

# Rail Transportation News

The Michigan Tech Rail Transportation Program Newsletter

Spring, 2011

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## Railroad Engineering in Cold Climates

Pasi Lautala, Director of the Rail Transportation Program, recently spent two weeks in China and Tibet as the railroad engineering expert for a documentary film titled “Megastructures – Extreme Railway.” The film, produced by the Gamma Project, tells the story of the incredible engineering challenges involved with building and maintaining the highest railway line in the world, the Qinghai-Tibet Railway. Building the track that links Xining, the capitol city of Qinghai Province, with Lhasa, the capital city of the Tibet Autonomous Region, was a unique engineering and operational challenge—especially considering more than 960 kilometers (~600 miles) of the system is at an altitude of over 4,000 meters (13,123 ft.) with 632 kilometers (~400 miles) of it built on permafrost.

After landing in Beijing, Lautala and the film crew traveled 30 hours by train before arriving at their destination, the town of Golmud, where the train had originally stopped for 50 years until the construction of the Qinghai-Tibet Railway. From there, exploration continued by highway and included stopping periodically to investigate the various engineering solutions Chinese engineers have implemented to secure the long-term performance of the railway line.

The Gamma Project team chose Lautala for the documentary because of his research experience with railway construction in arctic conditions. For the past two years, Lautala has been working with the University of Alaska-Fairbanks on a study of the proposed Alaska-Canada

Rail Link (ACRL); a railway that would connect the current Alaskan and Canadian rail networks through both seasonal frost and permafrost areas. The objective of the study titled “Synthesis of Railroad Engineering Best Practices in Areas of Deep Seasonal Frost and Permafrost” was to recognize the special design, construction and

maintenance requirements of railways in arctic environments. To understand these challenges, Lautala and his research team conducted extensive literature reviews and performed scan tours of cold climate railroads in Alaska, Russia, Scandinavia, Canada and China. The final draft of the research report is currently under review and Lautala is scheduled to present the findings of the study at upcoming conferences in Calgary, Alberta and Anchorage, Alaska.

Getting an opportunity to return to China with the film crew and investigate the Qinghai-Tibet railway in detail proved a professional highlight for Lautala. The magnitude of the railway, which was constructed over four years between 2002 and 2006 made an impression on Lautala. He

noted, “It is the most recently built major cold-climate railroad in the world and also a stunning engineering feat. The extensive research that is still under way generates a wealth of information for Chinese and foreign scientists who continue to develop railroads in some of the harshest environmental conditions in the world. Such knowledge is irreplaceable for years to come.”

Expected release of the Gamma Project’s documentary, “Megastructures – Extreme Railway” is set for mid-year 2011.



(Above) Pasi Lautala at Beiluhe Research Station, China  
(Below) Freight Train on QTR





## Director's Message

Welcome to the spring newsletter of the Michigan Tech Transportation Institute's Rail Transportation Program (RTP). As you may have realized, we have shifted the release of our newsletter so we can establish a semi-annual cycle between the newsletter and our annual report. Spring is also a great time to report on our activities as students are getting ready to complete their last assignments and either leave for a well-deserved vacation, or continue their career development with internships—in many cases with rail industry companies.

The past six months have once again been full of events and activities, both for our program and for rail transportation in the United States. On the passenger side, Amtrak has been doing well with ridership increases, but their high-speed rail program has been running into little bumps along the way. Freight rail, on the other hand, has witnessed a speedy recovery from the economic downturn.

While there are lots of differing opinions on the future direction that US rail transportation (and transportation in general) should take, most experts agree that workforce development and education should be high priorities. The current workforce is aging rapidly and education and training infrastructure for rail transportation, including new technologies such as high-speed rail, is very limited in the US. To make matters worse transportation, including rail, is not one of the most highly regarded careers by today's youth.

Though workforce development tends to pale in importance when compared to political and technical challenges, I am glad to see that this issue is starting to receive the attention it deserves. APTA, AREMA and FRA are all placing more emphasis on securing the next generation of transportation professionals and we are eager to assist them through our activities by increasing the visibility of rail within Michigan Tech's student body and the community. We have been actively making presentations in conferences and local meetings, we have introduced a railway seminar to our curriculum, our Transportation Enterprise students are wrapping up their first rail-related research project and we are delighted to host another visiting Professor from Beijing Jiaotong University, China. In other activities, we hosted a community event to discuss the history and future of passenger rail, made yet another participation record in our 6th Annual Railroad Night, and our Railroad Engineering and Activities Club officers have done a tremendous job increasing their membership.

All of these activities are baby steps toward securing the next generation of rail industry workers and I'm proud that Michigan Tech can be an example for other universities interested in joining the career path. I hope you enjoy the rest of the newsletter and I hope you are as excited about the spring and melting snow as we are.

*Pasi*

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## Railroad Engineering Activities Club Update

Since the inception of the Railroad Engineering and Activities Club (REAC) in 2005, our group has served the Michigan Tech community by educating students about the rail industry and the multitude of opportunities that it provides. REAC also provides a foundation to help students network with rail industry professionals. REAC was the first official student chapter of the American Railway Engineering and Maintenance-of-Way Association (AREMA) and has nearly 50 members from eight different degree programs.

REAC is very active on campus, hosting monthly general meetings and social events, as well as going on field visits and attending conferences. REAC's aim is to educate/broaden the knowledge of current and perspectives students, faculty, staff and the general community about today's rail industry. 2010-2011 field visits are highlighted on the next page. This year's monthly meeting presentations covered a wide variety of topics, ranging from high speed rail to locomotive technologies and environmental issues. Providing a versatile group of speakers reinforces our vision as a multi-disciplinary organization with opportunities for students from different degree paths. Last year's industry speakers included: Mike Stanfill and Ryan Mills (BNSF), Phil Pasterak (PB), Chao Ma (visiting Scholar), Andy Manty (NS), Brent Marsh (Wisconsin Southern), Jim Spiegel (EMD), and Michigan Tech Rail's summer interns.

The past year was another successful year for us and it is looking even brighter as we move towards 2011-2012. With our growing membership, understanding and involvement with the railroad industry, REAC continues to provide an even better future for students who can expect to become the future leaders of the industry.

*Stephen Chartier, REAC President*

# Transportation Enterprise – CN/CXT Sustainability Assessment Project

Sustainability is a growing concern for many companies in the twenty-first century. Measuring sustainability is not an easy task as it includes economic, social, and environmental aspects and there is currently no standard method to do so.

The objective of the CN/CXT project was to provide a definition for sustainability and to create sustainability metrics that fit the defined views on sustainability, are beneficial to society as a whole, and can be used to measure current and future sustainable progress by L.B. Foster's Subsidiary company, CXT Concrete Ties, Inc. The project was sponsored by CXT, the Rail Transportation Program (RTP) at Michigan Technological University, CN Railroad, the University Transportation Center for Materials in Sustainable Transportation Infrastructure (UTC-MiSTI) and the Great Lakes Cement Promotion Association.

The project spanned two semesters. During the first semester, the Enterprise team members laid the foundation for determining metrics through research on CXT's operations and the goals of their client (CN Railroad), and on methods of modeling sustainability. The main focus of the second semester was to create a sustainability model for CXT's Spokane tie production facility. The model was designed to be used annually to serve as a metric for environmental sustainability.

The primary outcome of the project was the creation of a prototype environmental sustainability model to calculate the CXT Spokane tie production facility's carbon footprint and to identify possible areas of improvement. In addition, the team

provided research outcomes related to recycling methods for concrete ties and recorded comparisons between concrete and wood ties.

The project is in its final stages and a report will be presented to CXT Concrete Ties, CN Railroad and the Transportation Enterprise Advisory Board upon completion of the spring semester.



CXT Concrete Tie Production Facility, Spokane, Washington



CN/CXT Sustainability Assessment Team

“Sustainability is meeting current economic needs while promoting social qualities and good environmental practices from extraction of materials to disposal or reuse. For CXT this means creating a quality product while efficiently allocating material resources, minimizing waste streams, and implementing green technologies as they become economically feasible, as well as having an active presence in the community and providing a safe workplace for employees.”

*-Sustainability Assessment Team's definition of Sustainability*

## REAC Fall Activities

REAC's field and conference visits are annual highlights for students because they offer a personal look into the rail industry. For our fall trip, students visited Big Lake Northstar's Minneapolis facilities and the North Star Commuter Line.

The day started off with a quick safety briefing before setting off to the Big Lake Northstar Facility. There, students were able to see the operational and maintenance facility for the new Minneapolis region commuter line. A train ride from Big Lake to the Fridley station allowed for a visit to the BNSF Northtown yard where students watched a short presentation and took a tour of the “hump yard” offices and loco-

motive shop. They got a first-hand look at the maintenance and repair processes necessary to keep the 4,000 horsepower “beasts” running. Students were also able to see a section of the shop that acted as a wheel shaping area which housed several unique machines used to improve the geometry of locomotive wheels. The trip, organized by Tech Alum Chad Scherwinski from BNSF, was another great success and we are looking forward to working with the BNSF crew again in the future.



BNSF Locomotive Shops

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## Fall Activities

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Other events this year included the 2010 AREMA Conference in Orlando, FL, which five of our students attended. We also held several local volunteer outings with the Lake Linden Railroad Museum and the Quincy Mine Association. Students helped the Lake Linden Railroad Museum with their Halloween and Christmas trains, and assisted the Quincy Mine in attaching rail end plates on their tram line shuttle. These events are a great way for students to get involved with the community and learn about the rail industry and related infrastructure.



REAC Students Assisting the Quincy Mine Association

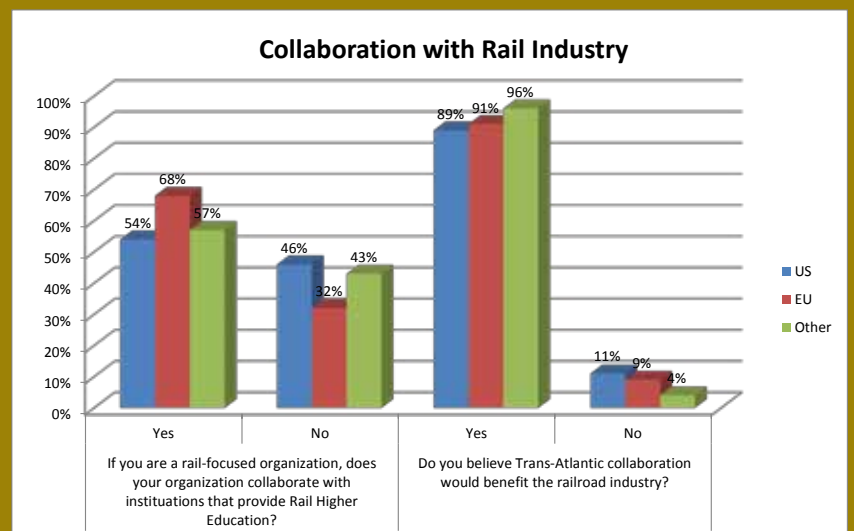
## Research Highlight – TUNRail

A two-year policy project, known as TUNRail, is a collaboration between universities in Europe and the United States aimed at developing future railway engineers and related education. RTP Director Pasi Lautala leads the US project team. The study, titled “Tuning Transatlantic Cooperation in Higher Education,” is sponsored by the Fund for the Improvement of Postsecondary Education (FIPSE) as part of the FY2009 EU-US Atlantis Program. For more information on the project and related outcomes, visit the project website: [www.tunrail.info](http://www.tunrail.info).

As part of the project, a two part online industry survey was conducted to determine the quantitative and qualitative needs for higher educated professionals in the rail industry. Globally, over 600 respondents completed the first portion of the survey. The more detailed second section, which focused on preferred experience and educational backgrounds of graduates, was completed by 150 respondents. Some of the results included:

- Almost all respondents saw the benefits of Trans-Atlantic collaboration.
- Over 80 percent reported that the number of their employees involved in rail activities has increased in recent years and they expect it to continue to increase over the next five years. United States respondents had the most optimistic views of future rail employment levels.
- Over 50 percent of the respondents claimed that their organization was collaborating with a university. There was a much higher level of collaboration in research and project activities between academia and industry in the EU, while the US had slightly more internship/co-op arrangements.
- The greatest barrier for engaging in university-industry collaboration (mentioned by over 50 percent of the respondents) was the perception that time commitment for such agreements would be too high.

Many rail organizations see the importance of collaborating with universities and believe the railroad industry as a whole would benefit from Trans-Atlantic collaboration



# Rail Transportation Program Hosts Visiting Scholar from Beijing Jiaotong University

The Rail Transportation Program welcomed their second visiting scholar to the program in January 2011. Dr. Mei Han is an associate professor from the School of Traffic and Transportation, Beijing Jiaotong University, concentrating on railroad related teaching and research in China. Mei came to the RTP for a six month teaching sabbatical and will continue her rail research while at Michigan Tech. Mei is providing the Rail Transportation Program students with insight into Chinese railway systems, attending conferences, and participating in the activities of the Railroad Engineering and Activities Club (REAC). Her stay will also include discussions on the potential expansion of collaboration between the two universities.

Mei has participated in authoring three textbooks and editing one. She has also published 18 journal papers and 15 conference papers. Her recent research has concentrated on four main areas:



Han Mei, RTP Visiting Scholar

1. **Railroad safety technology on freight transportation** - Offsets Generated by Lateral Vibration of Vehicle Loaded, Organization of Train Operation for Over Dimensional and Over Heavy Load, the Allowable Height of Combined Center of Gravity, etc. This research is being conducted for China's Ministry of Railways, primarily to evaluate the effects of speed increases to the safety of rail transportation.
2. **Technical Conditions for Railway Freight Loading and Securement** – this includes Analysis of the Relationship Between Freight Rail Design Loading and Securement Schemes. Much of this research is for private enterprises interested in shipping a variety of commodities in rail cars. Typical commodities include: steel products, dressed stone, excavators, concrete girders, tank wagons, transformers, etc.
3. **Container Transportation Technology** – An Organization Plan for Railway Double-stack Container Trains and Multimodal Transportation. This research is being carried out for China's Ministry of Railways.
4. **Experiments on Railway Freight Transportation** – this includes Field Test of Over Dimensional and Over Heavy Freight, Field Test of the Height of Combined Center of Gravity for Loaded Cars, Value of Required Securing Forces Acting on Load with Train Speed Increase, etc. Research has been carried out for China's Ministry of Railways.

Welcome Mei!

## Passenger Rail Night

In December 2010, the Rail Transportation Program and REAC held the “History and Future of Passenger Rail Night” event. The event included three high level speakers:

- Dr. Bill Sproule, Civil and Environmental Engineering Professor at Michigan Tech (History of Passenger Rail in the Copper Country)
- Mr. James McCommons, Northern Michigan University (Author of the book “Waiting on a Train”, Passenger Rail in the U.S.)
- Mr. Tim Hoeffner, Administrator: Office of High Speed Rail, MDOT (Future of Passenger Rail in Michigan).

The event was open to students, faculty and the general public and received a great welcome. The presentations provided an excellent synopsis of the passenger rail sector in the United States and offered an outlook of what the future holds for passenger rail travel.



Rail Passenger Night Speakers (from left to right): Bill Sproule, James McCommons, Tim Hoeffner

## Sixth Annual Railroad Night

Six years after the beginning our annual RTP Railroad Night, the success continues. Hosted by the Rail Transportation Program and the Railroad Engineering and Activities Club, this year’s event was held on February 22 at the Shelden Grill Restaurant and was attended by over 130 students, faculty, community and industry representatives. We also had our biggest company representation with 15 different rail companies at the event.

The keynote speaker was Mr. Michael Franke, Vice President of State and Commuter Partnerships for Amtrak. Mr. Franke is an industry veteran who has worked for several railroads over his 40 plus year career. His presentation provided an overview of the history of Amtrak, discussed the company’s current progress and challenges and highlighted the interrelationship between Amtrak and the freight railroad industry.

REAC also inducted a new honorary member during the event. Mr. Chad Scherwinski from BNSF graduated from Michigan Tech in 2006 with a degree in Civil Engineering. After graduation, Chad began working for the BNSF Railroad, where he is currently a Manager of Engineering. He has been very involved with REAC and has been constantly providing support for involved students interested in rail industry careers. Chad has helped to organize many field visits over the years, most recently the fall trip to BNSF’s Minneapolis facilities. REAC would like to congratulate Chad for his nomination and welcome him into the ranks of our distinguished members.



Pasi Lautala (Left) and Keynote Speaker Michael Franke (Right)

## Conferences and Events

### Transportation Research Board Annual Meeting, Washington, D.C. January 23-27, 2011.

The Rail Transportation Program was represented by Director Pasi Lautala and Ph.D. student Hamed Pouryousef at the 90th annual meeting of the Transportation Research Board. Puryousef presented a paper titled “High Speed Rail Access to Existing Stations in Downtowns” and Lautala (with co-authors Robert Handler and Justin Hicks) showcased their poster “Spatially Based Model to Determine Price-Optimal Log Transportation by Trucks and Rail in Upper Midwest: Development and Initial Outcomes”.

While in Washington, D.C., Director Lautala met with state and federal representatives to discuss rail transportation issues in the U.S. and the development of the planned National University Rail Transportation Centers (NURails).

### Joint Rail Conference, Pueblo, Colorado. March 16-18, 2011.

RTP Director Pasi Lautala recently served as conference chair for the Railroad Infrastructure Engineering Track at the 2011 Joint Rail Conference titled “Shared Corridors, Shared Interests” and presented a paper “Railway Education Today and Steps toward Global Education”. Hamed Pouryousef presented “Sensitivity Analysis of Track Maintenance Strategies for the High Speed Rail (HSR) Services”. Mei Han, visiting scholar from the Beijing Jiaotong University in China, also participated in the conference.



(From Left to Right) Hamed Pouryouset, Han Mei, and Pasi Lautala at the Joint Rail Conference

## RTP Research Projects

### Synthesis of Railroad Engineering Best Practices in Deep Seasonal Frost and Permafrost Areas

A final draft report is currently under review for this project, funded through the University of Alaska-Fairbanks, to investigate the literature and experiences of the existing and planned rail systems and to develop recommendations for future projects of the proposed Alaska-Canada Rail Link (ACRL).

### Project 3 of Frontier Renewable Resources Center of Energy Excellence: Improving Forest Feedstock Harvesting, Processing and Hauling Efficiencies and Project 3 of Michigan Economic Development Corporation Forestry Biofuel Statewide Collaboration Center (MI)

Michigan Tech, in collaboration with Michigan State University (MSU) has two ongoing projects related to the production, harvesting, processing and hauling of biomass in the State of Michigan.

### Improving Log Transportation with Data Based Monitoring and Analysis in Northern Wisconsin and Upper Peninsula of Michigan

The objective of this project is to use inexpensive GPS tracking devices to further the understanding of inefficiencies in current log truck movements and to use the data to improve the performance of log transportation systems in northern Wisconsin and the Upper Peninsula of Michigan.

### Tuning Transatlantic Cooperation in Higher Education (TUNRail)

See the TUNRail article on page four for additional information.

# Rail and Intermodal Transportation Summer Youth Program – Partial Scholarships Available

A partial scholarship is available for the Rail and Intermodal Summer Youth Program. The program, now in its second year, is designed to create awareness and interest in rail and intermodal transportation among youth. The week long exploration includes hands on courses, guest lecturers as well as field trips to rail and intermodal sites in Marquette, MI and Duluth, MN.

The program will be held July 17-23, 2011 as a collaborative effort between the Rail Transportation Program at Michigan Tech and the Transportation and Logistics Management Program at the University of Wisconsin-Superior. A portion of the week will be spent at each university campus.

The program is open to high school students in grades 9-11. Additional information about the program and instructions on how to apply can be found at: [http://youthprograms.mtu.edu/docs/RIT\\_Application.pdf](http://youthprograms.mtu.edu/docs/RIT_Application.pdf).



2010 Summer Youth Program Participants

## About Michigan Technological University

Michigan Technological University is a leading public research university, conducting research, developing new technologies, and preparing students to create the future for a prosperous and sustainable world. Michigan Tech offers more than 120 undergraduate and graduate degree programs in engineering, forestry and environmental sciences, computer sciences, technology, business and economics, natural and physical sciences, arts, humanities and social sciences.

### MichiganTech



## MichiganTech

Create the Future

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## About the Michigan Tech Transportation Institute

Established in 1998, the Michigan Tech Transportation Institute (MTTI) is a multi-disciplinary organization conducting a wide range of transportation-focused activities including research, education and training, outreach, product development, and technology transfer. Consistent with Michigan Technological University's reputation as a premier research university, MTTI accomplishes its mission with faculty, students, professional staff, accredited laboratories, and years of experience performing projects for a wide range of clients both nationally and internationally. To date, MTTI has obtained over \$27 million in external funding for its transportation-related activities and research in:

- **Transportation Structures** – bridges, pavements, geotechnical applications, construction, nanotechnology for sensors, increasing transportation infrastructure service life
- **Transportation Materials** – concrete, asphalt, steel, wood, aggregates, recycled materials (fly ash, slag, cement kiln dust)
- **Transportation Systems** – planning, design, construction operations, transportation asset management (highways, railroads, airports, public transit, waterways)
- **Technology Transfer** – research, outreach, management, workforce development, management tools (GIS, asset management, project estimating)
- **GeoTech and Construction** – subsurface material conditions, risk assessment, foundations, pavement subgrades, soil conditions, earthworks
- **Environmental Aspects** – transportation issues of energy, carbon dioxide, pollutants, flora, fauna, wildlife
- **Societal Aspects** – historical developments in transportation, archaeological studies, human factors, interactions between society and transportation policy, planning, regulation