

CESTiCC



Center for Environmentally Sustainable Transportation in Cold Climates

In this newsletter - Fall 2016

[Message from the Director](#)

[Research Highlights](#)

[Outreach](#)

[Technology Transfer](#)

[Achievements and Accolades](#)

[Upcoming Events](#)

[Message from the Director](#)



Snow is on the ground, the nights are long and cold, and students are eager to take a well-earned break. Make no mistake: it is officially the end of another fall semester, and what a busy semester it has been! Sixteen new projects have started, and we've been extremely busy with outreach and technology transfer activities.

2016 has been a very eventful year, and we are proud of the accomplishments of the center, its PIs, students, and staff. We hope you will continue to stay engaged with CESTiCC. I invite you to visit our [website](#) and our [Facebook](#) page to stay up-to-date with our many activities.

Best wishes for an excellent holiday season and New Year. We are looking forward to an exciting and prosperous 2017.

Warm regards,
Jenny Liu

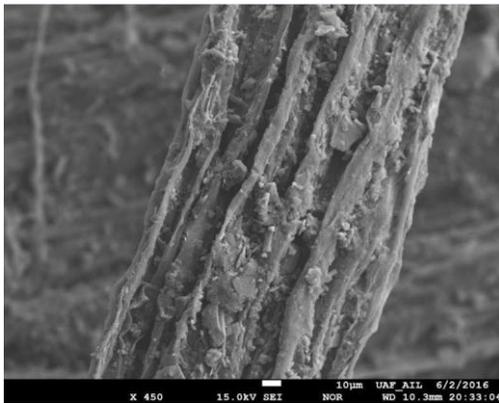
[Research Highlights](#)

Several research projects were completed this fall. Here we highlight one from our *Materials & Design* research thrust. For a complete list of our active and completed

research projects, please visit our [research site](#).

[A Bio-Wicking System to Prevent Frost Heave in Alaskan Pavements](#)

Water within pavement layers is a major cause of pavement deterioration. Conventional drainage systems can only drain gravity water but not capillary water. Consequently, pavements experience distresses due to capillary water rise in the base course materials, no matter how well the embankment was designed and constructed. According to Dr. Xiong Zhang's previous study, a newly developed H2Ri geotextile with wicking fabric is able to drain capillary water laterally to the road side under unsaturated conditions. The field test section at the Beaver Slide of the Dalton Highway, Alaska also indicated that H2Ri geotextile successfully eliminated the frost heave and subsequent thaw weakening by draining the water laterally to the roadside. However, current designs require that H2Ri be exposed at the shoulders of the road embankment so that water can be vaporized to generate a hydraulic gradient to maintain constant water transport. This causes some potential concerns: (1) the H2Ri might degrade with time due to sunlight exposure, (2) routine grass mowing maintenance practice might cause mechanical damage to the H2Ri geotextile, (3) the geotextile might lose function under high suction conditions due to air entry into the geotextile drainage channels, and (4) clogging and salt concentration might be issues that will influence drainage efficiency.



This research investigated the possibility of a bio-wicking system to address these concerns. The H2Ri was buried below the topsoil at the road shoulders. The road shoulders were then hydro-seeded to establish vegetation, consistent with current maintenance practices of state DOTs. Thus the evaporation occurred at the leaves of the vegetation instead of directly from the exposed wicking fabric, which

eliminated the above concerns. The vegetation now works as a “pump” to generate hydraulic gradient to wick water out of the soil while the H2Ri is a “pipe” to transport water under unsaturated conditions (negative pore water pressures). The vegetation will typically wilt at a suction of 1,500 kPa so that the H2Ri will not be too dry to lose the ability to transport water. This bio-wicking system can maintain the benefits of wicking fabric while greatly simplifying maintenance.

Both elemental level and full-scale test results were performed and the results indicated that the bio-wicking system is more effective in draining capillary water within the base courses compared with the preliminary design, in which the geotextile is directly exposed. However, good drainage conditions were required for the bio-wicking system to maintain efficiency. Accumulation of excess water resulted in water re-entering the road embankment. Moreover, the similarities in microstructures of the grass and H2Ri wicking fabric indicated that their working mechanisms for grass and H2Ri geotextile were essentially the same: (1) both of them have small channels which can absorb water from surrounding soils, and (2) both systems take advantage of the water potential difference (suction gradient) between the soil and the atmosphere to vaporize water. In this bio-wicking system, the relatively smaller channels in the grass roots further ensured water removal from H2Ri geotextile, transporting through the grass stems, and eventually evapo-transpiring into the air at the leaf-air interfaces. In sum, the bio-wicking system seemed to successfully address preliminary concerns and is a more efficient system to dehydrate road embankments under unsaturated conditions.



Outreach



[2016 UAF Engineering Activities Fair](#)

Joe Alloway staffed a table at the 2016 UAF Engineering Activities Fair on Friday, September 9th. Joe spoke with students about the exciting things going on in CESTICC and what students can do to get involved.



["Can you see me now?" in Roads and Bridges Magazine](#)

Researchers Anburaj Muthumani and Laura Fay wrote an article for [Roads & Bridges](#) magazine related to their research into lighting for snowplows for optimal safety. Maintenance vehicles such as plows generally move much slower than other vehicles, and can be involved in accidents as a result. The article, "[Can you see me now?](#)", summarizes research that was conducted to optimize safety and create a "Best Practices" guide for lighting snowplows.



[Srijan Aggarwal Led a Class for UAF Inside Out](#)

CESTiCC researcher Dr. Srijan Aggarwal led the College of Engineering and Mines class for [UAF's preview day, Inside Out](#), a showcase of UAF for high school juniors, seniors and their families. Dr. Aggarwal's class, "Air Pollution", introduced students to key concepts in [environmental engineering](#) and focused on the importance of practical solutions.



[Xianming Shi's Work on Green Deicers Featured in WSU Magazine](#)

Xianming Shi's work on sustainable deicers and anti-icers was recently featured in the [Washington State University Magazine](#). The article highlights some of the environmental impacts of America's use of salt as a deicer and the potential of other deicing products made from more sustainable waste products, such as apple skins and peony leaves. This work is tied to one of Dr. Shi's [completed CESTiCC projects](#).



[Air Quality Presentations at Pearl Creek Elementary School](#)

Dr. Srijan Aggarwal and Joe Alloway presented on Air Quality in Interior Alaska to students of all grade levels at Pearl Creek Elementary School. Winter in interior Alaska often brings temperature inversions. These inversions trap pollutants, such as wood smoke and vehicle exhaust, in the lower atmosphere, where they become an environmental hazard. The presentations taught students how to protect themselves and what they could do to improve air quality in cold climates.

[Technology Transfer](#)



[Marcel Huijser Presented at IENE in Lyon, France](#)

CESTiCC researcher Dr. Marcel Huijser attended the Infra Eco Network Europe (IENE) this fall. He presented his research on "The reliability and effectiveness of a radar based animal detection system and road crossing behavior of large ungulates" which was based on his ongoing [CESTiCC project](#).

[Horacio Toniolo and Jenny Liu Presented in UAA Professional Development Seminar Series](#)

CESTiCC researchers Horacio Toniolo and Jenny Liu presented their research as part of the [UAA College of Engineering Professional Development Seminar Series](#). Dr. Toniolo presented "Sag River Flooding, North Slope Alaska" on October 14th and Dr. Liu presented "Sustainable Materials and Design for Alaskan Pavements" on November 18th.

[Rob Ament Presented at the Pronghorn Antelope Workshop](#)

CESTiCC Assistant Director Rob Ament presented at the [27th Biennial Western States and Provinces Pronghorn Antelope Workshop](#) in Fairmont Hot Springs, Montana. His presentation was entitled, "Effectiveness of Mitigation Measures to Reduce the Impacts of Transportation on Wildlife Movement and Mortality."



[Liv Haselbach Presented in Cartagena, Colombia](#)

Dr. Liv Haselbach traveled to Cartagena, Colombia during the week of September 19th for a variety of concrete related events. She served as a US Delegate to the ISO Technical Committee 71 on concrete. She also presented her work on pervious concrete for ASOCRETO, Colombia's concrete association and the Argos Corporation.



[Jenny Liu and Xavier Schlee Presented for Fairbanks Transportation Infrastructure Committee](#)

Jenny Liu and Xavier Schlee presented for the Fairbanks Greater Chamber of Commerce Transportation Infrastructure committee in October. Their presentation was entitled, "High Abrasion-resistant and Long-lasting Concrete" and introduced a new research project aimed at creating an abrasion resistant concrete mix design with a reduced cost and an increased life span to address some of Alaska's distinct challenges.

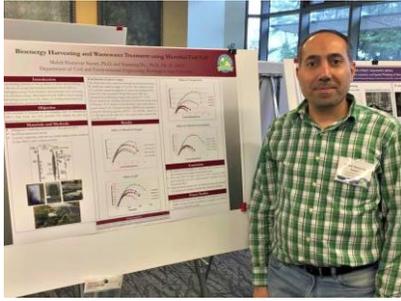
[Drs. Perkins and Bennett Led the 2016 Moolin Seminar on Sustainable Construction](#)

Drs. Perkins and Bennett organized and presented at the [2016 Moolin Seminar - Environmentally Sustainable Construction Practices in Cold Regions](#) on October 31 in Anchorage, Alaska. Their presentation on "Guidelines for Sustainable Construction in Alaska: Tips, suggestions, and ideas for increasing the net benefit of Alaskan construction projects" and was based on findings from their completed [CESTiCC project](#).



[Laura Fay Presented at Northwest Pavement Management Association](#)

CESTiCC Associate Director Laura Fay gave two invited presentations at the [Northwest Pavement Management Association](#) conference in Portland Oregon. The presentations were "Turning Roads back to gravel – is this a good option for your road?" and "Deicing (Winter Operations) on Porous and Permeable Pavements."



[Student Researchers Presented at PacTrans Conference](#)

Student researchers Mehdi Honarvar Nazari and Gang Xu gave poster presentations at the 2016 PacTrans conference in Seattle, Washington. Dr. Nazari's poster was "Bioenergy Harvesting and Wastewater Treatment Using Microbial Fuel Cell" and Mr. Xu's poster was "Graphene Oxide Modified Pervious Concrete."



[Ning Xie Presented in Qingdao, China](#)

CESTiCC researcher Ning Xie recently presented at the [International Union of Materials Research Societies 17th International Conference in Asia](#). He chaired the session on "Green and Low-carbon Emissions Building Materials" and gave a presentation entitled "the

Application of Nanotechnology in Lightweight Concrete."

[Webinar Series](#)

Five webinars were hosted by CESTiCC this fall. The presentations for each were recorded and are available on the [CESTiCC website](#).

[Performance of Multiaxial Paving Interlayer-Reinforced Asphalt Pavement](#)

In this webinar, CESTiCC director Jenny Liu presented a talk on the use of paving interlayers in Alaska and other northern states. Her study tested the efficacy of paving interlayers through laboratory investigation, pavement structural analysis, finite element method analysis and surveys from field test sections. Results found that performance was improved with the use of paving interlayers in terms of reduced amount and severity of cracking.

[Pervious Concrete Performance in Eastern Washington](#)

This webinar focuses on the findings of Dr. Liv Haselbach's ongoing CESTiCC project, [The Stormwater-Pavement Interface in Cold Climates](#). Low impace design (LID) is a set of policies and practices designed to handled stormwater runoff in order to best mimic natural hydrological processes. However, LID technologies which are equipped to handle colder climates and areas with poorly draining soils and steep slopes have not been well developed. This presentation shares the findings from the first phase of research on this topic.

[CESTiCC, RE-CAST and ACI Alaska Chapter Presented: The Role of Cementitious Materials in the Next Decade](#)

Today, concrete and its derivatives are ubiquitous, but their presence and use can only grow as academia and industry address the challenges of sustainability and resilience. In this webinar, Dr. Antonio Nanni discussed the role of cementitious materials in the next decade. Topics included: a) new classes of binders complementing portland cement; b) additives that transform fresh properties; c) non-corrosive reinforcement resulting in concrete without chloride limits; d) use of saltwater and recycled/alternative aggregates; and, e) brittle matrix composites for repair.

[CESTiCC and IACIP Presented: Planning and preparation for an Academic Career \(II\)](#)

This is CESTiCC second collaboration with the International Association of Chinese Infrastructure Professionals (IACIP) on the topic of planning and preparing for an academic career. The webinar consisted of a panel of renowned professors in civil engineering programs sharing their insights on the ins and outs of working as a professional academic. Particular focus was placed on topics such as preparing an application package and how to best prepare for interviews.

[Energy Harvesting and Self-power Monitoring System for the Next Generation Smart Roadways](#)

This webinar by Dr. Samer Dessouky proposes technology responding to the call for energy resources and building sustainable roadways. Millions of roadway lane miles are subjected to stresses and strains under solar heat and traffic loading conditions, making them great candidates for energy harvesting. The proposed green technology is a hybrid energy harvesting and sensing system for roadways, and uses piezoelectric materials placed under the asphalt layer during construction to convert mechanical and thermal stresses into electricity.

[Achievements and Accolades](#)



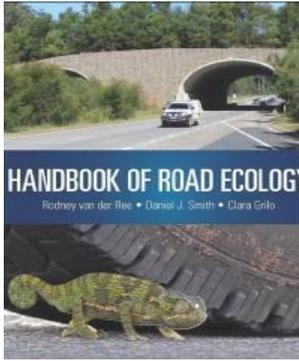
[Xianming Shi Received NSF Grant and WSU Excellence Award](#)

Xianming Shi received an NSF Grant for a CRISP Type 2/Collaborative Research project named, "Multi-Agent Sustainable Water Decision Theory (MUST): Nexus of Water, Road, Hierarchical Social Contractual Systems." The work will be a collaboration with Dr. Xiong Yu of Case Western Reserve University and a few other co-PIs. Dr. Shi also received an award from the WSU Excellence fund for his study, "Anti-Corrosion Coatings and Concrete Repair Technologies."



[Quinn Langfitt Received Eisenhower Fellowship](#)

PhD candidate and 2014 CESTiCC Student of the Year Quinn Langfitt was selected as a 2016 Eisenhower Transportation Fellow. The fellowship will support his project entitled "Impacts of Hybrid Normalization on Transportation Agency Decision-Making."



Matt Blank Received an IENE Project Award for 2016

The IENE Project Award 2016 was given to the book *Handbook of Road Ecology*, published in 2015. Center researcher Matt Blank and Fabrice Ottburg co-authored chapter 45: Solutions to the impacts of roads and other barriers on fish and fish habitat.



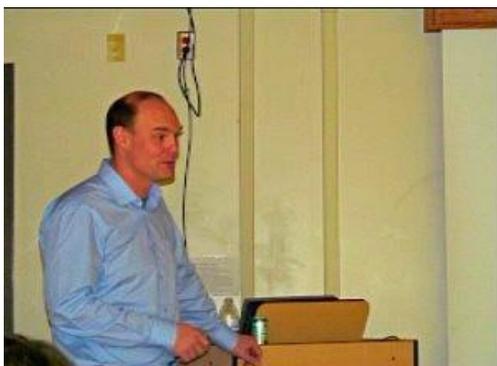
Advisory Board Member and Associate Director Promoted to Full Professor

Advisory Board member Jungho Baek and associate director Liv Haselbach were both promoted to full professor at the

University of Alaska Fairbanks and Washington State University, respectively.

Beaux Kemp and Anthony Mullin Completed Their Graduate Programs

CESTiCC 2015 Student of the Year Beaux Kemp and 2015 Michael Kyte Region 10 Outstanding Student of the Year Anthony Mullin successfully completed their MS and PhD programs, respectively, and will graduate in December. Mullin defended his thesis, "Evaluation of Crack Sealing Techniques in Alaska's Asphalt Concrete Pavement" in March. Kemp defended his MS thesis, "Material Characterization of Alaskan Asphalt Mixtures Containing Reclaimed Asphalt Pavement (RAP)" in October, which was connected to a completed CESTiCC Project.



Anthony Mullin and Carrie Sorensen Received Coral Sales Scholarship

Anthony Mullin and Carrie Sorensen received the 2016 Douglas P. Daniels/Coral Sales Company Scholarship. Anthony Mullin will receive his Ph.D. in Civil Engineering in December. Carrie Sorensen is a MS student pursuing an interdisciplinary degree in Transportation Statistics and is currently working on a research project with Dr. Nathan Belz. These scholarships are awarded to students dedicated to transportation who exhibit the characteristics of Leadership and strong interpersonal communication skills.



[Srijan Aggarwal and Patrik Sartz Receive Awards from Air and Waste Management Association](#)

Dr. Srijan Aggarwal and his student Patrik Sartz were awarded the [2016 Lab Coat and Hard Hat Awards](#) from the [Pacific Northwest International Section of the Air & Waste Management Association for 2016](#). They were nominated for their work evaluating air quality during the in-situ burning of crude oil at the Poker Flat research center. The lab coat award was given to Dr. Aggarwal for developing tests to identify the herding chemical in air samples. The hard hat award was given to Mr. Sartz for developing a specialized cart with a variety of air monitoring equipment.



[CESTiCC 2016 Student of the Year: Mehdi Honarvar Nazari](#)

Mehdi Honarvar Nazari completed a Ph.D. in Metallurgical & Materials Engineering in 2010 at the University of Tehran and worked as a Research Associate and laboratory manager at the WTI and WSU. He is pursuing his 2nd Ph.D. in Environmental Engineering. He has worked on CESTiCC research on the evaluation of bio-based anti-icers and DOT research pertaining to the negative effects of deicers on protection equipment and the environment.

[Upcoming Events](#)

[Transportation Research Board 96th Annual Meeting - January 8-12, 2017](#)

CESTiCC will be active showcasing the Center's research and outreach through various venues at [TRB](#), such as lectern, poster, workshop sessions, and professional meetings.

[Future Cities Competition - January 14](#)

Researcher Somayeh Nassiri will co-chair the regional [Future Cities Competition](#) at WSU on January 14, 2017. Future Cities challenges 6-8th grade students to design a future city showcasing answers for a current sustainability challenge.

[CESTiCC February Webinar - February 8, 10-11 AM Alaska Daylight Time](#)

Dr. Xiong Zhang, a CESTiCC PI will present a webinar of his research on "[A Bio-Wicking System to Prevent Frost Heave in Alaskan Pavements](#)." Registration for this event will be open soon.

[ASCE CI Summit - March 2-5](#)

On behalf of the ASCE Bituminous Material Committee, Jenny Liu will preside and also serve in a technical panel on Life Cycle Sustainability of Asphalt Concrete Pavements at the [Construction Institute summit](#).

Kids2College - April 19

CESTiCC will present classes and lab tours to local 5th and 6th graders about how we all use and need transportation infrastructure and exactly what transportation engineers do.

Pearl Creek Transportation Day - May, 2017

Building on the success of the 2016 event, CESTiCC will return to Pearl Creek Elementary School in May, 2017 to host transportation day. The event seeks to teach and excite students about transportation issues.



Copyright © 2016, Center for Environmentally Sustainable Transportation in Cold Climates, All rights reserved.

Our Email address is

uaf-cesticc@alaska.edu

Our Website is

cem.uaf.edu/cesticc/

Our Facebook is

[facebook.com/cesticc](https://www.facebook.com/cesticc)

Center for Environmentally Sustainable Transportation in Cold Climates · Room 245 Duckering, P.O. Box 755900
University of Alaska Fairbanks · Fairbanks, Ak 99775 · USA