



## A conversation with Engineering's new dean

**M**ichael Spencer, the new dean of the Clarence M. Mitchell, Jr. School of Engineering, knows that Morgan has a story to tell, one of innovation, diversity and a tremendous value proposition.

Dr. Spencer came to Morgan in January 2017 from Cornell University, where he was a professor in the Department of Electrical and Computer Engineering. Before that, he was a professor at Howard University for nearly 18 years.

Dr. Spencer received his bachelor's, master's and doctoral degrees in electrical engineering from Cornell and has more than 160 publications and 20 patents in the fields of compound semiconductors, graphene, power conversion, microwave devices and solar cell technology. He grew up in the Washington, D.C., area and loves football, rooting for the Redskins.

Preparing students for a fast-arriving future, one that includes sophisticated drones and autonomous cars, falls to Dr. Spencer, who welcomes visitors with a big smile.

"Innovation and creativity is the real challenge," he says. "It's a challenge we've been struggling with – how do you teach innovation?" He believes engaging in problem-based learning and working in teams is key, and the teams need to include business folks and economists as well as engineers.

"The problems are very large," he notes. "How do you produce clean water? There are political issues as well as techni-

cal issues."

If students are exposed to the possibility of using their creativity, he says, then patentable ideas and new businesses will follow. "All of these things students should be conscious of early on," he says. "You have a hundred ideas, but at the end of the day, only two of them might work out."

And universities need to determine which fundamental research questions they can address.

"What are the research areas for the country and how to do universities play into it?" Dr. Spencer says. "It takes a considerable amount of thought to figure out what resources we have and where can we make an impact."

Without that, he says with a laugh, "You'll get beaten by Google, who can put up massive amounts of money."

One of the challenges is making the region and the country



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## New summer program builds on past success



*Madison Bannerman,  
MSSTI participant*

**W**ould it work with middle school students?

For 21 years, the National Transportation Center at Morgan State University has run its highly successful Summer Transportation Institute, which gives 20 high school students a chance to experience the world of transportation professionals.

The free, four-week program includes field trips, hands-on activities, SAT prep and recreation on campus. Over the years, several students have gone on to major in engineering or transportation studies.

This year, the National Transportation Center and a new research, education and public outreach center at

Morgan, the Urban Mobility & Equity Center, expanded the summer offerings to include a program for 17 middle school students, the Middle School Summer Transportation Initiative (MSSTI). The program was sponsored by the Maryland State Highway

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# A Message from the NTC Director

DR. ANDREW FARKAS



The National Transportation Center at Morgan State University continues to gear up its new Tier 1 Urban Mobility & Equity Center, as well as remain an active partner with Region 3 MATS UTC at University of Virginia and NTC@Maryland, the economic development national center at University of Maryland. As usual, much of summer 2017 was very busy. We ran our 21st Summer Transportation Institute for high school students and, for the first time, a similar Middle-School Summer Transportation Initiative. We finished old projects and started new ones through our UTC consortia. Twelve graduate students started their MDOT internships in July at various business units, such as Maryland Transit Administration and Motor Vehicle Administration. We participated with consortium universities for the Region 3 UTC Re-competition, and we are in the midst of selecting UMEC research projects and preparing budgets for the second year of USDOT funding.

We are particularly proud of our technical and policy development assistance to the State of Maryland. We have:

- provided assistance to the Maryland Energy Administration by testifying on the Clean Cars Act of 2017 to the Maryland legislature. My testimony supported efforts to make the bill's financial incentives for electric vehicle (EV) purchases more equitable by including a price cap on EVs' eligibility. The bill was enacted with a price cap during the 2017 legislative session;
- assisted the Maryland Transit Administration in planning the route for the BaltimoreLink Silver Line, a bus line that for the first time directly links the Morgan State campus and nearby residential communities with downtown Baltimore and other educational institutions. The line will have an end station layover on campus.

This newsletter features more details about our accomplishments. We appreciate all the good wishes and support that we have received from our various partners, advisors, and other stakeholders over the past academic year. We hope to continue to earn your support over the coming year. •

## ABOUT THE CENTER

The National Transportation Center (NTC) at Morgan State University is committed to transportation research and education that support the well-being and economic development of communities.

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## Maryland State Highway Administration

### 2017 Summer Interns

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# Summer Program ... from page 1

Administration, which received approval from the Federal Highway Administration to use funding from an on the job training program.

While the high school students focused on aviation – including building a motorized airplane, touring aviation museums and even “flying” a plane in a flight simulator – the middle schoolers learned about bridge construction. They built bridges from paper and Popsicle sticks, and then used the elements in the TRAC Bridge Module to construct bridges out of balsa wood. They tested the bridges, determining their weight capacity, during a final presentation that was attended by FHWA officials and NTC staff. Students also visited the region’s bridges, whose construction and condition ranged from stately to dilapidated.

And it worked – MSSTI proved to be just as popular as the high school version.

Ariana Makumi, who will enter sixth grade in the fall, likes to draw and feels that would combine well with engineering or architecture.

“There’s nothing that’s not involved in engineering,” she said. “When we built the bridges it was really fun. Engineers do everything you do – the food you eat has to be transported from all over the world so you can eat it.”

She enjoyed learning about Glenn L. Martin after a visit to the airport and aviation museum that bears his name.

“It was really cool,” she said. “I had never been up close to a plane before. Some of the planes were actually used in World War II.”

Both programs concluded on July 28, 2017, with a banquet featuring keynote speaker Gregory Slater, the administrator of the Maryland Department of Transportation State Highway Administration.

“We need you as a group of young, creative minds of all interests to shape this transportation field,” he told the students. “Careers in transportation matter – we shape communities ... we can degrade the quality of life or enhance it – it matters.”

The summer programs are not just enrichment for students, they introduce them to the field of transportation, creating the future workforce.

Amina Georgie, a senior at George Washington Carver Center for Arts and Technology who is interested in engineering, came to STI to explore that interest.

“Everything is for free – that’s a plus,” she said. “I liked that it had SAT prep; I thought it would be a good opportunity.”

Said Kobe White, a junior at New Town High School, “I wanted to do something in science. After this, I developed a new love for transportation – it seems more interesting than I thought.”

Dr. Andrew Farkas, director of both UMEC and the NTC, said, “This is the first year for the middle

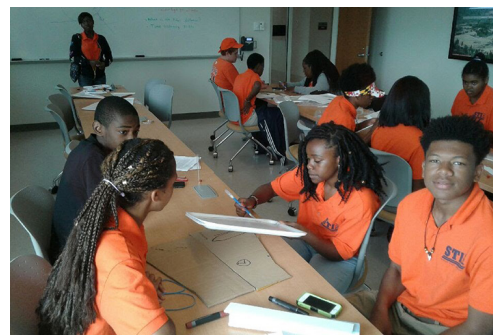


*Nathaniel Parker, MSSTI participant, tests a bridge.*

school program, and a number of people have told me – individuals who made presentations to the middle-schoolers – how inquisitive they were and what good questions they asked. They had nothing but good things to say.”

Jawiyambe Thomas-James went through STI in 2012 and now is a sophomore majoring in civil engineering at Morgan.

“The most memorable thing was definitely the trip to Virginia Tech and visiting their SmartRoad,” he recalls. “STI influenced my decision to attend Morgan for engineering by exposing me to the staff and the environment in the engineering department. The program showed me how I would be treated and expected to perform here at Morgan. The program also gave me an insight on whether I wanted to focus on transportation engineering or civil engineering, and how I could possibly work in both focuses in the future.”



## NEW RESEARCH PROJECTS

Climate Change & Non-Motorized Transport

*Dr. Ardeshir Faghri (University of Delaware), **Dr. Hyeon-Shic Shin***

Impact of Level of Service (LOS) on the Driver's Behavior on Arterials

*Dr. Behzad Aghdashi (North Carolina State University), **Dr. Celeste Chavis**, **Dr. Mansoureh Jeihani**, Sangkey Kim*

Eco-Speed Control for Hybrid Electric Vehicles and Buses in the Vicinity of Signalized Intersections

*Dr. Hesham Rakha (Virginia Tech), **Dr. Mansoureh Jeihani**, **Dr. Celeste Chavis**, Dr. Hai Chen (Virginia Tech)*

Quantifying the Impact of On-Street Parking Information on Congestion Mitigation

***Dr. Celeste Chavis**, **Dr. Mansoureh Jeihani**, Dr. Hesham Rakha (Virginia Tech)*

Inlet Cleaning Pollutant Characterization Study for Total Maximum Daily Load (TMDL) Compliance

***Dr. James G. Hunter**, **Dr. Dong Hee Kang**, Dr. Neely Law (Center for Watershed Protection), Bill Stack (Center for Watershed Protection)*

Improving the Reliability of Freight Transportation

*Dr. Paul Schonfeld (University of Maryland), Dr. George List (North Carolina State University), **Dr. Hyeon-Shic Shin***

## ONGOING RESEARCH PROJECTS

Connected Vehicle Technologies for Energy Efficient Urban Transportation

*Dr. Ajay Prasad (University of Delaware), Dr. Suresh Advani (University of Delaware), **Dr. Hyeon-Shic Shin***

Needs, Barriers, and Analysis Methods for Integrated Urban Freight Transportation

***Dr. Hyeon-Shic Shin**, Dr. Paul Schofeld (University of Maryland)*

Mitigating Pollutants from Highway Infrastructure for Total Maximum Daily Load (TMDL) Compliance: Monitoring Efficacy of Best Management Practices and Advancing Decision Support

***Dr. James Hunter**, **Dr. Dong Hee Kang**, Dr. Teresa Culver (University of Virginia)*

Environmental and Safety Attributes of Electric Vehicle Ownership and Commuting Behavior: Public Policy and Equity Considerations

***Dr. Andrew Farkas**, **Dr. Hyeon-Shic Shin***

Multi-layered Integrated Urban Freight Delivery Network – Phase I: Identification of Policy Preferences based on Qualitative and Conjoint Analysis

***Dr. Hyeon-Shic Shin**, **Dr. Michael Callow***

Potential Effects of Composition and Structure of Dynamic Message Sign (DMS) Messages on Driver Behavior and Their Decision to Use Freeway Incident Management (FITM) Routes

***Dr. Mansoureh Jeihani***

The NTC now works with Morgan's new research center, the Urban Mobility & Equity Center (UMEC), which is also directed by Dr. Andrew Farkas. For a complete list of UMEC research, visit [www.morgan.edu/UMEC](http://www.morgan.edu/UMEC)



# Battered roads help restore Bay's oyster population

A lengthy, three-part research project at Morgan State University determined that two problems affecting the Chesapeake Bay region could be the solution for each other.

The first problem: To restore the Bay's oyster population, baby oysters called spat are grown in tanks and placed on oyster shells, which then are planted on a hard reef that keeps them from sinking into the Bay's silty bottom. The reefs themselves were once made of oyster shells, but those shells are now scarce due to the declining oyster population.

The second problem: Maryland is committed to maintaining its roads, continually removing old concrete, which is often discarded, necessitating a disposal site. The state is looking for ways to recycle the old concrete, which can be reused by crushing and milling it into a material called recycled concrete aggregate (RCA).

Could that RCA take the place of oyster shells to create reefs? And could it do so without leaching pollutants into

Bay waters? Would it somehow make spat more vulnerable to predators? And if oysters did thrive, would commercial watermen be able to harvest them from an RCA reef? Would oil and gas spilled on concrete when it was a road be a problem, and how could that be evaluated?

The Maryland State Highway Administration funded a three-phase research project through Morgan State

*“Historic oyster populations could filter the Bay’s entire water every three or four days, but today that takes nearly a year.”*

*--Dr. Kelton Clark*

University's Patuxent Environmental & Aquatic Research Laboratory (PEARL) and its National Transportation Center to answer those questions. The first phase of “Evaluation of Waste Concrete Road Materials for Use in

Oyster Aquaculture,” began in 2011 and the final phase was completed in late 2016.

“Native oyster populations are at less than 1 percent of historic levels due to protozoan diseases, overharvesting and pollution,” said Dr. Kelton Clark, who recently retired from directing PEARL. “This tremendous decline has dramatically changed the Bay's ecosystem and oyster industry. Individual oysters filter 4 to 34 liters of water per hour, removing sediments and pollutants. Historic oyster populations could filter the Bay's entire water every three or four days, but today that takes nearly a year.”

The first phase of the research evaluated the potential leachability of chemicals in extensive tank tests at PEARL, using water drawn from the Bay. Oyster growth and spat survival were also evaluated in flow tanks, comparing traditional shell and a mixture of shell with RCA as a base material.

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## 2017 COMPLETED RESEARCH PROJECTS

Quantifying Travel Time Reliability Perception and Developing Disaggregate Behavior Models under Information Provision Using a Driving Simulator

**Dr. Mansoureh Jeihani, Dr. Farzad Moazzami**

Electric Vehicle Ownership Factors, Preferred Safety Technologies and Commuting Behavior in the United States

**Dr. Andrew Farkas, Dr. Hyeon-Shic Shin, Seyedehsan Dadvar, Jessica Molina**

For more information about our research, visit [www.morgan.edu/soe/ntc](http://www.morgan.edu/soe/ntc)



# Technology Transfer

- Director Andrew Farkas provided assistance as a technical expert for the Clean Cars Act of 2017 in the Maryland State Legislature to make the bill's financial incentives for electric vehicle purchases more equitable; the bill was enacted.

- Dr. Young-Jae Lee hosted a U.S. DOT T3e webinar in April entitled "Connected Vehicle Technology for Improving Transit Operations" and presented his research with his doctoral student Seyedehsan Dadvar.

- In April, Advances in Engineering website highlighted and introduced Dr. Young-Jae Lee's published paper at Transportation Research Part C in 2016, "Transit Signal Priority Accommodating Conflicting Requests Under Connected Vehicle Technology" as one of the key scientific articles in the Civil Engineering area.

- Dr. Young-Jae Lee presented his research, "Evaluation and Application of Transit Network Directness Using Geographic Information Systems" at the 10th National GIS in Transit Conference by TRB and URISA (Urban and Regional Information Systems Association) in September in Washington, D.C.

- Dr. Young-Jae Lee published his research at ASCE Journal of Transportation Engineering (Young-Jae, Seyedehsan Dadvar, Jia Hu and Byungkyu Brian Park, "Results of Transit Signal Priority Experiment in Connected Vehicle Technology Environment," ASCE Journal of Transportation Engineering, Part A: Systems 143 (8), 2017).

- Dr. Young-Jae Lee published his research at Transportation Research Record (Laaly, Safieh, Mansoureh Jeihani, and Young-Jae Lee, "A Multiscale Transit-Oriented Development (TOD) Definition Based on Context Sensitive Paradigm," Transportation Research Record No. 2671, pp. 31-39, TRB, Washington DC, 2017).

- Dr. Young-Jae Lee presented three papers at the Transportation Research Board Annual Meeting in Washington, DC, in January:

- Safieh Laaly, Young-Jae Lee and Mansoureh Jeihani, "A New 5-Scale Transit Oriented Development (TOD) Definition Based on Context Sensitive Paradigm,"

- Hyeon-Shic Shin, Seyedehsan Dadvar, Shilpi Bharti and Young-Jae Lee, "Results and Lessons from Local Calibration Process of Highway Safety Manual for the State of Maryland: Freeway Segment, Speed-Changed Lanes and Ramp Terminals,"

- Seyedehsan Dadvar, Keith Hayes, Hyeon-Shic Shin and Young-Jae Lee, "Complexity vs. Predictability: Evaluation of Different Levels of HSM Predictive Methods on Maryland Route 100."

- The U.S. DOT's July UTC Spotlight Newsletter featured research, "Measuring User Acceptance of and Willingness-To-Pay for CVI Technology," conducted by Dr. Hyeon-Shic Shin, Dr. Michael Callow, Dr. Andrew Farkas, Dr. Young-Jae Lee and Seyedehsan Dadvar.

- "Evaluation of Waste Concrete Road Materials for Use in Oyster Aquaculture," a three-phase research project conducted at Morgan's Patuxent Environmental

& Aquatic Research Laboratory, was featured in the Bay Journal and the Port of Baltimore magazine.

- The National Science Foundation awarded Seyedehsan Dadvar, a Ph.D. student in the Department of Transportation and Urban Infrastructure Studies, full financial support to attend the Trans-Atlantic Symposium on ICT Technology and Policy at University of Minnesota in Minneapolis in June. The symposium included presentations and discussions about the latest research in Information Communication Technology (ICT) from American and European researchers, with sessions about the interactions of ICT and transportation such as connected vehicles, autonomous vehicles, ride-sharing, and other emerging transportation technologies. Dadvar particularly enjoyed meeting and chatting with other students, especially a group of Ph.D. students from Germany. Ajibola Ayanbeku, a Ph.D. student in Civil Engineering, also attended.

- Dr. Celeste Chavis presented "Baltimore Bikeshare: Who's Using and Why?" in July at the 2017 Baltimore City Data Day, an annual workshop to help communities expand their capacity to use technology and data to advance their goals.

- Dr. Celeste Chavis presented "Quantifying the Impact of On-Street Parking Information on Congestion Mitigation" at the Joint ITE/CIT 2017 Annual Meeting in July in Toronto.

# Oyster Aquaculture ... from page 5



*Dr. Kelton Clark, right, former Director of PEARL who recently retired, explains how the effect of the recycled concrete aggregate on oysters is tested in tanks.*

“The results showed that using RCA as a base for oyster reefs did not adversely affect either oyster growth or the surrounding environment,” Dr. Clark said. “None of the materials leached at a rate that exceeded the Environmental Protection Agency’s drinking water standards, and the RCA did not raise the pH above the threshold for introduction into Maryland waters.”

The second phase involved actually constructing reefs with a base of RCA in two locations in the Bay with different salinities, one in the Patuxent River just north of Broomes Island and the other in Fishing Bay on the Eastern Shore, and measuring whether potential predators would be attracted to such reefs. The research showed that the recruitment and survival of oysters with RCA was the same as a traditional reef.

The involvement of local watermen was critical to the success of the research. Researchers created a tank divided in half with boards that simulated the washboards of an oyster boat, and recruited watermen from around the region to tong for oysters. One half of the tanks had traditional oyster shells while the other had RCA. Watermen discovered that since the

RCA weighs more than oyster shells, it was more difficult to tong. The watermen suggested that it could be used with a veneer of oyster shells or in areas not used for harvesting oysters.

Since accidental spills of oil and gas occur on roads, the final phase evaluated the RCA for petroleum byproducts and provided evaluation methodologies.

Samples were collected from three different concrete dumping sites twice, and all analysis was performed at least three times.

“As alternative materials are introduced in marine environments, the State Highway Administration needs a testing protocol to assess their potential impacts,” said Dr. Dong Hee Kang, one of the researchers. “In all of the samples, organic chemical concentrations were below the detection limit. We did detect hydrocarbons from two samples, but the detected concentrations were 100 times lower than the water quality standard of Maryland. It’s safe to say that RCA is not a cause for concern for hydrocarbon components leaching when used as a base for oyster reefs.”

One of the next steps will be

developing a permitting process for such artificial reefs. Currently, Maryland does not have any established criteria for artificial reef materials. A permit to place material in the tidal waters of the Chesapeake Bay requires sign-off from Maryland Departments of the Environment, Natural Resources, and Health, Maryland Board of Public Works, U.S. Army Corps of Engineers, U.S. Coast Guard, in some cases the U.S. Fish and Wildlife Service (USFWS), and (rarely) the Department of the Interior.

“This research has established some valuable methodologies and results that will provide a basis of knowledge for future permitting,” said Dr. Andrew Farkas, director of the National Transportation Center.

The final reports for all three phases of the research are available at [http://www.morgan.edu/school\\_of\\_engineering/research\\_centers/national\\_transportation\\_center/research/completed\\_projects.html](http://www.morgan.edu/school_of_engineering/research_centers/national_transportation_center/research/completed_projects.html) •





# Engineering's new dean ... from page 1

more aware of what Morgan offers.

"Morgan is a unique place in the City of Baltimore," Dr. Spencer says, citing Morgan's history of increasing diversity in the engineering workforce. But what isn't as well known is the value that Morgan offers today's students.

"It's possible for a student – if you are an honors student – to pay almost nothing," he says, adding that even those who aren't honors students benefit from a tuition that is markedly lower than other schools. "You can come out and start your career almost debt free."

That's a significant advantage since black students will shoulder 80 percent more debt than their non-black counterparts, and the average student loan debt for 2016, according to Forbes magazine, was \$37,172.

Offering affordable opportunities for students is an important social justice role for Morgan, and one that reduces the digital divide.

"We're entering into an age where artificial intelligence is penetrating jobs and computers have become more dominant," Dr. Spencer says. "We saw what happened when coal left the middle of

the country."

Not only will engineers be needed for such jobs, but they'll be doing so in an atmosphere of increasing urbanization. Dr. Spencer was intrigued by presentations he saw this summer at the National Academy of Engineering Grand Challenges about urbanization and one in particular about a program in China that used GPS and intelligent sensors to make shared bikes easily available. "It's the ability to integrate all of these things," he says.

He wants to ensure that students studying transportation and civil engineering are connected to other disciplines, too, such as mechanical and electrical engineering.

"It's predicted that 75 percent of the total gross national product will be concentrated in the top 100 cities, and those cities are even further subdivided into connected cities and smart cities," Dr. Spencer says, citing Boston and Washington, D.C., as examples of smart cities. "Increasing urbanization will further crowd the streets and make transportation more challenging."

One area of research that intrigues

him is autonomous vehicles. "We know autonomous vehicles are coming and faster than people think, but they'll take away jobs, like truck drivers and taxi drivers, and that's a concern." He's fascinated by drones and the idea of an autonomous plane, citing the example of small planes that have to allocate weight for the pilot.

Dr. Spencer, who has settled in Towson, notes that the Baltimore region – with its proximity to D.C., affordable housing stock, and AMTRAK and MARC rail service – is well positioned.

"But one of the big issues is transportation, especially if we want to be a bedroom community for Washington. As I learn more about Baltimore, I learn that the Light Rail isn't quite what people want it to be," he says. "And where are bicycles going to play into this? There's a lot to be done with bike transportation and making cities walkable – it's a very, very rich area, and Morgan seems to be fortunate to have a niche in this area. We hope to maintain that and go forward – that's unique, there are not too many transportation departments." •

## MDOT/MSU interns celebrate another successful year

The MDOT/MSU Graduate School Internship Program concluded another year in June with a luncheon to celebrate the achievements of the interns and their mentors from the various business units of the Maryland Department of Transportation.

Dr. Charles Glass, the assistant secretary for Transportation Policy Analysis and Planning for MDOT and the keynote speaker at the luncheon, noted, "This program exemplifies what MDOT tries to do with workforce development."

The 30-year-old program once was exclusively transportation students,

but now it includes students from engineering, architecture and planning, business and the liberal arts.

"It's truly an interdisciplinary program, and one that we're extremely proud of," said Dr. Andrew

Farkas, director of both the National Transportation Center and the U.S. Department of Transportation's Urban Mobility & Equity Center at Morgan, which partner with MDOT to manage the program. •

