

CIVIL
ENGINEERING

THE CIVILIAN

CIVIL ENGINEERING NEWSLETTER

NORTH DAKOTA STATE UNIVERSITY

FALL 2012

WATER RESOURCES

TRANSPORTATION

STRUCTURAL

GEOTECHNICAL

MATERIALS

ENVIRONMENTAL

A Message from the Chair

Welcome to “The Civilian,” the newsletter of Civil Engineering Department, North Dakota State University (NDSU)! It has been about ten years since the last issue of our newsletter was published. That is why this rejuvenating issue is quite long. Our intention from now on is to publish at least one issue of newsletter annually to keep our alumni and friends informed regularly. If you have any news including your achievements and awards, please share your stories with us by e-mailing them to our faculty newsletter editor (a.bezbaruah@ndsu.edu). There have been several major changes in the department in the past ten years. Our department has grown from 8 to 14 full-time faculty, 350 to 450 undergraduate students, and 29 to 66 graduate students (22 M.S. and 7 Ph.D. to 34 M.S. and 32 Ph.D.). Our research productivities have increased tremendously from 2.3 million to 6.2 million in active research funding and 5 to 50 peer reviewed journal publications per year. It is also worth noting that our department hit a century mark in 2009 and is now 103 years old.



Recently, we bid farewell to one of our invaluable long-time faculty, Donald Andersen, as he retired after being with us for 33 years. Without a doubt, he is one of the most beloved colleagues and faculty. On a brighter note, he has agreed to serve as our emeritus faculty. We have hired Ying Huang to fill his position. She came to us from the Missouri University of Science and Technology where she completed her doctoral work. Her research is in the area of sensor development and applications for infrastructure. We are happy to have her. Her hiring increases the gender diversity of our faculty which is one of our goals.

As featured in this newsletter, our department has achieved a lot in the past several years. Our student organizations have been very active and have received regional and national awards in the American Society of Civil Engineers Steel Bridge Competition, Water Environment Federation Design, and Material Research Society Chapter Challenge. Our Engineers without Borders Chapter has helped an underprivileged Mayan village in Guatemala to have access to drinking water supply and to build an elementary school. Our faculty has been honored with local, national, and international awards on teaching and research. Recently, we have been ranked among the top 100 Civil Engineering programs in the country for funding from National Science Foundation. In 2011-2012, the quality of our instruction is better than the university average (based on student rating of instruction). This is unique for an engineering program at NDSU. Our success would not have been possible without the unyielding dedication of our faculty, staff, and adjunct faculty.

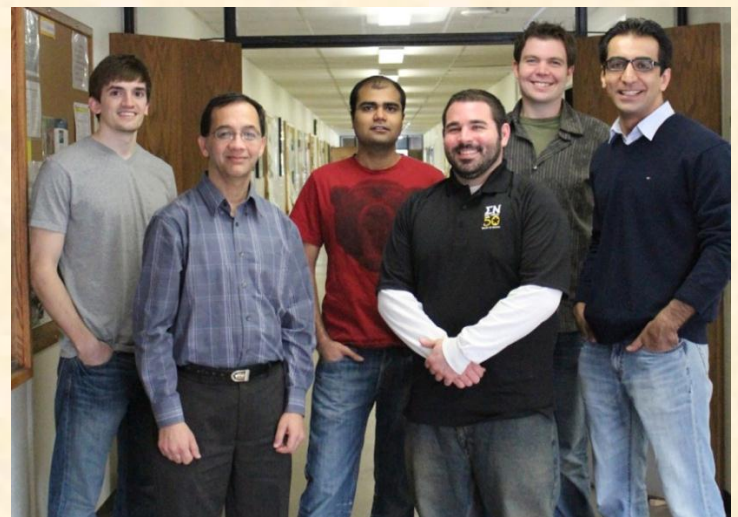
As we look forward to the future, we will continue our strong culture as a well-balanced department in teaching and research. We plan to enhance our teaching performances by using new technologies in our classes and offering more courses in the cutting edge and crosscutting areas in civil engineering including sensors, sustainability, and nanotechnology. Our faculty members are tasked with competing for multi-million dollar grants to establish research centers and programs to increase our national and international reputation. We plan to further diversify our students and faculty particularly on gender which has been proven to benefit learning experiences. I am so proud to play a small part in our department which has a rich tradition and history. I hope you share the same feeling as alumni and friends of our department. Please enjoy our newsletter.

Very truly yours,

Eakalak Khan

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Newsletter Editorial Board: Dan Bergerson (Editor/Graphic Designer), Achintya Bezbaruah (Faculty Editor), Anurag Sharma (Graphic Designer/Reporter), Anthony Waldenmaier (Former Editor), Eric Miller (Photographer) and Amir Ghavibazoo (Former Editor). [Race Rolland (Graphic Designer) and Andrew Vistad (Photographer) are not pictured.]

CAREER BREAKTHROUGHS: TAKING RESEARCH TO NEW HEIGHTS

Clays for Bone Tissue Regeneration



The Katti Research Group led by PIs Kalpana and Dinesh Katti and doctoral student Avinash Ambre have designed novel nanocomposites made up of degradable bio-based polymers (chitosan: from shrimp shells, and polygalactouronic acid: from fruits), mineral hydroxyapatite, and nanoclays. These new

nanocomposites are used for applications in bone tissue engineering, wherein the goal is to teach the human body (cells and tissues) to manufacture new bone. The premise is simple. A scaffold made with degradable materials

is seeded with human cells. The cells grow, proliferate and differentiate, and make new bone material while the scaffold degrades. The end result is a new 'engineered bone' that is identical to human bone in terms of mechanics, structure and chemical characteristics. Although many challenges exist to perfect the degradation and mechanics of the scaffold-cell, the present scaffold is made with modified nanoclays (based on montmorillonite) to design new mechanically strong and biocompatible scaffold materials. An amazing application of a conventional material to improve the quality of life of millions of people! Kalpana is a University Distinguished Professor, and her work was supported by National Science Foundation (NSF) through a CAREER grant.

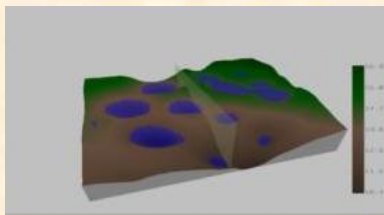


Scanning electron micrograph displaying mesenchymal stem cells on nanoclay-biopolymer scaffolds

Overland Flow Study Tools Developed



Dr. Xuefeng (Michael) Chu and his research team developed a comprehensive Windows-based modeling system for hydrologic research, education, and outreach activities. The modeling system is a part of his NSF-funded CAREER project on microtopography-controlled puddle-filling to puddle-merging (P2P) overland flow. The P2P software integrates four major components: (1) overland flow modeling system, (2) interactive educational system, (3) 2D/3D visualization and hydrotopographic analysis tools, and (4) the existing HYDROL-INF hydrologic modeling system. The P2P



The P2P models simulate the dynamic P2P filling-spilling-merging-separating process and quasi-3-D overland flow and unsaturated flow.

models are capable of simulating the dynamic filling-spilling-merging-separating process, quasi-three-dimensional overland flow and unsaturated flow. The software developed by Assistant Professor Chu's group has been used in research projects, watershed modeling courses, and K-12 outreach activities.

Polymers in Pavements?

With the aging of infrastructure system in the United States, it is important to consider sustainable means to revitalize or replace existing structures. Research at NDSU explores quality assurance for recycled asphalt pavement and crumb



Crumb rubber processed as asphalt modifier

rubber modifiers to resolve transportation related sustainability issues. Existing quality assurance and quality control methods of field agencies need evaluation to improve current practices and optimize the use of material resources. As part of this NSF supported CAREER research project, the Warm Mix Asphalt (WMA)

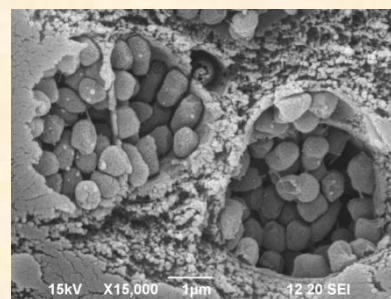
Team led by Associate Professor Magdy Abdelrahman is working on recycled asphalt pavement (RAP) that can replace virgin aggregates in new pavement projects. Research focuses on modeling resilient modulus criteria and examining the development of stress in RAP-incorporated aggregate blends. The NDSU researchers are also developing methods that use recycled rubber as an additive to asphalt. The additive is expected to improve the performance of asphalt cement used in pavements. This interdisciplinary research combines Superpave technology and polymeric chemistry towards developing rubber-based asphalt blends.

Housing for Bacteria?

Can you believe that Professor Eakalak Khan and his research group construct millimeter-sized 'housing units' for bacteria? These bacterial cells then



work for the research team and degrade pollutants present in wastewater to ensure safety of our rivers, streams, and lakes. His group used various biopolymers to entrap bacteria and used them to degrade pollutants present in wastewater. Eakalak's NSF funded CAREER research project on the applications of cell entrapment for water pollution control has enhanced our understanding how cells behave in a confined environment and has wide ramification on the wastewater industry. While entrapped cells are



Scanning electron microscopic image of *Pseudomonas putida* cells entrapped in calcium alginate beads with unusual round shape

used for food, pharmaceutical, and biomedical applications, their civil engineering

applications are rare. A cell entrapment system used in a wastewater treatment plant can substantially increase treatment efficiency as bacterial population can be retained in the treatment units for a longer time.



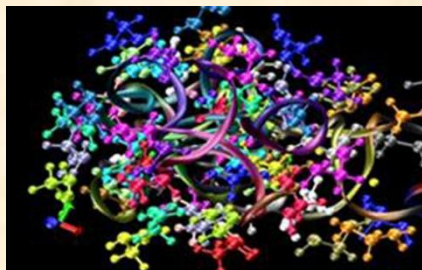
SMALL IS BOLD AND BEAUTIFUL: NANOTECHNOLOGY MAKES THE LARGEST IMPACTS

Bone Diseases:

An Unprecedented Insight into Collagen Mechanics

Collagen is the most abundant protein in human body and is a major component of bone and cartilage, and is impacted by diseases like arthritis and osteogenesis imperfecta. Understanding mechanics of collagen is important for developing theories on mechanics of collagenous tissues such as skin, cartilage, and bone. The Katti Research Group (Professors Dinesh Katti and Kalpana Katti and doctoral student Shashindra Pradhan) has recently discovered a third level of hierarchy in a full length collagen molecule. The NDSU group has performed the first steered molecular dynamics simulation of a full length collagen using some of the world's fastest supercomputers and found that a third level helix exists in collagen, and that it plays a major role in the deformation behavior of the molecule. This discovery has profound impact on understanding molecular scale behavior and its impact on bone and cartilage mechanics, and that is important to understand the origin of bone and cartilage diseases. This research has also revealed that although hydrogen bonding between chains of the molecule is important for the conformation of the molecule the interactions between all atoms in the chain play a more important role in the mechanics of a collagen molecule. This finding challenges the conventional view that hydrogen bonding controls the mechanics of collagen.

Giant Leaps into the Nano World



Cross section through the collagen molecule

Nanotechnology involves materials which are one billionth of a meter (10^{-9} m) in at least one dimension. Properties of nanomaterials vary markedly from bulk materials. Because of their unique physico-chemical properties, nanomaterials are finding uses in cosmetics, medicines, paints, and dental implants to name a few. While we all recognize the revolutionary power of a new technology that positively impacts our lives, the darker side of the technology is often overlooked. What can be a better example than the environmental impacts of electronic industry, insecticides and pesticides, or industrial revolution as a whole? Aren't we still struggling to address the ill effects of the otherwise marvelous developments? Civil Engineering Department at NDSU is in the forefront of studying the environmental impacts of nanotechnology and thriving to make it sustainable. Since joining NDSU in 2005, Assistant Professor Achintya Bezbaruah has established Environmental Nanotechnology as a new emphasis area in Civil Engineering and NDSU. This is an emerging area where impacts of nanotechnology on the environment are examined and nanotechnology is used to improve the environment. Nanoenvirology Research Group's (<http://www.ndsu.edu/pubweb/~bezbarua/>) emphasis on life-cycle research of nanomaterials has put the group uniquely in the national scenario with only a few research groups in the nation focusing on this specialized area. The group's success in publishing high impact journal papers and securing grants has put NDSU in the national and international maps of environmental

nanotechnology research. Most important aspect of this new research area is that it is multidisciplinary in nature and the group has been able to give leadership in creating a strong team of researchers from various departments and centers at NDSU, other universities from the US, and international research institutions. So far, the research group received ~\$675,000 in federal and ~\$200,000 smaller grants to carry out environmental nanotechnology research. Presently, the group has seven graduate students and five undergraduate researchers. Further, Civil Engineering Department is among the select few in the world to offer a course on Environmental Nanotechnology which introduces engineering students to the emerging technology from a life-cycle perspective and designs of nanotechnology systems.

Nanoing the Youth

Various industries are embracing nanotechnology and the evolving technology has already influenced the economy with high magnitude and wide scope. The nanotechnology-based products are now entering the consumer market too. Nanotechnology global market is predicted peak \$30 million in 2015 and is growing at an annual rate of ~20%, and so it is time that we educate our younger generation of the opportunities in the nanotechnology area. Civil Engineering Department is involved in various programs to promote nanotechnology in particular, and science, technology, engineering, and mathematics (STEM) education in general among K-12 students.



Nanoenvirology Research Group Members

Since 2008, Nanoenvirology Research Group (NRG) of Civil Engineering Department has been participating in Marketplace for Kids in their annual Fargo-Moorhead event. Students and faculty from Civil Engineering offer 'Nano...Nano...' workshops to the students who participate in the Marketplace. The hands-on workshops on nanotechnology specifically target elementary and middle school students. Objective of this outreach program is to educate our younger generation in the emerging area of nanotechnology and motivate them to choose careers in STEM. With funding from National Science Foundation (NSF), NRG has worked with West Fargo STEM Center Middle School (North Dakota) teachers to develop a nanotechnology education program for the seventh grade students at the school, and presently offer one module every month. The group is expanding to the program to school students in Standing Rock Reservation in North Dakota. Within this program NDSU's undergraduate and graduate students offer an in-class 'get your hands dirty' training program to teach nanotechnology and other engineering concepts through hands on activities. The program includes experimentation with



day to day nanoparticles, projects on slow nutrient release nanomaterials, and 'Nano Day' activities. Material Research Society at NDSU is also working on outreach programs to educate K-12 students on nanotechnology under the guidance of Professor Kalpana Katti.

Under the same NSF project four students from West Fargo High School have worked in Environmental Nanotechnology research under the mentorship of graduate students. Four students who worked various aspects of nanotechnology are presenting their finding in the World Environmental and Water Resources Congress to be held at Cincinnati in May of 2013. NSF's the Broadening Participation Research Initiation Grants in Engineering (BRIGE) provides funding to conduct fundamental research through the participation of underrepresented students. The present BRIGE project is on applications of biopolymers to surface modify nanoparticles for groundwater remediation applications.

Last summer Professor Kalpana Katti introduced "Nanoscience: It's Itsy-Bitsier Than Teeny-Tiny!" to area third

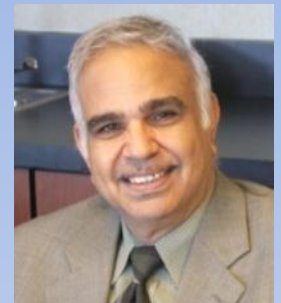
through sixth graders at Fargo Public Library. The students learned that even though a nano-sized material can't be seen without a microscope, the "tiny guys" can make huge impacts. Students were introduced to various materials made using nanotechnology and were given models of buckyballs to take home. The major emphasis of the presentation was on civil engineering and how civil engineers are using nanotechnology. At the end of the session, one of students was saying, "Mom, that thing that I wanted to be before, a chemist. Now I think I want to be a civil engineer!" Yes, indeed!!



HONORS AND AWARDS: GLOBAL EXCELLENCE

Dr. Padmanabhan Chairs National Task Committee on TMDL Modeling

Selection of a suite of credible watershed models by professional consensus is a crucial step in all types of watershed analysis including total maximum daily load or TMDL (of pollutants) analysis. The applicability of a model for a specific TMDL analysis should be evaluated based on the capability to simulate runoff and transport at a time-scale and spatial resolution appropriate for the evaluation of cause and effect. Without adequate definition of cause and effect, water quality management is reduced to trial-and-error adaptive management which is expensive and time consuming. To address this critical need Professor G. Padmanabhan conceived and proposed a Task Committee and now serves as the chair of the TMDL Analysis and Modeling Task Committee under the Watershed Management Technical Committee of the American Society of Civil Engineers' (ASCE) Watershed Council. The committee is expected to achieve its goals by 2014. The primary task of this committee is to critically review a random sample of the TMDLs on file with the United States Environmental Protection Agency (USEPA) for causes of impairment and the suitability of models used in the selected cases and other currently available watershed models for TMDL analysis. The committee will identify most of the diverse methods/techniques that are used to establish TMDLs. It also will identify the methodologies/models that are used to evaluate the current loads into waterbodies, and record some of the best management practices being used throughout the country to bring the current loads to the established TMDL. Further, the committee will suggest how best to integrate the ever advancing remote sensing and geographic information system into watershed analysis. The task committee will define minimum consensus protocols to guide the process of defining the credibility of simulations to support watershed analysis and management. The protocols will include calibration and testing of watershed models and defining the uncertainties that watershed managers must take into account. The protocols will also define minimal data requirements and how best to collect and compile these data for major watershed investigations involved in the TMDL approach. The findings of the committee will be compiled as an ASCE Manual of Practice.



John Booker Excellence Award for Dr. Dinesh Katti

The John Booker Excellence Award is given every three years in the field of geomechanics and geotechnical engineering. It is a prestigious international award given by the International Association for Computer Methods and Advances in Geomechanics (IACMAG). Specifically, the John Booker Excellence Award recognizes individuals who have made significant contributions in research in geomechanics for nonlinear and time-dependent problems including analytical and computational methods, constitutive modeling, consolidation, and contaminant transport. Consideration is given to mathematical rigor and elegance that lead to fundamental understanding and insights into engineering and physical phenomena. In May 2011, Professor Dinesh Katti was conferred with the John Booker Excellence Award in

Geomechanics and Geotechnical Engineering. The award was presented to Dr. Katti in Melbourne City Hall in Melbourne (Australia) for "major contributions to geomechanics through the development of methodologies that describe the role of molecular phenomena on the macroscopic mechanical and permeability properties of swelling clays, for bringing molecular mechanics and molecular dynamics to the field of geomechanics, and for excellent research contributions for swelling clays, clay liners, and multiscale approach for mechanics of swelling clays and nanoclays."

SERVICE AND OUTREACH PROGRAMS INVOLVING CE STUDENTS AND FACULTY



STEM (Science, Technology, Engineering, and Mathematics) is an acronym for the fundamental education disciplines of sciences. NDSU hosts most majors in the STEM disciplines, ranging from biology to math education to engineering. We, in Civil Engineering, pride ourselves on passing on our knowledge to younger generation and being instrumental in enticing the youth to engineering. Over the past couple of years, the CE department has hosted several programs to cater to the students in elementary, middle, and high schools from North Dakota and Minnesota. Each program was geared towards promoting civil engineering as a promising career.

The Overland Flow Lab (OFL) Team held summer camps involving hydrologic education. As a part of the STEM Kids Summer Enrichment Program, fourth and fifth graders from the Fargo-Moorhead area visited OFL and learned about flooding and how overland flow is generated. The OFL also hosted a



session for Nurturing American Tribal Undergraduate Research and Education (NATURE), a program aimed towards attracting students of American Indian descent to scientific research. The OFL also hosted the YourVille Program (details on Page 10) for the seventh grade students from West Fargo STEM Center Middle School.

The Civil Engineering Materials Laboratory played the host to area K-12 students in the past years. The students were introduced to civil engineering with a special focus on construction materials, sustainability, and applications of recycled materials in construction. In spring of 2012, the group organized a session on Recycled Materials in Infrastructure for the participants in Expanding Your Horizons, a program organized by NDSU and intended to expose female middle and high school students to different fields of science and technology. In addition, area third to fifth grade students visited the materials lab during the STEM Kids Program. The students were taught about how to select materials for construction and how concrete works.

CE faculty from environmental engineering served as mentors to West Fargo junior high students who participated in a national competition organized by NASA. Teams from all over the country submitted designs for the Waste Limitation



Management and Recycling Design Challenge where in the students designed and tested systems that turn human generated wastewater (including urine!) into drinkable water. The West Fargo teams' designs took first and second places in 2010 and 2011 in the nation for having the most efficient and cost effective designs. They were awarded with prizes that included a trip to the Kennedy Space Center in Florida and VIP tours of the facility.

In addition to the teaching and mentoring programs offered by the CE department, students from the NDSU chapter of the American Society of Civil Engineers teamed up with local engineering firm Ulteig Engineers for the fifth annual Construction Competition at a local mall. The ASCE-Ulteig team built an 8-foot tall hour glass that used over 1,000 food cans which were donated to the Great Plains Food Bank after the competition. The goal of the competition was to raise awareness among the youth toward engineering education.

Innovation: Defining New Boundaries

New Device for Swelling Clay Testing Invented

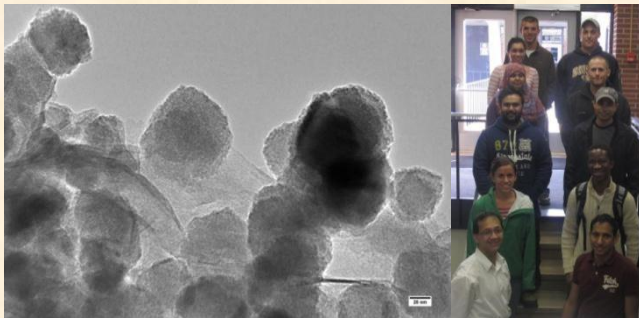


The new permeameter for swelling clays: "Porous rigid wall flexible wall permeameter"

Swelling clays cause enormous damage to the nation's infrastructure. The annual damage is estimated as 7-8 billion dollars. On the other hand these clays are used in barriers (e.g., geosynthetic clay liner or GCL for landfills) to prevent toxic fluids from entering the aquifer. Study of permeability behavior is of paramount importance to understand swelling clays. The common permeability devices used currently for swelling clays including flexible wall permeameters are not suitable because of swelling characteristics of the clay affect the geometry of the sample and significantly change to the clay microstructure as a result of particle breakdown (a discovery made by the Katti Group at NDSU in 2000). Department Dinesh Katti and Kalpana Katti and doctoral student Priyanthi Amarasinghe have invented a device called "Porous rigid wall flexible wall permeameter" that overcomes these issues and accurately measures the permeability, swelling pressure, and consolidation properties of swelling clays. In addition, this device also allows for microstructural evaluation of samples using electron microscopy and study of clay-fluid interactions using infrared spectroscopy. The design of this device has been submitted for an international patent. The use of this device has already led to important findings that accurately describe the relationship between dielectric properties of fluid and permeability of Na-montmorillonite clays that are used in GCLs. These relationships indicate that the coefficient of permeability of environmentally toxic solvents such as trichloroethylene and toluene are 500,000 times higher than that with water permeating through the clay barriers, and can be extended to evaluate behavior of other low polarity fluids.

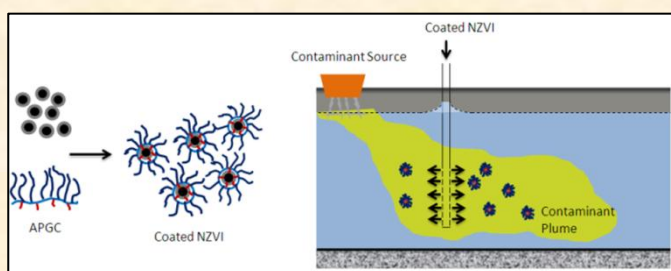


Swimming Trunks for Nanoparticles



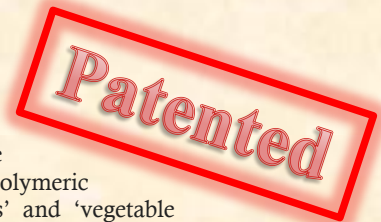
(Left) High resolution microscopy photograph of polymer coated NZVI. (Right) The nanotechnology research group.

What does a swimmer need to perfect her or his skills? A perfect pair of swimming trunks, agile hands, and strong legs is all essential. The same concept has been used by Environmental Engineering faculty Achintya Bezbaruah, his collaborator Dr. Bret Chisholm from NDSU's Center for Nanoscale Science and Engineering, and doctoral students Harjyoti Kalita and Sita Krajangpan to come up with a swimming gear for their "nano swimmers". They have used a nanoarchitronic design concept to put a hydrophobic polymer coating on nanoscale zero-valent iron (NZVI) particles and anchored the polymer layer to iron surface with acrylic acid (AA). To improve the dispersion (or free floating) behavior of the polymer coated NZVI particles polyethylene glycol (PEG) is grafted onto the hydrophobic surface. With this new hydrophobic polymer-PEG-AA copolymer coating, much better suspension of nanoparticles can be achieved and application of NZVI groundwater remediation will be much easier. Bezbaruah's Nanoenvirology Research Group has used polydimethylsiloxane



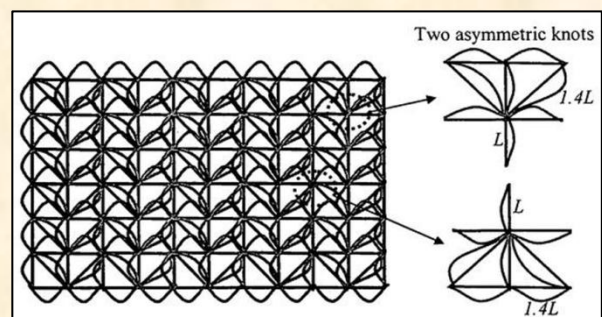
Source: *Environmental Science & Technology*, 2012
(Patent#2011/0042325)

(PDMS) and soybean oil-based copolymers for the hydrophobic layer. Two patents have been applied based on the findings within this research. The intellectual properties, viz., 'polymeric delivery vehicle for nanoparticles' and 'vegetable oil-based polymer for nanoparticle surface modifications', are expected to find wide range of applications in biomedical engineering and food sciences in addition to environmental engineering.



Better Body Armors to Save Thousands of Lives

There is a huge demand for effective and light-weight armor systems that can respond to a broad range of threats. Some ceramic materials like boron carbide are used in protective armor, and they do an excellent job of blocking low-energy projectiles such as handgun bullets, but yields too easily to more powerful ammunitions due to loss of resistance. In their efforts to overcome the loss of resistance problem in conventional blast resistant materials, Structural Engineering faculty Mijia Yang and his doctoral advisor Dr. Pizhong Qiao have invented 'bistable bond lattice structures for blast resistant armor appliques' and obtained an U.S. patent for their invention. The invention presents innovative lattice structures that can be used in blast fragment shielding through specially designed bistable bonds with asymmetric waiting links embedded in the structures. The invention provides a way to distribute the damage over a large area in an even manner and, thus, helping in blast mitigation. Adoption of this invention in armors and military shelters is expected to save thousands of lives in the coming years.



Source: *The U.S. Patent and Trademark Office* (Patent#8141317)

CE Student Athletes Speak – Balancing Sports & Academia

Megan Swan – NDSU Golf Team

- Summit League Winter/Spring All-American Academic Team 2010-2012
- Commissioner's List of Academic Excellence
- Tied for 4th at Concordia Cobber Open in Fall 2011
- Placed 15th at Xavier LPGA International in Spring 2011
- National Golf Coaches Association All-American Scholar Team 2010-2011

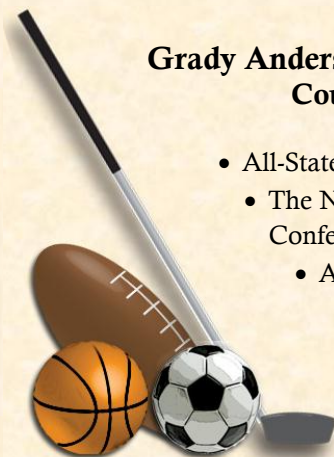


How do you balance sports with academia?

I strike a balance of academia and sports by staying very organized and scheduling my time. Also, the golf team as a whole is very academically-driven so it helps to be immersed in an environment that encourages me to study and do well in my classes.

Grady Anderson – NDSU Track/Cross Country Team

- All-State Cross Country runner in High School
- The NDSU team placed 2nd in the Summit League Conference in 2011
 - All-Academic achiever in 2011 and 2012



How do you balance academics with athletics?

Balancing academics and athletics has been a constant battle. I'd like to thank my parents and coaches for stressing the importance of school in my life at a young age. I think sports and athletics go hand-in-hand. It takes determination and focus to excel in either. I enjoy the challenge of school, and I know teachers don't want to hear this, but if it comes down to studying for a test or getting sleep for a race. I'll take the sleep every time! Through Blood, Sweat, and Tears; Go Bison!



Josh Eiler – NDSU Track & Field Team

Accomplishments in the track & field team:

I was able to throw a personal best at outdoor conference (2012). With a throw of 176-3 feet, I am now ranked 8th on NDSU's all-time record board. I also placed 6th in the hammer throw. This performance contributed points to the team's total of 216, winning the meet by 82.5 points over South Dakota.

Overall experience of being a student athlete:

Being a student-athlete has shown me that neither talent nor natural brilliance is worth anything without opportunity. I am very blessed to have the opportunity to compete here at NDSU. Over the last 3 years I have gained a more sincere understanding of humility. When a team bears each other's burdens and accepts other people's advice, everyone is able to feed off everyone else, making the team better as a whole. Civil engineers generally work on teams. I believe this concept of a team working in unison is invaluable. I hope to apply this "team theory" in everything I do.



IMMERSING IN CUTTING EDGE RESEARCH AS AN UNDERGRADUATE: ENVISIONING THE FUTURE

Amanda Grosz began her undergraduate studies in the fall of 2010 and is currently enrolled as a junior in the Civil Engineering program at NDSU. While in the freshman year she worked in research projects relating to bone tissue engineering and oil shales with Professors Dinesh Katti and Kalpana Katti. Then there was an opportunity to work on a USDA-NIFA grant in Civil Engineering. Amanda wasn't going to let this chance pass her by, so she applied for and received a position as an Undergraduate Research Assistant starting Spring of 2012, and presently working with Drs. Achintya Bezbaruah and Kalpana Katti.

Working on her research Amanda has learned about the properties of human bones of which she knew nothing about until being involved with her research. Currently she is working on effects of engineered nanoparticles on plants in the molecular level. Amanda has gained a stronger understanding about nanoparticles and how they can alter the chemical and physical properties of other entities. It is fun to work with plant cells and DNA, and how they interact with carbon nanotubes and zinc nanoparticles!

Amanda's research experiences to date have helped her to establish a strong foundation for the future. She realizes that she has the unique opportunity to expand on what she has learned in class, and she has gained a stronger appreciation and understanding of the concepts taught in various courses.

Amanda has found that college education is what you make of it and she encourages everyone who has considered a possible career in the science, technology, engineering, or mathematics fields to go for it! As she puts it, "I love working in this field and feel strongly that this is an equal-opportunity career path which is full of potential for anyone who dares to try." Joining a strong graduate program is the next item in Amanda's agenda. All planned out!



Ashley Roder came to NDSU in fall 2008 for undergraduate studies in Civil Engineering. She quickly became involved with Society of Women Engineers, American Water Works Association, Water Environment Federation, and American Society for Civil Engineers.

Her introductory soil mechanics class brought to her attention the lack in knowledge pertaining to the behavior of swelling clays. Soon after she began working with Professor Dinesh Katti's research group, and had the opportunity to become involved in research with several graduate students.

Ashley has been conducting simulations of sodium-montmorillonite interactions with clay using NAMD, a molecular dynamics program intended for the modeling of complex molecular organizations. In addition to molecular modeling, she has helped graduate students in performing nanoindentation and modulus mapping of human bone samples.

Kristal Gruba is an undergraduate research assistant working with graduate student Mary Pate in a research dealing surface modification of nanoscale zero-valent iron particles for groundwater remediation. Kristal is graduating in 2012 with a Civil Engineering BS degree. She has also completed a minor in mathematics. Now, graduate study in structural engineering is in her cards.

Her present research work in Assistant Professor Achintya Bezbaruah's Nanoenvirology Research Group is funded by National Science Foundation. Every day of research brings in new excitements, and unique satisfaction. "Failures in the lab (you have them, no denying) call for looking back to find out what went wrong, bring in more challenges, and, of course, make me more determined. These are life skills I am leaning now, and will use them for the rest of my life."

Kristal feels that involvement in undergraduate research is very beneficial for her. One of the major benefits of doing research is that it has helped her to enhance her time management skills. Also by doing research as an undergraduate, Kristal will have plenty of practice in the lab by the time she becomes a graduate student. Along with that, the knowledge of how to effectively keep track of data and information will be valuable in her future career.



CE GOES

Students and Faculty of NDSU have racked up quite a few frequent flyer miles in the last couple of years. Traveling all across the world from Nicaragua to Kenya to Vietnam, the Civil Engineering Department at NDSU has made the university proud. Here are a few highlights!

Alumnus Tests his H₂O Knowledge in Haiti



Graduating from NDSU in fall of 2009, Peter DeMuth is a busy Assistant Resident Engineer with the Central Corridor Light Rail Project for the Metropolitan Council in St Paul, MN. During the first week in February of 2012 Peter travelled to Haiti to serve the most vulnerable in that country with a team from Healing Haiti. This was a trip he had planned on making, and when the opportunity arose to do some civil engineering work, this energetic NDSU alumnus graciously volunteered. His knowledge from NDSU was up for a big test! After he is back from Haiti, Peter wrote in a note sent to his undergraduate advisor Dr. Bezbaruah, "After arriving in Haiti, I realized how different life is in this economically challenged country while the needs are just the same (as in the US). There are no common water mains or sewer services, and what exists of public infrastructure is less than acceptable here in the United States. Most neighborhoods get water from the common pump or trucks that deliver water near their neighborhoods. The people must carry water back to their houses bucket by bucket."

Healing Haiti had ambitious plans for the water filtration system. Peter helped install a one million gallon capacity activated carbon filter tank with timed back wash valve and dual ionization and oxygen electrodes. He also helped install a system at an orphanage that had two tanks for the media and a gravity flow tank. Healing Haiti has asked for Peter to help in their future projects. He is looking forward to serving on future missions and being able to apply his technical knowledge outside of his salaried job.

Fulbright Scholar Seydou Joins NDSU



Seydou Cisse is a Fulbright Scholar pursuing his master's program in Environmental and Conservation Sciences (ECS) program under the supervision of Assistant Professor Bezbaruah. He is here on a mission to learn and go back to his home country of Guinea to implement things he learns here. Seydou's graduate research is on finding viable treatment options for acid mine drainage that he can apply to the numerous contaminated sites in his home country. A graduate from the University of Conakry, Seydou worked for Guinee-Ecologie (a non-profit organization specializing in environmental education and conservation), and most recently in Simandou Iron Ore Mining Project. He has a personal commitment to find an appropriate technology to remediate polluted waters and make life better for fellow Guineans living in iron mining areas. The estimated reserves of iron ore in Guinea is ~16 billion tons with an iron content of 40-70%. Mining operations in Guinea are causing a number of environmental problems including major water quality impairments, and Seydou is determined to bring a positive change.

Engineers Without Borders



NDSU Engineers Without Borders (EWB) Student Chapter has been making an impact on a Mayan village with 300 people in Guatemala. The Chapter has recently completed the design and construction of a project that expands a water supply system for Las Tabilitas, Guatemala. The project provides water for 15 new households that had to be in a hilly part of the village because of land limitation. The original water system was not able to serve these households because of inadequate pressure and low flow in dry season. The Chapter is currently working on an elementary school building project for the village. The EWB members are now finalizing the design of the building and planning to implement it in Spring 2013. *Pictured above: EWB member Matt Haugstad with children of Las Tabilitas.*

YourVille Project

Seventh graders from West Fargo Middle School participated in a STEM outreach program coordinated by Overland Flow Lab (OFL) Team under the leadership of Assistant Professor Michael Chu. The students were involved in a project called "YourVille," in which they formed groups and built a model sub-division for a country of Africa. The model was designed to accommodate the local topography, climate, and medical and cultural needs of the assigned nation. They visited a local engineering firm to learn more about how engineers and surveyors design such projects. Eventually, these students presented their models to the local engineering community and citizens of the African nations they selected to work for.



GLOBAL

Faculty and Student Researchers Visit NDSU from Chulalongkorn University, Thailand



Last fall the Civil Engineering Department welcomed Professors Chantra Tongcumpou and Ekawan Luepromchai, Director and Deputy Director of International Postgraduate Programs at National Center for Environmental and Hazardous Waste Management at Chulalongkorn University, Thailand. Accompanying them were postdoctoral researcher Dr. Seelawut Damrongsiri and doctoral student Jaruwan Talawat. The Chulalongkorn Center has collaborated with NDSU by inviting four CE faculties to teach short graduate courses and to serve as co-advisers to their graduate students. In addition, the Center has sent their graduate students to conduct research at NDSU as visiting scholars. The Center is finalizing an agreement with Environmental and Conservation Science program at NDSU on programs where their M.S. and Ph.D. students would transfer to Fargo after 1 or 2 years to complete their degrees at NDSU. The team toured CE facilities and met with Water Resource and Environmental faculty, Drs. Bezbaruah, Chu, Khan, Lin, and Padmanabhan to discuss possible research expansion and graduate education collaborations.

Dr. Zhao Visits from Tianjin to Research at NDSU



Jianhai Zhao is an associate professor in the Department of Environmental and Municipal Engineering at Tianjin Institute of Urban Construction in China. He was selected by the Tianjin Municipal Education Commission as the Young and Middle Aged Key Faculty to study and research environmental engineering in the USA for one year. He joined NDSU as a visiting professor with Associate Professor Wei Lin and his research group, and worked on a research project to evaluate the effectiveness of artificial aeration on increasing dissolved oxygen level in stratified eutrophic lakes and also on phosphorus release from lake sediments under oxic and anoxic conditions. The group analyzed water and sediment quality data from Heinrich-Martin Dam, North Dakota and studied their relationships with blue green algal blooms.

Rohit Khanna graduated from the Materials and nanotechnology Program at NDSU in 2010 and has been offered a Japan Society of Promotion of Science (JSPS) fellowship for 2012-14. The total grant is ¥ 12,006,000 yen (USD \$155,680) and it is a very prestigious award. At NDSU, Rohit studied nanomechanics of live cells on scaffolds for bone tissue engineering under the guidance of Professors Kalpana Katti and Dinesh Katti.

Dr. Lin Presents at International Forum

Associate Professor Wei Lin visited his home country China as an invited speaker for the 2011 International Forum on Contaminated Sites Remediation. Drawing from his previous experience on hazardous waste management, he gave a presentation under the title "From Love Canal to Brown Fields to Sustainable Community Development."



WaterRediscover Goes International



In 2011, the CE Department organized the first International WaterRediscover Program on water recycling reuse among middle and high school students from 4 countries (Bangladesh, India, Uganda, and the USA). The main objectives of WaterRediscover are to entice the younger generations to STEM education and careers, provide an opportunity for students from the US to interact with their international peers, and create a sense of global understanding. The five participating teams worked on water recycling projects using the Engineering Design Process (EDP). The project culminated with the International WaterRediscover Teleconference on November 17, where participating teams interacted with each other and presented their findings using audio-visual aids. NDSU President Dean Bruscianni inaugurated the teleconference and reiterated NDSU's commitment to promote higher education. The 2012-13 WaterRediscover Program is presently in full swing where about 10-15 teams from across the globe are expected to participate. This year's International WaterRediscover Teleconference will be a multi-day event with one day dedicated to female participants.

Dr. Padmanabhan visits University of Da Lat, Vietnam



Professor G. Padmanabhan visited the Environmental Sciences faculty at the University of Da Lat (UDL), Da Lat City, Vietnam during his sabbatical last spring. He worked with the faculty and students on various environmental issues of importance to Vietnam, and to develop collaborative projects between NDSU and UDL. During his stay at UDL Dr. Padmanabhan helped the faculty in developing a plan for a research-based academic program. He also worked hand-in-hand with the UDL researchers and started a few research projects on non-point source pollution of lakes, environmental policies and regulations, crop residue reuse and disposal, and climate impacts on agriculture and society. He hopes his work with the Vietnamese institution will foster collaborations between the two institutions and provide opportunities to both NDSU and UDL faculty and students to pursue research on areas of common interest.

Catching up with Graduates

Alumni Profile

JAY THOMPSON

Graduate Student – Stanford University, CA

Undergraduate: 2005, Presidential Scholar, 2001-2005

Masters: 2008, Environmental Engineering

Ph.D: 2008-Present, PhD Student/Candidate, Environmental Engineering, Stanford University



Advice to Future Graduates:

Become fluent in your technical core. While softer skills are important, it is our technical abilities that make us engineers. Take an extra statistics class or two. As engineers, data are at the heart of most of what we do. Work on technical writing so you can communicate your great ideas to your boss or clients! A technically brilliant but poorly communicated idea will languish.

Transition to Stanford University:

I interpret my experience at Stanford as yet another piece of evidence that the opportunities are here to receive truly first-class education at NDSU CE. Though I was a good student as an undergrad, I do not believe that I was a singularly strong one. I have absolutely no doubt that many others from our department can excel in a top tier graduate program.

The education I received at NDSU CE prepared me well for life at Stanford. The Stanford environmental engineering program attracts students with a wide variety of backgrounds. Naturally, we all have different strengths and weaknesses. In the areas in which I was trained, however, I feel that my base of knowledge is at least consistent with my peers from other institutions.

If I may offer one additional piece of advice for students with aspirations of entering graduate school, it would be to get involved in research – the earlier the better. You will gain a deeper understanding of a topic than is possible in the classroom.

Alumni Profile



NICHOLAS P. GLUDT, PE

VICE PRESIDENT
MOORE
ENGINEERING

WEST FARGO, ND

Graduated: 1981, BS

Work Experience: Senior Engineer, Gearhart Industries Ft. Worth TX (1981-1986); Project Engineer SRF Consulting Plymouth, MN (1986-1989); Vice President, Moore Engineering Inc. (1989-Present).

Undergraduate Achievements: Young Engineer of Year for Local Chapter NDSPE

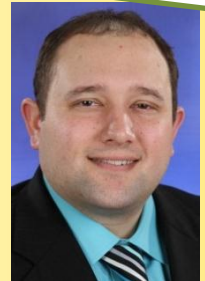
Post-Graduate Achievements: Published an article in technical publication (1993) on the use of CADD software for Maple River dam design.

Fondest Memories from NDSU: Per Don Anderson my survey instructor, if you are ever lost in the woods, pound in a survey lath and a bull dozer will be by in minutes to knock over and you can ask for directions. Do not fall asleep in Dr. Richards' class or you will be awakened by a high-speed chalk eraser.

Present Association with CE: Nick serves as a member of the Civil Engineering Industry Advisory Committee.

Alumni Profile

LANCE MEYER, PE CITY ENGINEER, CITY OF MINOT, ND



Graduated: 2006, BS

Work Experience: Engineer I, Bonestroo, Inc. (2007-2009); Assistant City Engineer, City of Minot, ND (2009-2011); Current City Engineer, City of Minot, ND (2011-Present)

Advice to Future Graduates:

The world we live in is becoming more and more fast-paced. Deadlines are tighter, risks are greater, and clients need projects at lower costs but still expect a high level of service. Always remember that above all, we must design our projects in the ways that keep public safety and quality of life at the forefront. To design anything less than that is doing a disservice to your client/agency and to yourself. Also, take the time to develop relationships and trust with your clients. Relationships matter and they can carry you through the hard times.

Many cities are faced with aging infrastructure, but often times the costs to replace those facilities are so expensive that communities delay projects until funds can be obtained. Engineers are looked upon to find financial solutions in addition to the technical answers that are needed to design and build the project. Having a good understanding of financing and business principals can be just as important as knowing the engineering principals of the project at hand.

Now more than ever, agencies require higher levels of justification for projects. Engineers need to understand social and economic impacts of their projects so that the agencies providing the funding can justify the project as having a positive impact and the money well spent. This makes obtaining project funding more and more complex and engineers have to be prepared for this level of details in the project development phase.

INSTITUTE OF TRANSPORTATION ENGINEERS

NDSU ITE attended ITE's international Annual Meeting and Exhibit. There were 45 exhibitors attending the meeting with displays of modern transportation related technologies.

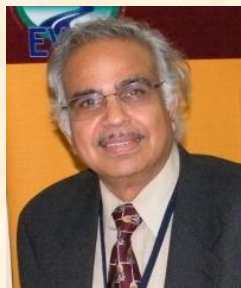


Meeting Attendees: Zach Peterson, Matt Jacobson-Heck, and Catherine Hovey

TAKING WATER AND ENVIRONMENTAL CHALLENGES HEAD-ON

Padmanabhan's Group Develops Drought Indices and Studies Estrogen Conjugates in Soil and Water Environment

Water Resources faculty G Padmanabhan is involved in research on quantity and quality of water. His group works on spatial and temporal



variations of drought and impact of drought on North Dakota agriculture. The group has developed a county-wide drought index known as Drought Severity and Coverage Index based on U.S. Drought Monitoring Data, and a Crop-based Drought Severity and Coverage Index based on the USDA National Agricultural Statistics Service (NASS) data. Geographical Information System (GIS) and Remote Sensing techniques have been used in developing the new index and studying its properties.

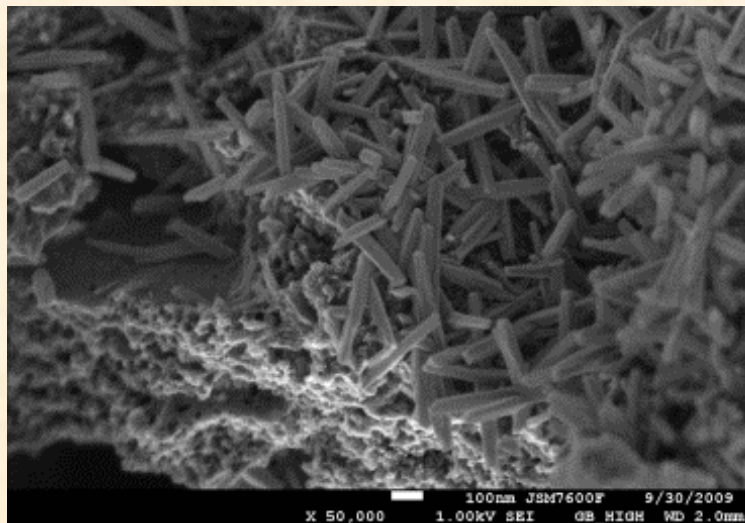
Fate and transport of contaminants in soil and water environment is another area where the group is very active. Recently, the group studied estrogen conjugates in agricultural soils in the backdrop of the fact that the bulk of all estrogens released from animals are in conjugated forms. The group discovered that the estrogen conjugate like 17 β -estradiol-3-glucuronide, which was considered to be of minor importance, is, in fact, a major concern in conjugate transport in agricultural soils. The group's work is interdisciplinary, involving biochemistry, analytical chemistry, soil science, and environmental engineering. The research group also collaborates with the USDA Biosciences Research Laboratory at the NDSU campus.

Contact the Department

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Making Strides in Arsenic Removal, Nitrification, and Eutrophic Lake Studies

Environmental Engineering faculty Wei Lin's most recent research projects involve experimental investigation and modeling simulation of arsenic removal from drinking water sources using iron-impregnated activated carbon, nitrification in chlorinated water distribution networks, and impact of aeration on sediment nutrient release and algal growth in eutrophic lakes. In collaboration with U.S. Geological Survey's North Dakota Water Science Center, he is studying the impacts of hydroclimatic and land use changes on stream runoff and water quality.



Akaganeite impregnated on inner surface of activated carbon

Karen R. Ryberg is a doctoral scholar in the Environmental and Conservation Sciences (ECS) Program at NDSU and is working with Associate Professor Wei Lin in the Civil Engineering Department. She also works for the U.S. Geological Survey's North Dakota Water Science Center (NDWSC) in Bismarck.



Ryberg has an M.S. in Statistics from Colorado State University and the USGS encouraged her to pursue a Ph.D., which led to her to consider NDSU. The NDWSC has numerous ties to Dr. Lin, through water issues and his having been the advisor of two other NDWSC employees, Rochelle Nustad (M.S. Environmental Engineering) and Brent Hanson (M.S. Civil Engineering). Civil Engineering and the ECS program offered Ryberg an unique opportunity to pursue her interests and career goals, and so she began studies at NDSU in 2011. While attending classes in Fargo, she telecommutes to Bismarck for her work with USGS. Ryberg's current dissertation research is on the impacts of climate variability on streamflow in the north central United States. Additional work will include studying the interaction of climate variability and streamflow with water quality and/or land-use change. In October of 2012, she traveled to Russia and gave two workshop presentations on her research as part of a US government scientists exchange program.

While at NDSU, she hopes to foster more interaction between the USGS and NDSU by having USGS personnel give seminars at NDSU, helping people at NDSU who have questions about USGS water-related data (<http://waterdata.usgs.gov/>), and working with Dr. Lin and others on opportunities for collaborations.

SPOTLIGHT ON FACULTY AND STAFF: STRIVING FOR THE BEST

Predicting Fatigue Life of Woven Composites



Woven composites are widely used in high performance applications in civil and defense industries due to their better mechanical properties than unidirectional composites. Woven composites have higher resistance to impact loading, higher strength and dimensional stability, and high heat and fire resistance. They are preferred in applications where multi-axial stress state exists. It is difficult and expensive to test these materials in multi-axial fatigue environment and for a variety of load combinations. A novel approach developed by Professor Frank Yazdani and his students to predict the fatigue life of woven composites in different load combinations is expected to make things easier. This novel approach can be extended to predict fatigue life of high strength concrete materials.

Rocking up Footings for Earthquake Resistance



Sustainable infrastructures, dynamic soil-foundation-structure interaction, computational modeling, and probabilistic performance assessment of geotechnical systems are the focus areas of Associate Professor Sivapalan Gajan's on-going research. He has particular interest on the performance evaluation of innovative foundations and improved soil-structure interaction mechanisms to enhance the performance of structures during natural hazards (earthquakes, and wind and wave loading). His research findings reveal that properly designed shallow foundations with controlled rocking possess many desirable characteristics such as well-defined capacities, increased ductility, seismic energy dissipation, isolation, and self-centering mechanisms. Dr. Gajan advocates rocking foundations and nonlinear yielding behavior of soils in place of (or in combination with) structural energy dissipation devices to improve the performance of structural systems subjected to seismic loading (see Figure below). His research group has also developed a probabilistic framework to investigate the effects of uncertainties in geomaterial properties on the probabilistic seismic performance of soil-shallow foundation systems with controlled rocking. The probabilistic framework systematically propagates the

uncertainties in soil properties and ground motion characteristics through a nonlinear dynamic soil-foundation contact interface model to the super structure model and predicts the sensitivity of the response of soil-structure systems in probabilistic space using Monte-Carlo simulations.

Tie up with NASA: Sensors for Aerospace Structures

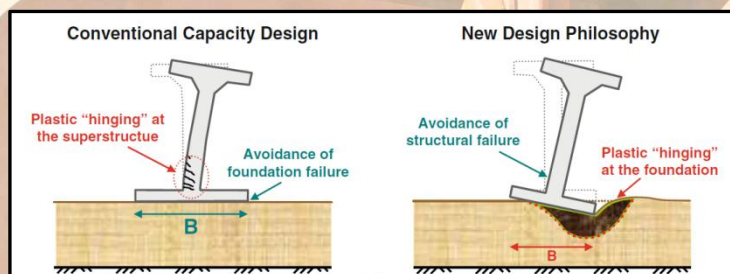


Assistant Professor Mijia Yang recently invented a design methodology for cushion and barrier systems used in anti-impact/anti-blasting infrastructures which can be fully integrated with the bridge condition assessment tool. The cushion and barrier systems can protect infrastructures from severe impacts during crashes. The integrated bridge health monitoring technology can monitor the health of the bridge and pin down the critical maintenance or repair needs for effective use of state and federal resources. Dr. Yang is currently collaborating with NASA's Glenn Center, and trying to expand this technology in aerospace structures through fiber optical sensors. The research is expected to provide NASA with real-time monitoring data of aircraft structures and extreme events like bird impacts.

Varma Plays National Leadership Roles



Associate Professor Dr. Amiy Varma has been engaged in research related to airport planning and design, traffic engineering and operations, transportation planning, freight transportation. He conducted freight performance measures, warrants for right turn lanes and impact on access management, and statewide travel demand model related research for Minnesota Department of Transportation. Currently, he is engaged in modeling and analysis of arterial work zones and impact of railroad preemption controls on surface street operation, which would result in better understanding of the impacts on traffic operations and lead to development of improved guidelines. Improvement the state of practice and related public policies is a major focus in all the research carried out by Dr. Varma and his group. Dr. Varma led the Transportation Research Board's (TRB) Airport-aircraft Compatibility Committee as the Chair from 2005 to 2011, and helped the committee advance issues related to impact of new and large aircraft like A380 on the airfield design as well as issues related to runway safety area design. Dr. Varma also led the Institute of Transportation Engineers' (ITE) Freight Mobility Council from 2009 to 2011. The council works on issues related to freight- mobility related issues, urban freight movement research, and cross-cutting issues related to sustainable freight development and planning. Currently, Dr. Varma chairs ASCE Transportation and Development Institute's (T&DI) Airport Operations and Planning Committee.



Source: *Bulletin of Earthquake Engineering*, 2010



Jan Lofberg - Administrative Assistant

Degree: Bachelors of Science in Management Information Systems, NDSU

Favorite Hobby: Camping, "find me at the lake every weekend I can make it!"
Interesting Fact about Jan: She's been in the service for 21 years; Marine Corps Active Duty for 4 years and continued into the Army National Guard.



Milka Singha

Student Services Coordinator

Parting words for graduates:
 "Keep in touch and good luck!"



Frank Peloubet, PE
Adjunct Professor

Frank is the lead professor for senior design. He also teaches courses on the history of technology in America, surveying, and university studies.



Dr. George LaPalm, PE
Emeritus Professor

Dr. LaPalm teaches structural engineering courses. He is known to be the most technology savvy person in the department.



Dr. Saeed Ahmari,
Post-doctoral Research Scientist

Dr. Ahmari is pioneering research in remote health monitoring of aging infrastructure with Dr. Mijia Yang. He also teaches courses in structural engineering.

STUDENT AWARDS

Student led Conference Makes an Impact

The Student Environmental Prairie Conference initiated by NDSU Civil Engineering students and students from University of Manitoba held its 6th annual meeting on SDSU campus in Brookings, SD on August 6-8, 2012. The objective of the conference is to provide a unique platform for students to share their research ideas and achievements. The conference was organized by NDSU WEF Student Chapter in 2008 and 2011 on NDSU campus. This year, NDSU graduate students from Department of Civil Engineering and Environmental Conservation Sciences (ECS) program have attended and presented their research work at this conference in Brookings. Alumni of these programs who are currently working for engineering firms in Fargo-Moorhead area have also presented their professional work and their past research work at NDSU. With growing participation of students and young professionals, the conference has now built a strong link between participating universities and the local environmental consulting firms. A team from UND joined the conference this year for the first time.

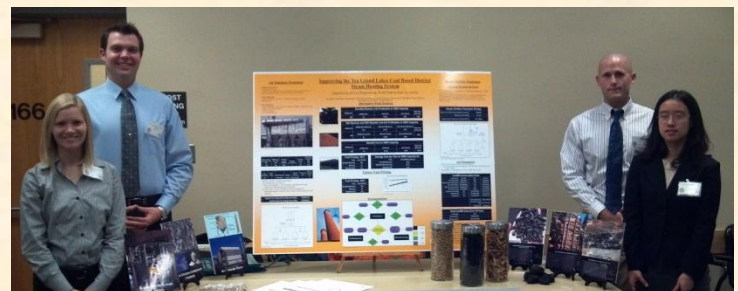
NDSU Shines at WEFTEC 2012

NDSU students and alumni put up quite a show at WEFTEC 2012 (September 28-October 3) with numerous presentations and participation in the student design completion. Six students from the NDSU's AWWA/WEF Student Chapter traveled to New Orleans, LA for WEFTEC 2012. Prior to the start of the conference, students joined 70 other conference attendees for the 5th annual WEF community service project. Haley Falconer (Watson), BS 2008, was the organizer of the event. Volunteers took to New Orleans' City Park, which was devastated during hurricane Katrina, for "Bogging in the Big Easy". Over 5,000 plants were planted to construct a wetland in the city's largest park to protect surface waters, provide wildlife habitat, and create recreational area. Next day, the students participated in the student design competition, attended technical sessions, and visited the technical exhibition. It was good opportunity for the students to network with peers and professionals. Eric Dodds, MS 2001, was elected to a two-year term as the Chair of the WEF Students and Young Professionals Committee.



CE Team Makes it to the Top in Carbon Challenge

Undergraduate members of the AWWA/WEF Student Chapter Steven Jensen (Sr.), Jingyi Sun (exchange student from China), Alysa Emerson (Sr.) and Eric Miller (Sr.) took first place at the 27th Annual Conference on the Environment, hosted by the Upper Midwest Section of the Air and Waste Management Associations and the Central States Water Environment Association on November 13, 2012. The competition was held at the University of Minnesota, St. Paul Campus. The 2012 design competition challenged students from the University of Minnesota - St. Paul, University of Minnesota - Duluth, and North Dakota State University to develop air quality control plans for a hypothetical coal powered steam generation plant. The winning design solution by the NDSU team involved modifying the original bituminous coal fuel source to a 60 percent woody biomass and 40 percent bituminous coal mix. This change greatly reduced the emissions of SO₂, and particulate matter, while making a move to a carbon neutral emission of CO₂ and CO. The team was recognized with a citation and prize money of \$1300.



'The Don' Retires: Remembering the Icon

by Anthony Waldenmaier

Spring 2012 marked the end of an era for the Department of Civil Engineering, as Dr. Don Andersen retired after 33 years of teaching at NDSU. He will remain with the department as a professor emeritus, which is a great honor. To summarize the impact that Dr. Andersen has had as a member of the CE department is no easy task. He served as the advisor to the NDSU Chapters of Institute of Transportation Engineers and American Society of Civil Engineers, professor of several courses, and an advisor and mentor to so many students. He was recognized as one of the best teachers in the College of Engineering and Architecture, and worked on research projects with NDDOT.



Dr. Andersen's NDSU roots stem further back than just his teaching years; he is also a graduate of NDSU (BSCE, 1970). Along with his BS, he earned his Masters of Engineering from Penn State University in 1973 and began teaching at NDSU in 1977. After a short stint at NDSU, he earned his Doctorate of Engineering from Texas A&M University in 1982, before returning to teaching. In the years between his undergraduate and teaching careers, Andersen worked at the Nebraska Department of Roads (1970-74) and the Texas Transportation Institute (Texas A&M, 1974-1977), while earning his Masters degree.

As a student and advisee of Dr. Andersen, I consider myself lucky to have had an opportunity to learn from "The Don." Not only was he an excellent professor in the class room, but he was a great person to know in life. If anyone ever had a question about jobs, research, résumés, or anything else, they knew Dr. Andersen would always be there to help. At the end of the day, amidst all of the "Animal Walks into a Bar" jokes, it was clear that Dr. Andersen cared for every student and wanted each of them to make the best of themselves. He possessed the ability to keep a class light-hearted and still teach an in-depth technical course. When asked what the highlight of his teaching career is, he'll reply, "Seeing a lot of good students become successful in life."

In his retirement, Dr. Andersen plans to spend time on his farm in Ada, Minnesota, traveling, golfing, playing Angry Birds, and, of course, continuing his toy tractor collection. However, on retirement from NDSU, he wanted everybody to know, "NDSU may have only recently moved to Division 1 sports, but we have always been a Division 1 engineering school. Winning the National Steel Bridge Competition six times is just one example. [Also], my condolences to all the alumni who had to put up with me in class over the past 33 years. I wish some of the jokes could have been better. I couldn't afford good joke writers."

To Dr. Andersen from some former students on Facebook



Nicole Flint

Dr. Anderson is one of the best darn professors the NDSU CE Dept has ever had. I particularly enjoyed his humor! His antics in the classroom or whenever I would see him would always brighten my days. Beyond the humor though, his concern for his students' success was evident and very much appreciated.

Good luck in Retirement old man!



Mike Bibow

I have a job in Railroad Design & Engineering due to the wonderful direction I was given by Don over the course of my education at NDSU. Hats off to a great professor and energetic advisor; that office at the end of the hall will surely be hard to fill.



Andrew Wrucke

I always remember walking into his office after a meeting with my advisor during Grad School, and he would always be there to chat and just keep me company. He was a great professor and an even greater person to just B.S. with.

Favorite (and probably only said once) joke:
A standard deviation walks into a bar and asks, "Where's Norm?"

Andrew Wrucke
December, 2008



Eric Hodgson Wish you all the best Dr. Andersen. Enjoy your Retirement :) Dec. 2010

YING HUANG BRINGS SMART INFRASTRUCTURE TO CE

Dr. Huang joined the Civil Engineering Department as an Assistant Professor in the fall semester of 2012.

“Intelligent” Transportation Infrastructure: Transport to the Next Generation



Transportation has been playing a critical role in our society from the most ancient times till today. We will be more dependent on transportation infrastructures (roads, bridges, railways, airways, waterways, canals, pipelines, and terminals) in the future. The service condition of the transportation infrastructures determines the quality of transportation. The advances in technology have made transportation management easier and transportation environment safer. The use of global positioning system (GPS) and the road-assistant camera monitoring systems are examples of that. More importantly, these advances will also guide us to the next generation the “intelligent” transportation infrastructure.

An “intelligent” transportation infrastructure is expected to be self-sensing for its components’ structural

health conditions such as crack, corrosion, and service requirements. It will be self-analyzing for the service conditions, and self-warning when it is unsafe to use and, thus, prevent life and property losses. An intelligent infrastructure will ultimately be adaptively self-mitigating in extreme events such as earthquakes, floods, and hurricanes.

Seem like expectations are a little bit too high? Here comes the expert, Dr. Ying Huang from the civil engineering department of NDSU, who believes that with combined efforts from transportation, structural, mechanical, electrical and computer engineers, material scientists, and other experts, the intelligent transportation infrastructure is not far away from becoming a reality. Dr. Huang joined the department as an Assistant Professor of transportation engineering in the fall semester of 2012. She is a graduate from Missouri-Rolla, and works on structural health monitoring, smart structures, intelligent transportation systems, adaptive and smart materials, finite element modeling, and multi-hazard assessment and mitigation.

OVERCOMING OBSTACLES TO THRIVE IN CIVIL ENGINEERING: DANIELLE FRANSSSEN’S STORY

Ever since Danielle Franssen was a kid she has been fascinated with building things. In high school she was given the opportunity to visit construction job sites and sit in on professional meetings to gain a better understanding of just what structural engineers do. From that point on she knew civil engineering was the career for her.

Danielle chose NDSU because they have a very good engineering program and the tuition was lower than any of the competing colleges. Her freshman year was off to a great start! She was meeting new people, enjoying the college experience, and most importantly, had freedom from home. But all that came to a screeching halt just after Labor Day of her freshman year. Danielle was admitted to the ER because her left lung had spontaneously collapsed, and they had to insert a chest tube. She went in and out of the ER for several weeks and eventually ended up having surgery to remove part of her left lung. She tried desperately to stay in school but time was against her as she had missed just about the entire month of



September. Danielle met with her advisor about the struggles of keeping up with school. He told her that your health must always come first in life and at any point if you are not 100% you need to take a step back and get your health back together. He told her it was alright to take the semester off and return when she had recovered. Danielle did just that and withdrew out of her first semester.

Withdrawing out of her first semester in college was very disappointing for Danielle; however, she came back more determined than ever to still finish her degree in four years. She is now a senior and will be graduating in May of 2013. Her goal upon graduation is to attend Arizona State University to pursue her Master of Science in Engineering. Her career goal is to be able to use sustainable engineering to help minimize total project costs while maximizing the environmental potential. The possibilities are truly endless. Danielle believes sustainability is what can turn a big city into a great city and she can’t wait to do so!

Danielle has received a number of scholarships for the 2012-2013 school year. The major scholarships include: ITS Minnesota Transportation Engineering Scholarship, Association of Women Contractors- Hellen Baker Award, Charles E. Herman Scholarship from Upper Great Plains Transportation Institute, John A. Oakey Memorial Scholarship from NDSU Civil Engineering Department, Minnesota County Engineer Association Scholarship.

NDSU STEEL

The NDSU Steel Bridge Team has placed well in the national competition many times over the past few decades. The team has won nationals a total of six times!! These victories came in 1995, 2002, 2004, 2006, 2007, and 2010. Having a strong steel bridge team is a tradition that the department hopes to extend far into the future! Here are some pictures from past years.



1995 National Champions



2006 National Champions



2007 National Champions



2010 National Champions

BRIDGE TEAM



2008 National Qualifiers

**Best of luck to all
future steel bridge
teams in carrying on
this strong tradition!**



2007 Steel Bridge – Source: M. Abdelrahman

Advisory Committee Meeting

On November 30, 2012, Industrial and Student Advisory Committees and faculty met to discuss the current state of the Department of Civil Engineering. Several topics including a new design course in environmental engineering, capstone course, graphical and computer skills, and general issues related to undergraduate program were examined.

The meeting included open forums with Dean Gary Smith and Provost Bruce Rafert.





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