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Research highlights

Geotechnical Engineering Research at Purdue University

Purdue University, West Lafayette, is a public institution founded in 1869. Purdue offers more than 200 majors for undergraduates, over 69 masters and doctoral programs, and professional degrees in pharmacy and veterinary medicine. Purdue is classified as an R1 university (a "Doctoral University" with "very high research activity"). Purdue has produced 25 astronauts as of April 2019, including Neil Armstrong. Purdue has been associated with 13 Nobel Prizes. Purdue's Geotechnical Engineering program has a long tradition that is celebrated every year with two endowed lectures in honor of previous faculty members: the Lovell Lecture in the fall semester and the Leonards Lecture in the spring. The program, which is housed in the Lyles School of Civil Engineering, has a strong emphasis on doctoral-level research. The five faculty members—Professors Antonio Bobet, Monica Prezzi, Rodrigo Salgado, Marika Santagata and Joe Sinfield—are involved in research covering a broad range of areas. Research is connected to centers (listed at the end) or to individual faculty member laboratories.

Research at the Center for Offshore, Foundation and Energy Engineering (COFFEE)

Prof. Rodrigo Salgado
Co-Director of the COFFEE

Ph.D. in Civil Engineering, University of California, Berkeley, 1993

M.S., University of California, Berkeley, 1990

Civil Engineer, UGRGS, 1986

Dr. Rodrigo Salgado is the Charles Pankow Professor in Civil Engineering at Purdue University. Dr. Salgado is the author of the text *The Engineering of Foundations*

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

and the Editor in Chief of the ASCE J. of Geotech. and Geoenv. Engrg. Dr. Salgado has been the recipient of the ASCE Arthur Casagrande Award, the ASCE Huber Research Prize, the IACMAG Excellent Contributions Award, the Prakash Research Award, the Geotechnical Research Medal (2015) from the Institution of Civil Engineers (ICE) and the Outstanding Reviewer Award from Elsevier for his work for Computers and Geotechnics (2015 and 2017). Dr. Salgado's interests lie in geomechanics, computational mechanics, constitutive modeling and offshore engineering.

Prof. Monica Prezzi
Co-Director of the Center for Offshore, Foundation and Energy Engineering
Ph.D. in Civil Engineering, University of California, Berkeley, 1995
M.S., University of California, Berkeley, 1995
M.Eng., UFRGS, 1990
Civil Engineer, UGRGS, 1986

Dr. Monica Prezzi is a Professor of Civil Engineering at Purdue University. She received the Deep Foundations Institute (DFI) Young Professor Paper Award for her work on auger cast-in-place and drilled displacement piles in 2005. In 2011, Dr. Prezzi received from the Institution of Civil Engineers (ICE) the Telford Premium for their paper on theoretical analysis of PVDs. In 2015, Dr. Prezzi was recognized with the ICE Geotechnical Research Medal for the best geotechnical engineering paper published in Géotechnique in 2014 on the use of Digital Image Correlation (DIC) in the experimental study of complex boundary-value problems. Dr. Prezzi is currently doing research on image analysis applications to geomechanics, analysis and design of piles, particle morphology and crushing, and utilization of recyclable materials in civil engineering.

Current research topics

Directed by Professors Rodrigo Salgado and Monica Prezzi, the Center for Offshore, Foundation and Energy Engineering (COFFEE) at Purdue University has been actively contributing in research areas of computational geomechanics, advanced image techniques, offshore engineering, foundation engineering (both on and offshore) and innovative energy engineering applications.

1 Advanced Computational Geomechanics

1.1 Development of realistic constitutive models for sand and clay

Student currently working on this topic: Jeehee Lim

Researchers at COFFEE have been continuously developing and perfecting realistic and rigorous constitutive models for sand and clay following the framework of critical-state soil mechanics. Based on two-surface plasticity, the first generation of the sand model [1] captures the peak strength and dilatancy response of sand as a function of relative density, confining pressure and initial fabric. The first generation of the clay model [2] also uses two-surface plasticity to capture the mechanical response of clay under different loading paths. In addition, the clay model uses a cap bounding surface to capture the mechanical response of clay in consolidation. The second generation of the sand model [3] was developed to capture the evolution of fabric under shearing and its effect on the mechanical response of sand. To be applied in large-deformation boundary-value problems (BVPs), the third generation of the sand model has recently been developed based on the laws of thermodynamics [4,5], the principle of material frame indifference [6,7], the self-consistency criterion [8–10], and the yielding stationary principle [10,11]. It also uses a cap bounding surface to capture sand response under consolidation. Figure 1 shows the performance of the third generation of the sand model under shearing and compression. Currently, COFFEE researchers are developing a new generation of soil models that capture the response of soil to cyclic loading.

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

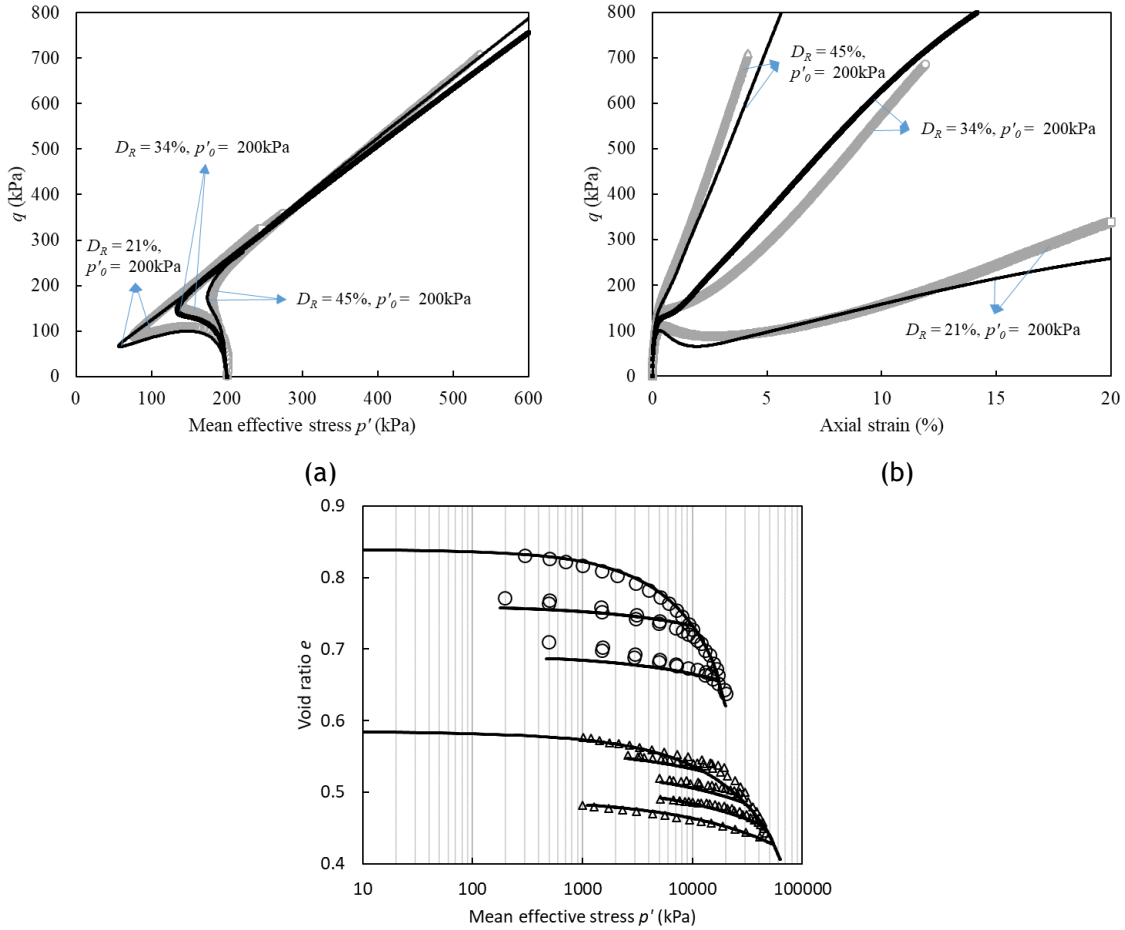


Figure 1 Performance of the third generation of the sand model developed at COFFEE: (a) and (b) comparison between experimental data [12] (grey symbols) and model predictions (black lines) for undrained triaxial compression tests of dry-deposited Toyoura sand; (c) comparison between experimental data [13–15] (hollow symbols) and model predictions (solid lines) for isotropic compression tests on initially loose and dense samples (with D_R = 37% and 100%)

Related references: [1–3,16,17]

1.2 Large deformation simulations using the Material Point Method (MPM)

Student currently working on this topic: Vibhav Bisht

At COFFEE, an in-house Material Point Method (MPM) [18] code has been developed to simulate large deformation geotechnical boundary-value problems. The MPM code was constructed with a focus on (1) efficiency and (2) robustness. Efficiency is achieved in various ways, including use of a structured irregular background grid [19] that minimizes the time required for the element search operation. Additionally, computationally heavy methods can be run in parallel to minimize run time. Robustness is achieved through use of rigorous computational schemes. An explicit time integration scheme is used to minimize convergence issues commonly encountered in implicit integration with non-linear materials. Stress integration of the constitutive model is performed using the robust adaptive sub-stepping scheme proposed by Sloan [20].

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

Currently, the MPM code is being used to simulate cone penetration in Toyoura sand. An advanced two-surface constitutive model is used to ensure that the obtained soil response is realistic. Figure 2 shows the contours of the vertical displacement in sand around the cone penetrometer advanced to different depths.

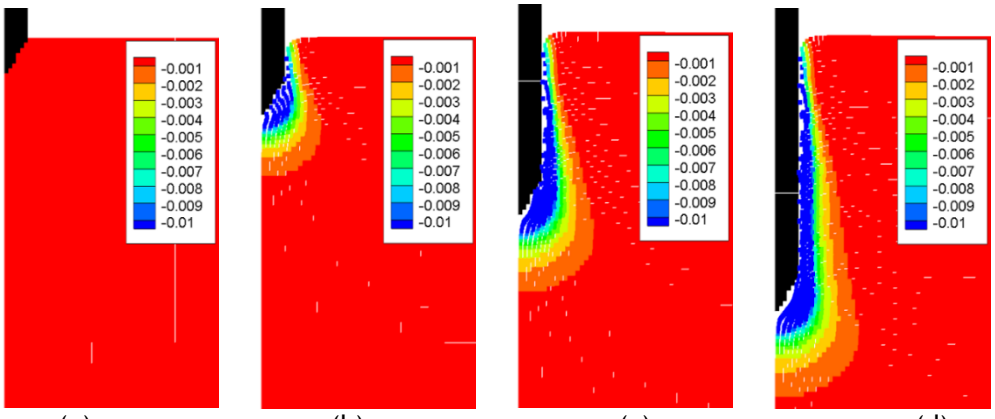


Figure 2 Vertical displacement contours in sand around the cone penetrometer simulated using the material point method, at a penetration depth of: (a) 0.5 d_{cone}; (b) 1.5 d_{cone}; (c) 3.5 d_{cone}; and (d) 5.5 d_{cone}

Related references: [19,21,22]

1.3 Rigorous Finite-Element (FE) analyses of geotechnical BVPs

Postdoc and student currently working on this topic: Fei Han and Qian Hu

Using realistic two-surface constitutive models, COFFEE researchers have been performing rigorous Finite-Element (FE) simulations of footings, walls, single piles and pile groups installed in sand/clay subjected to axial, lateral and combined loading [23–28]. The mesh used in the FE analyses are carefully prepared so that the FE analysis captures the formation of shear bands realistically in soil. These high-quality FE analyses have laid the theoretical foundation of the Purdue pile design methods and continue to shed light on the relationship between the global response of the soil-structure system and the behavior of soil elements.

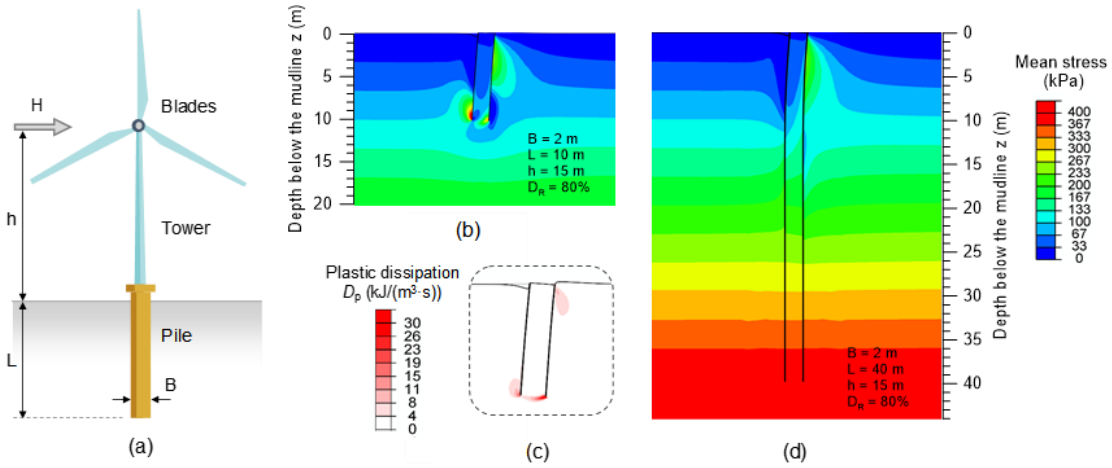


Figure 3 Finite-element analysis of laterally loaded monopiles: (a) a typical laterally loaded monopile supporting a wind turbine; (b) contour plots of the mean stress in sand for a 2-m-diameter monopile with L = 10 m (L/B = 5); (c) plastic dissipation in the sand for a 2-m-diameter monopile with L = 10 m (L/B = 5); (d) mean stress in sand for a 2-m-diameter monopile with L = 40 m (L/B = 20). Both piles are embedded in dense sand (D_R = 80%) and loaded at h = 15 m to a pile rotation of 1° at the mudline.

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

As an example, a series of rigorous FE analyses of laterally-loaded monopiles were performed covering a wide range of pile dimensions, load eccentricities, sand relative densities, and layering of the soil profile [23]. The analyses revealed the different responses and deflection modes of short, stiff piles and long, slender piles subjected to lateral loads, as shown in Figure 3. Based on the analysis results, design equations were proposed for calculation of the lateral capacity of monopiles in sand that produce estimates that are in very close agreement with the FE results.

Related references: [23–33]

2 Advanced Image Techniques in Geotechnical Engineering

2.1 Digital Image Correlation (DIC) analysis of penetration experiments

Students currently working on this topic: Eshan Ganju, Ayda Catalina-Galvis Castro, Firas Hashem, Rameez Raja, and Juliana Pereira

The penetration problem contains virtually all the challenges that geomechanicians may face, i.e., large displacements, large rotations, large strains, strain localization, crushing, and a moving soil-metal boundary. To better understand the penetration processes in sands, COFFEE researchers carry out penetration experiments in a unique half-cylindrical calibration chamber with observation windows that allow the collection of images of the sand and penetrometer during penetration. Figure 4 shows the DIC calibration chamber. As the penetration experiment progresses, a sequence of images of the sand and advancing penetrometer (see Figure 5a and Figure 6a for examples) is captured and then analyzed using the Digital Image Correlation (DIC) algorithm to obtain displacement and strain fields in the sand domain [34–36].

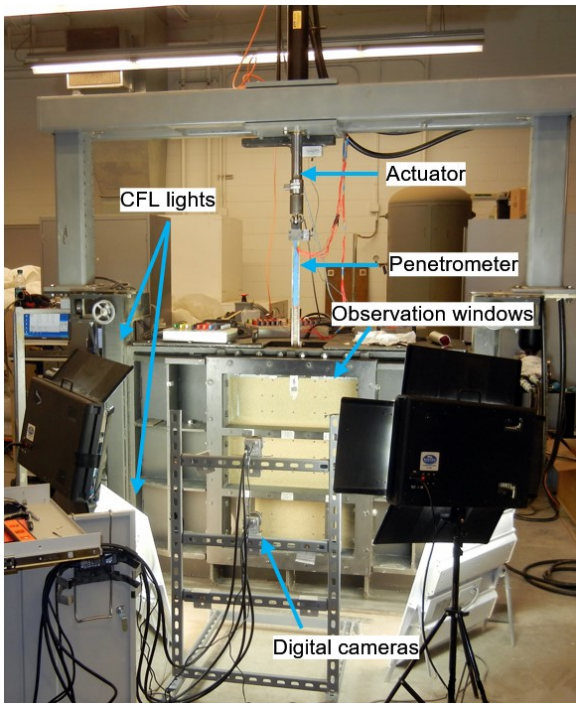


Figure 4 Experimental setup: the half-cylindrical calibration chamber with three observation windows, and digital cameras positioned in front of it for image acquisition [37]

Ongoing research at the center focuses on the visualization of displacement fields, strain fields and shear band patterns around deep and shallow foundations. Recent research findings have shown that the displacement and strains are highly localized near the surface of deep foundations or cone penetrometers (see Figure 5c), whereas localizations are observed for shallow foundation (flat footings) not only near the surface of the shallow foundation, but also away from it (Figure 6c). Other ongoing work on DIC analysis at the Center includes the effect of particle morphology and particle strength on the penetration resistance in sands and the effect of cyclic loading on the capacity of deep foundations. The data generated from the DIC analysis will serve as a useful benchmark for validation of numerical simulations of the penetration process in both deep and shallow environments.

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

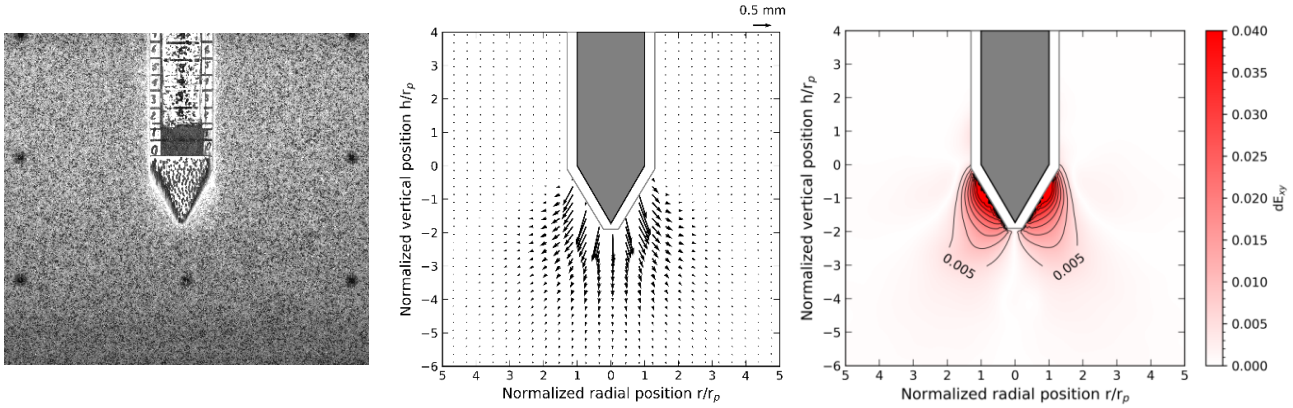


Figure 5 DIC calibration chamber experiment on deep penetration: (a) high-resolution image taken during penetration; (b) displacement vectors; (c) heatmap and contours in-plane shear strain in the sand domain ([37,38])

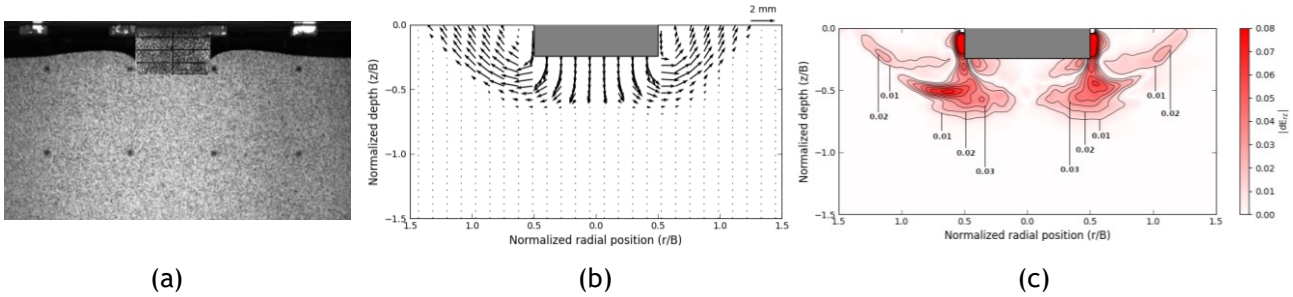


Figure 6 DIC calibration chamber experiment on shallow penetration: (a) high-resolution image taken during penetration; (b) displacement vectors; (c) heatmap and contours in-plane shear strain in the sand

Related references: [34,37–47]

2.2 Analysis of CT-scan images of undisturbed samples to quantify crushing

Students currently working on this topic: Eshan Ganju and Mustafa Kilic

Particle crushing plays an important role in the development of penetration resistance. To quantify the crushing around a penetrometer, COFFEE researchers use X-ray CT scans of undisturbed samples extracted around the cone penetrometer at the end of the penetration experiments. Agar, a biopolymer, is used to extract undisturbed soil samples that are then scanned in a high-resolution X-ray CT scanner. This provides "3D images" of the sand around the cone penetrometer. Subregions can then be extracted from within the 3D images of the sand samples and analyzed using a watershed segmentation algorithm to obtain the sizes of the sand particles. In this manner, researcher at COFFEE are able to quantify the particle-size distribution and particle crushing around the cone penetrometer [37]. Figure 7 shows the broad outline of the procedure followed to quantify crushing. Ongoing research at the center is focused on developing the analysis method to quantify the particle morphology, inter-particle contact, and fabric.

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

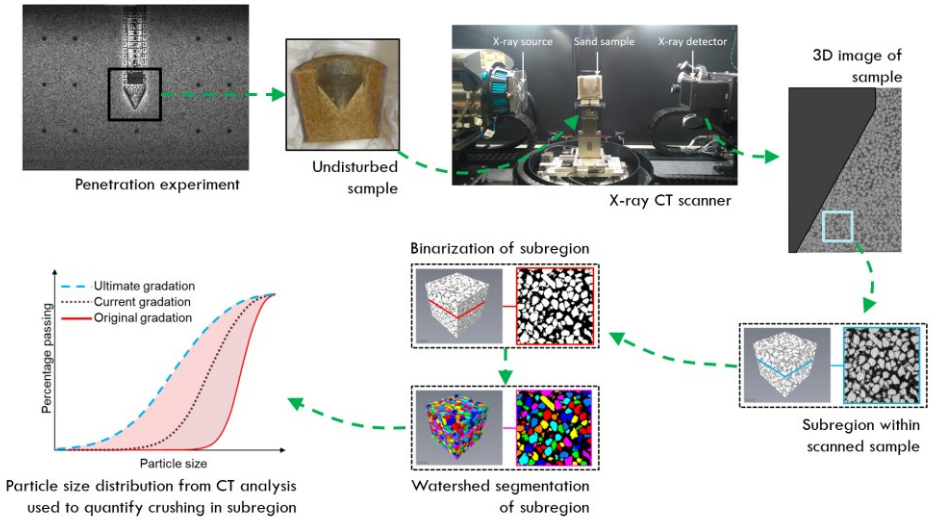


Figure 7 Summary of the procedure followed to quantify the crushing of particles around a penetrometer in a deep penetration environment

Related references: [37,38]

2.3 Analysis of 3D images during 1D compression to quantify fabric evolution

Students currently working on this topic: Eshan Ganju and Mustafa Kilic

Fabric plays a major role in the mechanical behavior of sands. To better understand how the fabric of sands evolves during loading, researchers at COFFEE perform 1D compression experiments in a special loading frame positioned inside an X-ray CT scanner. The scanner allows ones to capture 3D images of the sand *in situ* as it is being loaded. X-ray CT scans at multiple load levels are performed and then analyzed to obtain the particle-size distribution and fabric of the sample. The fabric of the sand is quantified by identifying the inter-particle contact normals between particles following the procedure outlined in [48]. Ongoing research at COFFEE aims to study the effect of the sand particle morphology and relative density on fabric evolution during loading. The objective of this research is to make meaningful measurements of fabric that can be used in the development of realistic constitutive models of sand. Figure 8 shows the outline:.

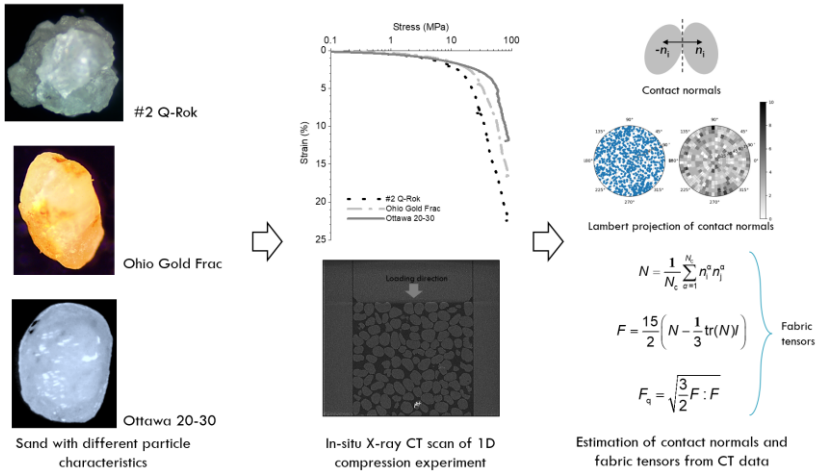


Figure 8 The scheme to quantify fabric evolution in sand during 1D compression accounting for difference in particle characteristics

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

3 Large-Scale Field Testing with Instrumentation

3.1 Static and dynamic testing on open-ended and closed-ended pipe piles

Postdoc and student currently working on this topic: Fei Han and Eshan Ganju

Closed-ended and open-ended pipe piles are often used as the foundation of buildings and bridges to transfer the superstructure load to the soil. COFFEE researchers have successfully performed a series of dynamic and static load tests [49–56] on heavily-instrumented piles with the following objectives:

(1) study the load-settlement response of closed-ended and open-ended pipe piles;
(2) relate the observed pile responses to soil data obtained through *in situ* and laboratory testing;
(3) understand how plugging develops during driving of open-ended pipe pile and how plugging affects the pile's axial capacity;
(4) validate and improve pile design methods.

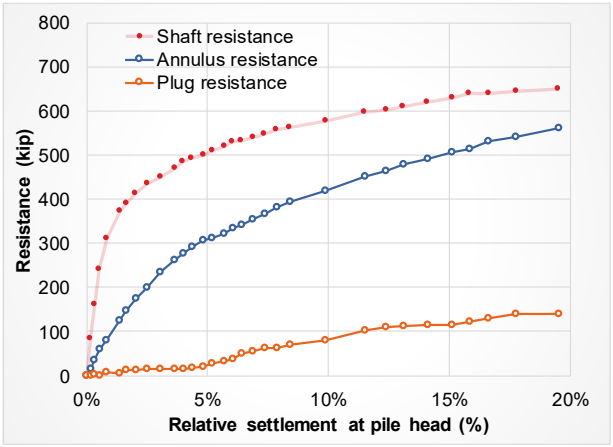
As an example, in conjunction with the construction of the Sagamore Parkway Bridge in West Lafayette, Indiana, USA, a 26-inch-diameter, 100-ft-long, open-ended pipe pile was driven and load tested at the construction site to provide guidance for the foundation design [55]. The test pile was instrumented using a double-wall system, which consists of two concentric steel pipes connected on the top end. The two pipes were first instrumented separately and then assembled by sliding the inner pipe into the outer pipe (as shown in Figure 9a). The assembly of the double-wall pile was challenging, as it required tremendous care to ensure concentricity of the two pipes without damaging any of the strain gauges or their cables, given that the clearance between the two pipes was minimal. The double-wall instrumentation allowed independent measurements of the mobilization of the outer shaft, inner shaft (plug) and annulus resistances as a function of the pile-head settlement during the static load test (see Figure 9c). With more than 100 sensors installed on both pipes, a detailed profile of the locked-in residual load during driving, and the axial load and unit shaft resistance distribution during static loading were obtained. The complete dataset, consisting of full soil profile characterization, continuous measurement of plug formation, and detailed pile resistance measurements, advances the understanding of the effect of plugging on pile resistance mobilization, provides benchmark data for numerical analysis, and serves as the basis for the development and validation of pile design methods.

(a) (b)

Figure 9. Static and dynamic load tests on large-diameter open-ended pipe pile: (a) assembly of the double-wall system; (b) on-site operations at the end of pile installation;

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University



(c)

Figure 9(c) development of the three resistance components (shaft, annulus, and plug resistances) of the open-ended test pile obtained from the static load test

Related references: [49-62]

3.2 Long-term monitoring of bridge and foundation under dead and live loads

Postdoc and student currently working on this topic: Fei Han and Mehdi Marashi

The Sagamore Parkway Bridge consists of twin parallel bridges over the Wabash River in Indiana, USA. The old steel-truss eastbound bridge was demolished in November 2016 and replaced with a new seven-span concrete bridge. During bridge construction, one of the bridge piers and its foundation elements were selected for instrumentation for monitoring the long-term response of the bridge to dead and live loads [63]. As shown in Figure 10, sensors were installed in the bridge pier and on all of the fifteen piles supporting it. The main goals of the project were:

(1) to compare the estimated loads (dead and live loads) in bridge design with the measured loads;
(2) to study the transfer of the superstructure loads to the foundation and the load distribution among the individual piles in the group.

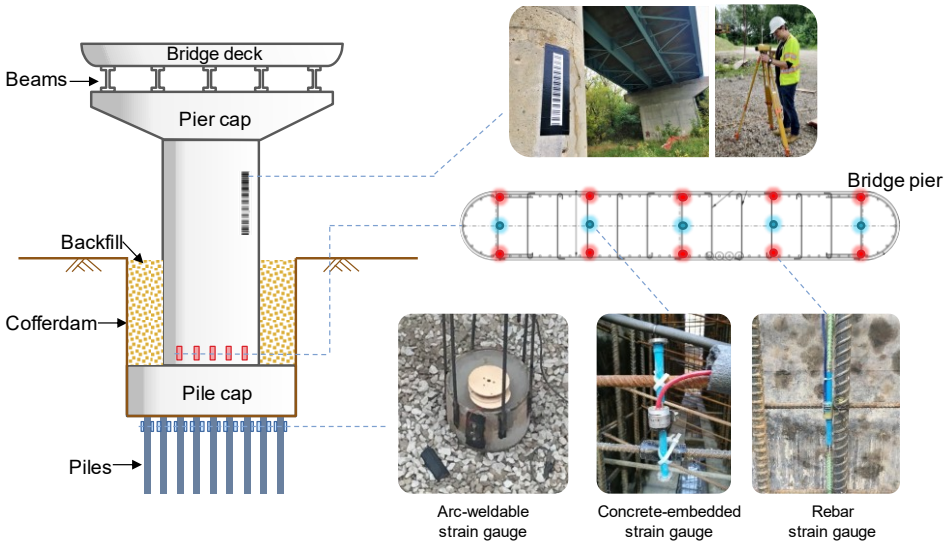


Figure 10 The instrumentation scheme for measurement of bridge pier settlement and load transfer from the superstructure to the foundation elements

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

The pier settlement and the dead load transferred from the bridge pier to its foundation elements were monitored during the bridge construction stages. In addition, a live load test was performed [64] by parking twelve loaded triaxle trucks at specified locations on the bridge deck near the target pier in a sequence that simulates a group of trucks approaching the bridge pier, parking for a period of time at specified locations, driving over the pier and leaving the bridge (see Figure 11). The dataset generated in this research provides valuable insights on bridge foundation design regarding:

(1) the contribution of the pile cap to the overall foundation capacity (the soil below the pile cap carried about 20%-25% of the total load);
(2) load-settlement response of individual piles in the group vs. that of an isolated, single pile;
(3) dead and live loads estimated in bridge design vs. the actual loads carried by bridge components.

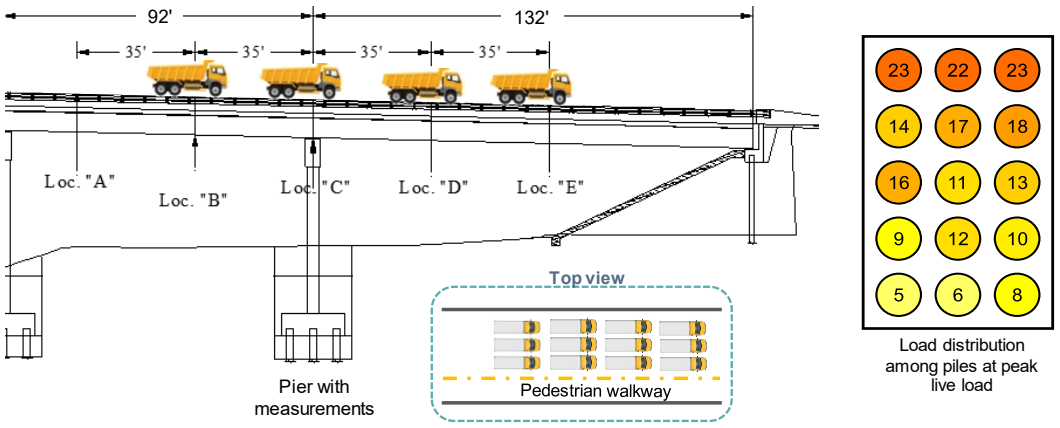


Figure 11 Live load test performed on the Sagamore Parkway Bridge: (a) location of the loaded trucks on the bridge deck to apply the live load; (b) the distribution of live load (resulting from the truck loads) among individual piles in the group at peak live load (uneven loads were measured in piles due to the eccentricity of the live load caused by the asymmetric driveway lane design)

Related references: [63,64]

3.3 Monitoring of instrumented MSE wall during construction and under service

Students currently working on this topic: Venkata Abhishek Sakleshpur and Rameez Raja

Researchers at COFFEE are actively working on instrumentation and monitoring of MSE walls during construction and under service. Figure 12 shows an example of the instrumentation scheme that involves the installation of inclinometers, rebar strain gauges, arc-welded and spot-welded vibrating-wire strain gauges, vertical and lateral earth pressure cells, settlement cells, and crackmeters. The objectives of the instrumentation are to obtain the:

(1) lateral displacement profile of the wall facing;
(2) settlement profile of the reinforced fill;
(3) loads carried by the pile cap and piles;
(4) reinforcement tension profile;
(5) vertical and lateral stress distribution within the reinforced fill;
(6) load transferred to the leveling pad;
(7) magnitude of expansion and/or contraction of the vertical and horizontal joints between adjacent precast concrete panels.

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

Collected instrumentation data will assist researchers diagnose potential problems arising during MSE wall installation, assess current MSE wall design methods, and carry out long-term monitoring of the MSE wall performance under service.

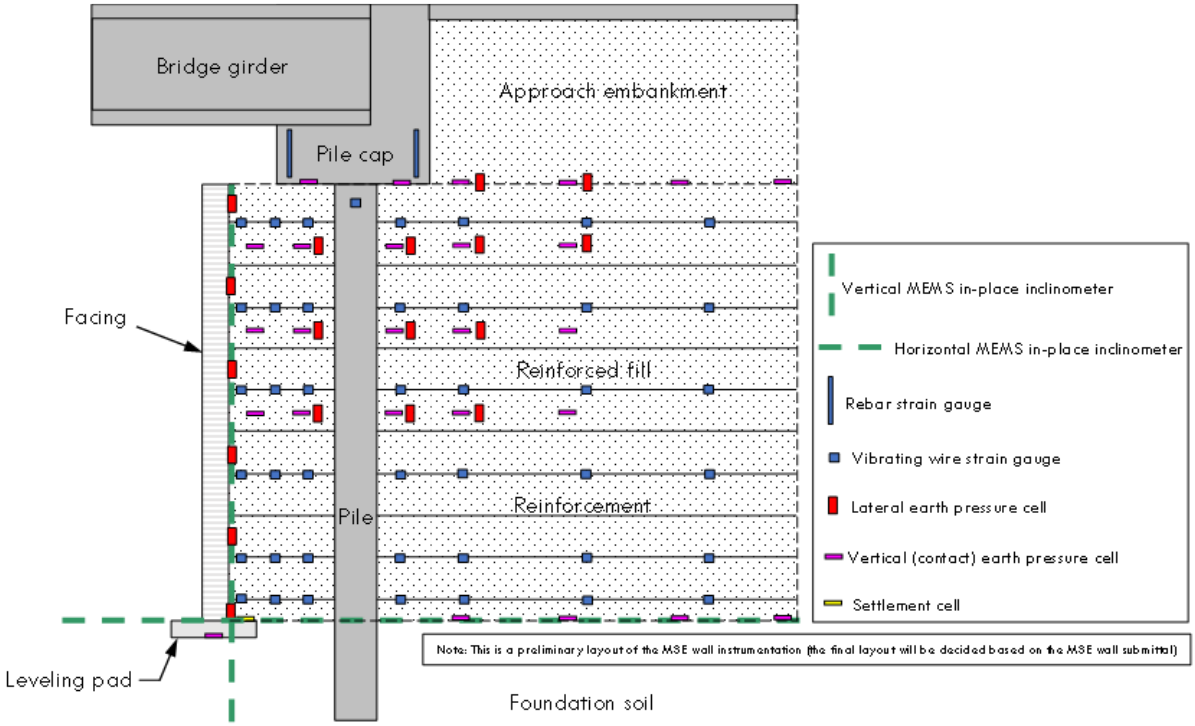
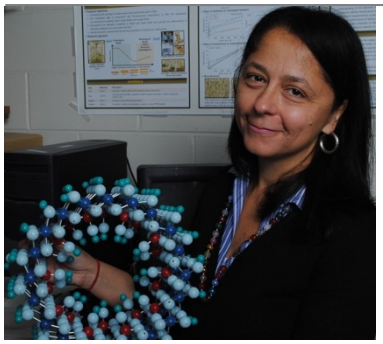


Figure 12 Instrumentation scheme for the MSE wall

Prof. Marika Santagata's Research Program



Prof. Marika Santagata
Ph.D. in Civil and Environmental Engineering, Massachusetts Institute of Technology, 1998

M.S. in Civil and Environmental Engineering, Massachusetts Institute of Technology, 1994

Laurea in Civil Engineering, University of Ancona, Italy, 1990

Dr. Santagata is an Associate Professor of Civil Engineering at Purdue University. Her research interests are founded on fundamental studies of the behavior of a broad range of soils and of their interaction with other materials, employing experimental investigations that probe the materials of interest at different scales. Dr. Santagata is past Chair of the Committee on Soil Properties and Modeling of the Geo-Institute of ASCE and serves on ASCE's Walter L. Huber Research Prizes committee. She served as Associate Editor for ASCE's Journal of Geotechnical and Geoenvironmental Engineering between 2005 and 2013. Dr. Santagata is a recipient of the US National Science Foundation Faculty Early CAREER Development Award (2007).

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

Current Research Topics

1. Mitigation of soil liquefaction using nanomaterials

In collaboration with:
Professors Antonio Bobet and Joe Sinfield, Lyles School of Civil Engineering, Purdue University
Professor Cliff Johnston, Department of Agronomy, Purdue University

Graduate researchers: Alain El Howayek, Felipe Ochoa-Cornejo

Work performed at Purdue [65-69] has pioneered the use of laponite, a synthetic nanoclay with structure comparable to that of natural hectorite, to treat soils susceptible to liquefaction. This novel approach to liquefaction mitigation, which builds on previous work with bentonite, involves the modification of the pore fluid between the grains ("pore fluid engineering") through the introduction, with no alteration of the soil skeleton, of a laponite suspension, which, over time, develops solid like response and thixotropic properties, creating a secondary nanostructure (**Figure 13**(b)) in the pore space. Careful engineering of the colloidal interactions is required to delay the formation of this nanostructure, and facilitate "delivery" of the clay particles in suspension form inside the pore space. **Figure 13** illustrates the different scales involved in the problem.

Laboratory cyclic and resonant column tests on sand-laponite specimens demonstrate that the addition of small amounts of laponite impacts all stages of cyclic loading, increasing the cyclic resistance and delaying generation of excess pore pressure and degradation of shear modulus.

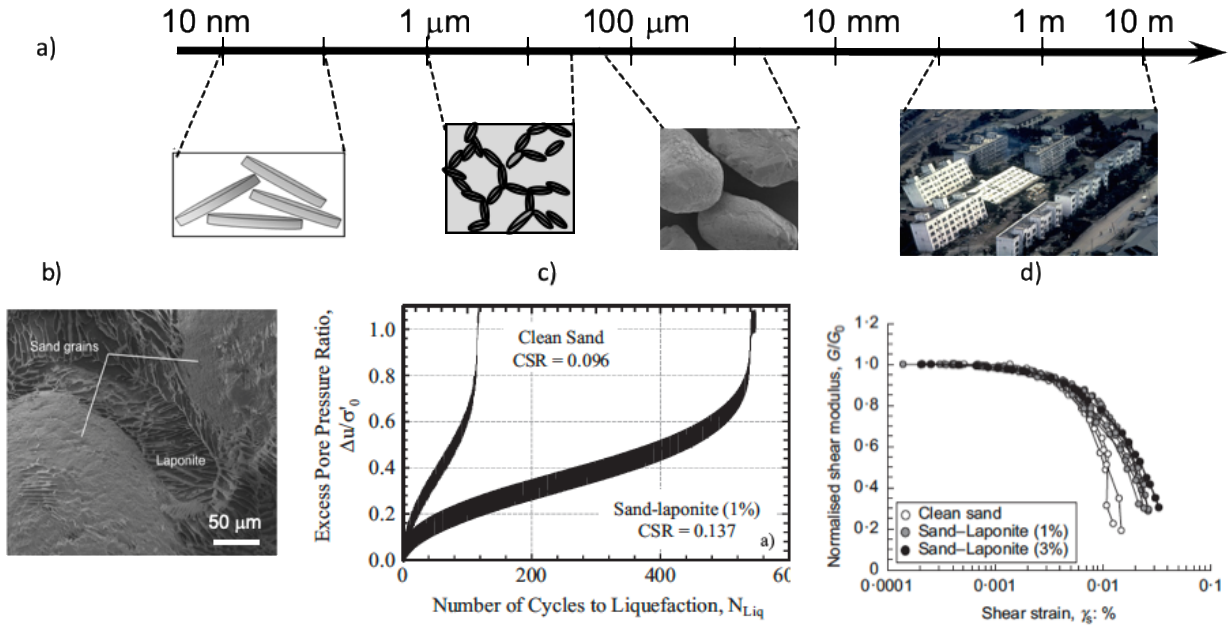


Figure 13 a) Multi-scale approach to liquefaction mitigation [65]; b) cryo-SEM image of structure of sand specimen permeated with laponite suspension [65]; c) improvement in liquefaction resistance [67] and delayed stiffness degradation [69] in sand-laponite specimens. Note: c)-d) are for sand-laponite dry-mixed specimens

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

4 Rheology and microstructure of ultra-soft geomaterials

Current graduate researchers: Amy Getchell, Mohammadhasan Sasar

Clay-water suspensions are geomaterials, whose structure is dominated by the presence of water, and that are characterized by mechanical properties falling much below those characteristic of traditional soft clays examined in the geotechnical literature (e.g. shear stiffness G in the Pa to kPa range – see Figure 14). Within the geotechnical field, the study of these ultra-soft geomaterials is relevant to the behavior of dredged sediments, coastal and underwater deposits, mining tailings, drilling and trenchless technology fluids, grouts, slurries used for cutoff walls and ground support.

Current research at Purdue is employing advanced rheometrical techniques, in particular small and large amplitude oscillatory strain tests, to characterize the flow and deformation behavior of these geomaterials. This work has highlighted some key features of their mechanical response, including the presence of a region characterized by "solid-like" behavior that extends to very large strains, the marked sensitivity of the response to stress history, and the effects of thixotropy and aging.

These methods also find application in the development of methodologies for modifying the behavior of clay-water systems, as changes in the particle-to-particle interactions and the overall microstructure of these materials due to interaction with the additives are fingerprinted in the rheological response.

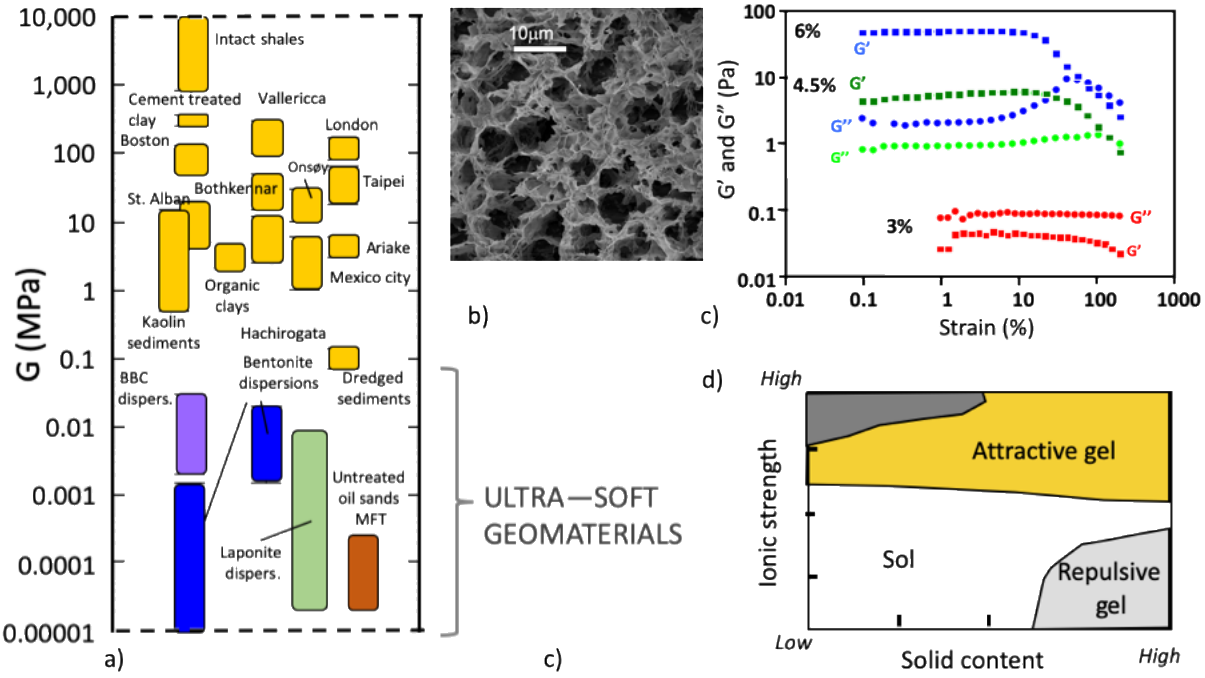


Figure 14 a) Shear stiffness of clay-based geomaterials (adapted from [70]); b) cryo-SEM image of concentrated bentonite gel [65]; c) deformation behavior of bentonite-based drilling fluid [71]; d) schematic of phase diagram of bentonite suspensions in water [72]

5 Polymer flocculation of clay tailings

In collaboration with: Professor Cliff Johnston, Department of Agronomy, Purdue University

Current graduate researcher: Mohammadhasan Sasar

Polymeric flocculants currently represent the most effective approach to accelerating consolidation of the nearly one billion m^3 of mature fine tailings (MFTs) generated by the extraction of bitumen from oil sands.

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

Despite the wide application of this methodology, the mechanisms that control the effectiveness of the treatment are not completely understood, and many questions remain regarding the long term engineering properties of the geomaterial created as a result of the treatment. This is due to the complex and variable nature of MFTs, that are composed of micron and nano-sized clay minerals, some residual bitumen, and process chemicals, and the many other factors that come into play, including chemistry of the process water, type and amount of polymer added, and mixing energy applied.

Research underway at Purdue is aimed at developing an improved understanding of the interplay that exists between the chemistry of polymer treated mature fine tailings and their short term and long term structure and engineering properties. This understanding is critical for the prediction of the geotechnical behavior of polymer-treated MFTs, and their interaction with the environment.

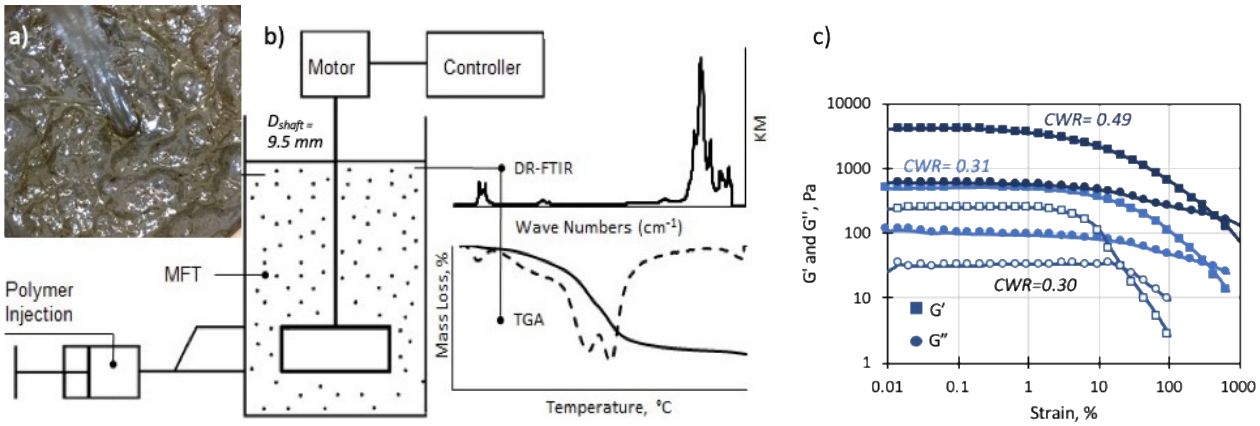


Figure 15 a) structure of flocculated MFT; b) schematic of experimental setup used to prepare optimally-dosed/optimally-mixed samples of polymer flocculated MFT for rheological tests and chemical analyses [73]; c) large amplitude oscillatory strain behavior of raw (hollow symbols) and flocculated (solid symbols) MFT with different clay-water ratio (CWR)

6 Tunable clay-water systems

Current graduate researcher: Amy Getchell

Clay-water systems possess a "large response function" in that the dependence of their structure on geo-chemical parameters provides the opportunity to achieve a target response at the macro-scale. Previous research at Purdue explored how dispersants can be used to control rheology of bentonite suspensions to allow their injection in a porous medium [74]. Current work with suspensions of laponite, a synthetic nano-clay, demonstrates that, again through the use of a dispersant, it is possible to carefully tailor the time dependent rheology of these suspensions, controlling the early age viscosity, the time period over which the dispersion exhibits Newtonian behavior, the time associated with the transition of the dispersions from sol to gel, and the mechanical properties of the gel ultimately formed. Laponite suspensions therefore represent excellent model fluids to study a wide range of complex solid-fluid interaction problems. A current research project is utilizing this approach to conduct a fundamental study of pore fluid effects on the un-drained behavior of saturated granular materials.

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

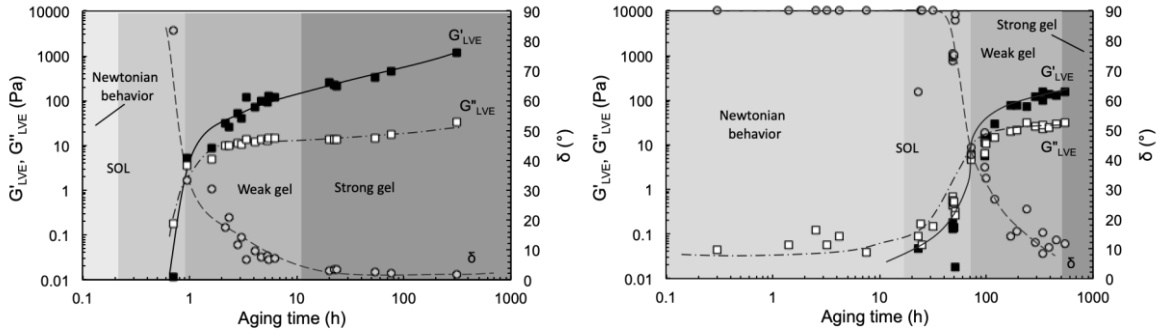


Figure 16 Time dependent rheology of 3% Laponite suspensions a) without; b) with addition of a dispersant

7 Nanoconfined water in halloysite

In collaboration with: Professor Cliff Johnston, Department of Agronomy, Purdue University

Central to a wide range of disciplines are the interactions of water with clay minerals. These interactions are complex and influenced by the nature of the clay mineral surface, type of exchangeable cations, pH and ionic composition of the aqueous phase, particle size and shape, and the overall pore size distribution. Through thermal, spectroscopic and structural methods, a study of the de-hydration of halloysite conducted at Purdue has shown the unique characteristics of the four populations of water molecules contained in this mineral: the 'free H_2O' external to the halloysite particles, the 'lumen H_2O' molecules located on the hydrophilic inner surface of the halloysite tubes, the 'interlayer water' molecules between the layers and the 'structural H_2O' that is lost from the sample through dehydroxylation. The observed effects of nanoconfinement on the properties of water have broad applications in material science and biology.

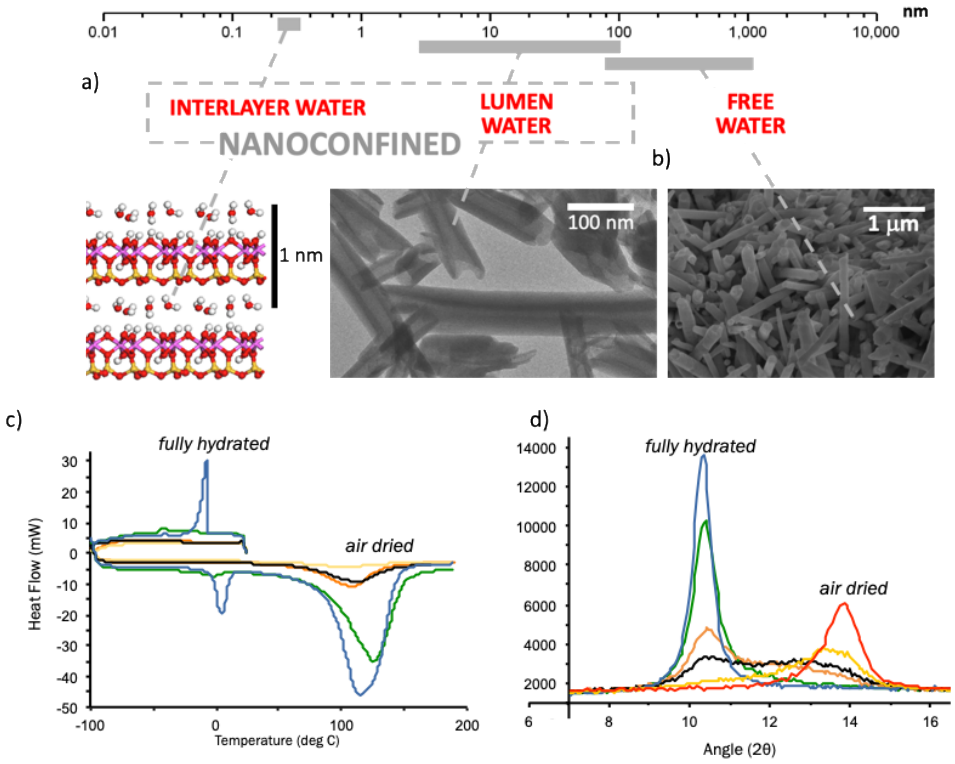


Figure 17 a) Multi-scale architecture and b) TEM and cryo-SEM images of halloysite; c) low temperature differential scanning calorimetry and d) X-ray diffraction of halloysite during de-hydration

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

8 Geotechnical properties of soft carbonatic deposits

In collaboration with: Professor Antonio Bobet, Lyles School of Civil Engineering, Purdue University
Graduate researcher: Alain El Howayek

Soft, carbonate-rich, fine-grained soils are commonly found in the glaciated regions of the northern United States and Canada. A recent study of a glaciolacustrine carbonatic fine-grained soil deposit (35-60% carbonates) formed ~22,000 BP in southwest Indiana, USA, involved field tests (seismic cone penetration tests, standard penetration tests, field vane shear tests), and laboratory experiments (including incremental and constant rate of strain consolidation tests, and K_0-consolidated undrained triaxial tests) conducted on high quality Shelby tube samples. Additionally, X-ray diffraction and thermogravimetric analyses were used to obtain the mineral composition; while scanning electron microscopy equipped with energy dispersive X-ray spectroscopy was employed to examine the microstructure of the soil, including the morphology of select minerals, the biological intrusions present, and the distribution of carbonates within the soil. The work has provided insights into the nature of the structure formed in presence of carbonates, the impact of carbonate cementation on the engineering properties, and the applicability of published correlations for interpretation of the geotechnical properties of carbonatic soils from field results.

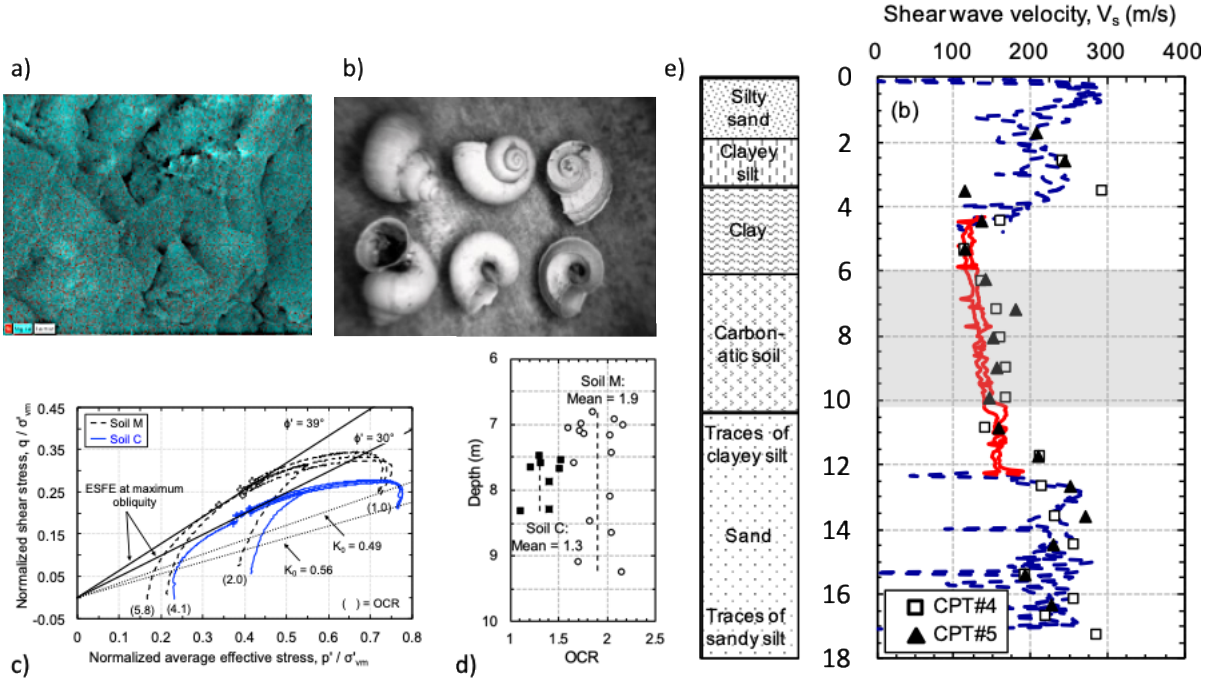


Figure 18 a) Map from EDX analyses showing the distribution of Ca and Mg (teal) and Si (red) in a carbonatic silt [75]; b) examples of gastropods collected from the carbonatic silt [76]; c) distinct triaxial response from SHANSEP tests on two carbonatic sublayers [77]; d) variation of OCR in sublayers [78]; e) comparison of shear wave velocity measured with seismic CPT to predictions (red and blue lines) from CPT data [77]

9 Hydro-mechanical properties of pavement unbound granular layers

In collaboration with:
Professor Emeritus Philippe Bourdeau, Lyles School of Civil Engineering, Purdue University
Dr. Peter Becker, Research Division, Indiana Department of Transportation

Current graduate researchers: Luis-Enrique Garzon-Sabogal, Amy Getchell
In pavement structures, unbound granular materials are routinely used for subbase/base layers to provide a stable construction platform, facilitate drainage, mitigate pumping of the subgrade fines, and protect the

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

pavement from the effects of frost. These layers are critical in achieving the desired pavement performance and extending the service life of the structure.

Work at Purdue is evaluating the performance and applicability of novel approaches for measuring the hydro-mechanical properties of coarse aggregates used in bases and subbases that will result in the development of performance-based specifications.

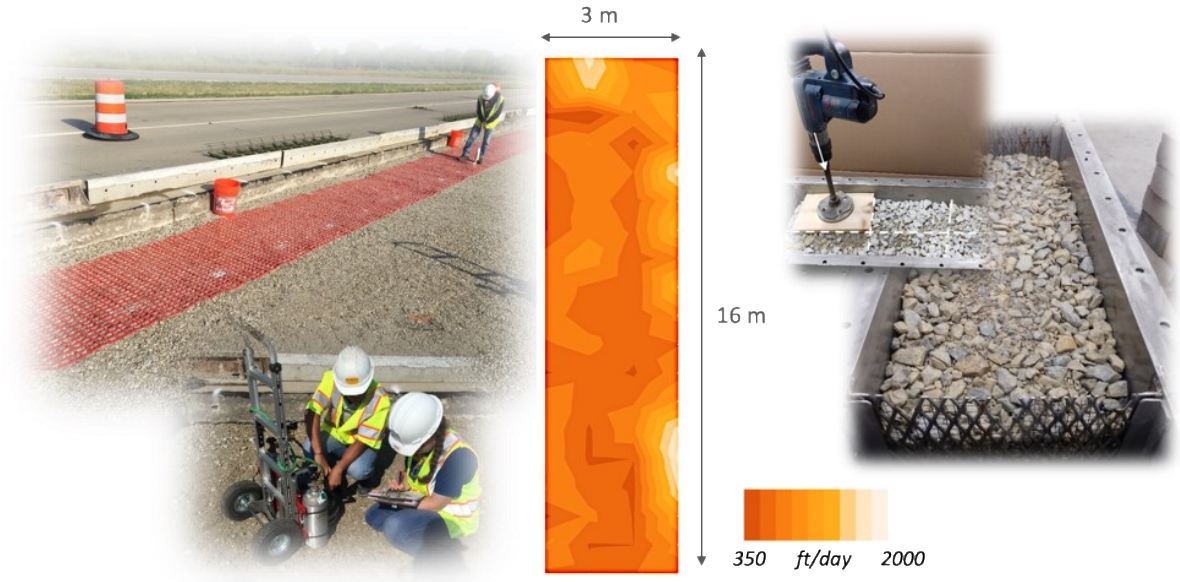


Figure 19 a) Mapping of hydraulic conductivity of compacted aggregate in the field using the air permeameter [79]; b) large permeameter used for laboratory measurements

Prof. Joe Sinfield's Research Program

Prof. Joe Sinfield
Professor of Civil Engineering and

Director of the College of Engineering Innovation and Leadership Studies Program

Ph.D. in Civil and Environmental Engineering, Massachusetts Institute of Technology, 1997

M.S. in Civil and Environmental Engineering, Massachusetts Institute of Technology, 1994

B.S. in Civil Engineering, Bucknell University, 1992

Dr. Sinfield is a Professor of Civil Engineering at Purdue University, founding Director of Purdue University's College of Engineering Innovation and Leadership Studies Program, and proposal co-PI and Innovation Science Lead for the USAID LASER PULSE program (Long-term Assistance and SErvices for Research, Partners for University-Led Solutions Engine). His work focuses on sensing, systems, and innovation science. In the civil engineering arena, he develops and adapts sensors that make use of electromagnetic radiation to achieve a deeper understanding of physical and chemical phenomena that underlie critical geoenvironmental and geotechnical problems.

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

Current Research Topics

1. Improved background and clutter reduction for pipe detection under pavement using Ground Penetrating Radar (GPR)
Graduate researcher: Hao Bai

Pavement drainage systems are one of the key drivers of pavement function and longevity, and effective drain maintenance can significantly extend a pavement's service life. Maintenance of these drains, however, is often hampered by the challenge of locating the drains which are often undocumented on as-built drawings, and may have outlets that are completely obscured due to silt build-up and overgrowth of vegetative cover. Thus, locating existing drainage pipes is considered a critical part of pavement field maintenance operations. Work in the Purdue Civil Engineering Sensing Laboratory has advanced the potential to employ Ground Penetrating Radar (GPR) for rapid and effective detection of these often obscured underground targets. Specifically, a dual-frequency GPR system has been developed that takes advantage of the inherent downward frequency shift of a signal transmitted through earth materials to enhance collection efficiency and collected signal energy. As shown in the Figure 20, the use of a frequency shifted receiver improves signal amplitude and overall signal to noise [80]. In addition, work probabilistic algorithms have been developed to improve background noise and clutter reduction in GPR signatures to enhance target signals in what amounts to a constructed environment that tends to have more consistent subsurface properties than one might encounter in a general setting [81].

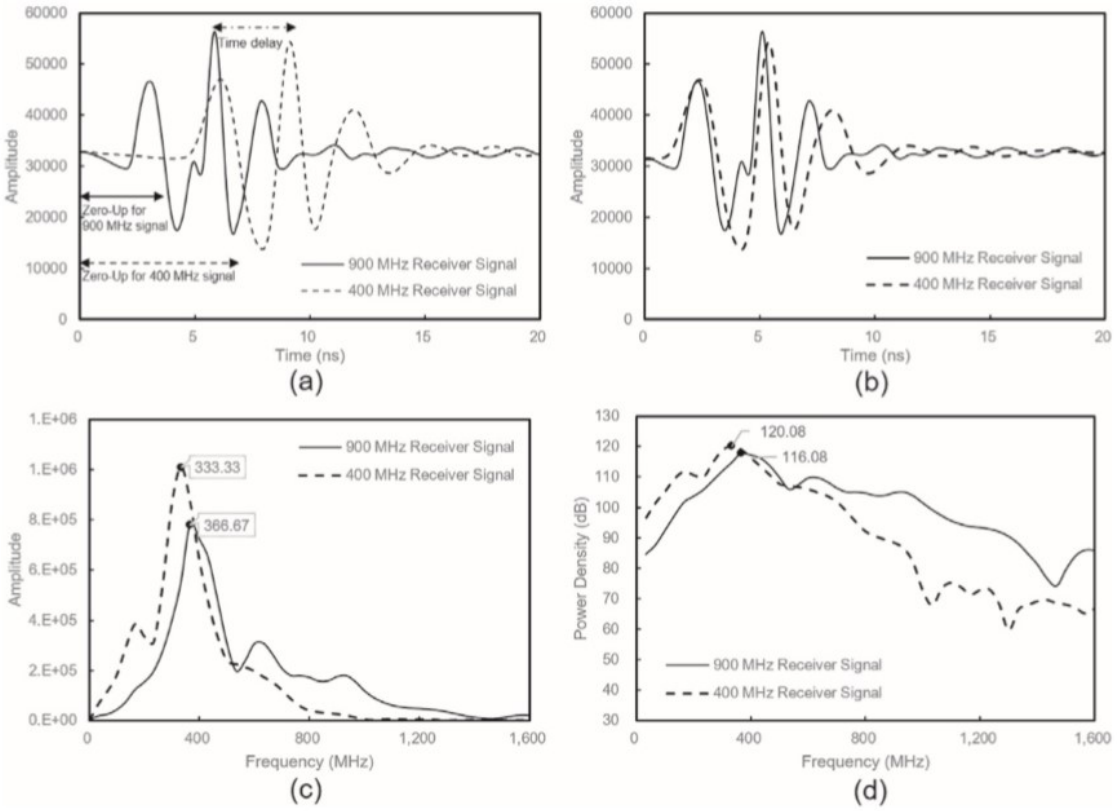


Figure 20 GPR signals received by 900 MHz receiver and 400 MHz receiver at target locations under the laboratory test pavement: (a) Time domain signals; (b) Zero-up adjusted time domain signals; (c) Frequency domain signals; (d) Power spectra of signals (excitation at 900 MHz) [80]

Key references: [80,81]

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

2. Holistic synergy analysis for building subsystem performance
Graduate researcher: Domenique Lumpkin

This work focuses on the development of a structured process to systematically study the complex interactions between building subsystems and their occupants to specifically define their effects on human and building performance outcomes. Employing systems theory, work is being carried out to define the dynamic interactions between the human and technical parts and processes of building systems to provide a holistic lens on human-building interaction. Findings to date highlight that independent building subsystem outputs have functional, social, and emotional effects on humans that are not intentionally captured in the traditional building design metrics, offering opportunities for innovation in the design process and in realized building solutions [82].

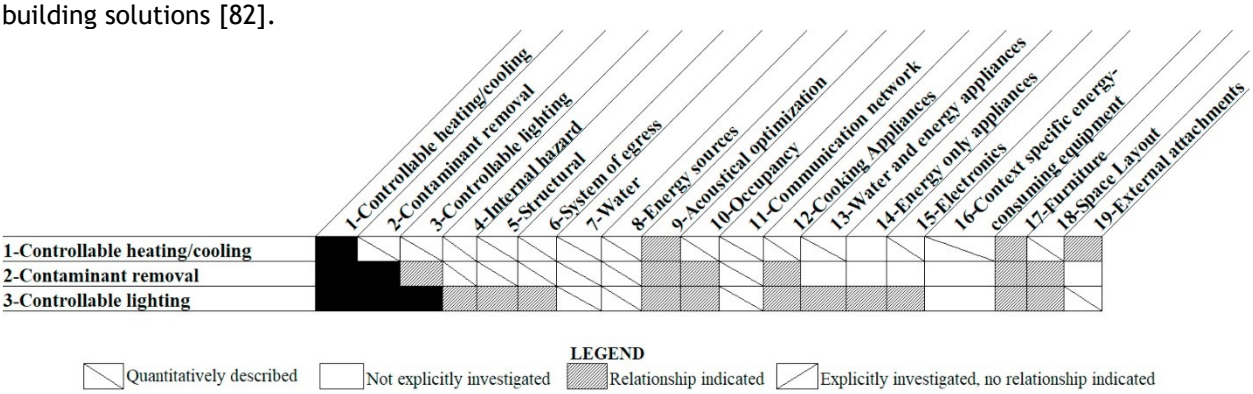


Figure 21 Illustrative subset of linkages between building technical systems and indication of documented/quantifiable relationship to occupant performance measures [82].

Key reference: [82]

3. Pursuit of Low-Cost Field-Deployable Quantitative Raman Spectroscopy
Graduate researchers: Oliver Colic, Daniel Fagerman, Chike Monwuba, Yu-Chung Lin

Long-term efforts in the Purdue Civil Engineering Sensing Laboratory have focused on realizing the potential offered by Raman spectroscopy for the in-situ study of a broad array of environmentally relevant compounds. While the analytical specificity, sensitivity, and versatility of the technique is significant, its use has been hampered by challenges in optimizing the sensor-sample interface, managing turbidity for quantitative analysis, limiting fluorescence interference, preventing biofouling (particularly for long-term monitoring), and achieving low cost. Research at Purdue over the last several years has systematically addressed each of these factors so that Raman spectroscopy is arguably ready to be revisited as a robust and flexible field measurement technique that may now warrant targeted development effort so that it may become a more routinely employed field analysis method [83–85]. One such advance is illustrated in the figure below, which highlights the ability of a patented time resolved photon counting method to significant increase signal-to-noise and thus improve detection sensitivity of Raman observations at field-relevant concentrations. The developments achieved to date are believed to be applicable to material analyses in an array of complex, turbid, and/or fluorescence-prone settings encountered across a broad set of fields [86].

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

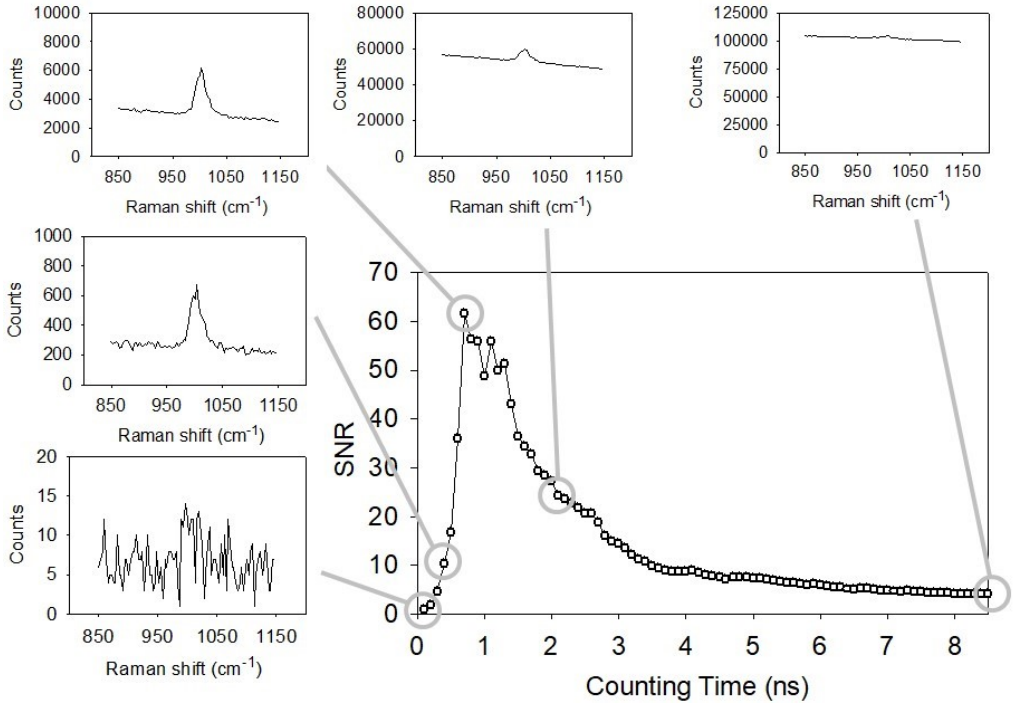


Figure **22** Variation in neat benzene Raman peak SNR in the presence of 100 mM rhodamine 6G as a function of counting time **[85]**

4. Grand Challenge Problem Solving

Graduate and post-doctoral researchers: Anan Sheth, Romika Kotian, Akash Patil, Dr. Daniel Bampoh

At Purdue, our Laboratory for Innovation Science is linking schools of thought from strategy, data science, innovation and design to understand the fundamental principles that underlie the innovative mindsets, behaviors and methods of innovative individuals and organizations, and employing these insights to frame and systematically address some of the most complex problems faced by society through in-depth collaboration with researchers and development practitioners engaged in the USAID LASER PULSE initiative. Work to date has engaged stakeholders in Uganda, Colombia, Vietnam, and Ethiopia with problem loci encompassing food security, material and child health, potable water availability, rural development, youth, and national resilience, among other complex socio technical topics. One of the many techniques employed in this work includes natural language processing. Advances at Purdue have led to means to link problem and solution spaces through automated content analysis of large language corpuses, using language relationships as shown in the figure below.

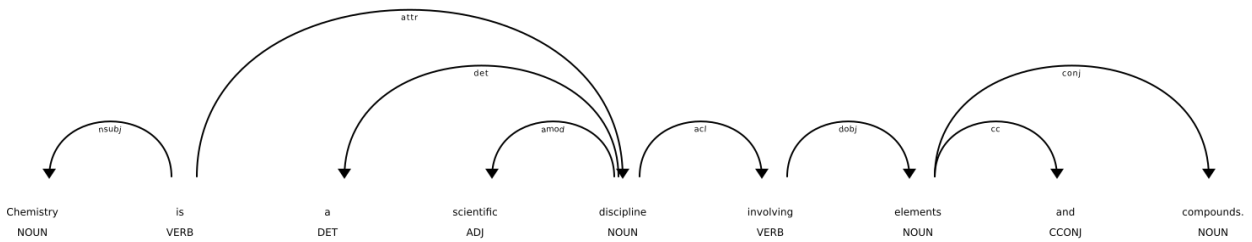


Figure 23 A dependency parse of language in the domain of chemistry – a potential solution source for an array of complex challenges [87]

Key reference: [87]

Research highlights (Con't)

Geotechnical Engineering Research at Purdue University

Centers and programs with which faculty members are associated:

Directed by Professors Rodrigo Salgado and Monica Prezzi, Purdue University's Center for Offshore, Foundation and Energy Engineering (COFFEE) is engaged in the creation and dissemination of knowledge and development of resources for the practicing community in the areas of offshore engineering, foundation engineering (both on and offshore) and innovative energy engineering applications.

https://engineering.purdue.edu/COFFEE/index.html

Professor Antonio Bobet is one of the PIs of the NASA-funded RETH Institute where researchers are developing technologies needed to establish Resilient Extra-Terrestrial Habitats.

https://www.purdue.edu/reth/

Professor Antonio Bobet is one of the PIs of the NSF-funded NHERI Network Coordination Office. The NCO serves as a focal point and leader of a multi-hazards research community focused on mitigating the impact of future earthquakes and windstorms, and related hazards such as tsunamis and storm surge on our nation's physical civil infrastructure

https://www.designsafe-ci.org/about/designsafe/

Professor Joe Sinfield is proposal co-PI and Innovation Science Lead for LASER (Long-term Assistance and Services for Research) PULSE (Partners for University-Led Solutions Engine), which fosters a global network of researchers and implementers that is collaborating with the U.S. Agency for International Development (USAID) to more deeply understand grand challenges, identify critical gaps in current approaches to address these problems, and fund research that can help close identified gaps, all while building local capacity to carry out this work in USAID interest countries.

https://stemedhub.org/groups/laserpulse/aboutus

All Purdue geotechnical faculty are active in research related to transportation infrastructure through the Joint Transportation Research Program (JTRP), a long-lasting partnership between Purdue University and Indiana Department of Transportation (INDOT).

https://engineering.purdue.edu/JTRP

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Geotechnical Engineering Research at Purdue University

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Research highlights (Con't)

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Major projects

Rock-Filled Concrete (RFC) Arch Dam: Innovation leads to growing use of RFC in arch dams

Embankment dams are normally made of local materials. Profs Feng JIN and Xuehui AN at Tsinghua University, China invented a new type of concrete dam, namely rock-filled concrete (RFC) dam, which makes use of local rocks obtained from mountainous areas. Formed by pouring self-compacting concrete into assembly of large rocks, the RFC is featured as a sustainable and environmentally friendly technology with considerable reduced consumption of cement. It is different from conventional concrete dam, as RFC does not require cooling pipes for temperature control measures and eliminates the needs of vibration or roller compaction during concrete placement. These features make the RFC promising for broad applications in the construction of dams and other relevant civil infrastructure. The technology has gained significant attention among the engineering community in China and other regions, RFC technology is recognized as an innovative dam construction technique by the International Commission on Large Dams (ICOLD) who has a bulletin on this topic to be issued soon. To date, more than 100 RFC dams have been constructed or are under construction in China. Internally, several RFC dam projects are about to start in other countries including Pakistan and Burundi. Using rock-filled concrete for railway foundation backfill has also been recently studied by Turkish engineers.

(a) (b)

Figure 1. Notable examples of completed RFC arch dams; (a) Lyutang RFC arch dam in Guizhou Province; (b) Baijia RFC double curvature arch dam in Shaanxi Province

Although arch dams have many salient features such as concrete-saving, cost-efficient and with excellent resistance to earthquake loading, compulsory primary cooling, secondary cooling and arch closure grouting make the construction process fairly complicated. There also exists many key challenges for the design of conventional arch dams. For example, it is difficult to maintain the construction efficiency of RFC, while probably minimising the effects of transverse joints as well as closure grouting. Supported by extensive fundamental research, Prof. Feng JIN's research group has made a breakthrough on the theoretical analysis of stress and temperature, structural detailing and construction techniques that have successfully tackled various engineering issues. These successes have constituted the innovative design and construction approach for an integral RFC arch dam.

Several signature completed RFC integral arch dam projects are shown in Fig. 1, while the RFC arch dams currently under construction are given in Fig. 2, including the Fengguang dam project (dam height, H=48.5m), Goujiang dam project (H=41m), Xiaoyuanli dam project (H=46.6m) and Longdongwan dam project (H=48m). More than 10 projects have been completed to successfully design and construct RFC arch dams, making the innovative RGC technology promising for broad applications in other earth structures such as arched retaining wall and anti-slide piles.

Major projects (Con't)

Rock-Filled Concrete (RFC) Arch Dam: Innovation leads to growing use of RFC in arch dams

Figure 2. Some examples of RFC arch dams during construction

TC corner

Inauguration of the TC107 symposium "Laterites and lateritic soils"

ISSMGE TC107 Symposium on "Laterites and lateritic soils" was inaugurated by Prof. E. C. Shin (Incheon University, Korea) in the presence of TC107 Committee members – Prof. R. Shivashankar (NIT Surathkal), Dr. Joshua Omer (Kingston University, London), Prof. J. Jayamohan, (LBSITW, Trivandrum) and Prof. Purnanand Savoikar (GEC) and Prof. Deepankar Choudhury (IIT Bombay). Prof. Deepankar Choudhury explained how TC107 and TC 207 are interconnected and noted that collective programs could be organized in the future.

Prof. E. C. Shin (Incheon University) delivered an inaugural keynote lecture on "*Use of weathered granite soil for construction of earth structures*". He presented the behavior of retaining walls made by connected bags of weathered granite soil resting on gabion layer. Case studies were presented on "*seismic analysis of foundation systems*" by Prof. Deepankar Choudhury, in his invited keynote lecture. Prof. R. Shivashankar delivered a keynote lecture on "*Laterite soils: properties and problems*" highlighting some slope stability problems and erosion issues in lithomargic clays. A number of case studies involving geotechnical challenges were presented. Prof. Joshua Omer delivered a keynote lecture on "*Use of artificial neural networks and CPT data to assess influence zone around pile base"*. In his lecture, case studies using ANN networks to predict pile capacity and its validation with field studies were presented. Dr. Jayamohan delivered a keynote lecture on "*Lateritic soils: Some research studies and some case studies*". He highlighted an important aspect on how behaviour of laterites is different from conventional soil mechanics. Case studies of the failure of retaining walls were presented. Prof. Jaykumar Shukla presented a number of case histories in his keynote lecture. Last but not least, Dr. Purnanand Savoikar's lecture on "*Soils in Goa - Geotechnical properties, problems and solutions*" was about some case studies of lateritic soils in Goa.

Twenty-four full length technical papers were received in this symposium, out of which 16 were presented in two technical sessions. The papers were presented in two themes namely laterites and lateritic soils and other problematic soils. Two parallel sessions were held for paper presentation. The papers on lateritic soils in Goa authored by Prof Tanvi Mardolkar and Leonardo Souza and the other one on the problematic soils authored by Dr. Vinod Mauriya and Satish Yadav were voted as the best papers in the symposium.

Dr. Krupa Shankara (Principal of Goa College of Engineering Farmagudi) was the chief guest for the valedictory function and Er. Ravikiran Vaidya (Principal, Geodynamics) was the guest of honour. Dr. Nisha P. Naik welcomed the gathering and presented a brief overview about the two-day event. Prof. E. C. Shin, Prof. Joshua Omer, Er. Karthikeyan, Er. Madhav Kamat Ms. S Vibha expressed their feedback about the symposium. Er. Ravikiran Vaidya and Dr. Krupashankara M S. also spoke on the occasion. Prof. Purnanand Savoikar proposed the vote of thanks.

Inaugural ceremony

Delegates attending the symposium

TC corner

The 1st online international administrative meeting of members of the technical committee TC305, ISSMGE

On the basis of Geotechnical Institute at ENU, there was the First online international meeting of members of TC 305 (ISSMGE) on topic "Geotechnical infrastructure for megacities and new capitals."

Over 40 experts from the USA, Argentina, India, Japan, South Korea, France, Germany, Italy, Spain, Albania, Poland, Turkey, Iran, Kyrgyzstan participated to this online forum (on the ZOOM platform). The main topics were features of the design and construction of the underground part of high-rise buildings and structures, calculation of models of soil bases and the experience of the USA, Italy, Germany, Turkey, Japan, South Korea, India in the design and construction of underground and elevated structures, the development of underground space in complex ground conditions.

Photo 1.The participants of the Forum

Professor Hoe Ling (Columbia University, New York, USA), Vice-Chairman of TC-305, presented the report on topic “Displacements and settlements of soil ground (data base) at during time of deep excavation in megacities.”

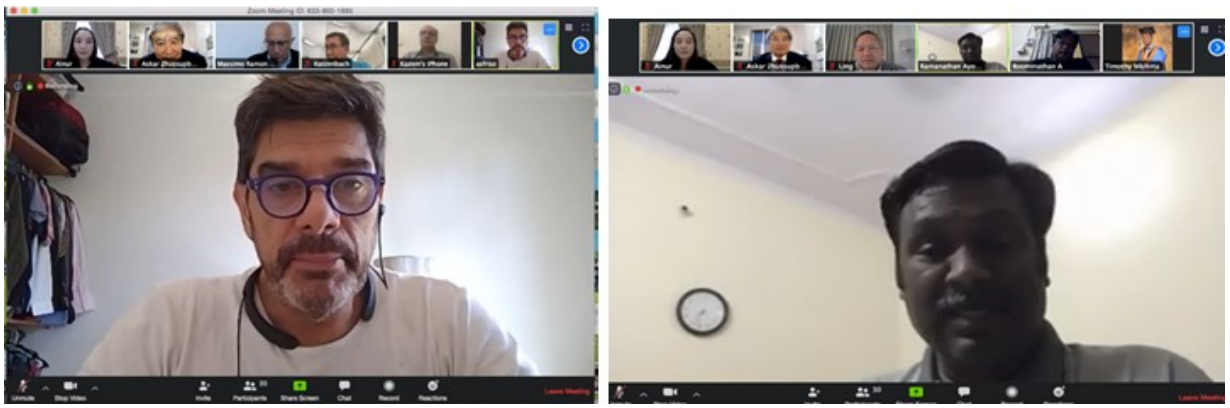


Photo 2. Discussion between participants

TC corner

The 1st online international administrative meeting of members of the technical committee TC305, ISSMGE (Con't)

Moreover, PhD Students and young teachers of Architecture and Civil Engineering Faculty of Eurasian National University, also participated at the online forum which allowed them to gain tremendous experience and knowledge in the field of geotechnics.

In conclusion, Professor Askar Zhussupbekov informed the meeting participants that they should prepare papers for the 20th ICSMGE, which will be held in September 2021 in Sydney (Australia), and also emphasized maintaining vigilance in self-isolation and protecting the family from COVID 19. He also invited of members of TC 305 for participate in 17ARC on Geotechnical Engineering which will held in Nur-Sultan, Kazakhstan, August, 2023.

Conference report

Indo-China Research Webinar Series in Civil and Environmental Engineering with Geotechnical Issues

Indo-China Research Webinar Series in Civil and Environmental Engineering with Geotechnical Issues

Date: 8th -19th May 2020

A Brief Report on the 1st Indo-China Research Webinar Series 2020

The 1st Indo-China Research Webinar Series 2020 in Civil, Geotechnical and Environmental Engineering was held from 8th to 19th May, 2020. This workshop was collaboratively organized by Dr. Ankit Garg, Associate Professor, Shantou University, China, Prof. (Dr.) Chandresh H. Solanki, Professor, SVNIT, Surat & Indian Geotechnical Society Surat Chapter, Gujarat, India Dr. Chandra Bogireddy, Assistant Professor, Vardhaman College of Engineering, Hyderabad, India and Dr. Junwei Liu, Vice Dean & Associate Professor, Qingdao University of Technology, China.

In the Indo-China research webinar around 16 technical sessions were held with 8 Speakers each from Universities in China and India. The total of participants in all sessions combined were more than 5000, included participants from India, China, Kazakhstan, Russia, Iraq and other countries. In total, 10 Special Guests were invited that graced the audience with their motivational words promoting such cooperation in future. Guests include Prof. G. L. Sivakumar Babu, President, Indian Geotechnical Society & Professor IISc Bangalore, Prof. S.R. Gandhi, Director, S.V. NIT Surat, India, Prof. Gautam Biswas, Former Director, IIT Guwahati, Fellow of ASME, Prof. Da Hsuan Feng, Fellow American Physical Society, USA, Chairman of Advisory Board, Hainan University, Former Vice President for Research, University of Texas, USA, Prof. S. K. Das, Director, IIT Ropar, Prof. D. N. Singh, Institute Chair Professor, IIT Bombay & Editor in Chief, Environmental Geotechnics, Prof. Chandan Ghosh, IIT Jammu, NIDM, Ministry of Home affairs, Prof. Askar Zhussupbekov, Past Vice- President of ISSMGE for Asia , Chair of TC 305 of ISSMGE, Director of the Geotechnical Institute of the Eurasian National University (Nur-Sultan, Kazakhstan), Prof. Neelamani, Senior Research Scientist, Kuwait Institute of Scientific Research, Dr. Jaykumar Shukla, Principal Engineer, Geo Dynamics, India and Mr. Subba Reddy Nelluru (UK). Also, supported by Dr. S. Sai Satyanarayana Reddy, Principal, VCE and Dr. K. Mallikharjuna Babu, Director and CEO, Vardhaman College of Engineering Hyderabad.

The opening day of 1st Indo-China Research Webinar Series was held on 8th May 2020 with a briefing from Prof. Chandresh H. Solanki, Dr Ankit Garg and Dr. Bogireddy. Dr. Ankit Garg presented an introduction to Shantou University and also related International programs including joint new full fledge campus (Guangdong Technion Israel Institute of Technology, GTIIT, China) with Technion Israel Institute of Technology at Shantou. And also, Dr. Mallikarjuna Rao, Head of Civil Engineering Department, VCE briefed about institute and research collaboration possibilities. It was great to see more than 820 participants joining in first session Indo China Webinar Series 2020. Prof. Anasua Guharay from BITS Pilani, Hyderabad and Prof. Yeyuan Xiao from Shantou University, China delivered lectures on utilization of construction waste for backfill soils and waste-water bioremediation, respectively.

2nd Day (i.e., May 9th, 2020) was graced by presence of President of Indian Geotechnical Society, Prof. G. L. Sivakumar Babu, who delivered speech for exploring cooperation between India and China at various levels such as Scholars, Faculties, Industry and for Design Codes. He encouraged young participants to conduct more such sessions especially in these times to share knowledge, skills and build long term cooperation. This was followed by two research sessions, with one from Dr. Bogireddy Chandra from India and Dr. Wang Qinhua from Shantou University, China. Dr. Bogireddy presented an alternative approach to rapid assessment

Conference report

Indo-China Research Webinar Series in Civil and Environmental Engineering with Geotechnical Issues (Con't)

of compressibility behaviour of soils. Dr. Wang presented a real case study on "Linked high-rise buildings" using wind tunnel testing at Shantou University. He also showcased "Vertical forest" modelling in wind tunnel. Such vertical forests are high rise buildings with dense vegetation in balconies. They are a part of urban green infrastructure owing to its environmental and psychological benefits to society.

Day 3 (i.e., May 11th, 2020) was opened with a briefing from Special Guest, Prof. Honghu Zhu from Nanjing University, China. Prof. Zhu briefed about Nanjing University and development of Research institutes for monitoring of geotechnical infrastructures using Fiber Optic Sensing. This was followed by Mr. Suba Reddy Nelluru (Wasco Energy Group, UK and Indonesia), who delivered a message of motivation for young students about different directions for careers in an Industry. Prof. Chandresh H. Solanki from S.V NIT Surat, India delivered an overview of Indian Geotechnical Society Chapters and also presented a memorable glimpse of Indian Geotechnical Conference (IGC 2019), that was organized under the leadership of Prof. Chandresh H. Solanki & Er. Hiiesh H. Desai, Chairman, Indian Geotechnical Society, Surat Chapter in December 2019. Prof. Solanki then gave a detailed technical presentation on new approaches for quick estimation of foundation settlements in alluvial deposits. Dr. Feng Song from Fuzhou University presented an interesting study on development of analytical solutions for slope stability considering influence of vegetation. He also summarized research related to capillary barriers with and without vegetation at his laboratory.

Day 4 (i.e., May 12th, 2020) was a wonderful day that includes a very informative presentation on "Megacities and related infrastructure development in Kazakhstan" from our Special Guest, Prof. Askar Zhussupbekov, who is Past Vice-President of ISSMGE for Asia, Chair of TC305of ISSMGE, President of Kazakhstan Geotechnical Society & Director of the Geotechnical Institute of the Eurasian National University (Nur-Sultan, Kazakhstan). He emphasized on importance of proper site investigation in field for geotechnical infrastructure projects with introduction of activity of TC305 (ISSMGE) on Geotechnical infrastructures for megacities and new capitals. This was followed by webinar on "Shear strength properties of intact rock mass" by Dr. G.V. Ramana from National Institute of Technology, Warangal, India. He gave insights on use of statistical approach for better interpretation of shear strength of rock mass. From China, Prof. Abraham Chiu (Shantou University) presented an insightful presentation on shear modulus of hydrate bearing carbonate silt-sand mixtures. The research is carried with a focus on exploring shale gas hydrate as a potential future energy source.

Day 5 (i.e., May 13th, 2020) involves presentations by two Guest Speakers, Dr. Brijesh Kumar Yadav from IIT Roorkee, India and Dr. Chao-sheng Tang from Nanjing University, China. Dr. Brijesh Kumar Yadav introduced Indian Institute of Technology (IIT) Roorkee, India followed by history of Department of Hydrology at IIT Roorkee, India. Department of Hydrology of IIT Roorkee, India was established under UNESCO. He then discussed about various engineered bioremediation techniques for treatment of polluted sites. His presentation was interesting as it was able to connect fundamental theory to Laboratory experiments to Field application. Prof. Askar Zhussupbekov and his students from Kazakhstan attended the session and asked interesting question about field application of bio-remediation technique in other countries. Prof. Chao-Sheng Tang from Nanjing University, China presented about macro to micro investigation of tensile strength and crack resistance of fiber reinforced soil. He also presented an in-house developed crack measurement software that is freely available for all students to use.

Day 6 (i.e., May 15th, 2020) was very special with two Honourable Guests, Prof. S.R Gandhi, Director of S.V.NIT Surat, India and Prof. Da Hsuan Feng (Fellow of American Physical Society, USA and Chairman of International Advisory Board, Hainan University, China). Prof S.R. Gandhi inaugurated the day by describing one of achievements in utilizing fly ash in geotechnical engineering. Prof. S.R Gandhi thanked and encouraged more such cooperation in future. Due to time difference between India and USA, Prof Da Hsuan Feng gave an audio recorded speech emphasizing Late Former Prime Minister, Jawahar Lal Nehru words (*If India and China holds together, the future of Asia is assured*), that were spoken to his Father Paul Feng in 1945. This was followed by two research webinars from Prof. Neelima Satyam from Indian Institute of Technology (IIT), Indore, India and Prof. Mu Qingyu from Xian Jiatong University, China. Prof. Neelima shared research

Conference report

Indo-China Research Webinar Series in Civil and Environmental Engineering with Geotechnical Issues (Con't)

on real time monitoring of landslide in Himalaya region while Prof. Mu shared research on frozen soil, that is also highly relevant to colder regions of both India and China. Prof. Askar Zhussupbekov asked wonderful question especially relating to depths of frozen soil. Another question on effects of impurity on frozen soil was also asked by Prof. Brijesh Yadav from IIT Roorkee. They also expressed pleasure to cooperate in future with Prof. Mu Qingyu.

On Day 7 (i.e. May 18th, 2020), we had two Special Guests, Dr. Jaykumar Shukla, Principal Engineer, Geo Dynamics, India and Prof. S. Neelamani, Senior Research Scientist, Kuwait Institute of Scientific Research and two Speakers for technical sessions, Prof. Sreedeep S. (IIT Guwahati, India) and Prof. Honghu Zhu (Nanjing University, China). Prof. S.R Gandhi (Honourable Director of S.V NIT) graced the event with his presence. Dr. Jaykumar Shukla shared efforts made under Indian Geotechnical Society (IGS) to connect Industry and Academy for enhancing industry-based research in various academic institutions. This was followed by webinar session from Prof. Sreedeep S., who introduced new biopolymer for enhancing soil water retention curve and also raised questions in the end in how to explore such biopolymers in agriculture. Prof. Honghu Zhu from Nanjing University, China introduced development of fiber optic monitoring system for evaluating stability of geotechnical infrastructure. The utilization of "Raman Scattering" Honourable Nobel Prize Winner Sir C.V. Raman in fiber optic technology introduced by Prof. Honghu Zhu was highly mesmerizing. Prof. S. Neelamani concluded the day with an emphasis on importance of Marine engineering and also what type of research problems can be taken up by young research scholars in future. He also introduced new innovations in Marine structures that has been patented.

Final day (19th May, 2020) of Indo-China Research Webinar Series was graced by several Eminent Special Guests including Prof. Gautam Biswas (Former Director of IIT Guwahati and Fellow of the ASME), Prof. S.K Das (Director, IIT Ropar), Prof. D. N. Singh (Institute Chair Professor, IIT Bombay & Editor in Chief of Environmental Geotechnics, ICE, UK) and Prof. Chandan Ghosh (IIT Jammu and also, National Institute of Disaster Management under Ministry of Home Affairs, India). Prof. Gautam Biswas has highlighted the great scientific contributions from Indian Science and in particular from Japan, China and India. Contributions from Honourable Novel Prize Winner, Dr. C. V. Raman to Prof. S. N. Bose and Prof. J. C. Bose were highlighted. Prof. Gautam Biswas Sir has expressed high optimism and instilled motivation among young participants with many re-visiting memory of great contribution from Asia. His lecture that went for 50 minutes was appreciated by many researchers from different disciplines. Prof. Sarit Kumar Das, Director IIT Ropar attended the lecture and shared a message of motivation to utilize such times in organizing Joint series for knowledge sharing and building cooperation among countries. Prof. Chandan Ghosh thanked organizers for the webinar series in tough times and also encouraged to do more in building international cooperation among young participants from both countries. This was followed by two technical sessions with each from India Dr. Vinod Kumar, (Madanapalle Institute of technology and Sciences, India) and from China Dr. Haihong Song, Shantou University. Dr. Vinod shared research on use of light weight deflectometer for quality control evaluation of unbound layers while Dr. Haihong Song shared research on utilizing biochar for wastewater treatment. She also showcase real time monitoring system that has been deployed for river cleaning around Shantou region of China. The system has been jointly developed with a faculty from Guangdong Technion Israel Institute of Technology (GTIIT, China).

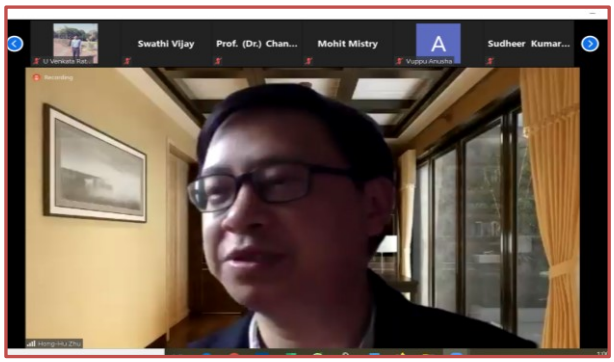
Prof. D. N. Singh from IIT Bombay reviewed Webinar Series and appreciated emerging/cutting edge topics related to fiber-optic sensing, frozen soil characteristics, Hydrate gas and bio-geotechnology that were covered in this series. He encouraged researchers to conduct more in-depth research in such areas. He specifically encouraged researchers to think how to model a vegetated soil from soil mechanics point of view. Finally, Indo-China webinar series vote of thanks given by the organizers.

Conference report

Indo-China Research Webinar Series in Civil and Environmental Engineering with Geotechnical Issues (Con't)

Glimpse of the Indo-China Research Webinar photos are as follows:

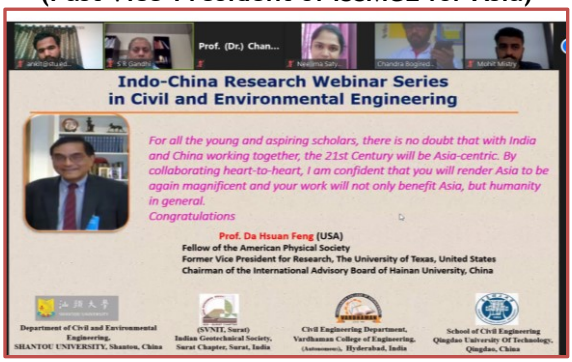
Honourable Guest, Prof. G.L. Sivakumar Babu, President of Indian Geotechnical Society (IGS), sharing his message for audience



Special Guest, Prof. Honghu Zhu briefing on 11th May, 2020

Special Guest, Prof. Askar Zhussupbekov (Past Vice-President of ISSMGE for Asia)

Honourable Guest, Prof. S. R Gandhi (Director, S.V. NIT Surat) briefing to participants



Honourable Guest, Prof. Da Hsuan Feng briefing to participants

Presentation by Honourable Guest, Prof. Gautam Biswas (Former Director of IIT Guwahati, ASME Fellow, Professor, IIT Kanpur)

ISSMGE Foundation reports

The 16th ARC (16th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering) was very well organized and had many scientifically interesting papers presented. There was a lot of TC (Technical Committee) sessions about different topics in the Geotechnical Engineering field. I participated in the Young Member Presidential Group (YMPG) and Young Geotechnical Engineers Session (YGES), and I presented the topic, "Laboratory tests of soils on Triaxial compression apparatus" in which I talked about the problems of soils of the city of Nur-Sultan and the method of determining mechanical properties using a new device called "Triaxial compression apparatus". The auditorium found it very interesting and then they asked questions about the features of the soils of the city of Nur-Sultan and about the features of the device and so on. The purpose of the session was to bring up young geotechnical engineers who will move forward to the aims and ideals of the ISSMGE. The participants of the YMPG/YGES from each member society gave oral presentations in the allotted sessions, which were evaluated by a screening committee.

On the 18th of October was the technical visit to the construction site of Terminal 3 of Taipei International Airport. Taipei Airport Terminal 3 is very large according to preliminary data, and as a result it should reduce the load of the 1st and 2nd Terminals. Engineer specialists spoke in detail about the features of the foundations and other supporting structures of the airport. A detailed presentation on the engineering features of this building was demonstrated. After the presentation, there was a little discussion, where delegates asked questions of interest. It was an amazing experience for me to see constructions such as this, and I got a lot of great impressions of Taipei from this visit.

The 16ARC conference gave me a valuable platform to learn and understand the different aspects of geotechnical engineering and update myself with the latest technologies thereby giving me an opportunity to extend knowledge in my area of research.

I am very grateful to the ISSMGE Foundation for the opportunity to travel to the 16ARC conference.

Photos with delegates


During presentation

Iliyas Zhumadilov
Kazakhstan Geotechnical Society

ISSMGE Foundation reports (Con't)

On December 5, the 9th youth geotechnical conference began, in which I made a scientific report. The topic of the report was: Investigation of hydrometeorological basis of storm sewer calculation for Nur-Sultan City. The report was devoted to methods of processing long-term data on measuring atmospheric precipitation in the capital. An analysis of massive climate data for the period 1936-2015 was presented. The daily precipitation in the city was processed on an open-source R computer program. This program is intended for statistical data processing, as well as hydrological. The special HydroTSM package allows you to analyze daily, monthly and seasonal fluctuations in precipitation, displaying the processing results in graphical drawings. Thus, both the processing results and the capabilities of the R program and its Hydro TSM package for temporal and spatial analysis were demonstrated.

In my presentation, boxplots, matrices and long-term seasonal distribution of precipitation were presented.

Photos with delegates

During presentation

Yerkebulan Zharkenov
Kazakhstan Geotechnical Society

ISSMGE Foundation reports (Con't)

The 27th European Young Geotechnical Engineers Conference was held in Bodrum, Muğla, Turkey in the period from September 26 to September 27, 2019. As a member of the All-Ukrainian Public Organization "Ukrainian Society of Soil Mechanics, Geotechnics and Foundation Engineering" I was offered the opportunity to receive an ISSMGE grant for participation in it. More than 50 scientists and specialists from over 20 European countries took part in the conference. Each of them have achieved a lot in their field of concern, enforced their researched with calculations made in software systems.

I made a presentation at the conference about the results of the study "Calculation of the reinforced foundation of the sunflower seed oil warehouse in Mariupol commercial seaport".

It was very mentally beneficial and interesting to listen to reports of the leading experts in the field of geotechnics:

- Prof. Pierre Delage. Topic: The mechanical properties of Martian soils: insights from InSight
- Dr. Nejan Huvaj. Topic: Stability of natural and man-made slopes: from FS to RFEM and MPM.
- Dr. Andrea Dominijanni. Topic: Chemico-osmotic effects in bentonite-based barriers for containment applications.
- Prof. İlknur Bozbey. Topic: Effects of soil pulverization level on lime stabilized clays: Implications on pavement design and performance

I was also very happy to meet professor Roger Frank, whom I met during his visit to Ukraine, when professor Roger Frank presented his report on the topic: Basic principles of Eurocode 7 "Geotechnical Design". Thereafter, this report was published by Ukrainian scientific and technical magazine "Svit Geotekhniki" ("World of Geotechnics").

During the conference, I broadened my outlook in various fields of geotechnics and now I am thinking over the ways to use such technologies in severe geological environment of Ukraine. I had a wonderful opportunity to meet and to have discussions with professors, researchers and engineers from different countries prompting me to shape my researches in the field of geotechnics in the context of Ukraine.
I would like to express my gratitude to International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) as a whole and Turkish Society for ISSMGE (ZMGM) for the opportunity offered to me to take part in conferences of such high level.

Photos with delegates

During presentation

SHOKAREV ANDRII
Zaporizhia Division of State Enterprise "The State Research Institute of Building Constructions", Zaporizhia city, Ukraine

Event Diary

ISSMGE EVENTS

Please refer to the specific conference website for full details and latest information.

2020

3rd International Conference on Geotechnical Engineering
Location: Cinnamon Grand, Colombo ; Sri Lanka
Date: 10-08-2020 - 11-08-2020
Language: English
Organiser: Sri Lankan Geotechnical Society ;
Contact person: Dr. JSM Fowze;
Email: slgssecretariat@gmail.com;
Website: http://icgecolombo.org/2020/index.php

6th International Conference on Geotechnical and Geophysical Site Characterization - POSTPONED
Date: 07-09-2020 - 11-09-2020
Location: Budapest Congress Center, Hungary , Budapest
Language: English
Organizer: Hungarian Geotechnical Society
Contact person: Tamas Huszak
Address: Muegyetem rkp. 3.
Phone: 0036303239406
Email: huszak@mail.bme.hu
Website: http://www.isc6-budapest.com
Email: info@isc6-budapest.com

4th European Conference on Unsaturated Soils - Unsaturated Horizons
Location: Instituto Superior Técnico, Lisbon, Portugal
Address: Av Rovisco Pais, 1
Date: 19-10-2020 - 21-10-2020
Language: English
Organiser: IST, TUDelft and UPC
Contact person: info@EUNSAT2020.tecnico.ulisboa.pt
Website: http://www.EUNSAT2020.tecnico.ulisboa.pt

Geo-Expo 2020 Scientific and Expert Conference - Prijedor, Bosnia And Herzegovina
Location : Hotel Prijedor, Bosnia & Herzegovina
Date : 22-10-2020 - 23-10-2020
Language : Bosnian, Croatian, Serbian and English
Organiser : Geotechnical Society of Bosnia and Herzegovina ;
Contact person: Sabrina Salkovic ;
Address: Univerzitetska 2
Phone: +38761451701
Email: geotehnika@geotehnika.ba
Website: https://www.geotehnika.ba

Event Diary (Con't)

Geomeast 2020 International Congress and Exhibition - 08-11-2020 - 12-11-2020
Date : 08-11-2020 – 12-11-2020
Location: Cairo, Egypt
Language: English
Organiser: Soil-Structure Interaction Group in Egypt (SSIGE) ;
Contact person: Ms. Amany El-Masry, Address: Nasr City ;
Email: info@ssige.org;
Website: http://www.geomeast2020.orgm

10th International Conference on Scour and Erosion
Location: DoubleTree Washington DC – Crystal City, USA,
Date: 15-11-2020 - 18-11-2020
Language: English
Organiser: Geotechnics of Soil Erosion Committee, ASCE Geo-Institute;
Contact person: Ming Xiao (ICSE-10 Chair);
Address: Pennsylvania State University;
Phone: 010-814-865-8056;
Email: mxiao@engr.psu.edu;
Website: https://www.engr.psu.edu/xiao/ICSE-10%20Call%20for%20abstract.pdf

6th International Conference on Forensic Geotechnical Engineering
Location: Indian Institute Technology Delhi, New Delhi, India
Date: 10-12 December 2020
Language: English
rganiser: TC 302 - Forensic Geotechnical Engineering
Contact person: Prof.Prashanth Vangla
Address: Department of Civil Engineering, IIT Delhi
Phone: +91 9611189007
Email: Prashanth.Vangla@civil.iitd.ac.in,
Website: http://tc302-issmge.com/

28th European Young Geotechnical Engineers Conference and Geogames
Location: National Research Moscow State University of Civil Engineering, Russia, Moscow
Date: 17-12-2020 - 19-12-2020
Language: English
Organiser: Russian Society for Soil Mechanics, Geotechnics and Foundation Engineering
Contact person: PhD Ivan Luzin
Address: NR MSUCE, 26 Yaroslavskoye shosse
Phone: +7-495-287-4914 (2384)
Email: youngburo@gmail.com

2021

14th Baltic Sea Geotechnical Conference 2020
Location: Clarion Hotel Helsinki, Finland
Date: 18-01-2021 - 20-01-2021
Language: English
Organiser: Finnish Geotechnical Society
Contact person: Leena Korkiala-Tanttu
Email: leena.korkiala-tanttu@aalto.fi
Website: http://www.ril.fi/en/events/bsgc-2020.html
Email: ville.raassakka@ril.fi

Event Diary (Con't)

18th NGM Nordic Geotechnical Meeting
Location: Helsinki, Finland
Date: 18 – 20 January 2021
Contact person: Ville Raassakka
Email: ville.raasakka@ril.fi
Website: http://www.ril.fi/en/events/ngm-2020.html

3rd Pan-American Conference on Unsaturated Soils
Location: PUC-Rio, in Rio de Janeiro, Brazil
Date: 25-01-2021 - 28-01-2021
Organiser: Tácio de Campos (PUC-Rio), Fernando Marinho (USP), Gilson Gitirana (UFG)
Contact person: Tácio de Campos
Email: panam2021unsat@puc-rio.br
Website: https://panamunsat2021.com

3rd International Symposium on Coupled Phenomena in Environmental Geotechnics
Location: Kyoto University, Japan
Date: 17-03-2021 – 19-03-2021
Language:English
Organiser: TC215 (Environmental Geotechnics), Japanese Geotechnical Society (JGS), and Kyoto University
Contact person: Takeshi Katsumi
Address: Yoshida-honmachi
Phone: +81-75-753-9205
Fax: +81-75-753-5116
Email: katsumi.takeshi.6v@kyoto-u.ac.jp
Website: https://cpeg2020.org
Email: cpeg2020@geotech.gee.kyoto-u.ac.jp

2nd International Conference on Energy Geotechnics
Location: Robert Paine Scripps Forum for Science, Society and the Environment. La Jolla, CA, USA.
Date : 28-03-2021- 31-03-2021
Language: English
Organiser: John McCartney (UC San Diego, USA) and Ingrid Tomac (UC San Diego, USA),
Contact Information: ICEGT-2020 Secretariat,
Address: 9500 Gilman Dr., La Jolla CA,
Phone: +1-858-822-5212,
Fax: +1-858-822-2260,
Email: secretariat@icegt-2020.com,
Website: https://icegt-2020.eng.ucsd.edu/home

International Conference on Challenges and Achievements in Geotechnical Engineering
Location : POLIS University campus, Albania , Tirana
Dates : 31-03-2021 - 02-04-2021
Language : English
Organiser : Albanian Geotechnical Society
Contact person: Erdi Myftaraga
Phone: +355699336911
Email: emy@greengeotechnics.com

Event Diary (Con't)

2nd Vietnam Symposium on Advances in Offshore Engineering
Location: Ho Chi Minh City University of Technology, Vietnam
Dates: 22-04-2021 - 24-04-2021
Language: English
Organiser: Association of Vietnamese Scientists and Experts; Ho Chi Minh City University of Technology
Contact person: Dinh Hong DOAN
Email: vsoe2021@sciencesconf.org
Website: https://vsoe2021.sciencesconf.org /

4th International Conference on Transportation Geotechnics (4th ICTG)
Location: Sheraton Grand Chicago, USA
Date: 23-05-2021 – 26-05-2021
Organiser: Professor Erol Tutumluer, 4th ICTG Chairman and Chair of ISSMGE TC 202,
Contact Information: Professor Erol Tutumluer,
Address: 1205 Newmark CEE Laboratory, MC-250 205 N. Mathews,
Phone: +1 (217) 333-8637,
Email: CITL-ICTG2020@illinois.edu,
Website: http://www.conferences.illinois.edu/ICTG2020

Mediterranean Symposium on Landslides
Location: Congressi Partenope, Naples, Italy, Naples
Date: 07-06-2021 - 09-06-2021
Language: English
Organiser: Gianfranco Urciuoli (Università di Napoli Federico II), Giovanni Crosta (Università di Milano Bi-cocca), Luciano Picarelli (Università della Campania L. Vanvitelli)
Contact person: Università di Napoli Federico II
Email: medsymplandslides@gmail.com
Website: https://medsymplandslides.wixsite.com/msl2021

The 2nd International Conference on Press-In Engineering 2021, Kochi
Location : Kami Campus, Kochi University of Technology, Japan
Dates: 19-21 June, 2021
Language : English
Organiser : International Press-in Association (IPA)
Contact person: ICPE2021 Organizing Committee
Address: 5F, Sanwa Konan Bldg, 2-4-3 Konan, 2-4-3 Konan, Minato-ku
Phone: +81-(0)3-5461-1191
Fax: +81-(0)3-5461-1192
Email: icpe2021@gmail.com
Website: https://icpe-ipa.org/

The 1st International Conference on Sustainability in Geotechnical Engineering – Geodiversity & Resilience (1ST ICSGE'21)
Location: The Congress Center of LNEC Lisbon, Portugal , Lisboa
Date: 27-06-2021 - 30-06-2021
Organiser: The National Laboratory for Civil Engineering (LNEC)
Contact person: LNEC Congress Centre Secretariat
Address: Avenida do Brasil, 101 1700-066 Lisboa
Phone: (+351) 218 443 483
Email: formacao@lnec.pt
Website: http://icsge.lnec.pt/

Event Diary (Con't)

TC204: Geotechnical Aspects of Underground Construction In Soft Ground - TC204 Cambridge 2020
Date: 28-06-2021 - 30-06-2021
Location: University of Cambridge, United Kingdom
Language: English
Organiser: University of Cambridge
Contact person: Dr Mohammed Elshafie
Address: Laing O'Rourke Centre, Department of Engineering, Cambridge University
Phone: +44(0) 1223 332780
Email: me254@cam.ac.uk

6th Geochina International Conference 2021
Location: NanChang, China
Date : 19-07-2021 - 21-07-2021
Organiser : East China Jia Tong University in Cooperation with Chinese Ministry of Education, GeoChina Civil Infrastructure Association, University of Oklahoma
Contact person: Dr. Dar Hao Chen ; Address: Texas Transportation Institute ; Email: d-chen@tti.tamu.edu;
Website : http://geochina2021.geoconf.org; Email : geochina.adm@gmail.com

7th International Young Geotechnical Engineers Conference
Location : International Convention Centre, Sydney, Australia
Dates : 10-09-2021 - 12-09-2021
Language : English
Organiser : Australian Geomechanics Society
Contact person: ICMS Australasia
Address: Level 9, 234 George Street, Sydney NSW, 2000
Phone: (+61 2) 9254 5000
Email: info@icsmge2021.com
Website : http://icsmge2021.org/7iygec/

20th International Conference on Soil Mechanics and Geotechnical Engineering
Location: International Convention Centre Sydney, Australia
Date :12-09-2021 - 17-09-2021
Language: English
Organiser: The Australian Geomechanics Society;
Contact person: ICMS Australasia;
Address: Level 9, 234 George Street Sydney NSW 200 ;
Email: emmab@icmsaust.com.au;
Website: http://www.icsmge2021.org/

4th International Symposium on Frontiers in Offshore Geotechnics
Date: 08-11-2021 – 11-11-2021
Location: University of Texas, Austin, United States
Language: English
Organiser: ISFOG 2020 Organising Committee
Contact person: Phil Watson
Address: The University of Western Australia
Phone: 0418881280
Email: phillip.watson@uwa.edu.au
Website: http://www.isfog2020.org

Event Diary (Con't)

XI Congreso Chileno de Geotecnia
Location: Universidad de Talca, Chile
Dates: Talca 22-11-2021 - 24-11-2021
Language: Spanish
Organiser: Chilean Geotechnical Society
Contact Information
Contact person: Macarena Tugas
Email: coordinadorasochige@gmail.com
Website: http://www.sochige.cl
Email: directorio@sochige.cl

5th International Symposium on Cone Penetration Testing (CPT'22)
Location : Centro Congressi CNR, Bologna, Italy
Dates : 26-06-2022 - 29-06-2022
Language : English
Organiser : Italian Geotechnical Society (AGI) and University of Bologna (endorsed by TC102)
Contact person: Susanna Antonielli (AGI), Prof. Guido Gottardi (University of Bologna)
Email: guido.gottardi2@unibo.it
Email : agi@associazionegeotecnica.it

The 9th International Congress on Environmental Geotechnics
Location: Chania, Crete island, Greece,
Dates: 26-06-2022 - 29-06-2022
Language: English
Organiser: Chair: Dimitrios Zekkos, University of California at Berkeley ; zekkos@berkeley.edu
Contact person: Dr. Rallis Kourkoulis
Email: rallisko@grid-engineers.com
Website : https://www.iceg2022.org/

NON-ISSMGE SPONSORED EVENTS

2020

Recent Trends in Geotechnical and Geo-Environmental Engineering and Education
Location: Bali, Indonesia
Date: 15 – 17 July 2020,
Organiser: RTEE Conference
Contact person: Amy Marshall ;
Email: support@rtgee.org;
Website: https://rtgee.org/ .

Event Diary (Con't)

DFI 45th Annual Conference on Deep Foundations
Location: Gaylord National Resort & Convention Center, Oxon Hill, MD, USA
Dates: 13-10-2020 - 16-10-2020
Organizer: Deep Foundations Institute
Contact person: Theresa Engler
Address: 326 Lafayette Avenue, Hawthorne, NJ 07506, USA
Phone: 19734234030
Fax: 19734234031
Email: tengler@dfi.org
Website: http://www.dfi.org
Email: staff@dfi.org

Geoamerica 2020
Location: Windsor Convention Expo Center, Brazil , Rio de Janeiro
Dates: 26-10-2020 - 29-10-2020
Language: English
Organiser: International Geosynthetics Society
Contact person: André Estêvão Silva
Email: geoamericas2020@geoamericas2020.com
Website: http://www.geoamericas2020.com

Fifth World Landslide Forum
Location: Kyoto International Conference Center, Kyoto, Japan
Dates: 02-11-2020 - 06-11-2020
Organizer: International Consortium on Landslides
Contact person: Ryosuke Uzuoka
Address: Gokasho
Phone: +81-774-38-4090
Email: uzuoka.ryosuke.6z@kyoto-u.ac.jp
Website: http://wlf5.iplhq.org/
Email: secretariat@iclhq.org

16th International Conference of the International Association for Computer Methods and Advances in Geomechanics - IACMAG
Location: Politecnico di Torino Conference Centre, Italy
Dates: 03-05-2021 - 04-05-2021
Language: English
Organiser: Politecnico di Torino
Contact person: Symposium srl
Address: via Gozzano 14
Phone: +390119211467
Email: info@symposium.it
Email: marco.barla@polito.it

Event Diary (Con't)

The Third International Conference on Environmental Geotechnology, Recycled Waste Materials and Sustainable Engineering
Location: Dokuz Eylul University, Izmir, Turkey,
Dates: 17-06-2021 - 19-06-2021
Organiser: Dokuz Eylul University
Contact person: Tugce Ozdamar Kul
Address: Dokuz Eylul University
Phone: +905325164800
Email: egrwse2020@gmail.com
Website: http://www.egrwse2020.com

Dfi Deep Mixing 2021
Location: Polish Baltic Philharmonic and Congress Centre, Gdansk, Poland
Dates: 05-07-2021 - 08-07-2021
Language: English
Organizer: Deep Foundations Institute
Contact person: Theresa Engler
Address: 326 Lafayette Avenue
Phone: 9734234030
Fax: 9734234031
Email: tengler@dfi.org
Website: http://www.dfi.org/DM2021

7th International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics
Location: The National Science Seminar Complex, Indian Institute of Science Bangalore, India,
Date: 12-07-2021 - 17-07-2021
Organiser: Indian Society of Earthquake Technology
Website: http://7icragee.org/index.php
Email: conf@7icragee.org

FOR FURTHER DETAILS, PLEASE REFER TO THE WEBSITE OF THE SPECIFIC CONFERENCE

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Web: www.geoharbour.com

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Artarmon NSW 2064
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Nigeria

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Foundation Donors

The Foundation of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) was created to provide financial help to geo-engineers throughout the world who wish to further their geo-engineering knowledge and enhance their practice through various activities which they could not otherwise afford. These activities include attending conferences, participating in continuing education events, purchasing geotechnical reference books and manuals.

- **Diamond: $50,000 and above**
  - **a.** ISSMGE-2010 http://www.issmge.org/
  - **b.** Prof. Jean-Louis and Mrs. Janet Briaud https://www.briaud.com and http://ceprofs.tamu.edu/briaud/
- **Platinum: $25,000 to $49,999**
- **Gold: $10,000 to $24,999**
  - **a.** International I-G-M http://www.i-igm.net/
  - **b.** Geo-Institute of ASCE http://content.geoinstitute.org/
  - **c.** Japanese Geotechnical Society http://www.jiban.or.jp/
  - **d.** The Chinese Institution of Soil Mechanics and Geotechnical Engineering – CCES www.geochina-cces.cn/en
  - **e.** Korean Geotechnical Society www.kgshome.or.kr
  - **f.** Comité Français de Mécanique des Sols et de Géotechnique www.cfms-sols.org
- **Silver: $1,000 to $9,999**
  - **a.** Prof. John Schmertmann
  - **b.** Deep Foundation Institute www.dfi.org
  - **c.** Yonsei University http://civil.yonsei.ac.kr

Foundation Donors (Con't)

d. CalGeo – The California Geotechnical Engineering Association
www.calgeo.org

e. Prof. Ikuo Towhata
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