE-CERT also awarded the 2007-2008 Ford Motor Company Undergraduate Scholarship to Lindsay Yee. Yee is a second-year engineering student who is assisting Bethany Warren on Warren’s project on the effect of humidity

on secondary organic aerosol formation. As the winner of this award, Yee will receive \$5,000 toward student expenses.

The Esther Hays Graduate Fellowship - with an award of \$5,000 - was given to an outstanding second-year graduate student, Harshit Agrawal. Agrawal works at the Atmospheric Processes Laboratory under the guidance of Dr. David Cocker.

Additional graduate students recognized for their outstanding performances were Qing Qing and Henry Vu. Qing, a second-year graduate student in chemical engineering, won the Pierson Graduate Fellowship with an award of \$5,000 to offset academic and/or research

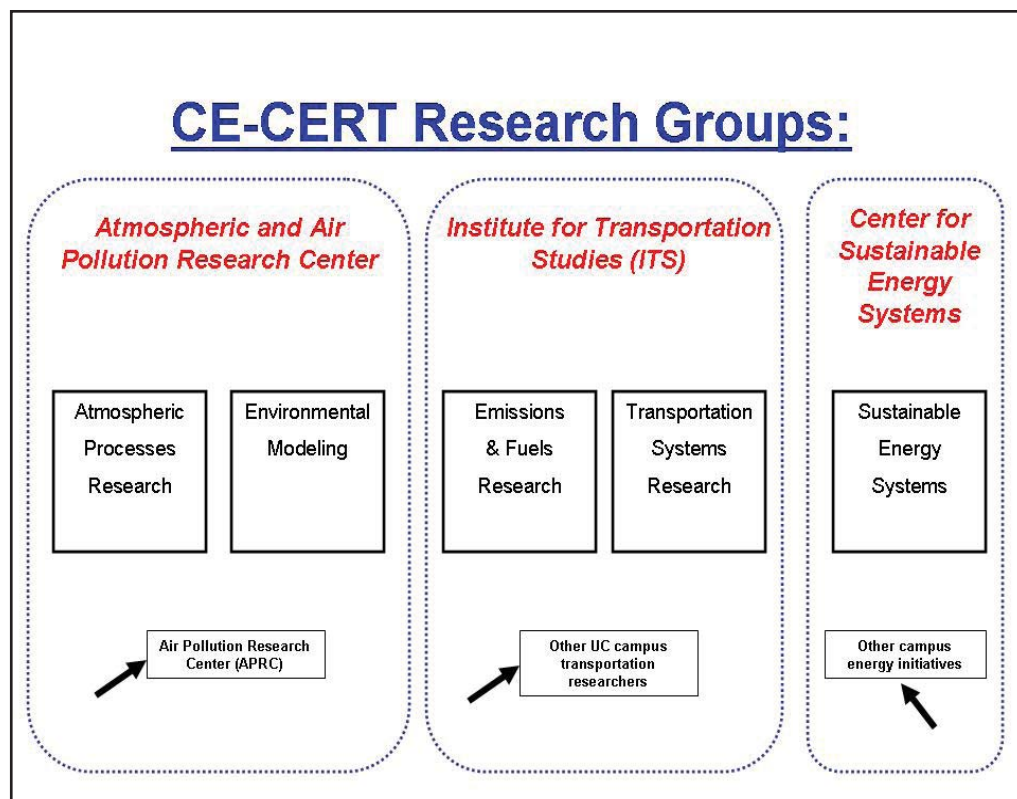
expenses. Qing is under the supervision of Dr. Charles Wyman. Vu, a third-year Ph.D. student in mechanical engineering, won the Roberta Nichols Graduate Fellowship for \$1,000. Vu, who is studying the atomization mechanics of flashing sprays, was under the supervision of Drs. Guillermo Aguilar and Hee-Jung Jung.

CE-CERT received multiple applications for these awards from students representing diverse talents and backgrounds.

“We congratulate this year’s winners for the outstanding quality of their research, and are confident they will continue to do well in the future,” said Center Director Matt Barth.



***CE-CERT  
Research Groups  
for the  
Collaborative Era***



our sale-for-service laboratories, to insure that they are fully utilized and can contribute their share to the facilities burden. As I mentioned earlier, we need to find incentives to motivate faculty and senior researchers to participate in defining a course for the Center and managing us down the path to success on that course.

In other areas, we need to improve collaboration. In fact, I think it's time to pass from the Stabilization Phase at CE-CERT to the Collaboration Phase.

We need to collaborate with such campus groups as the Air Pollution Research Center, the Center for Sustainable Suburban Development, the College's new effort in Materials Science and the campus' traditional strong programs in agriculture.

We need to collaborate more with other institutions, especially those in places such as Japan, China and Europe, and with international research programs.

I think the Collaboration Phase will feature:

- Faculty growth
- Further improvement in our research reputation
- Greater student involvement in research projects
- More undergraduate scholarship activities
- A simplified financial structure
- And, of course, more collaboration.

I can see a change in our current organization from five research groups to three, with CE-CERT becoming the umbrella organization for three sub-centers. I see atmospheric processes research and environmental

modeling joined in an Atmospheric and Air Pollution Research Center with a strong focus on global climate change and strong ties with the existing Air Pollution Research Center on campus. I see emissions and fuels research and transportation systems joined in an Institute for Transportation Studies, working with other UC transportation institutes to continue to explore how changing vehicles, fuels, engines, engine-control systems, traffic-control systems and monitoring devices can contribute to improving air quality. I would see the sustainable energy systems group becoming a center, or sub-center if you will, on its own.

This re-grouping would have several benefits. We would be bringing in additional faculty researchers from elsewhere on campus. Our administrative and technical staffs could be used more efficiently to service all centers. It would allow greater flexibility in assigning research focus.

To summarize, I would say CE-CERT has come a long way with little long-term planning and support. Despite that, we have reached a critical mass for survival and established a great reputation for our research.

Those are strengths that, with proper support from campus, from our outside supporters and contractors, and from our own people, can be used to make CE-CERT a premier research institution in its areas of expertise.



BARTH, from p. 1

of traffic congestion on energy and emissions; the design of sophisticated shared-use-vehicle computer model; a comprehensive model for estimating transportation air quality effects; and a state-of-the-art emissions modeling suite.

Professor Barth received his B.S. in Electrical Engineering/Computer Science from the University of Colorado, and M.S. and Ph.D. in Electrical and Computer Engineering from the University of California, Santa Barbara. He has been a visiting researcher at the University of Tokyo and Osaka University, and has served on several National Research Council (NRC) committees. He is married with two children and lives in Riverside. His hobbies include hiking, camping, biking and other outdoor activities.

CE-CERT (College of Engi-



*Officials from COFCO, Ltd., China's largest processor of agricultural products, bio-chemicals and bio-energy products, tour CE-CERT's hydrogasification laboratory, which is perfecting a process to turn carbonaceous materials in sulfur-free diesel fuel.*

neering-Center for Environmental Research and Technology) does \$6 million annually in research contracts and grants. With a staff of approximately 80 scientists, technicians and staff, it houses five research groups: Atmospheric Processes; Emissions and Fuels;

Environmental Modeling; Sustainable Energy Systems; and Transportation Systems. The Center is dedicated to being an honest broker between industry and regulators by providing scientifically exacting research data.

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