The ITS Berkeley Online Magazine *Fall 2005: Volume 1, Number 1*

FEATURES:

The Women of Berkeley ITS

Berkeley transportation Ph.D. alumnae comment on their career paths in academia and what the future holds for the next generation of women in transportation. *(Pictured above: Kara Kockelman, Ph.D., 1998)*

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Federal Highway Administration Taps PATH for Key Role.

AND: Message from the Director

Samer Madanat, who began his term in July 2005, talks about new opportunities inside Berkeley and out.

Other News:

Harmer E. Davis Transportation Librarians Honored by Their Peers

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BITS Units Participate in the 12th ITS World Congress, Nov. 6-10, in San Francisco

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New Books from ITS Berkeley Faculty

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- **Z. Max Shen** (co-author) *Handbook of Quantitative Supply Chain Analysis: Modeling in the E-Business Era*
- **Samer Madanat** (co-author) *Applications of Advanced Technology in Transportation (ASCE Publications)*

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*Welcome to the first issue of NewsBITS, the magazine of the **Berkeley Institute of Transportation Studies**. It is published four times a year by the BITS Publications Office. Your comments are welcome. Address them to the editors listed below.*

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Current Issue

- **Editor:** *Phyllis Orrick*
- **Associate Editor:** *Christine Cosgrove*

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Last Updated June 12, 2006

Last January, Harvard University President Lawrence Summers ignited a controversy with his remarks about whether women have what it takes to make it to the top academically in the sciences.

More recently, a study published in the August 19 issue of *Science*, found that more women are receiving doctorates in science and engineering, but few are rewarded with top-level faculty positions. The study's authors suggested that "hostility from colleagues and a chilly campus climate" were partly to blame. Other reasons included the difficulty of balancing family and work, unconscious bias resulting in discrimination, and a lack of female role models.

And recent articles by Mary Ann Mason, Dean of the Graduate Division at UC Berkeley, conclude that having babies early in an academic career can derail women traveling along a tenure track. (See "Do Babies Matter?" and "Do Babies Matter?" Part II.)

Given the controversy swirling over women in academia in the sciences, it's interesting to note the relatively large share of women students who enroll in the UC Berkeley graduate transportation programs and who in turn participate as researchers in projects at the Berkeley Institute of Transportation Studies (BITS). (Go to *Graduate Students page*.)

In recent years, women have comprised an average of roughly 40 percent of the new transportation graduate students, both master's and Ph.D. candidates. The effect of this high degree of women in the graduate program is amplified when it comes to their participation in academia because of the historically large share of Ph.D.s from BITS who go on to teach at universities. We have identified more than 80. (Go to *Berkeley Transportation Alumni in Academia* page.)

To get a better understanding of some of the issues affecting women in academia in transportation, roughly a dozen recent alumnae who received their doctorates between 1992 and 2005 were contacted and asked to respond to what they like and don't like about working in academia, what is most rewarding and most frustrating, what trends they are

seeing in terms of the numbers of women studying transportation, and their advice to younger women considering the field. Nine of them responded by press time.

The group's transportation interests and expertise encompass a wide range: vehicle routing and scheduling in freight transportation, pedestrian access, energy use and air quality, transportation finance, policy and planning, and modeling complex logistics problems—to name a few. And although studies show that women in engineering fields traditionally have a harder time attaining top-level appointments and tend to be paid slightly less than their male counterparts, most of these respondents are optimistic about the future.

Others noted that the field of transportation has broadened substantially in recent years in ways that will continue to attract more women. "Transportation planning is often regarded as the most quantitative and least people-oriented of the planning fields, which I'm afraid sends some women in the other direction," commented **Jennifer Dill**, an assistant professor at Portland State University who received her Ph.D. in 2001. "The field is evolving and really needs planners who are more adept at working with people in collaborative processes. All transportation planners do not do modeling! We do all sorts of things that draw upon a wide range of skills."

"As (the field) becomes more welcoming of people working from a non-engineering perspective—i.e. more interest in the social impacts of transportation as well as urban design issues—I think that will encourage more women to enter the field," noted **Asha Weinstein**, an assistant professor at San Jose State University who received her doctorate in 2002.

Flexibility, intellectual challenge and the joy of teaching

When asked why they chose careers in academia rather than industry, the women gave answers that reflected their love of intellectual challenges and intellectual freedom. "I value the opportunity to work on issues I'm interested in and believe are important, rather than having my work determined by clients," noted **Noreen McDonald**, who received her Ph.D. earlier this year and is an assistant professor at the University of Virginia.

Some, like Weinstein, love teaching and a more collegial setting. "I…prefer an environment where people are less competitive and more collaborative, and I have found that …academia can be a good place to find that. The classroom, if designed right, can be a perfect example of a collaborative environment, since we are all there to learn," she added.

Most enjoy the combination of research and teaching—what one alumna called "a great complement" and another described as "the best thing about being in academia."

As **Anne Goodchild**, who will receive her doctorate this year and begin teaching at the University of Washington in Seattle, put it, "When I get tired of working quietly in my office, I can balance that with the enthusiasm of undergraduates."

In some ways academia offers greater flexibility in terms of working hours and family life, although one alumna pointed out that academic institutions have often been slower to resolve maternity leave and child-care issues than the private sector.

Those who have worked in both types of institutions find that academia requires more self-direction than industry. **Rachel Weinberger**, who received her Ph.D. in 2001 and recently left a consulting firm to join the faculty as an assistant professor at the University of Pennsylvania, put it this way: "It's hard to make a comparison in just a few short paragraphs. But if pressed, I would say academia is both more fun and more stressful than industry."

"I wanted the intellectual freedom that academia provides, as well as the access it offers to a variety of people and problems. The ability to set my own research agenda is priceless," notes **Kara Kockelman**.

The importance of being mentored

As an undergraduate and graduate student, **Ruth Steiner**, who received her Ph.D. in 1996 and is an associate professor at the University of Florida, felt she was "fortunate to work with exceptional women…I likely would not be in transportation today were it not for [Professor] Betty Deakin [Director of the University of California Transportation Center], who was my advisor during my master's and Ph.D. program."

When Steiner was applying for her first academic position, a friend asked her why she wanted to stay in academia. She replied that she wanted to teach "because there are not enough women in the classroom." Throughout her career she has found support from women classmates and colleagues, as well as women's book groups, dinner groups and academic groups.

Other women also mentioned Deakin as a beacon of support and inspiration, as well as male faculty, including Professors Marty Wachs and Carlos Daganzo at UC Berkeley, and Professors Dan Sperling and Bob Johnston at UC Davis.

Susan Handy, an associate professor at UC Davis who received her Ph.D. in 1992, notes that she didn't know any women in transportation before she got into the field, but "found plenty once I got there, particularly at Berkeley and in transportation agencies in the Bay Area, mostly populated with Berkeley graduates…Having women like Betty Deakin, Gen Giuliano [Professor, University of Southern California], and Sandy Rosenbloom [Professor, University of Arizona] in academic positions in transportation certainly helped."

More women in transportation, or fewer?

Although women have comprised nearly half of the new classes of graduate students at Berkeley in recent years, our alumnae see their numbers dropping at other universities. **Karen Smilowitz**, an assistamt professor at Northwestern University who received her Ph.D. in 2001, finds enrollment of women is dropping at her institution, as does the University of Florida's Ruth Steiner.

At Portland State University, Jennifer Dill reports that the percentage of women varies from year to year so she can't say for sure if more women are entering transportation planning. "I can say that the women transportation planning students that I have had have been outstanding, usually among the top of all the planning students. They are strong, outgoing, intelligent and giving people who go on to contribute to the profession …I wish I could clone them!"

San Jose State University has also seen an uptick in the number of women in the transportation engineering master's program—but for an unusual reason. As Asha Weinstein describes it, "many southeast Asian women, who have married men working in Silicon Valley, move here to follow their husbands, and then, unable to work, look around for university programs." She believes that the number of these women who end up writing their master's theses on transportation topics do so in part because they are more comfortable working with her because she is a woman. "Had I been male, they might have ended up with another advisor and another topic."

Advice to younger women

"Go for it," say the Berkeley ITS women in academia. Although the difficulties of successfully negotiating the sometimes treacherous waters of academia have been well publicized, the Berkeley ITS alumnae believe it's possible to have both a family life and a rewarding career.

"We need more women in both planning and engineering; we need more role models for younger women," notes Jennifer Dill. "There is a wide range of places out there with a wide range of demands…You should be able to find an environment that suits your needs and interests."

One of the greatest hurdles women face is their lack of self-confidence—what UC Davis' Susan Handy refers to as the "imposter syndrome," which "will surface on a regular basis. Remember that many of your male colleagues feel it, too."

Anne Goodchild agrees. "I think there are many women who opt out of a career in academia because they think they aren't good enough, or they don't want to work so hard. But these choices are based on biased perceptions. In the same situations, I think men have more confidence and just keep plodding along. You are smart enough!"

Finally, Northwestern's Karen Smilowitz suggests, "Go to Berkeley! Even though ITS isn't overflowing with women faculty, ITS is incredibly supportive of women…The transportation group (faculty, staff, and students) is very collegial, and I think this atmosphere makes it easier to succeed. I miss Friday afternoon cookie hours, ITS picnics, and the operations group spring hikes."

For a complete transcript of remarks by the ITS Berkeley alumnae who responded to our queries, go here.

—Christine Cosgrove

Related links:

Women's Transportation Seminar International

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Next Generation Simulation

Federal Highway Administration Taps PATH for Key Role in Filling Gaps in Functionality and Datasets

The Federal Highway Administration (FHWA) is using the **California Partners for Advanced Transit and Highways (PATH)** program of the UC Berkeley Institute of Transportation Studies (BITS) as a key contributor in its **Next Generation Simulation (NGSIM)** program. NGSIM is a multi-year project whose major goals are to address gaps in the functionality of existing traffic simulation tools, which requires new algorithm development, and to fill the need for comprehensive datasets on vehicle movement and interactions so that the algorithms used in existing models can be properly validated.

Traffic simulation models offer significant potential for evaluating existing operating conditions on freeways and other transportation facilities, and they can also help decision-makers analyze alternative operational and management strategies. However, after 35 years of development and application, they still have shortcomings.

The objective of NGSIM is to develop behavioral algorithms in support of microscopic traffic simulation, with supporting documentation and validation data sets. All NGSIM products will be freely available to simulation model developers and the transportation community at large. Current study products are posted on the **NGSIM Web site**.

"This work isn't going on in a vacuum," says PATH Director **Alexander Skabardonis**, who has served as senior advisor to the NGSIM effort since its inception, and who is principal investigator for the PATH NGSIM projects to produce data sets and carry out algorithm development. The research team consists of a consortium of private consulting firms, universities and other senior advisors. Three stakeholder groups (traffic modelers, software developers, and model users) oversee the work and review the results.

Using machine vision

Datasets for validating microscopic simulation algorithms (e.g., car-following or lane-changing) consist of vehicle trajectories over extended freeway segments under various traffic conditions (from free flow to congestion). Vehicle trajectories can be extracted from video recordings manually , a very time-consuming and expensive process, or automatically, using a machine-vision algorithm.

Following a survey of existing machine-vision algorithms worldwide, the NGSIM research team selected the algorithms produced as part of ongoing research at PATH to produce a prototype data set of vehicle trajectories and to assess emerging technologies to automate the trajectory generation process.

For over a decade, PATH researchers have collected video data and developed machine-vision algorithms to detect and track vehicles from video images under the sponsorship of the California Department of Transportation (Caltrans) and the

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National Science Foundation (NSF). One valuable result is the **Berkeley Highway Lab (BHL)**, a unique testbed for collecting traffic surveillance data.

The BHL video surveillance system (***click for enlarged view of I-80***) consists of eight digital video cameras with overlapping fields of view on the roof of a 30-story building overlooking a section of the I-80 freeway in the City of Emeryville, California. BHL is currently maintained by **California Center for Innovative Transportation (CCIT)**.

"As part of the NGSIM, we tested the existing PATH algorithms and developed a new approach, where vehicles are first detected based on their appearance then tracked by a separate tracking algorithm," Skabardonis explained. "A new vehicle detection algorithm was developed that requires significantly smaller computation."

Vehicle detection is accomplished by extracting line segments from images and matching them to 3-D vehicle models. "This algorithm shows superior vehicle localization performance in varying illumination conditions compared to the previous motion-based approaches," he added.

Once a vehicle is detected, it can be tracked based on its appearance in the camera image. A sequence of cameras is used to track the detected vehicles along a stretch of freeway. Vehicles in the overlapping area between two cameras are passed from one camera to the next by comparing their appearance in both cameras.

The algorithm can automatically generate trajectories for about 90 percent of the vehicles. To generate a complete set of trajectories from video data, researchers developed an interactive vehicle tracking system based on this algorithm (known as "caltrack" software), which runs on desktop PCs. In this system, a human operator supervises the vehicle detection and tracking procedures and confirms or modifies the results to ensure a complete set of trajectories.

The resulting system is unique; only a decades-old manual trajectory extraction system is known, Skabardonis explained. It reduces costs by 93 percent, according to a series of cost-testing analyses. "While the manual system required $250,000 to process an hour-long video of six lanes of a mile-long freeway segment, our system only required $18,000," Skabardonis said.

A video dataset collected from the BHL was used to generate a prototype dataset. The prototype dataset consists of trajectories of 4,733 vehicles over 2,952 ft. (approximately 1 km.) at 1/15 of a second, for a total of 2.8M data points. This is the largest and most comprehensive dataset on vehicle trajectories ever produced. Because it is freely available on the NGSIM site, it can be used by anyone with Internet access. Already more than 250 users have downloaded the data from the NGSIM site for various applications, Skabardonis reported.

PATH is expected to be awarded a project to develop an improved algorithm for simulating freeway flow under stop and go traffic conditions as part of NGSIM. Existing simulation models have difficulty in accurately modeling oversaturated traffic conditions on freeways. Examples include repeated stops and starts across lanes, increased lane changes to position on “moving” lanes (as perceived by drivers) or in the presence of tall vehicles (trucks, busses, SUVs), and large vehicle headways (reduced capacities).

The proposed oversaturated flow algorithm builds upon previous and ongoing research by UC Berkeley Institute of Transportation Studies (BITS) faculty and researchers supported by PATH that has produced important contributions in both

theory and experimental observations. “As in the case of the data processing, this project shows the leveraging of our work and an opportunity to show people the work we do at PATH at a national level,” Skabardonis said.

Success could mean a relationship with the NGSIM project that could last for five more years and develop exciting new modeling tools, he added. “All we have to do is come up with a cool algorithm tested with real-world data in the next few months. And I think we will.”

—David Downs

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Message from the Director

Samer Madanat: Fall 2005

I would like to extend a warm welcome to our new and returning students and researchers. As many of us at ITS already know—and as our new students will soon discover—this is an exciting time to be working in the field of transportation research. Not only is the field expanding in multiple directions, but opportunities are emerging that call for multidisciplinary approaches. For example, research teams composed of traffic engineers, system engineers, human factor specialists and communications engineers are collaborating to develop wireless communication systems for improving transportation safety and traffic operations. Transportation and environmental engineers are working together to explore innovative solutions aimed at reducing the environmental effects of motorized transportation in urban areas.

At the same time, improved methods of investigation are creating a renewed interest in older problems, such as transit operations and planning and logistics and supply chain management. A new appreciation for the critical role that mobility plays in the quality of life in urban areas is leading planners to study with fresh eyes the interaction of land use and transportation. In addition, the conflicting pressures of security and efficiency are calling for new methods to address congestion at airports, ports and other terminals.

ITS Berkeley researchers, students and faculty are actively engaged in many of these developments through a group of new initiatives, including two new research centers.

The **California Center for Innovative Transportation (CCIT)** was founded in 2001 in collaboration with Caltrans as a unit within California PATH to support the commercialization of Intelligent Transportation Systems technologies. In 2003, CCIT spun off from PATH to pursue a broader and more ambitious mission: to facilitate the deployment of transportation research results in the field by working with state and regional transportation agencies and private sector vendors. CCIT represents a commitment by ITS to deploy our research in the real world in ways that will make a difference to the traveling public. CCIT's first group of projects focuses on technologies that were developed at PATH. In the next few years, it will expand its portfolio of projects to include other research results.

If CCIT's activities are considered "last-mile" research, those of the **Berkeley Center for Future Urban Transport, a Volvo Center of Excellence,** are located at the other extreme of the research spectrum. Funded by a five-year grant from the Volvo Research and Educational foundations after a tough international competition, this center is a nice addition to the ITS family. The center's theme is the interplay of policy and technology in solving urban transport problems, and a significant part of its research agenda has been drawn from problems specific to individual cities around the world. By working with international partners in cities in China, Chile, Spain, Japan, France, and possibly other countries in the future, the center's researchers will develop solutions to problems of accessibility, mobility, sustainability and safety that are specifically tailored to individual cities. This new center represents one of the largest international research collaborations that ITS Berkeley has ever embarked on. Because funding for the center comes through a grant, it allows our faculty and students to explore highly innovative ideas without the constraints of project deadlines and deliverables. Eight ITS faculty members and up to 12 doctoral students will collaborate in these research activities.

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In addition to our new research centers, new faculty associates are strengthening our research capabilities.

- **Raja Sengupta** is an expert in the development of Wireless Networks for Traffic Safety applications. He has a growing research program, funded by automobile manufacturers, and is working closely with the research and development staff at PATH. Links to his research can be found on his **Home Page in the Department of Civil and Environmental Engineering**.
- **Alexandre Bayen** joined UC Berkeley this year. He is a control expert with emphasis in Air Traffic and an interest in other transportation networks. His addition to the ITS family strengthens our Air Transportation research at NEXTOR. You can learn about his research by following the links on his **Home Page in the Department of Civil and Environmental Engineering**.
- **Max Shen** adds to our strong programs in Logistics and Supply Chain Management. He joined the IEOR department at UC Berkeley this year after a short stint at the University of Florida. To learn more about his interests, visit his **Home Page in the Department of Industrial Engineering and Operations Research**.

Given these additions to our research activities and collaborators, we are starting this academic year on a high note. If you have suggestions or ideas, feel free to drop me a note at **madanat@ce.berkeley.edu**.