



Letter from the Interim Director



Daan Liang, Ph.D., P.E.

As university faculty, we are privileged with the opportunity to lend our expertise to influence industry practices and national policies. This month, **Dr. Kishor Mehta** and I were invited to participate in the Strategic Planning Stakeholders Workshop organized by the National Institute of Standards and Technology in Arlington, VA. (Please read the article in this newsletter for more details). A few weeks later, I was in Solomons, MD, with thirty additional professors in construction programs across the country for the *Building a Stronger Curriculum* Workshop sponsored by Kiewit, one of the largest contractors in the world. This event featured intense trainings, presentations, discussions, as well as field trip to a \$4 billion Cove Point LNG Terminal project under construction. The proposed facilities will provide a bi-directional service of import and export of liquefied natural gas (LNG) for Dominion, involving massive amounts of concrete, steel, pipes and wires. It definitely brought back my memories of being a young project manager more than a decade ago walking on job sites and witnessing structures being built before my eyes. By interacting with the project team including the field engineer, safety manager, foreman, craftsman, estimator and corporate executive, I became more appreciative of their “can-do” attitude as they strive for excellence, which supports the American culture that anything is possible. In the meantime, I saw ample opportunities to engage with the construction industry in workforce development and technological advancement.

I’m also excited to report that **Dr. Anna Young**, NWI’s Associate Managing Director, has recently added a title of Research Assistant Professor as approved by the Provost. This title not only reflects her academic credentials and a strong track record of securing external funding but also provides an opportunity for her further growth in wind-related research. With in-depth knowledge in interdisciplinary research (the topic of her doctoral dissertation) and experience in managing complex contracts such as SWIFT, Anna is expected to play a more active and leading role in proposal preparation and grant administration.

Would summer would be dull if there were no deadlines? This year, TTU has been selected by the Legislative Budget Board (LBB) for a Strategic Fiscal Review (SFR). As part of the SFR, NWI is asked to provide performance measures for special line item for fiscal years 2012-2019. Details needed for each performance measure identified are name, type, source, relevance, and performance history and projections. A team has been assembled consisting of **Dr. Anna Young** (Associate Managing Director), **Angela Beikmann** (Senior Accountant), **Kacey Young** (Lead Academic Advisor) and myself with specific tasks assigned to each of us. As the coordinator of wind PhD program, I’m racing to complete the TracDat student learning outcomes reporting for this year.

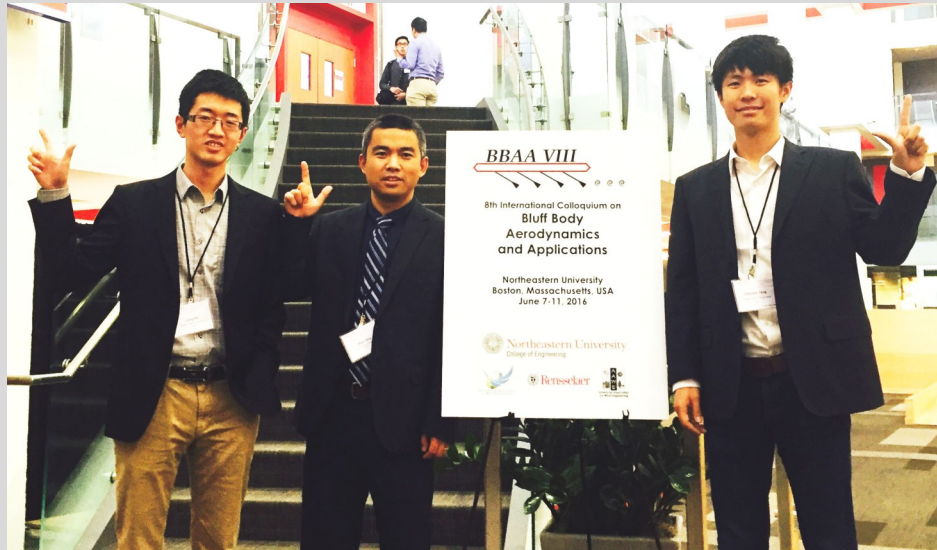
About two years ago, an External Advisory Board (EAB) was formed to provide guidance on NWI’s future directions and subsequently two board meetings were organized. Working with the Office of the Vice President for Research, we are reviewing EAB membership in preparation for the annual meeting in November. The goal is to have a group of distinguished leaders who broadly represent industry, academia, and government who will work closely with the Institute’s management in strategic planning and partnership. So far, a number of new nominations have been received and we could not be more excited about the prospect of them joining the Board.

Lastly, I’d like to share you a quote by President Reagan: “The greatest leader is not necessarily the one who does the greatest things. He is the one that gets the people to do the greatest things.”

Go Raiders!

Daan Liang, Interim Director

NWI Represented at 2016 Bluff Body Aerodynamics and Applications Conference



(Photo credit: Changda Feng.)

There was a large contingent of TTU-NWI representatives attending the recent 8th International Colloquium on Bluff Body Aerodynamics and Applications (BBA8) at Northeastern University on June 7-11.

Drs. Xinzhong Chen and **Delong Zuo** both had members of their research teams presenting a total of five separate papers, in addition to serving on the Scientific Committee and chairing the technical sessions. (For further details, please check the *Movers and Shakers* section.)

(L-R): **Liang Wu** (doctoral student in wind science and engineering), **Dr. Zhou Tang** (NWI post-doc researcher), and **Changda Feng** (doctoral student in wind science and engineering).

Visiting Speaker: Dr. Sudha Radhika, Geethanjali College of Engineering, Hyderabad, India



NWI recently welcomed Dr. Sudha Radhika, Professor and Head of the Department of Electrical and Electronics Engineering at the Geethanjali College of Engineering, Hyderabad, India.

Dr. Radhika gave a presentation on "Use of Post-Storm Imageries Alone for Wind Disaster Mitigation" on Wednesday, June 15th. Her talk focused on how recent advances in the remote sensing area have accelerated the availability of satellite/aerial image data worldwide.

As her abstract explains, "these satellite images are used to acquire the data of the damaged location from an eagle-eye's perspective, and such tracking allows for more immediate help to the injured while facilitating appropriate maintenance to damaged structures."

Thank you to all who were involved with this event.

Texas Tech Team's New Radar Prototype Could Help Lower Energy Costs



Texas Tech University scientists have brought the wind power industry one step closer to its potential with the creation of a system to measure wind flow and control turbine-to-turbine interaction for maximum power generation.

[National Wind Institute \(NWI\)](#) faculty affiliate John Schroeder and research professors Brian Hirth and Jerry Guynes have brought the measurement system online at the NWI field site. Funded by a \$1.4 million grant from the U.S. Department of Energy, the system is designed to make relevant measurements of complex flow fields in the lower atmosphere. In particular, the new system is designed to measure intra- and inter-wind plant flow fields.

"Understanding the complex flow field in the lower atmosphere is foundational information required to make more intelligent wind plants," said Schroeder, a professor in [atmospheric](#)

[science](#). "A wind turbine interacts with the flow field, creating a wake. As that wake translates downstream, it impacts other wind turbines. Right now, this technology is the best tool available to understand how the wind turbines/plants modulate the flow field and impact each other. Hence, this technology can provide information to help increase the performance of wind plants and essentially lower the cost of energy."

The new instrument builds upon NWI's pioneering success of using radar measurements to document complex wind flow fields within wind plants. Originally, the project team used the existing [Texas Tech Ka-band \(TTUKa\) mobile Doppler radars](#) to make these measurements. While successful, the TTUKa radars were limited in their ability to provide useful data in some atmospheric conditions. The objective of the new project is to translate the developed techniques to a new transformative instrument which could be used in a wider variety of atmospheric conditions.

"The TTUKa radars served previous research projects well, allowing us to identify and visualize complex wind flow phenomena that are known to impact wind plant performance, such as wind turbine wakes," Schroeder said. "In this project, we advanced the measurement technology, and the new radar system provides much better data availability without sacrificing resolution or scan speed. This improvement opens the door to more widespread adoption and use in industry."

While the research team says more evaluation time is needed, the initial results are exceptionally promising. During the first few weeks of operation in May, the new system provided useful measurements approximately 90 percent of the time.

"This change is a monumental improvement relative to the previous technology and a big step forward for more widespread applications," Schroeder said. "It's rewarding to see the research and development efforts that happened right here at Texas Tech translating quickly to industry. We're excited about the future of this technology and the global impact it might have on wind energy."

The goal of Department of Energy-funded incubator awards is to accelerate the deployment of innovative technologies into the marketplace. To facilitate a rapid implementation, Texas Tech has partnered with [SmartWind Technologies, LLC](#) to commercialize the developed wind energy applications.

"Drs. Schroeder, Hirth and Guynes' new method for measuring wind flow is another example of how our creative Texas Tech faculty enrich society through their discoveries," said Guy Loneragan, interim [vice president for research](#). "Their work will result in improved design and management of wind farms. This results in increased productivity for the operators of the wind turbines and more affordable energy for our nation's families. This illustrates the value of federal investment in research because it solves real-world problems and results in meaningful benefits for our citizens for years to come."

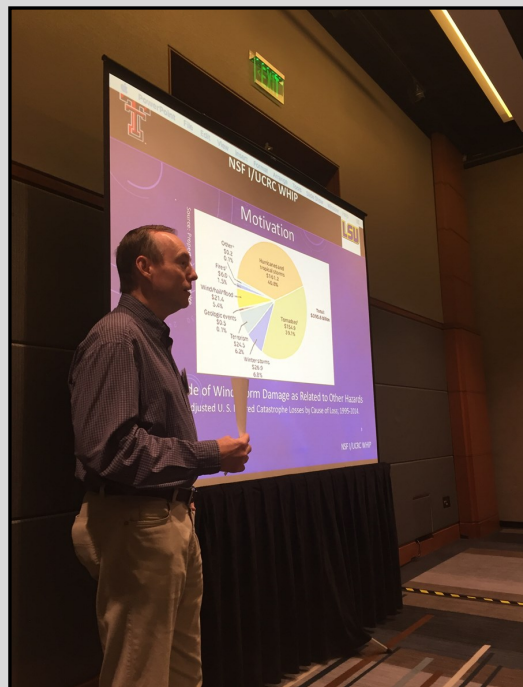
(Text credit: Glenys Young, Texas Tech Office of Communication and Marketing. Used with permission.)

Academia-Industry Partnership on Wind Hazard Research

On June 01, a meeting took place at the DFW Grand Hyatt focused on planning the NSF Industry & University Cooperative Research Center (I/UCRC) for Wind Hazard and Infrastructure Performance (WHIP).

It was attended by six researchers (**Drs. Kishor Mehta, Doug Smith, Stephen Morse, Dario Solis, and Daan Liang** from Texas Tech University, and Carol Friedland from Louisiana State University), one NSF evaluator (Dr. Donald Price), and ten representatives from industry and government.

During this one-day meeting, a total of twelve project proposals were presented, discussed, and scored. The feedback will be used later to enhance a proposal to the NSF for establishing and supporting WHIP.



(Right) - Eric Haefli, a Senior Technology Researcher at State Farm Insurance, addresses the group about the importance of academia-industry partnership to reduce future windstorm losses. (Photo credit: Daan Liang, NWI.)

NWI Instructor Attends Renewable Energy Educator Workshop



(Above) - NWI Instructor Matt Saldana.

NWI Instructor **Matt Saldana** recently attended a REcharge Labs Teaching Academy in Pittsburgh, PA, a week-long educator training workshop about renewable energy. The intensive training blends lectures and hands-on lessons to give educators content as well as context, and combines materials from REcharge Labs, WindWise Curricula, KidWind, and Vernier as well as other materials that are applicable for use in the classroom.

Matt reports, "I plan to integrate more hands-on activities within the classroom to give students a chance to build and tinker on a smaller scale to understand the fundamentals of renewable energy systems and how the design of components affects performance. I also plan to integrate these new lessons into the *Run on the Wind* and *GenerationTECH* summer science camps."

Matt has since become a certified REcharge Instructor and plans to reach out to the community and to continue to help educate students on renewable energies.

NWI is proud to support our Education team members in developing new skills. Congratulations, Matt.

NWI GRANTS AND CONTRACTS — JUNE 2016

Investigator	Unit	Credit	Award Amount Credited	Title	Agency	Project Period
Bruning, Eric C.	Geosciences	100%	\$193,911	(NWI) CAREER: Thunderstorm Electrical Energy Structure, Dissipation, and Visualization	Ntl Science Foundation	05/01/2014 - 04/30/2019
Smith, Douglas A.	Civil, Env and Construction Engr.	50%	\$65,000	NWI: Wind Hazard Risk Analysis	Electric Power Research Inc.	04/17/2015 - 05/31/2017
Barhorst, Alan A.	Mechanical Engr.	50%	\$65,000	NWI: Wind Hazard Risk Analysis	Electric Power Research Inc.	04/17/2015 - 05/31/2017
Bayne, Stephen B.	Electrical and Computer Engr.	50%	\$75,479	NWI: Load Interface for Fuel Cells with Enhanced Dynamic Response through Integrated Storage (GLEAMM)	Doosan	04/26/2016 - 04/26/2018
Giesselmann, Michael G.	Electrical and Computer Engr.	50%	\$75,479	NWI: Load Interface for Fuel Cells with Enhanced Dynamic Response through Integrated Storage (GLEAMM)	Doosan	04/26/2016 - 04/26/2018

Faculty Attend NWIRP Workshop



Dr. Daan Liang



Dr. Kishor Mehta

NWI Interim Director **Dr. Daan Liang** and NWI co-founder **Dr. Kishor Mehta** participated in the Strategic Planning Workshop for the National Windstorm Impact Reduction Program (NWIRP) on June 17. NWIRP is the re-authorized legislation passed by Congress in September 2015 which mandates that four federal agencies work with other government agencies and private industry to coordinate research and implementation programs to reduce damage caused by windstorms. The four federal agencies are the National Institute of Standards and Technology (NIST), the National Science Foundation (NSF), the Federal Emergency Management Agency (FEMA), and the National Oceanic and Atmospheric Administration (NOAA). The legislation has designated NIST as the lead agency, where Dr. Marc Levitan, a Texas Tech graduate, is the Interim Director of NWIRP.

The workshop was attended by invited participants and held in the NSF building in Arlington, VA. More than sixty participants representing a wide variety of disciplines provided input in breakout sessions, and this input from the stakeholders (wind engineers, insurance personnel, meteorologists, economists, government agencies such as DOD, NRC, DOE, and others) will be condensed by the representatives of the four agencies into one main document.

This strategic plan will then provide a roadmap for the country to follow over the next few years to pursue research and implementation of windstorm impact reduction.

Wonder Where Wind Comes From?

NWI faculty Affiliate Develops Interactive Educational Display at TTU Museum

For everyone who wonders why Lubbock is so windy in the spring, how it can be shorts weather in February and parka weather in March or what causes tornadoes, hurricanes and blizzards to hit where they do, come to the [Museum of Texas Tech University](#). Visitors will find these answers and more in a fun, interactive new exhibit that explains how weather begins and how it all works.

Hint: It all starts with the sun and the rotation of the Earth.

[How Weather Works: Understanding Our Place Between the Sun and a Storm](#) opened Sunday, June 26, and allows visitors of all ages to start at the sun, create atmospheric pressure, explore the Earth's spin and the jet stream and learn about the many powerful aspects of storms such as tornadoes, haboobs, hail and lightning. The exhibit includes a section on how chaos, or altering one or many components of the atmosphere, can affect weather.



Photo Credit: Liz Inskip-Paulk, TTU-NWI.

(Above) - Dr. Brian Ancell, Assistant Professor in ATMO and NWI faculty affiliate.

The exhibit showcases research led by [Brian Ancell](#), an Assistant Professor in the [Department of Geosciences, Atmospheric Science Group](#), who received an Early CAREER grant from the National Science Foundation. In addition to educator resource kits for local teachers and weather summer camps for middle school-age children, he coordinated with the museum to create this exhibit, which brings weather down to eye level and highlights how human activity can affect weather patterns.

"The driving research focuses on inadvertent weather modification, or how human activities such as irrigation, wind farms and urban heat islands can change the weather non-locally, or far away from the source," Ancell said.

The exhibit is split into two sections. The first covers the basic atmospheric principles that create weather, starting from the sun and the rotation of the Earth and ending with small-scale weather features like thunderstorms. Visitors will get to stand between the Earth and the sun and take temperature readings with an infrared gun, then learn how the uneven heating of the tilted Earth creates atmospheric pressure, which then creates wind. They also will explore the Coriolis Effect, which explains how the Earth's rotation leads to the jet stream and how weather systems work.

Visitors then move into a simulated immersive storm experience and learn about the formation of tornadoes, thunder, lightning, hail and dust storms, with a weather alert broadcast in the background and motion-activated thunderstorm above.

The second part of the exhibit discusses chaos and inadvertent weather modification, which is the focus of Ancell's research. Visitors will use a Plinko board representing the Texas-Louisiana coastline to show how minute variations can alter the path of pucks representing hurricanes.

This section also looks at how wind turbines remove energy from the atmosphere and how this affects the wind patterns. It will be updated throughout the duration of the exhibit as Ancell continues his research.

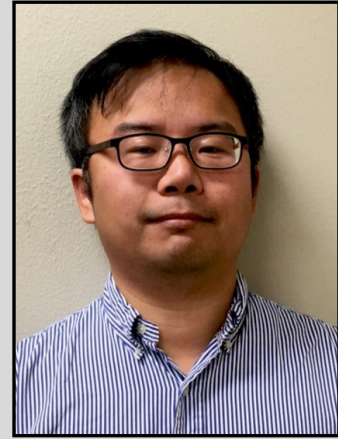
"Chaos is the reason why small changes to the atmosphere, such as those resulting from irrigation or wind farms, can grow to be large, modifying larger scale weather features well away from the changes in the first place," Ancell said.

The museum, located at 3301 4th St., is open from 10 a.m. to 5 p.m. Tuesday through Saturday and 1-5 p.m. Sunday. Admission is free.

(Text Credit: Heidi Toth, Texas Tech Office of Communications & Marketing. Used with permission.)

NWI MOVERS & SHAKERS

- NWI Ph.D. student **Hoonill Won** recently presented a poster at the 22nd Symposium on Boundary Layers and Turbulence held in Salt Lake City from June 20-24. Hoonill's poster was titled "Intra-Farm Wind Speed Variability Observed by Nacelle Anemometers in a Large Inland Wind Farm."
- Former NWI doctoral student **Dr. Jie Ding**, a May 2016 graduate, was recently recognized with Texas Tech University Graduate School's "Outstanding Dissertation Award" in the category of Math, Physical Sciences, and Engineering. Dr. Ding worked under the mentorship of NWI faculty affiliate **Dr. Xinzhong Chen**, Professor and Whitacre Faculty Fellow in the department of Civil, Environmental and Construction Engineering at TTU.
- On June 7-11, 2016, NWI's **Drs. Xinzhong Chen** and **Delong Zuo** (along with seven members of their research teams) participated in the 8th International Colloquium on Bluff Body Aerodynamics and Applications held at Northeastern University, Boston. Following the spirit of the past seven meetings held in Japan, Australia, United States, Germany, Canada, Italy and China, the colloquium brought an opportunity to exchange research information on the latest advances in the study of the separated flow around bluff bodies in terms of both fundamentals and applications. More than 200 papers were presented in the conference and contributed from 25 countries. Drs. Chen and Zuo also served on the Scientific Committee and chaired the technical sessions during the conference.



(Above) - NWI Ph.D. student Hoonill Won, who presented a poster at the 22nd Symposium on Boundary Layers and Turbulence in Salt Lake City from June 20-24.



(Above) - Dr. Jie Ding, NWI doctoral graduate.

Drs. Chen and Zuo's research teams made the following five presentations:

- 1) *Simulations of Tornado-Like Vortices in a Large-Scale Ward-Type Tornado Simulator* by **Zhuo Tang, Changda Feng, Liang Wu, Delong Zuo, and Darryl James.**
- 2) *Inelastic Crosswind Responses of Tall Buildings with Bi-linear Hysteretic Restoring Force Characteristics* by **Changda Feng, Xinzhong Chen, and Daan Liang.**
- 3) *A Hybrid Stochastic Wave and Proper Orthogonal Decomposition-Based Simulation Approach for Multivariate Non-Stationary Wind Turbulence Processes* by **Liuliu Peng, Guoqing Huang, Xinzhong Chen, and Ahsan Kareem.**
- 4) *Prediction of Wind-Induced Dynamic Response of Overhead Transmission Lines* by **Dahai Wang, Xinzhong Chen, and Lin Yang.**
- 5) *Wind Load Characteristics and Wind-Induced Response of Saddle-Shape Cable Nets Roof in Different Terrains* by **Fanghui Li, Xinzhong Chen, and Ming Gu.**



Photo credit: Skylar Starbuck, NWI Social Media Intern.

The NWI team cares and is at your service!

(L-R) - Dr. Anna Thomas Young, Maggie Gilchrest, Liz Inskip-Paulk, Angela Beikmann, Cynthia Barbosa, Kacey Young, Tammy Pitzer, and Dr. Chris Pattison.

If you are interested in having your latest scholarly endeavors featured in the next NWI newsletter, please forward your information (publications, proceedings, conference/workshop attendance, or other news etc.) to Liz Inskip-Paulk (email: Elizabeth.paulk@ttu.edu). Go Red Raiders!