



Letter from the Interim Director



Daan Liang, Ph.D., P.E., Interim Director, NWI.

Interdisciplinary research and education, a hallmark of National Wind Institute, is never intended to be easy and natural. As faculty, I can attest that often times I had wished to work alone rather than collaborating and dealing with others. After all, academic freedom allows us to pursue our own interests in ways we choose. However, we all recognize the fact that we are part of a community of scholars, and accomplishing bigger and better goals is only possible if we work as a team. This has been true if one looks at more than four decades of advancement made in wind science and engineering at Texas Tech by three generations of researchers and educators. The future path of NWI will be charted by its new leadership as much as by faculty affiliates who bring in novel ideas, exciting projects, and inspiring students.

As you may know, the university is developing a new strategic plan and the committee unveiled the draft at two forums. Kishor and I attended the first one on April 20 and learned a great deal about university's strategic priorities, goals, and strategies of the "next century". As the part of this effort, a few "signature" areas would be identified, focusing on what Texas Tech University is known and can lead globally. And wind ought be one of them, when considering its history, impact, and potential related to both energy and hazards. So we'd like each of you to continue your involvement with this important planning process and provide feedback to the committee.

On April 18, the Faculty Honor Convocation took place at the SUB where outstanding faculty were honored for their achievements and contributions. **Dr. John Schroeder**, Professor of Atmospheric Science and NWI faculty affiliate (and former director) received the President's Excellence in Commercialization Award for "outstanding contributions to the commercialization of innovative work conducted at Texas Tech". Meanwhile, one of the Horn Professor Graduate Achievement Awards went to Vanna Chmielewski, Ph.D. student of Geosciences working under **Dr. Eric Bruning**, Assistant Professor of Atmospheric Science and NWI faculty affiliate. I was so happy to be there and congratulate them on their success.

A group of us were invited by Reese Technology Center (RTC) to meet with and provide a briefing to Congressman Jodey Arrington (TX-19). As a close partner to RTC since its inception almost twenty years ago, the National Wind Institute has been utilizing our facilities for a broad range of educational and research activities and in the process helping it become a vibrant campus along with other public and private customers. Congressman Arrington was pleased with the progress of the GLEAMM project in which he had played a central role as Texas Tech's Vice Chancellor for Research and Commercialization. He also encouraged all of participants at the meeting to be bold and pursue game-changing ideas. His office is committed to helping promote Texas Tech University at federal levels.

The 200m tower has been a cornerstone of our field facilities, contributing valuable data to many research projects and successful careers. In the coming months, we will completely overhaul the lighting system by replacing the existing one that is 16 years old. The new LED system will be more reliable, easier to maintain, and meet FAA requirements. We are able to split the material cost (~\$16k) in three ways: sponsored projects (e.g. SWIFT), NWI F&A received, and the Office of the Vice President for Research. And installation will be performed by our own technical staff, saving lots of money by not needing an outside contractor. This is a perfect example where world-class data is made available only because we are able to combine resources and technical expertise as an institute.

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NWI INTERIM DIRECTOR'S LETTER *continued*

With four months left before the end of FY17, I'm happy to report that the total amount of our research awards already stands at \$2.6m, on track to exceed the sum (i.e. \$2.7m) in FY16. All four major areas – wind energy, smart grid, severe storm, and wind engineering – are progressing towards or exceeding last year's levels. Thanks to all of our affiliates who work so hard and make NWI successful.

Go Raiders!

Daan Liang, Interim Director

MCDONALD-MEHTA LECTURE SERIES: DR. SANJAY ARWADE

NWI was happy to welcome visiting speaker Dr. Sanjay Arwade from the University of Massachusetts at Amherst in April as part of the prestigious McDonald-Mehta Lecture Series for Spring 2017.

Dr. Arwade gave a lecture on the topic of "Extreme Events and the Reliability of Offshore Wind Energy Structures."

Dr. Arwade is a Professor and Graduate Program Director in the Department of Civil and Environmental Engineering at the University of Massachusetts at Amherst. He has a Ph.D. in Civil Engineering from Cornell University (2002), an M.S. in Civil Engineering from Cornell University (1999), and a B.S.E. in Civil Engineering from Princeton University (1996).

According to the UMass-Amherst faculty website, Dr. Arwade's research includes probabilistic mechanics, materials mechanics, historic structures, structural reliability, computational solid mechanics, structural aspects of wind energy development, and the structural design of green buildings.

The McDonald-Mehta Lecture Series is named after and funded with the endowment of **Dr. Kishor C. Mehta** and **Dr. James McDonald**, founding faculty members of the former Wind Science and Engineering Research Center (WISE) now the National Wind Institute (NWI). The lecture series invites nationally-known scientists and experts in wind-related industries to campus for presentations in their area of academic excellence.



(Above) - Dr. Sanjay Arwade, Professor at University of Massachusetts-Amherst and the visiting speaker for the Spring McDonald-Mehta Lecture Series at NWI in April.

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).

WEST TEXAS MESONET ADDS STATION #104: STINNETT

Work continues with the ongoing growth of the West Texas Mesonet network with the addition of station #104 (below) in Stinnett, Hutchinson County, in the Texas Panhandle.

The new Stinnett station is one mile north-northwest of Stinnett and 12 miles north of Borger.

The West Texas Mesonet would like to say special thanks to the Hutchinson County Emergency Management and the National Weather Service folks in Lubbock and in Amarillo for helping to construct this station.

Some of the stats about station #104:

- Latitude: 35° 50' 38.11" N
- Longitude: 101° 26' 49.67" W
- Elevation: 3322 feet
- On-line since: April 2017

Texas Tech University's West Texas Mesonet launched its [new app](#) last month, available to download for free in the App Store. The app's data is updated every five minutes from the weather stations in the mesonet's extensive coverage area, and is just one more service that NWI is offering weather trackers with the most up-to-date meteorological information on-the-go. The app can be found [here](#) or by searching "West Texas Mesonet" in the App Store.



(Above) - West Texas Mesonet station #104 flies its flag proudly as it goes on-line to add more options to the meteorological network.

NWI FACULTY AFFILIATES: PUBLICATIONS FOR APRIL 2017

- Lundquist, J. K., J. M. Wilczak, R. Ashton, L. Bianco, W. A. Brewer, A. Choukulkar, A. Clifton, M. Debnath, R. Delgado, K. Friedrich, **S. Gunter**, A. Hamidi, G. V. Iungo, A. Kaushik, B. Kosovic, P. Langan, A. Lass, E. Lavin, J. C. Lee, Joseph, K. L. McCaffrey, R. K. Newsom, D. C. Noone, S. P. Oncley, P. T. Quelet, S. P. Sandberg, **J. L. Schroeder**, W. J. Shaw, L. Spurling, C. St Martin, A. St Pe, E. Strobach, K. Tay, B. Vanderwrwende, A. Weickmann, D. Wolfe, and R. Worsnop (2017). "Assessing State-of-the-Art Capabilities for Probing the Atmospheric Boundary Layer: The XPIA Field Campaign." *Bulletin OF The American Meteorological Society*, 98 (2): 289-314. 10.1175/BAMS-D-15-00151.1 FEB 2017.
- Cardella, E., **B. T. Ewing**, and R. B. Williams (2017). "Price Volatility and Residential Electricity Decisions: Experimental Evidence on the Convergence of Energy Generating Source." *Energy Economics*, 62: 428-437. 10.1016/j.eneco.2016.07.012 FEB 2017.
- Apergis, N., **B. T. Ewing**, and J. E. Payne (2017). "Introduction: Symposium on Energy Sector Convergence." *Energy Economics*, 62: 335-337. 10.1016/j.eneco.2016.09.015 FEB 2017.
- Gunter, W. S., J. L. Schroeder, C. C. Weiss, and E. C. Bruning** (2017). "Surface Measurements of the 5 June 2013 Damaging Thunderstorm Wind Event Near Pep, Texas." *Wind and Structures*, 24 (2): 185-204. 10.12989/was.2017.24.2.185 FEB 2017.
- Jiang, Y., D. Chenguang, S.-L. Dai, and **B. Ren** (2017). "Deterministic Learning Enhanced Neutral Network Control of Unmanned Helicopter." *International Journal of Advanced Robotic Systems*, 13. 10.1177/1729881416671118 NOV 15 2016.
- Ren, B.,** Q.-C. Zhong, and J. Dai (2017). "Asymptotic Reference Tracking and Disturbance Rejection of UDE-Based Robust Control." *IEEE Transactions on Industrial Electronics*, 64 (4): 3166-3176. 10.1109/TIE.2016.2633473 APR 2017.
- Zhang, Z., **M. Giesselmann**, J. Mankowski, J. Dickens, A. Neuber, and R. P. Joshi (2017). "Evaluation of High Field and/or Local Heating Based Material Degradation of Nanoscale Metal Emitter Tips: a Molecular Dynamics Analysis." *Journal of Physics D-Applied Physics*, 50 (18). 10.1088/1361-6463/aa6497 MAY 10 2017.

NWI GRANTS AND CONTRACTS — APRIL 2017

Awarded:

NWI: *GLEAMM: Semiconductor Evaluation for High Action Applications*
U.S. Army Research Laboratory

Stephen Bayne (Center for Pulsed Power and Power Electronics)	80%	\$136,008
Michael Giesselmann (Center for Pulsed Power and Power Electronics)	20%	\$34,002

Pantex Wind Farm Usage Optimization based on Utility Market Pricing and Reliability Study of Electrical Distribution System
Consolidated Nuclear Security, LLC-Pantex

Argenis Bilbao (Center for Pulsed Power and Power Electronics)	33%	\$29,700
Stephen Bayne (Center for Pulsed Power and Power Electronics)	33%	\$29,700
Michael Giesselmann (Center for Pulsed Power and Power Electronics)	34%	\$30,600

ETF-Renewable Energy Initiative

Texas Emerging Technology Fund

Carsten H. Westergaard (Mechanical Engineering)	100%	\$600,450
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SAFETY IS ALWAYS FIRST AT NWI...



Our team at NWI has a goal above all other goals: **Safety First**, especially for our Technical Team at NWI research facilities at the Reese Technology Center.

Pictured left are two of our technical crew, **Lee Wilks**, Superintendent (L), and **Jeff Livingston**, Assistant Director of Operations (R), ready for a busy day in the field and dressed in safety gear.

Thank you to everyone who takes their role seriously when it comes to safety. There is nothing that is more valuable to NWI than our great team members!

Go safely, Red Raiders!

WISE WEDNESDAY LECTURE: TASSIA PENHA PEREIRA

The final event for the Spring semester with the WiSE Wednesday Lecture Series was held in April with **Ms. Tassia Penha Pereira**, M.Sc., one of our impressive students in the WiSE doctoral program.

Ms. Pereira is studying under the guidance of **Dr. Carsten Westergaard**, Professor of Practice in NWI, with a focus on full-scale wind turbine wake characterization.

As the WiSE Wednesday Lecture Series wraps up, NWI would like to thank all those who were instrumental in its success, including **Dr. Delong Zuo** (who has organized the series for three years), and the many students, staff, and faculty who have all supported it.

WiSE Wednesday will recommence in the Fall semester.



(Above) - Ms. Tassia Penha Pereira, WiSE doctoral student.

DR. DELONG ZUO RECOGNIZED FOR ORGANIZATIONAL EXCELLENCE WITH NWI'S LECTURE SERIES



(Above L-R) - Dr. Kishor Mehta, NWI co-founder and Horn Professor, presents Dr. Delong Zuo with a plaque to recognize his hard work and stellar organizational skills in running the two lecture series for NWI for the past three years.

NWI recently recognized **Dr. Delong Zuo**, Associate Professor in Civil, Environmental, and Construction Engineering and NWI long-time faculty affiliate, who has assisted with the organization and execution of the weekly Wind Science and Engineering Wednesday Series and the McDonald-Mehta Lecture Series.

The NWI is grateful for his service and appreciates the enrichment of the speakers, enhanced learning, and commitment to collaborative research and education over these past three years.

Thank you, Dr. Zuo, for your contribution to excellence!

VISITING SPEAKER: DR. GUOJI XU (LOUISIANA STATE UNIVERSITY)

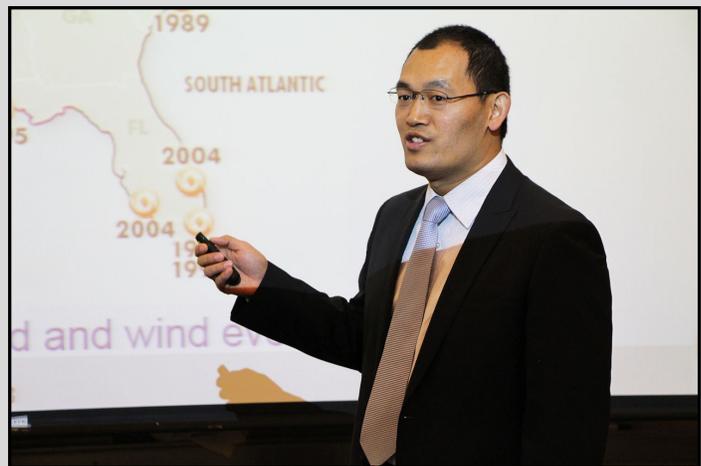
The NWI was honored to welcome Dr. Guoji Xu (*right*), Ph.D. and Research Assistant in Computer Science and Engineering at Louisiana State University.

Dr. Xu gave a well-attended presentation with the title "Application of Computational Fluid Dynamics (CFD) in Structural/Coastal/Wind Engineering" when he visited campus on Wednesday, April 05.

According to his abstract, Computational Fluid Dynamics (CFD) is widely used in many engineering disciplines due to its robust capabilities in the numerical simulations and the advances of computational power as its backend.

When hurricanes make landfall, many coastal low-lying bridges along the Gulf Coast are damaged and their failure agents are preliminarily identified as the hurricane-induced wave forces. The talk focused on the substantial research efforts made on improving the design of new bridges and retrofitting existing bridges so that that these bridges may survive future similar natural events.

Thank you to everyone who attended this lecture.



(Above) - Dr. Guoji Xu (Louisiana State University) who recently visited Texas Tech University to lecture on how hurricanes may impact bridges.

NWI MOVERS AND SHAKERS

NWI is a great place to work, and that showed during April's Length of Service Award Ceremony held the other week. Two of NWI's team were recognized for their dedication and years of service to Texas Tech University:

- **Larry Tanner** was recognized for 30 years of service.
- **Liz Inskip-Paulk** was recognized for 20 years of service.
- **John Geesling** was recognized for 15 years of service.
- **Yuepeng Cui, Yin Lu, Tammy Pitzer, and Matt Saldana** were recognized for 5 years of service.

(Image on right L-R) - *Liz Inskip-Paulk and Larry Tanner, two of the NWI team who were recognized for their length of service at TTU.*



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

Image above: (L-R) **Beverly Velasquez** (Student Assistant), **Angela Beikmann** (Business Manager), **Kyle Jay** (Instructor), **Maggie Gilchrest** (Unit Coordinator), **Dr. Anna Thomas** (Associate Managing Director), and **Kacey Marshall** (Lead Advisor.)

NWI Lead Advisor **Kacey Marshall** was recently nominated for the President's Excellence in Advising Award in recognition of "excellence in advising by faculty and/or staff", according to the award website.

(Right) - NWI is always open to telling the community and the surrounding region about our innovative research, and so we were happy to host a tour from a visiting group of folks with the U.S. Forest Service who were in town for training.

Fighting fires in West Texas and elsewhere means that the Forest Service representatives need to be familiar with the possibility of a fire breaking out around wind turbines.

Thank you to the U.S. Forest Service for your service to the region.

(Right) - NWI's **Jeff Livingston** teaches the group about some of the technicalities of wind farm arrays.



(Left) - The NWI team recently wore denim as part of the Denim Day initiative, a worldwide event to bring awareness of Sexual Violence Awareness Month. For more information on Denim Day, [check out this link](#).

The NWI team also participated in TTU's *Tech to Town*, a community service day, and also *Arbor Day*, where our team worked to beautify campus.

NWI has some great experts on wind and its related topics. **Dr. Chris Pattison**, Assistant Director of Education, was recently the focus on an interview article in the industry journal, *Wind Systems*. [See link here](#).

Additionally, the West Texas Mesonet was featured in an article in the Weather.gov blog for the Lubbock offices. [See link here](#).

Dr. John Schroeder, Professor in Geosciences and former Director of NWI, was recently recognized by the TTU Office of the Provost with the President's Excellence in Commercialization Award for his innovative and forward-thinking research.

TTU SELECTED FOR COLLEGIATE WIND COMPETITION

Text Credit: George Watson, TTU Marketing and Communication.



(Above) - NWI's Kacey Marshall and Kyle Jay who were visiting NREL to learn more about the DOE Collegiate Wind Competition for the TTU-NWI student team who have been selected to participate.

A team from Texas Tech University's National Wind Institute (NWI) has been chosen to participate in the 2018 Collegiate Wind Competition where students will build and market a model wind turbine.

Texas Tech is one of 12 universities chosen for the competition, which will be held during the annual American Wind Energy Association WINDPOWER Conference and Exhibition May 7-10, 2018, in Chicago. The competition and conference are sponsored by the U.S. Department of Energy and hosted by the National Renewable Energy Laboratory in Boulder, Colorado.

"Being asked to compete in the Collegiate Wind Competition is an honor," said Kyle Jay, an instructor in the NWI. "The competition will give the National Wind Institute and Texas Tech University students a chance to show our design and manufacturing prowess for a multi-disciplinary competition."

Students from each of the 12 participating universities will design and build a model wind turbine based on market research and site considerations, develop a business plan to market the product, and test the turbines against strict performance criteria determined by a panel of wind industry leaders who will judge each entry.

The Collegiate Wind Competition is designed to combine student expertise with that of engineering, business, communications and social science programs. Its aim is to challenge teams to combine their individual skills to develop state-of-the-art wind energy

solutions as a team, combining academic coursework with hands-on learning opportunities to provide valuable real-world experience as students prepare to enter the workforce.

In addition to Texas Tech, the other 11 schools participating in the 2018 Collegiate Wind Competition are: California State University Maritime Academy; California State University-Chico; Iowa State University; James Madison University; Kansas State University; Northern Arizona University; Penn State University; Seattle University; the Universidad del Turabo in Gurabo, Puerto Rico; the University of Wisconsin, and Virginia Tech University.

This is the third Collegiate Wind Competition the Energy Department has held, the last one in 2016 won by Penn State. The competition is a key component of the effort to accelerate development and deployment of energy efficiency and renewable energy technologies that help strengthen the country's energy security, environmental quality and economic health. It is directed by the Energy Department's Office of Energy Efficiency and Renewable Energy.

For more information, visit the Collegiate Wind Competition [website](#).



NWI STUDENT SPOTLIGHT: HOONILL WON

Mr. Hoonill Won is one of NWI's Wind Science and Engineering doctoral students studying under **Dr. Song-Lak Kang**, Assistant Professor in Atmospheric Sciences (Geosciences).

Hoonill's main area of academic focus is on the investigation of horizontal and vertical variability of horizontal wind flows in the atmospheric boundary layer (or ABL), working to further understanding on how the ABL wind flow behaves in order to improve the efficacy of wind energy.

"There is a lot of variation in wind flow, and this variability can impact wind power production," he adds. "A better understanding of wind characteristics will mean an increase in knowledge of how to harness that wind for energy production."

Aiming to graduate with his doctorate in August this summer, Hoonill believes that the best part of the NWI Wind Science and Engineering Ph.D. program is its multidisciplinary nature and how this has opened up research with other fields of study across campus and across industry.

Hoonill's research is investigating horizontal wind speeds from 273 separate turbines from a large onshore wind farm, focusing on how the variability of the spatial and temporal wind speed can impact wind flow within the wind farm regarding the estimation of wind power production. He is also researching about an approach to define the range of appropriate averaging scales of horizontal wind speed when spectral gap doesn't exist.

Hoonill was raised in Seoul, South Korea, and plans on working in industry upon his graduation. Thank you, Hoonill!



(Above) - Hoonill Won, Wind Science and Engineering Research doctoral student here in NWI.

NWI FACULTY AND STUDENTS SHINE AT SPARK CONFERENCE



At the recent *Sparking the Future of Innovation* Conference at TTU's Innovation Hub, several NWI faculty affiliates and students were recognized for excellence in their research.

The group (left image) includes doctoral students **Sarah Clemens**, **Theresa Aguilar**, **Tassia Penha Pereira**, **Ricardo Castillo**, and **Yeqin Wang**.

NWI faculty affiliates recognized at the event included **Dr. Suhas Pol**, **Dr. Carsten Westergaard** (center of image), **Dr. Argenis Bilbao**, **Dr. Stephen Bayne**, **Dr. Michael Giesselmann**, **Dr. Beibei Ren**, and others.

Congratulations to everyone who was recognized for excellence in your innovative project ideas.

CALENDAR — May/June/July 2017

May 15-16, 2017

2nd Workshop on Probabilistic Prognostics and Health Management of Energy Systems (PPHMES2017). Lubbock, TX.

The workshop objective is to bring international expertise together in order to address the prevailing issue of premature failure of energy systems, and to enhance the prediction tools of remaining useful life (RUL) by which the uncertainty of RUL prediction will be minimal.

The four main topics to be addressed are as follows:

- PHM for Off-Shore Energy Systems
- Internet-of-Things for PHM
- Vibration-Based PHM
- Emerging technologies on Sensing and Filtering

For more information, please check out the [website](#).

July 09-13, 2017

Run on the Wind (ROW) Summer Camp for Rising 6th-8th Grade Students. [On-line registration is here](#).

Ensuring the growth of this clean energy source is largely dependent upon creating a competent well-education workforce, and *Run on the Wind* provides young scholars with an introduction to the field of wind science and an opportunity to consider wind science as a future academic pursuit. (This is a collaboration with TTU's IDEAL program.)

Session topics include:

- Principles and physics of wind to electricity
- Environmental considerations of wind power
- Atmospheric and meteorological aspects of forecasting wind power
- Wind turbine design considerations
- Building a wind turbine
- Wind sailing at Reese Technology Center (weather permitting)
- Wind tunnel demonstration
- Model Turbine Project competition

July 09-14, 2017

Generation Tech: Fuel the Future Summer Camp for Rising 9th-12th grade students. [On-line registration is here](#).

Ensuring the growth of clean, renewable energy sources is largely dependent upon creating a competent well-educated workforce. Generation TECH will provide young scholars an introduction to the field of renewable energy and an opportunity to consider renewable energy technologies as a future academic pursuit.

Session topics include:

- Building a wind turbine
- Renewable energy design considerations
- Solar town build
- Concepts of solar panel design and installation
- Principles and physics of electricity
- Environmental consideration of renewable energy



Photo Credit: The Daily Telegraph.