



UNIVERSITY OF NORTH TEXAS<sup>®</sup>  
**DEPARTMENT OF MATERIALS  
SCIENCE AND ENGINEERING**

**CELEBRATING 20 YEARS OF EXCELLENCE**

INSIDE: FACTS AND FIGURES | FACULTY  
SUCCESS | UNDERGRADUATES |  
GRADUATES | RECENT RESEARCH

## LETTER FROM THE CHAIR

Dear Friends,

This year is a special milestone for our department, the 20th anniversary of its establishment at the University of North Texas in the Fall of 1996. The Department has experienced aggressive growth over the last two decades developing from a small graduate student department to one of the leading research departments with strong undergraduate and graduate programs. I joined the department last Fall and was glad to learn that the department's vibrant atmosphere, excellence in research and education are key components for this success.

We are proud that our department is one of the few departments nationwide that awards BS in Materials Science and Engineering, a degree which is in a high demand by both industry and research organizations. Our undergraduate program started in 2006 and now has about 100 students—about half of whom chose to continue with either MS or PhD degrees. Last year we introduced a Fast Track graduate pathway for the exceptional BS seniors, which became very successful. This year, our department was awarded ABET accredited status which is another milestone accomplishment, reflecting on the high education quality our faculty has strived to attain. As testimony to this effort – this year a team of our undergraduate students took 3rd place in a nation-wide materials knowledge bowl competition at the TMS International conference. With many social activities, cohort advising, research participation – our undergraduate program is positioned for the future growth.

With about 90 students in our graduate program, the department is maintaining a steady stream of MTSE doctoral and master graduates. In the last academic year, the department graduated 11 MS and 12 PhD students, who found jobs in industry, academia, and national laboratories. The department research spans from the aerospace alloys and processing, to corrosion and tribology for oil and gas industries, medical implant processing and radiation stable glasses and ceramics, energy storage and optoelectronic materials. With about \$3.5M research awards annually and over 100 publications last year, the department is one of the leading research organizations in UNT. We are very proud that UNT was named this year as a Tier I research university based on the fast growth in research.

In this newsletter, you will find some of the department's recent accomplishments, exciting starts and perspectives for the department future. Myself, faculty, students and staff look forward to engaging with you in areas of joint interest.

Andrey Voevodin, Chair

## BEHIND THE SCENES WITH MTSE STAFF

### Erik Forney

Position: Assistant to the Chair  
Where did you grow up?  
Nacogdoches, TX  
How long have you been at UNT? 11 years  
What are your hobbies or what do you do away from UNT? I spend time with family and I enjoy watching anything sports-related.

### David Garrett

Position: Microscope Supervisor  
Where did you grow up?  
Dallas, TX  
How long have you been at UNT? 25 years  
What are your hobbies or what do you do away from UNT? I enjoy off-road motorcycle riding and benchrest rifle shooting.

### Craig Collins

Position: Engineering Lab Technician  
Where did you grow up?  
San Angelo, TX.  
How long have you been at UNT? 12 years  
What are your hobbies or what do you do away from UNT? My favorite hobby is fly fishing for trout. My son is my fly-fishing partner.

### Sarah Jones

Position: Student Relations  
Where did you grow up? Sanger, TX  
How long have you been at UNT?  
I have been at UNT for nearly 6 years. I was a student from 2011-2015.  
What are your hobbies or what do you do away from UNT? I enjoy spending time with family and friends, and going on roadtrips.



## CONTRIBUTORS

Editor: Dr. Rick Reidy

Designer: Haley Barnes

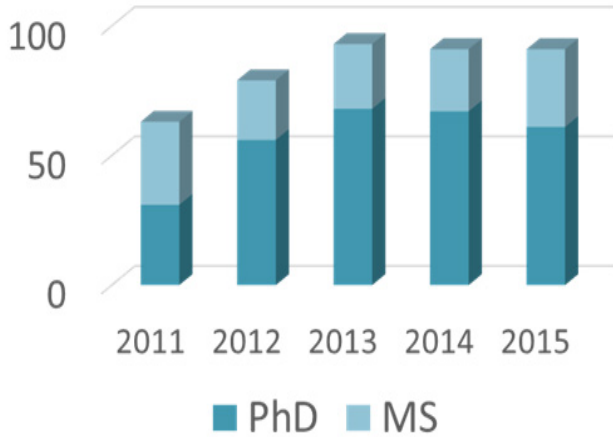
Special thanks to all of those who donated their quotes and images.

Cover Image: Class of 2016-Recent Graduates (left to right), Jonava Thomas (M.S.), Dr. Reinaldo Santos, and Dr. Sivanesh Palanivel.

Banner image: 45S5 bioglass, Dr. Jincheng Du.

## FACTS AND FIGURES

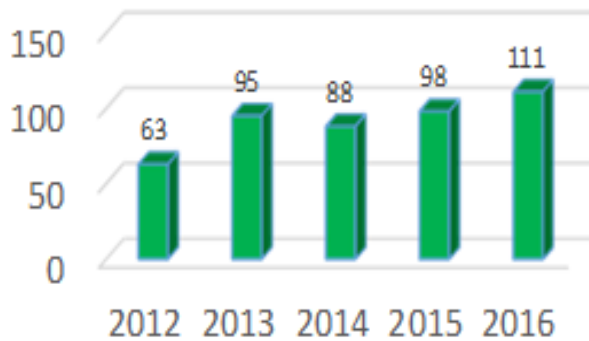
### Total Graduate students (#)



### AS OF FALL 2015:

- 111 undergraduates
  - 75 graduate students (70% PhD)
  - BS Awarded- 12 (rank 50/69)\*
  - MS Awarded-11 (rank 32/101)\*
  - PhD Awarded- 12 (rank 25/99)\*
- \*ranking based on 2015 ASEE data

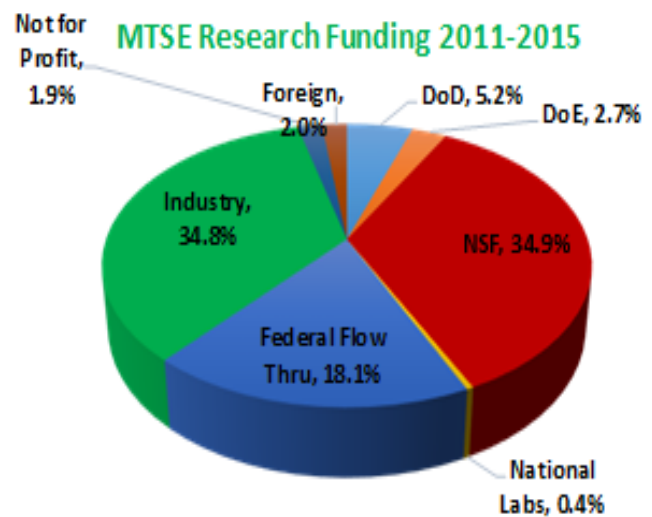
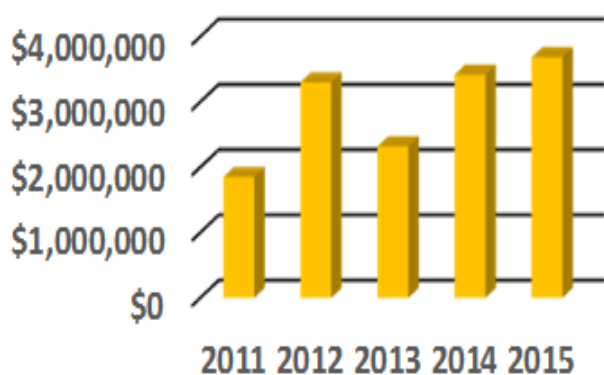
### Undergraduates Enrolled



### AS OF FALL 2015:

- 16 full time faculty
- Publications per faculty/year: 5.5
- Faculty research expenditures: \$3.6M (\$199.6k per faculty)

### Research Awards

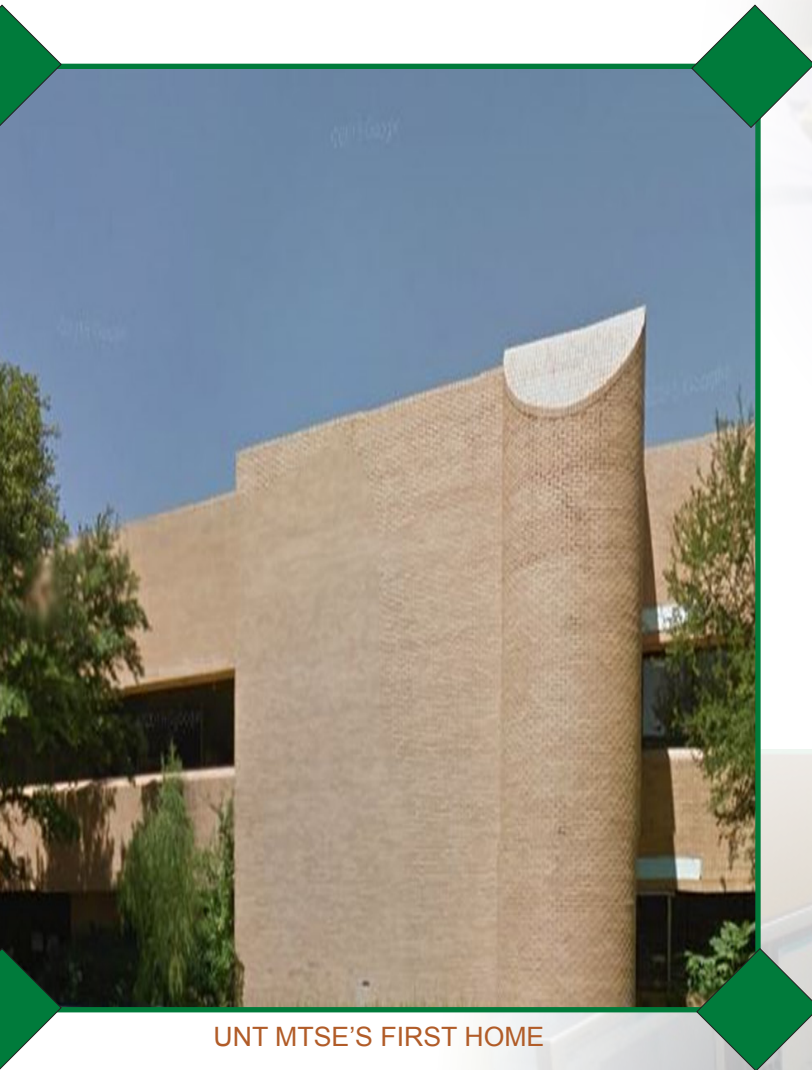




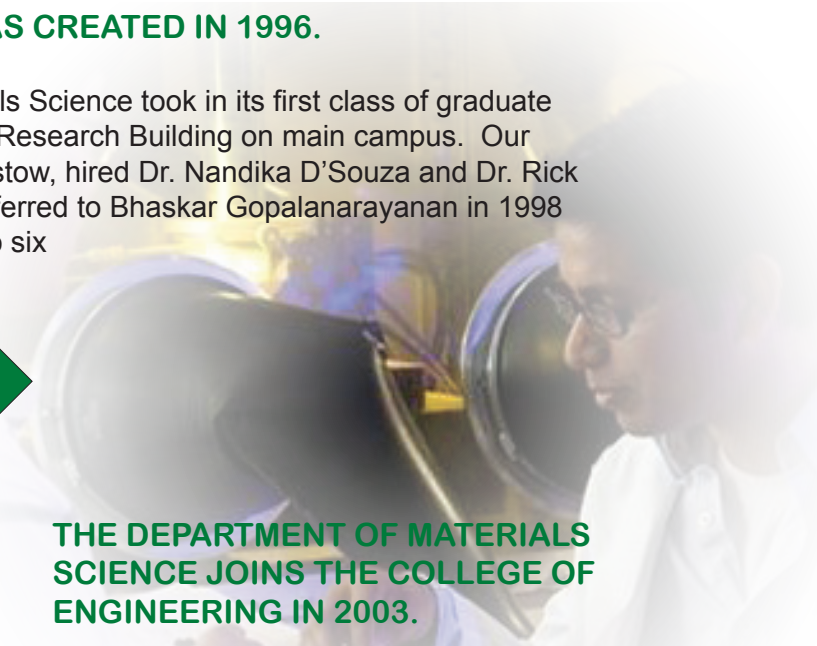
## CELEBRATING 20 YEARS OF HISTORY

### THE DEPARTMENT OF MATERIALS SCIENCE WAS CREATED IN 1996.

Offering MS and PhD degrees, the Department of Materials Science took in its first class of graduate candidates fall of 1996. It was first located in the Science Research Building on main campus. Our first chair was Dr. Rus Pinizzotto, who with Dr. Witold Brostow, hired Dr. Nandika D'Souza and Dr. Rick Reidy. The first Materials Science degree (PhD) was conferred to Bhaskar Gopalanarayanan in 1998 (now at Lexmark, Lexington, KY). The department grew to six faculty by 2000.



UNT MTSE'S FIRST HOME

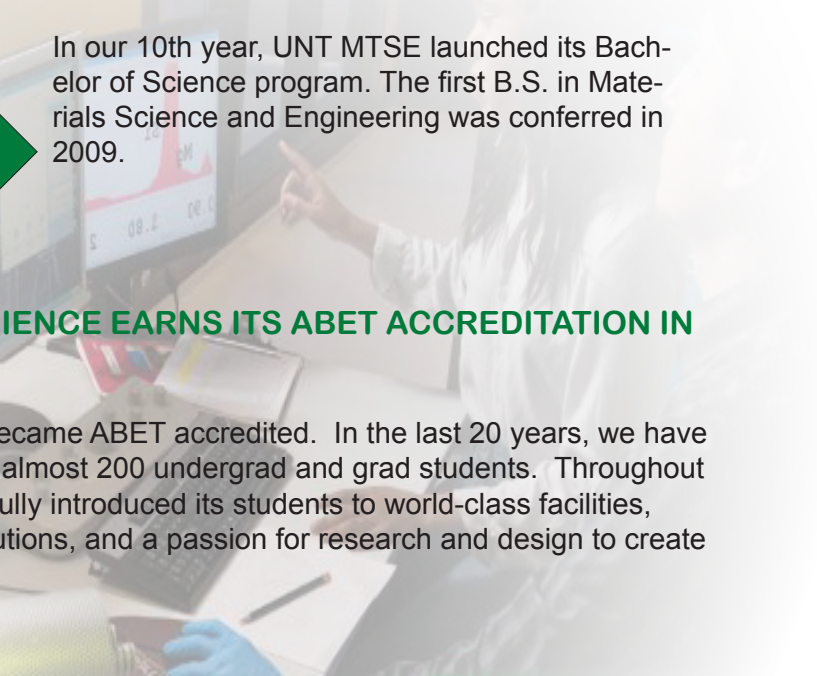


### THE DEPARTMENT OF MATERIALS SCIENCE JOINS THE COLLEGE OF ENGINEERING IN 2003.

Upon joining the newly formed College of Engineering, the department changed its name to Department of Materials Science and Engineering (MTSE). In 2004, UNT MTSE physically moved to its current home at Discovery Park with seven faculty. The Discovery Park campus is five miles north of University of North Texas's Main Campus.

### THE DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING STARTS ITS BACHELOR OF SCIENCE PROGRAM IN 2006.

In our 10th year, UNT MTSE launched its Bachelor of Science program. The first B.S. in Materials Science and Engineering was conferred in 2009.



### THE DEPARTMENT OF MATERIALS SCIENCE EARNS ITS ABET ACCREDITATION IN 2015.

In 2015, the MTSE undergraduate program became ABET accredited. In the last 20 years, we have grown from a handful of graduate students to almost 200 undergrad and grad students. Throughout these two decades, UNT MTSE has successfully introduced its students to world-class facilities, partnerships with international research institutions, and a passion for research and design to create the newest technologies.

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**DR. NARENDRA DAHOTRE MAKING A DIFFERENCE IN THE WORLD AND THE CLASSROOM**

In April 2016, Dr. Dahotre was elected to the American Institute for Medical and Biological Engineering (AIMBE) for his pioneering contributions to fundamentals and engineering of laser-material interactions during advanced manufacturing and processing of biomaterials and sustained service to the materials community.

AIMBE's mission is to advocate for the value of medical and biological engineering to society and to recognize and honor significant contributions in the field.



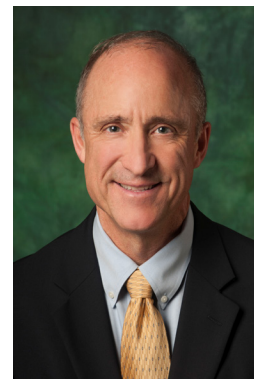
**DR. THOMAS SCHARF AWARDED THE UNT TEACHER AND SCHOLAR AWARD**

This award is given to a faculty member who has demonstrated excellence in research or creative productivity while also performing in an extraordinary manner as a teacher. The outstanding faculty who win this award will receive a prize of \$5,000 as well as a plaque commemorating the achievement and recognition at several university venues.



**DR. RICK REIDY ANNOUNCED UNT UNIVERSITY DISTINGUISHED TEACHING PROFESSOR**

Dr. Rick Reidy was named a UNT University Distinguished Teaching Professor. This award recognizes tenured faculty who perform outstanding teaching, instruct at the introductory levels of their disciplines, and promote continuous development of teaching excellence and improvement among their colleagues in the UNT community. The award consists of the designation "University Distinguished Teaching Professor" and a one-time supplement of \$5,000 added to the recipient's base salary.



(TOP) Dr. Voevodin uncovers the 2016 t-shirt design.  
(LEFT) Dr. Marcus Young (in purple) poses with recent Ph.D. graduate Ying Qui at the spring 2016 graduation

**NEW FACULTY**

In the Fall of 2016, the department welcomes Dr. Diana Berman of Argonne National Laboratory's Center for Nanoscale Materials as an Assistant Professor. Her current work at Argonne is on carbon based films for wear surfaces.



# MTSE Undergraduate Program

**3rd** place was at the TMS Quiz Bowl--this was exciting accomplishment for the MTSE team of Calvin Mikler, Zachery Herl, Arielle Clauser, and Sivanesh Palanivel. Brandon Ohl, competed in the bladesmithing competition with his finished sword and poster documenting his manufacturing process.

**45%** of our undergraduates go straight into graduate school. Three students of the 2016 class are in the inaugural class of our FastTrack students, completing their M.S. in a fifth year at the University of North Texas.

**100+**

undergraduates within the department. Two faculty advisors are assigned to each cohort of freshmen students and advise them through graduation.

*"The dedication my advisor, Dr. Young, has devoted to me has allowed me to thrive and continue to achieve incredible things, from participating in MTSE's first REU to connecting with the United States Army to complete my graduate studies in Germany."*

-Jennifer Scozzari, '16

**50%** of undergraduates complete research with faculty within MTSE and College of Engineering.

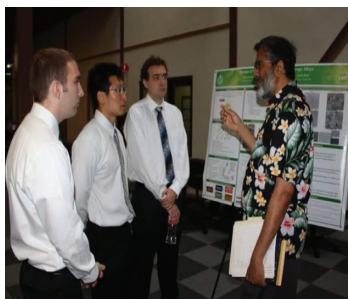
**2** department picnics that connect alumni, faculty, graduates, and undergraduates during the Fall and Spring semester.

**16** participants in the first student-led poster competition hosted by the Society for the Advancement of Materials Processing and Engineering.

## SENIOR DESIGN

Senior design continues to attract and recruit industrial partners to work and mentor our senior classes.

In 2016, Denbury and Dynalloy partnered with student teams.



## CAREER EXPERIENCE

Located in the hub of DFW, many students earn co-ops and internships that add industry and research experience to their skill sets.

Senior Martin Smith ('17) is spending the summer at Superconducting Technologies Inc. in Austin working on characterizing superconducting wires. Junior Samantha Zellner ('18) earned an internship with General Motors working on next generation of GM truck beds.

- Several students are working for companies such as Bell Helicopter, Lockheed Martin, and Nelson Forensics.



Pictured is Senior Keirsten Tafoya, an intern at Bell Helicopter assigned to etch tank line analysis.

## SUSTAINABILITY

The Society for the Advancement of Materials Processing and Engineering and the Society of Plastic Engineers teamed up to win funding from the UNT "We Mean Green" Fund to create their "Solar Bus" Project.

The project focuses on an ergonomic bus stop design made of recyclable polymeric materials and utilizes solar panels to create night-lighting and charging stations as students wait for the bus. SAMPE and SPE hope to manufacture the bus stop by 2017.

60 Ph.D. candidates, 20 M.S. candidates

UNT MTSE is proud of the work of our graduate students, many of whom work as research assistants and teaching assistants for our undergraduates. 30% of our grad students are from the US while 70% come from ten different countries and four continents.

## MTSE Graduate Program



### TIER 1 RESEARCH INSTITUTION AS OF 2016

With over \$3,500,000 dedicated to research, our graduate students make an impact in the prestige of our university and department. Graduate Sivanesh Palanivel (left) won a Best Poster Award at the TMS Annual Meeting for his work on a magnesium alloy. Graduate Xiaonan Lu (right) placed 3rd in a Best Poster Award at the American Ceramic Society Annual Meeting for her work on nuclear waste glasses which was collaborated with PNNL.

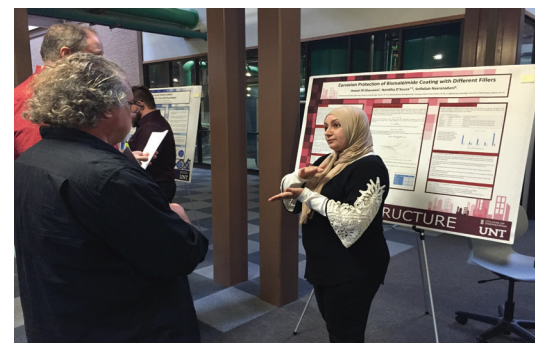
### LEADERSHIP IN ACADEMIA & INDUSTRY

Graduate Jessica Rimsza (Ph.D. '16, left) won the American Ceramic Society Graduate Excellence in Materials Science award as well as served as Chair on the ACerS PCSA Student Delegate Board. Ph.D. candidate Nathaniel Ley (right) was invited to intern at the Air Force Research Laboratory to study high temperature multi-component high entropy alloys for the next generation of aircraft steel engines.

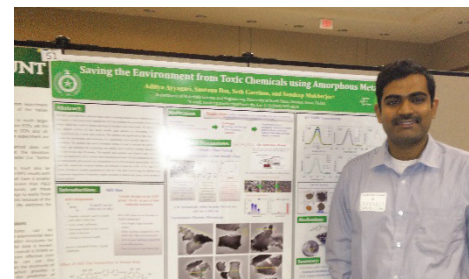


### INTERNATIONAL CREDIBILITY AND CONNECTIONS

Our recent graduates have positions in national labs (Sandia, PNNL, Oak Ridge, Brook Haven), industry (Intel, Micron, General Motors, Johns Manville) and as faculty in higher education institutions in US and abroad (Texas A&M University, Oklahoma State University). Graduate students Jessica Rimsza (Ph.D. '16) and Calvin Mikler (B.S. '15, M.S. candidate) have received National Science Foundation grants to travel internationally to complete their research.



(Top left) Graduates laugh with Dr. Jincheng Du during the Toulouse Graduate School Graduation Celebration. (Bottom Left) Ph.D. candidate Amaal Al-Shenawa presents at the SAMPE Poster Competition. (Right) Graduate student Aditya Sai presents his research.





## Recent Research Awards

Raj Banerjee “Integration of ICME with Legacy and Novel TMP Processing for Assured Properties in Large Titanium Structures (TMP 3a)” awarded by the LIFT-ALMMII institute under the National Network for Manufacturing Innovation (NNMI) for \$450,000 for period 2015-2018 in collaboration with GE, Boeing, and Ohio State. This project focuses on the development of advanced analytical models that can more accurately predict material properties, structural performance, and fatigue properties of titanium components.

Raj Banerjee, “DARPA Open Manufacturing: tiFAB – Phase II”, awarded by the Boeing Company total for \$332,953 over 3 years. This program focuses on the development and maturation of the electron-beam based additive manufacturing (AM) process using a wire feedstock.

Raj Banerjee, “Development of Combinatorial Techniques for Accelerated Discovery of Novel Structural Alloys”, Universal Technology Corporation (UTC) for \$50,561 for period 02/01/16 – 01/31/17. The objective of this program is to develop and integrate tools to enable discovery of new classes of aerospace structural materials using high throughput combinatorial approaches.

### Research Experience for Undergraduates

Under the leadership of Dr. Samir Aouadi and Dr. Marcus Young, the department is hosting its second REU. Hosting 10 students a summer, UNT MTSE pairs each undergraduate with a professor in the field of their choice. Students conduct research, design products or processes, and become trained in various manufacturing and characterization techniques.

In addition to research experiences, participants attended a seminar on scientific publishing that addressed the art of writing scientific papers, plagiarism and self-plagiarism, satisfying the novelty requirement of scientific articles, and a global view/trends on scientific research and publishing. UNT MTSE provided workshops on: Green technology that included hands-on experiments in the fabrication and testing of dye-sensitized solar cells; and jewelry making that included metal joining, wire drawing, plate rolling, and hot- and cold-working. The photo below shows students creating earrings from raw materials.



### Dr. Jincheng Du awarded a Department of Energy Nuclear Energy University Program Grant

The US Department of Energy Nuclear Energy University Program is a step forward to deliver solutions to high priority nuclear energy research challenges. Awarded over \$3 million over three years, Dr. Du’s proposal with Rutgers University, Washington State University, and PNNL would tackle the problem of nuclear waste storage and separation.

Jincheng Du, National Science Foundation (NSF), “GOALI/Collaborative, “Understanding Composition-Structure-Chemical Durability Relationships in Multicomponent Oxide Glasses: Influence of Mixed Network Former Effect”, \$317,000 (2015-2019). (collaboration with Rutgers and Corning, Inc.) — to understand the fundamental science governing corrosion of multicomponent silicate glasses with mixed glass formers in aqueous solutions, achieved through an integrated combination of experimental studies and computer simulation approaches.

Jincheng Du, Department of Energy (DOE), “Molecular Dynamics Based Simulations of Bulk/Interfacial Structures and Diffusion Behaviors in Nuclear Waste Glasses”, \$700,000 (2014-2017). (Collaboration with Pacific Northwest and Sandia National Laboratories)— use large-scale molecular dynamics-based computer simulations to investigate self-diffusion behaviors, interfacial structures, and hydrated gel structures formed during dissolution of these glasses, to obtain realistic and accurate short and medium range structures of these complex oxide glasses, to provide a mechanistic understanding of the dissolution behaviors.



## Faculty Highlights

### FRANCE COMES TO UNT

In the Spring of 2015, **Dr. Samir Aouadi** established a program with IUT of Evreux in France where undergraduate students from Evreux spend three months conducting research in our department. Eight students over the last two years have worked with MTSE researchers. At the end of the program, the students write a 30-page scientific report in English and present their findings in front of a committee at their home institution. This experience is enabling them to receive a special diploma that will make it easier for them to be recruited by multinational companies.



### ART MEETS SCIENCE

**Dr. Marcus Young**, MTSE assistant professor, and his students are investigating a secret underneath the final layer of paint on Alessandro Allori's 500 year old "Portrait of Grand Duchess Bianca Capello de Medici with Her Son."

The portrait, currently on display at the Dallas Museum of Art, is one piece of a story about a controversial royal family. At the left, Dr. Young is shown using the handheld X-ray fluorescence spectrometer on the Allori painting. Below, the image of the boy in the painting is overlaid with X-ray radiographic images. A younger child can be seen beneath the final image of the older boy.

In addition to this research, he is exploring how 3D printing technologies can create reproductions of famous sculptures and is using a scanning electron microscope with a focused ion beam to learn how silver-plated metal objects in the museum's collection were created and can be conserved.

Dr. Young's work has been featured in UNT Research Magazine, Forge Magazine, and the KERA news.



### Dr. Rajiv Mishra featured in NBC "Science of Innovation" videos.

Dr. Rajiv Mishra was featured in the "Science of Innovation: Friction Stir Welding", an educational video produced by NBC Learn, the educational arm of the NBC Universal News Group, in partnership with the National Science Foundation (NSF) and the U.S. Patent and Trademark Office (USPTO).

The "Science of Innovation" explores the science and engineering used to develop new products. Mishra is recognized as a world leader in the field of friction stir welding and processing, a method of joining solid-state metals without first melting the metals. The technology is being adopted by industry as a more efficient and environmentally friendly method of joining and forming metallic materials.



## Recent Graduates

### Master of Science

Fall 2015

**Venkata Aditya Ayyagari**- *Effect of Alloy Composition, Free Volume, and Glass Formability on the Corrosion Behavior of Bulk Metallic Glasses*

**Richard Gapfizi** (non-thesis)

**Alyn Gray**- *An Initial Study of Binary and Ternary Ti-based Alloys Manufactured using Laser Engineering Net Shaping (LENS)*

**Jingjing Gu**- *Ternary Oxide Structures for High Temperature Lubrication*

**Brian Hayes**- *Characterization of Ti-6Al-4V Produced via Electron Beam Additive Manufacturing*

**Nneoma Mojekwu**- *The Role of Crystallographic Texture in Achieving Low Friction Zinc Oxide Nanolaminate Films*

**Julie Strickland**- *Anisotropic Nature of Radially Strained Metal Tubes*

**Baozhuo Zhang**- *Synchrotron Radiation X-Ray Diffraction of Nickel-Titanium Shape Memory Alloy Wires during Mechanical Deformation*

Spring 2016

**Ke Chen** (non-thesis)

**Junjie Gu** (non-thesis)

**Graciela Carolina Penso** (non-thesis)

**Jonova Thomas**- *Microstructural Phase Evolution in Laser Deposited Compositionally Graded Titanium-Chromium Alloys*



### Doctor of Philosophy

Fall 2015

**Niraj Gupta**- *First Principles studies of Metastable Beta Titanium Alloys*

**Mageshwari Komarasamy**- *Deformation Micro-Mechanisms of Simple and Complex Concentrated FCC Alloys*

**Yue Liu**- *Precession Electron Diffraction Assisted Characterization of Deformation in  $\alpha$  and  $\alpha + \beta$  Titanium Alloys*

**Reinaldo Santos-Ortiz**- *Thin Films as a Platform for Understanding the Conversion Mechanism of FeF<sub>2</sub> Cathodes in Lithium-Ion Microbatteries*

Spring 2016

**Sanjay Kumar Karna**- *Light Emission From Plasmonic Graphene Oxide Nanoparticles*

**Jon Erik Mogonye**- *Noble Ion Implanted and ZnO Nanocomposite Au PVD Films for Sliding Electrical Contacts*

**Phalgun Nelaturu**- *Fatigue Behavior of A356 Aluminum Alloy*

**Sivanesh Palanivel**- *Thermomechanical Processing, Additive Manufacturing and Alloy Design of High Strength Mg Alloys*

**Ying Qui**- *Influence of High Strain Compression On Microstructure and Phase Transformation of NiTi Shape Memory Alloys*

**Jessica Marie Rimsza**- *Reactions And Interfacial Behaviors of The Water-Amorphous Silica System From Classical and AB Initio Molecular Dynamic Simulations*

**Harpreet Sidhar**- *Friction stir welding of high strength precipitation strengthened aluminum alloys*

## Alumni Profiles

NEWSLETTER FALL 2016

Pawan Nerusu (MS 2006)



**Hometown:** Hyderabad, India

**Current position:** Senior Metallurgical Engineer, C&J Energy, Houston, Texas (2014-present)

**Previous Positions:** Bodycote Thermal Processing (Metallurgical Engineer and Business Development Specialist, 2006-2008), Schlumberger Research Center (Metallurgical/Materials Engineer, 2008-2012), Baker Hughes (Senior Metallurgical Engineer, 2012), INTECSEA (Senior Engineering Specialist—Metallurgy and Welding, 2012-2014), and Technip (Senior Metallurgical Engineer, 2014).

**Interesting Experiences:** While he was at Bodycote, he was asked to set up operations in India where the company had no office or even a bank account. Pawan quickly learned that it was most efficient to merge with an existing Indian company than build from nothing. “Over the next several months we worked on transitioning to Bodycote. From payroll to billing and shipping, I had to learn everything. During the process I learned the overview of the entire business and operations. I had to work in areas where I had no prior experience and had to learn everything on the fly. For example, I had to change HR policies and setup safety-training procedures. I had to bring significant change to the company’s culture, which can be risky, but that turned out to be the best job of my life.” (Candance Allison, Stainless Steel World America, August 2015)

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*“Not every school or even every department has this type of individualized support that the Materials Science and Engineering department at UNT provided for me.”*

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Heather Dunn (BS 2016)



**Hometown:** Thomasville, Alabama

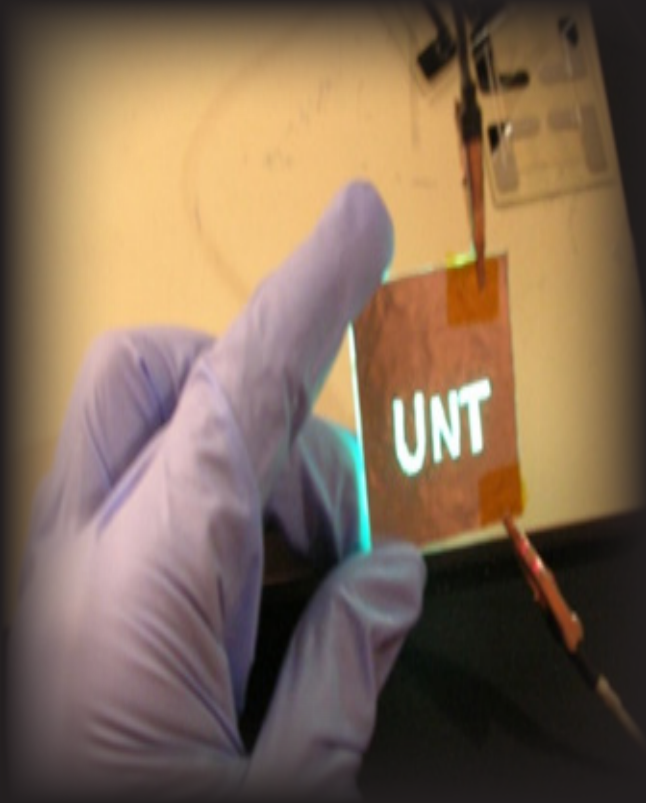
**Current position:** Nelson Forensics, Associate  
**Previous Positions:** Lab Intern for Nelson Forensics (1 year and 9 months); Independent Insurance Adjuster for E.A. Renfro (4 years); Teller for Regions Bank (4 years)

**Interesting Experiences:** I was not a typical student returning to school when I transferred to UNT. I was a few years older with work experience within the banking and insurance industry. This work experience provided me with knowledge and drive to finally complete my degree in Materials Science and Engineering. I understood the importance of working hard and building professional relationships. I also understood that internships and/or co-ops were essential within engineering to determine what you wanted to do post-graduation, as well as what you did not want to do. In school, you need to learn your fundamentals and essentially build your “toolbox.” Internships and/or co-ops are great pathways to real-world experience.

**How did your time at UNT help you with your career?**

I was surprised and humbled by the willingness of my professors to not only assist with class-related work, but also professional, long-term goals. Not every school or even every department has this type of individualized support that the Materials Science and Engineering department at UNT provided for me. My time at UNT was instrumental in positioning me into my current career with Nelson Forensics. The Materials Science and Engineering department at UNT has a diverse group of professors with both international and industry experience, and are easily assessable and willing to discuss long-term goals with students. The insight and perspective from these professors allowed me to not only receive a premium education, but also build relationships with businesses and professionals within and outside UNT.

# Advanced Materials Manufacturing and Processing Institute --a new effort lead by UNT MTSE



The Advanced Materials and Manufacturing Processes Institute (AMMPI) at the University of North Texas has been established as an Institute of Research Excellence. AMPMI is a multi-disciplinary team of researchers committed to collaborating on large research projects with an emphasis on application of findings and solutions to meet market issues and needs. Its mission is to test, develop and process next-generation structural materials via rapid combinatorial assessment and advanced processing technologies. The institute seeks to drive the development of functional materials for energy conversion and storage, optoelectronics, sensors and structural and environmental monitoring

## Advisory board:

Diran Apelian (WPI, Director of Metal Processing Institute)  
Subash Mahajan (UC-Davis, Distinguished Professor)  
Kevin Slattery (Boeing, Chief Scientist)  
James Withers (MER Corporation)  
Jeffrey Zabinski (Army Research Laboratory, Senior Scientist for Materials Science)

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