



# e-news



The Institute of Transportation Studies at UC Davis introduces *ITS-Davis e-news*, a periodic electronic newsletter for affiliates, friends and others interested in accomplishments, new research and ongoing activities at the Institute. *ITS-Davis e-news* reports information directly from ITS-Davis and from UC Davis academic departments affiliated with ITS-Davis that are conducting transportation-related research and education.

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**Education and Research Highlights**

## **AND OFF THEY GO: Congratulations to Recent Graduates**

ITS-Davis is pleased to announce and congratulate its 14 most recent masters and Ph.D. graduates. Some are graduating directly from the Institute's Transportation Technology & Policy graduate group, and some are graduating from the academic departments in which they conducted their transportation studies.

- Michael Bagley, Ph.D., Civil and Environmental Engineering  
Advisor: Pat Mokhtarian  
Dissertation: Incorporating Residential Choice into Travel Behavior - Land Use Interaction Research  
Employer: South Texas Community College
- Sean Co, M.S., Transportation Technology and Policy  
Advisor: Pat Mokhtarian  
Thesis: Integrating the Bicycle into Yosemite  
Employer: Independent Contractor
- Richard Curry, M.S., Civil and Environmental Engineering  
Advisor: Pat Mokhtarian  
Thesis: Attitudes Toward Travel: The Relationships Among Perceived Mobility, Travel Liking, and Relative Desired Mobility.  
Employer: Caltrans, Division of Planning
- Kellie Dougherty, MS, Civil and Environmental Engineering  
Advisor: Dan Chang
- Adam Forest, Ph.D., Economics  
Advisor: Peter Lindert  
Dissertation: tax compliance
- Jesse Herbert, Ph.D., Material Science and Engineering,  
Advisor: Joanna Groza  
Employer: PLUG Power, New York
- Doug Ito, M.S., Transportation Technology and Policy  
Advisor: Debbie Niemeier  
Thesis: Transportation air quality conformity modeling  
Employer: Caltrans
- Kevin Lee, M.S., Civil and Environmental Engineering  
Advisor: Dan Chang  
Employer: Jones & Stokes

- Tim Lipman, M.S., Transportation Technology and Policy; Ph.D., Ecology, Environmental Policy  
Advisor: Dan Sperling  
Dissertation: Zero-Emission Vehicle Scenario Cost Analysis Using A Fuzzy Set-Based Framework  
Employer: UC Berkeley, post graduate researcher
- Ravikumar Meenakshisundaram, M.S., Civil and Environmental Engineering  
Advisor: Debbie Niemeier  
Employer: Documentum
- Jolanda Pretorius, M.S., Transportation Technology and Policy  
Advisor: Dan Sperling  
Thesis: China's urban transportation sector  
Employer: World Bank
- Susan Shaheen, Ph.D., Ecology  
Advisor: Dan Sperling  
Dissertation: Dynamics in Behavioral Adaptation to a Transportation Innovation: A Case Study of Carlink - A Smart Carsharing System  
Employer: Partners for Advanced Transit and Highways (PATH) (University of California)
- Matt Sumpter, M.S., Transportation Technology and Policy  
Advisor: Debbie Niemeier  
Thesis: Transportation needs of northern California welfare recipients and strategies to meet their needs  
Activity: Pursuing Ph.D. at University of Texas
- John Wright, M.S., Transportation Technology and Policy  
Advisor: Dan Sperling  
Thesis: Electric Vehicles and Electricity Demand: An estimation of electricity load levels based on travel diaries of potential electric vehicle owners  
Employer: PATH

**KEEP ON TRUCKIN': Hybrid SUV Gets Best Gas Mileage in Future Truck Competition**



UC Davis students competing in the first national FutureTruck competition in mid-June won the best fuel economy category and finished in fourth place overall. The UC Davis team is advised by Professor Andrew Frank and Dr. Mark Duvall of the Mechanical and Aeronautical Engineering Department. The project is based in the USDOE-funded Hybrid Electric Vehicle Technology Center. The team achieved fuel economy of 18.7 miles per gallon in their hybrid Chevrolet Suburban, an almost 13 percent increase over the standard Suburban.

"Our strategy is a little bit different," undergraduate student Nat Meyr said in an interview with The Sacramento Bee. "Most schools have a gasoline car with electric assists. We do more of an electric car with a gasoline engine assist."

The UC Davis FutureTruck, named "Sequoia," is a charge-depletion parallel hybrid-electric vehicle (HEV), featuring HEV rear-wheel drive and electric front wheel drive. For its primary power source, it utilizes a 1.9L Saturn internal combustion engine, 75 kW Unique Mobility BDC motor, and Borg-Warner six-speed gearbox. The truck obtains secondary power from a 75 kW motor coupled to the front axle to provide 4-wheel drive capability and additional power for acceleration and towing. The electric components are powered by a 336-volt, 90 amp-hour Ovonic nickel-metal hydride battery pack with a total energy of 29.6 kWh and peak power of 180 kW at 50 percent state of charge.

A combination of efficient powertrain design and drag reduction techniques allows Sequoia to travel over 70 miles on battery power alone as a zero-emission vehicle. The students predict that charging the Suburban's battery at home combined with increased gasoline fuel economy could save drivers of a vehicle like Sequoia thousands of dollars in fuel costs over its lifetime.

The team would like to thank its many dedicated sponsors, including: General Motors, Sacramento Municipal Utility District, California Energy Commission, GM Truck Group, Ovonic Battery Company, The Saturn Corporation, GM Powertrain, Yolo-Solano Air Quality Management District, and Hexcel Composites. The DARPA Advanced Vehicle Program also provides funding for numerous advanced hybrid research projects at UC Davis.

The FutureTruck Competition replaces the FutureCar Competition, in which UC Davis took first place in 1997 with a hybrid Ford Taurus. The new challenge was to reinvent the

sport utility vehicle, and to maintain truck-like attributes the ability to carry cargo and pull heavy loads such as trailers while reducing fuel consumption and emissions.

Fifteen university teams from the United States and Canada competed in the two-week competition at the General Motors Desert Proving Grounds near Mesa Ariz. Davis was the only UC campus participating this year.

Dozens of reporters from across the country covered the competition. In addition to excellent coverage in major daily newspapers, the competition made headlines on Paul Harvey's national radio show, as well as NPR's All Things Considered.

The UC Davis team already has plans for next year's competition. They plan to refine the powertrain control strategy for greater fuel economy and reduced emissions. Additional reduction in vehicle mass and drag from advanced components can further increase the vehicle's all-electric range. Finally, there is a rumor that a special high-torque, high efficiency CVT (continuously variable transmission) developed in earlier FutureCar research could find its way into the powertrain bay for next year.

For more information about the FutureTruck Competition, visit <http://www.futuretruck.org>

To read more about the original UC Davis FutureCar program, visit <http://mae.ucdavis.edu/~futurecar/>

### **ENO FELLOWS: Two ITS-Davis Students Named**



Joshua Cunningham (left) and Richard Curry (middle) in

Washington DC with other Eno Fellows from the University of California (L to R) Karen Smilowitz (Berkeley), Gian-Claudia Sciara (Los Angeles), and Asha Weinstein (Berkeley).

Five of the 20 Eno Fellows announced for this year's Eno Transportation Foundation's prestigious Leadership Development Program are affiliated with the UC Institute of Transportation studies; two of the five are from ITS-Davis.

JOSHUA CUNNINGHAM is earning a Master's in Transportation Technology and Policy, and is working on the ITS-Davis Fuel Cell Vehicle Modeling Program.

RICHARD CURRY, who graduated in June with a Master's in Civil and Environmental Engineering, is applying his expertise in intelligent transportation and travel behavior in his new job with Caltrans.

The Eno Foundation awards fellowships each year; this year 44 nominees competed. The foundation considers candidates' academic and leadership abilities, as well as their transportation specialty, and seeks diverse geographic representation among winners. Candidates are nominated by faculty at their schools. In addition to the fellowship, recipients attend the annual Eno study conference in Washington, gain access to career development programs and receive the Foundation's publication, Transportation Quarterly.

For more on the Eno Foundation, visit <http://www.enotrans.com/>

### **A MAN AND HIS PLAN: ITS-Davis Student Wins Award from Volkswagen AG**



Hauer receives his award from Ursula Piëch, left, and Gov. Sigmar Gabriel

KARL-HEINZ HAUER, a third-year graduate student in Transportation Technology and Policy has won a \$100,000 award toward the start-up of a new business upon his

graduation from UC Davis. The award from Volkswagen AG is part of a new company program designed to foster innovation and draw new technology companies and suppliers to a new business campus in the city of Wolfsburg, Germany.

Hauer's winning business plan creates a company to develop and market technology to support the development, production and maintenance of fuel cell stacks. He says his UC Davis classes in technology management and economics provided the tools he needed to develop a business plan. Seminars exposed him to different ways of thinking, which enabled him to develop his own ideas, he adds.

Hauer's business plan was recognized in all three stages of the competition. In the first two stages, his was one of only 10 winning entries out of approximately 150 submissions. In the final stage, in which 50 plans were submitted, Hauer won second prize. The final stage included a high-pressure oral presentation. "The education and research at UC Davis trained me in verbalizing and presenting ideas on different levels," he notes.

Hauer shared the limelight with three other winners by presenting his plan before an audience of 650 at a castle in Wolfsburg in early July. Dignitaries at the presentation included Sigmar Gabriel, the governor of Niedersachsen, and Ursula Piëch, the wife of Volkswagen CEO Dr. Ferdinand Piëch.

Hauer, also this year's Chevron Fellow at ITS-Davis, will finish his Ph.D. at UC Davis in 2001 before launching his new venture. "After this I would like to start my own business helping fuel cell technology to mature and contributing this way to a healthier environment," he says.

### **CONFERENCE CREDIBILITY: ITS-Davis Students Lead Fuel Cell Sessions at 35th Intersociety Energy Conversion Engineering Conference**

There was no shortage of ITS-Davis presence at the 35th Intersociety Energy Conversion Engineering Conference held in late July in Las Vegas, NV. Students and faculty from the ITS-Davis Fuel Cell Vehicle (FCV) Center presented papers, comprising all of the time allocated to fuel cells, at the 35th annual conference.

The following papers were presented at the conference:

- R. M. Moore, Ph.D., "Indirect-Methanol and Direct-Methanol Fuel Cell Vehicles"
- K-H Hauer, "Dynamic Interaction Between the Electric Drive Train and Fuel Cell System for the Case of an Indirect Methanol Fuel Cell Vehicle"
- J. F. Contadini, "Social Cost Comparison Among Fuel Cell Vehicle Alternatives"

- D. J. Friedman, "Reformate Fuel Cell Stack Characteristics and System Interactions"
- P. Badrinarayanan, A. Eggert, K.H. Hauer, "The Implications of Water and Thermal Management Parameters in the Optimization of an Indirect Methanol Fuel Cell System"
- A. Eggert, D. Friedman, P. Badrinarayanan, S. Ramaswamy, K.H. Hauer, "Characteristics of an Indirect-Methanol Fuel Cell System"
- S. Ramaswamy, M. Sundaresan, A. Eggert, R.M. Moore, "System Dynamics and Efficiency of the Fuel Processor for an Indirect Methanol Fuel Cell Vehicle"
- M. Sundaresan, S. Ramaswamy, R.M. Moore, "Steam Reformer/Burner Integration and Analysis for an Indirect Methanol Fuel Cell Vehicle"
- T.E. Lipman, "Manufacturing and Lifecycle Costs of Battery Electric Vehicles, Direct-Hydrogen Fuel Cell Vehicles, and Direct-Methanol Fuel Cell Vehicles"
- A. Burke, M. Miller, "Fuel Efficiency Comparisons of Advanced Transit Buses Using Fuel Cell and Engine Hybrid Electric Drivelines"

FCV Center co-director Bob Moore's reactions: "Splendid. This confirms the breadth and quality of our work. What's most exciting is that we have so much more coming."

A list of all available papers of the FCVMP is located at <http://fcv.ucdavis.edu>.

## FACULTY ACCOMPLISHMENTS



Dr. Moore (left) with Dan Sperling, Geoffrey Ballard, and Bruce Gates.



Dr. R.M. (BOB) MOORE was elected as a ByFellow of Churchill College, University of Cambridge, Cambridge, England, UK, in February 1999.

In fulfilling the expectations of a ByFellow, Dr. Moore devoted his residency at the University of Cambridge to direct-methanol fuel cell devices and catalysts. This research program culminated in the First European Direct-Methanol Fuel Cell Research Workshop held at Churchill College in December 1999.

Dr. Moore has published extensively, and continues an active research program in direct-methanol fuel cell theory at both the University of California and Churchill College, Cambridge. He is also currently co-organizing the Second European Direct-Methanol Fuel Cell Research Workshop to be held at Churchill College in April 2001.

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## Private Support Highlights

The AFFILIATE PROGRAM, now 13 members strong, continues to provide valuable funding for new initiatives. Chevron Products Company joined with a gift of \$15,000. Recently renewing at the Patron Level of \$40,000 per year was Nissan Technical Center North America/Nissan North America. Renewals at the Basic Level of \$15,000 included Panasonic EV Energy, Powercell Corporation and Superfarad Svenska AB.

The UC DAVIS Fuel Cell Vehicle (FCV) CENTER established by the US DOE's Graduate Automotive Technology Education (GATE) program continues to attract additional funding.

- FCV Modeling Program renewals at the \$20,000 level recently include: British Petroleum, Chevron, Daewoo, Eaton, Exxon, GM, Honda, Hyundai, Isuzu, Nissan, Ricardo, Subaru, Toyota and Volkswagen.
- DaimlerChrysler joined the program in July 2000 with an initial gift of \$60,000. The program now has 18 corporate members.
- The W. Alton Jones Foundation approved \$161,250 over two years for a new fuel cell vehicle outreach project with key government, non-profit organization and industry leaders.

## CHINA AUTO INDUSTRY STUDY

This program is a new study to assess the energy and environmental consequences of China auto industry development. Read more under "New Initiatives" below.

- Toyota, General Motors, and DaimlerChrysler have each pledged \$30,000 for this effort.
- The Energy Foundation also approved an initial grant of \$25,000.

THANK YOU. ITS-Davis greatly appreciates the contributions of our private donors. If you have questions related to project collaborations, please contact development director Joe Krovoza ([jfkrovoza@ucdavis.edu](mailto:jfkrovoza@ucdavis.edu); 530/758-6983).

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## Research Results

### **PUBLICATIONS FROM ITS-DAVIS: Hot off the Presses**

- RR-00-4, Shaheen, Susan, J. Wright, D. Dick, L. Novick, "CarLink - A Smart Carsharing System Field Test Report" May 2000 \$25
- RR-00-1, Co, Sean, K.S. Kurani, T.S. Turrentine, "A Study of Visitor Bicycle Use in Yosemite Valley" April 2000 \$10

This document reports on the first comprehensive study of visitor bicycle use in Yosemite. It establishes several important baselines about cyclists during typical busy summer days, such as the number of cyclists, locations they visit, what proportion rent bicycles compared to bringing their own, the distribution of the size of cyclist groups, and the presence of children among cyclist groups. Researchers also queried cyclists about cycling infrastructure.

- RR-99-4, Delucchi, Mark A., A. Burke, T. Lipman, M. Miller, "Electric Vehicle Lifecycle Cost and Energy-Use Model: Report for the California Air Resources Board" May 2000 \$25

This report documents the design and lifecycle cost model, designs a motor vehicle to meet range and performance requirements specified by the model, and then calculates the initial retail cost and total lifecycle cost of the designed vehicle. The model can be used to investigate the relationship between the lifecycle cost - the total cost of vehicle ownership and operation over the life of the vehicle - and important parameters in the design and use of the vehicle.

### **ITS-DAVIS EV MARKET STUDIES STILL AVAILABLE**



ITS-Davis' Electric Vehicle (EV) market studies from 1995 and 1996 remain the most thorough investigations of potential EV market in California - as witnessed by continuing references to them at this year's spring California Air Resources Board ZEV workshops. The primary reports, and a few journal reprints, are listed below. Related publications on ITS-Davis' market research methodology are also available through the publications desk.

- RR-95-5, Turrentine, Thomas S., K.S. Kurani, "The Household Market for Electric Vehicles: Testing the Hybrid Household Hypothesis - A Reflexively Designed Survey of New-Car-Buying, Multi-Vehicle California Households" \$20
- RR-95-6, Kurani, Kenneth S., D. Sperling, T.E. Lipman, D. Stanger, T.S. Turrentine, A. Stein, "Household Markets for Neighborhood Electric Vehicles in California" \$25
- RR-96-19, Bunch, David, C. Kazimi, "Analysis of the Future Household Market for Alternative Fuel Vehicles in Southern California Using a Microsimulation Forecasting System" \$5
- RP-98-22, Turrentine, Thomas S., and K.S. Kurani, "Using reflexive methods to identify and estimate markets for novel transportation products: Household markets for electric vehicles" *Transportation*. 25:2, pp.207-22. 1998.
- RP-94-14, Kurani, Kenneth S., T.S. Turrentine, D. Sperling, "Demand for Electric Vehicles in Hybrid Households: An Exploratory Analysis" *Transport Policy*, pp. 244-256, May 1994
- RP-96-9, Kurani, Kenneth S., T.S. Turrentine, D. Sperling, "Testing Electric Vehicle Demand in 'Hybrid Households' Using a Reflexive Survey" *Transportation Research D*, pp.131-149, May 1996

**ITS-Davis publications can be ordered by fax, e-mail or mail.** International orders must be prepaid. Checks or money orders are accepted. No credit cards.

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One Shields Avenue, Davis, CA 95616-8762

## **SHARING IS GOOD: CarLink Study Results Promising; New Program Planned**



The ITS-Davis CarLink research team

Sharing a car for commuting and other trips can reduce a driver's stress, save money and reduce pollution, according to results released in late June by CarLink, a California public-private partnership program that was the first "smart" carsharing test in the United States and an ITS-Davis research project.

The 54 individuals enrolled in the CarLink project shared 12 natural-gas-powered Honda Civics for 10 months in the Bay Area. Some used the vehicles to get from home to the local BART transit station in the Bay Area (Homeside Users), while others used the vehicles to drive from the BART station to their jobs (Workside Commuters). The project employed "smart" automatic technologies for car reservations, pickup, operation, and return.

"With CarLink, individuals had an alternative to single-occupancy vehicles, shifting their commute trips to transit and clean vehicles," said Susan Shaheen, a postdoctoral researcher at Partners for Advanced Transit and Highways (PATH), a multidisciplinary program administered by the University of California, Berkeley. Shaheen studied CarLink as part of her doctoral research in ecology at UC Davis.

Key study findings include:

- CarLink users' commutes were less stressful.
- Average commute time was a few minutes shorter for Homeside Users and about 15 minutes longer for Workside Commuters.
- CarLink participants drove less than before they joined the study.
- CarLink participants increased their use of BART for recreational travel.
- The combination of CarLink, BART and carpooling resulted in an average net commute reduction of about 20 vehicle miles per day. CarLink resulted in at least 20 new BART trips each day.

Several Homeside Users said that if CarLink became a permanent service, they would sell one of their personal cars, which would greatly reduce their transportation costs.

In addition to ITS-Davis, government and private industry partners included PATH; California Department of Transportation (Caltrans); American Honda Motor Company, Inc.; BART; Lawrence Livermore National Laboratory; INVERS; and Teletrac.

In the last decade carsharing has become more common, especially in Europe. Approximately 200 carsharing organizations are active in 450 cities throughout Switzerland, Germany, Austria, the Netherlands, Denmark, Sweden, Norway, Great Britain and Italy. In the United States, besides the CarLink project, programs are under way or being planned in Seattle, Chicago, Portland, Ore., Boulder, Colo., and Riverside, Calif.

"The one-person, one-car approach to transportation is not sustainable," said Daniel Sperling, director of ITS-Davis. "Smart carsharing is an innovative step in the right direction - toward transportation that is more economic, equitable and environmental."

The CarLink program was launched on Jan. 20, 1999, and ended on Nov. 15, 1999. Its purpose was to examine participants' real-life experiences, identify market segments where smart carsharing would be attractive, and study the use of intelligent technologies to reduce the inconvenience of carsharing.

Participants were very cooperative in furnishing information and feedback about their CarLink use. They completed questionnaires before and after the program, provided data about their travel patterns, participated in household interviews and focus groups, and gave dozens of media interviews.

The next program, CarLink II, is set to launch in January 2001 in the San Francisco Bay Area. Negotiations are under way to run it as a pilot program initially managed by ITS-Davis but eventually becoming independent. CarLink II will be similar to CarLink I, but this time the research focus will be on demonstrating a business case and testing new carsharing technologies.

Several regional newspapers carried feature stories on the CarLink results, including the Contra Costa Times on July 3, and the Fairfield Daily Republic on July 8. In addition, the July 2000 issue of the Caltrans newsletter, CT News, features the project on its web site at <http://www.dot.ca.gov/ctnews/july00/>.

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**New Initiatives**

## CHANGE IS COMING TO CHINA'S AUTOMOTIVE MARKET

With China poised to become the world's second-largest market for new motor vehicles (after North America) in the medium-term future, the Chinese government has made the development of a domestic auto industry a top national priority. Until recently, the government had placed complicated restrictions on multinational firms in order to support domestic producers. Now that the U.S. has agreed to support China's entry into the World Trade Organization in the next year or two, the Chinese government has pledged to liberalize its restrictions.

- What is the current structure of the Chinese automobile industry?
- How will China's entrance into the WTO impact the Chinese automobile industry?
- How will the growth in car ownership impact infrastructure needs in China?
- Will technology transfer be effective?
- How should the Chinese government and private industry address the challenge of minimizing the environmental impact of the auto industry's development in China?

These are the primary components of an exciting new ITS-Davis/Program on Pacific Rim Business and Development research initiative. The project will measure the impact of government intervention on industry structure, product prices, consumer welfare and industrial development. The three principal investigators are Lee Branstetter, Director of UCD's East Asian Studies Program and Professor of Economics; Daniel Sperling, Director of ITS-Davis; and Robert Feenstra, Director of the Pacific Business and Development Program.

The project's initial funding partners are General Motors, Toyota and the Energy Foundation. Additional corporate, foundation and private support is being sought. Contact Joe Krovoza ([jfkrovoza@ucdavis.edu](mailto:jfkrovoza@ucdavis.edu), 530-754-6006) or Lee Branstetter ([branstet@ucdavis.edu](mailto:branstet@ucdavis.edu), 530-752-3033) for more information.

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