

CBBG

Center for Bio-mediated & Bio-inspired Geotechnics

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As I See It: View from Director's Chair

Mid-Year Report: Onward Biogeotechnical Warriors!

The CBBG ERC continues to move the frontier of biogeotechnical engineering, as evidence by the presence of CBBG researchers at the March ASCE Geo-Institute Geo Frontiers GeoCongress in Orlando, Florida, and the April CBBG Mid-Year Meeting at the University of California, Davis.

At the GeoCongress, CBBG researchers presented four technical papers and participated in three panel discussions, each time to a room packed full of Geo professionals. Three CBBG graduate students were finalists in the Geo Poster competition (organized by CBBG Co-PI Paola Bandini of New Mexico State University), with ASU graduate student, Miriam Woolley, finishing in third place for her poster on "Effectiveness of Hydrogel-Assisted Enzyme Induced Carbonate Precipitation for Fugitive Dust Mitigation."

CBBG members made presentations in several committee meetings, and participated in numerous informal discussions about our research and the potential for collaboration with our colleagues. Clearly, the eyes of the geotechnical community are upon us.

In addition to these technical activities, two CBBG undergraduates and two CBBG graduate students participated in the Mechanically Stabilized Earth Wall competition and, CBBG graduate student, Kimberly Martin, rapped rapturously about waste management and landfills in the first place winning Geo video.

The Mid-Year Meeting was an internal affair. CBBG partner, UC Davis, did a wonderful job organizing the meeting logistics and agenda, setting the bar high for Georgia Tech for next year's Mid-Year Meeting. The first day of the meeting was consumed by a series of meetings among the Leadership Team, the IDEA (Innovation Diversity Education Activities) Working Group, the Student Leadership Council, and Industry Advisory Board, which was then capped by a Student-Industry mixer, and a CBBG faculty dinner.

On Day 2, CBBG faculty, students, industry partners, and invited guests heard status updates on the Center as a whole, test bed development, Student Leadership Council Activities, and the Diversity and Education programs, were treated to brief presentations on each CBBG project from the Senior Investigator, participated in a workshop on Lifecycle Cost Sustainability Assessment, and received a short tutorial on the principles of centrifuge testing before adjourning to the National Hazards Engineering Research Infrastructure (NHERI) Centrifuge Test Facility for a facility tour and reception.

For many of the students and faculty in attendance, the third day was perhaps the most engaging part of the meeting. After a morning plenary session on the culture of collaboration, students and faculty broke into working groups wherein every student in attendance made a brief presentation on their work followed by lively discussions on potential synergies among related CBBG projects. This was the first opportunity for many of the students to make presentations on their work and hear first-hand what other CBBG researchers were up to. The four hours allocated for the working group sessions (including a

working lunch) were barely enough to review and discuss everyone's activities. Working group leaders reported back to the entire group on the context of these discussions in a general session before adjourning. While this was the end of the formal meeting, most CBBG students stayed through Saturday for a team-building field trip to the California Academy of Sciences.

The Mid-Year Meeting proved to be a wonderful opportunity to hear what everyone at the Center is doing directly from the researchers doing the work. The working group meetings were clearly a highlight of the meeting, energizing all in attendance with respect to both the scope of CBBG activities and the potential synergies among CBBG researchers. While the next in-person working group meetings will be at the annual meeting (at ASU, October 18-20), we hope to see these interactions continue via formal video web conferencing and informal communications based upon the relationships that have formed among CBBG researchers.

Important Dates

June 2017 - July 2017

Summer Programs at CBBG Partner Universities
REU/RET/Young Scholars

August 4, 2017

ERC 360 Closes for Grant Year 2

September 14, 2017

CBBG Year 2 Annual Report Due to NSF

October 18-20, 2017

Year 2 NSF Site Visit to CBBG
ASU Memorial Union
Tempe, Arizona

April 11-13, 2018

CBBG Mid-Year Meeting
Georgia Institute of Technology
Atlanta, Georgia

Research Highlights

CBBG Participation at Recent GeoFrontiers Conference

CBBG was well represented at the ASCE Geo-Institute GeoFrontiers Conference held in Orlando, Florida, March 13-16, 2017.

Professors Ed Kavazanjian, Jason DeJong, and David Frost participated in panel sessions on liquefaction, guidance on preparation of NSF sponsored research proposals, and biotechnical slope stabilization, respectively.



CBBG Industry Collaboration and Innovation Director and Assistant Research Professor, Nasser Hamdan, made a presentation to the

Geo-Institute Soil Improvement Committee chaired by Kord Wissman of Geopier Foundation Company, a CBBG Industry Partner.



ASU Postdoctoral Scholar, Dr. Hamed Khodadadi Tirkolaei, presented a paper in a Ground Improvement session on Mineralogy of Calcium Carbonate

in MICP-treated Soil Using Soaking and Injection Treatment Methods.



Professor David Frost of Georgia Tech participated in a panel discussion on Bio-Geotechnical Stabilization of Slopes.

Jason DeJong, Matt Burrall, and Dan Wilson of the University of California, Davis and David Frost of Georgia Tech had a paper in an Unconventional Materials session on "A Bio-inspired Perspective for Geotechnical Engineering Innovation."

Jason DeJong, Michael Gomez, and Jack Waller of the University of California, Davis presented a paper in a second Unconventional Materials session on "Influence of Bio-Cementation on Shearing Behavior of Sand using X-ray Computed Tomography."

David Frost, Alejandro Martinez, Seth Mallett, and Mahdi Roozbahani, all of Georgia Tech, and Jason DeJong of UC, Davis presented a paper in the second Unconventional Materials session on "The Intersection of Modern Soil Mechanics with Ants and Roots."



Professor Jason DeJong of UC, Davis participated in a panel discussion on In Situ Modification of Soil Properties Using Biological Mechanisms.

UC, Davis students Mike Gomez, Alena Raymond, and Matt Burrall, and Georgia Tech student Seth Mallett all had presentations at technical sessions.



ASU students Miriam Woolley, Elizabeth Stallings, and Caitlyn Hall participated in the GeoPoster competition. Miriam Woolley won 3rd place in the GeoPoster completion with her poster entitled, "Effectiveness of Hydrogel-Assisted EICP for Fugitive Dust Mitigation."



Two undergraduate students and two graduate students, including CBBG students Miriam Woolley and Juan Paez, participated on the ASU Team in the MSE Wall competition. The team qualified for the finals, but did not place.

The ASU team, featuring a rap by CBBG student Kimberly Martin, placed first in the Geo Video competition.



Kimberly Martin and team also won first prize for the T-Shirt Design Competition.



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Paassen Joins ASU, CBBG



Leon A. van Paassen joined ASU and CBBG as Associate Professor in the School of Sustainable Engineering and the Built Environment (SSEBE). Dr. van Paassen has been

working on bio-mediated improvement of the physical properties of soil.

On March 3, 2017, van Paassen presented a webinar to his CBBG colleagues on "Designing Large Scale Experiments for Bio-Based Geotechnics". He also has been very active in CBBG outreach activities since his arrival, participating with CBBG colleagues at the Capitol Science Fair (see photo below) and Night of the Open Door.



ASU/NMSU Collaborate on Soil Improvement Project

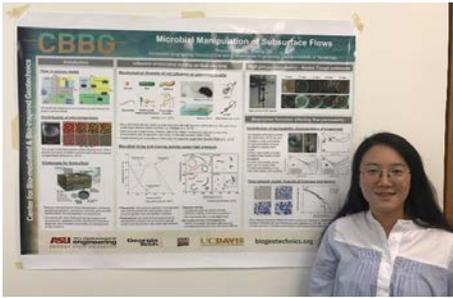


NMSU graduate student Jose N. Pasillas-Rodriguez is working in the ASU geotechnical laboratory to learn sample preparation and testing techniques for EICP (Enzyme-Induced Carbonate Precipitation). Jose will spend 5 weeks working with ASU students and post-doctoral researcher Hamed Khodadadi Tirkolaei this spring as part of CBBG research collaboration between ASU and NMSU.

Jose's CBBG research project at NMSU is on bio-inspired unsaturated soil improvement and reinforcement and focuses on deep foundations. He works on developing the concept of a root-inspired vascular system through a pile for ground improvement around the foundation. Drs. Craig Newton and Paola Bandini at NMSU are Jose's advisors.

Out & About

Jeong Presents at Energy Expo



CBBG graduate student researcher, Boyoung Jeong, at Georgia Tech, a recipient of the Korea Government Fellowship, presented her research on microbial manipulation of subsurface flows at the Georgia Tech 2017 Energy Expo in February.

The Energy Expo is a conference and presentation showcase open to the public. As Atlanta rapidly becomes a hub for energy innovation and entrepreneurship, the Energy Club and Strategic Energy Institute at Georgia Tech bring together about 300 energy researchers and industry experts across the country to share the latest technologies and challenge policy makers to have the same innovation.

Sun Presents at Symposium on Deep Sea Oil Spills



In a collaboration between the labs of Dr. Joel Kostka (Biological Sciences) and Dr. Sheng Dai (CEE) at Georgia Tech, Ph.D. student, Xiaoxu Sun, studies the impact of high pressure on hydrocarbon biodegradation. His results indicate that microbial communities are adapted to high pressure, with enhanced degradation observed in deep sea sediments exposed to high pressures. The results suggest that high pressure must be taken into account when modeling the fate and transport of oil in subsurface environments. Sun presented his results at the 2nd Symposium on Deep Sea Oil Spills in Hamburg, Germany, in September, 2016. Afterward, Sun remained in Germany for a week to collaborate with colleagues at the Hamburg University of Technology. Using fresh sediment he collected on a recent research cruise, Sun compared oil biodegradation rates measured under gas pressure at Hamburg with his rates determined under hydraulic pressure at Georgia Tech.

CBBG Mid-Year Meeting at UC, Davis

CBBG researchers from Georgia Tech (Jiaxing Su, Wencheng Jin, Fernando Patino and Mahdi Roozbahani) and UC Davis (Dr. Alejandro Martinez) seized the opportunity at the end of the CBBG mid-year meeting to try their skills at nature-inspired bridge building. Their first attempt at Bothe-Napa Valley State Park functioned well albeit with limited aesthetics!!!



GT Researchers Participate in Grenoble Workshop



L3SR Director Dr. Cino Viggiani and CBBG Co-PI Dr. David Frost perfecting the art of taking a "selfie" during a break in the workshop.

In February, Dr. David Frost and Dr. Chloe Arson participated in a workshop organized by L3SR laboratory in Grenoble, France. As a result of this meeting, a proposal was submitted to a European research agency (IDEX Grenoble Alpes) to support co-advised PhD students on bio-inspired geotechnics ("BIOinMECH: The

Mechanics of Bio-Inspired Processes: a Multi-scale Study of Multi-Functional Systems"). In the next month, Dr Arson is going to host two researchers from L3SR, to work on the micro mechanical modeling of particle crushing, particle community formation and force chain deployment.

Borela-Valente Presents Poster at U.S. Society of Dams Annual Conference and Exhibition

CBBG graduate student, Rodrigo Borela-Valente, presented a poster at the U.S. Society of Dams Annual Conference and Exhibition, in April 2017 in Anaheim, CA. The title of the paper was "Failure of the Acude da Nacao Earth Dam: A Probabilistic Perspective." His co-authors were Danielli de Melo Moura, Gabriela Alvarado, Wilson Espinoza, and Dr. Philippe Bourdeau. The work was based on research that Rodrigo undertook as part of a class project he did while an MS graduate student at Purdue University.

Other Research Presentations from Georgia Tech

C. Arson, L.F. Patino-Ramirez, W. Jin, "Bio-inspired design of subsurface flow networks," Seminar at the CNMS at Oak Ridge National Laboratory, March, 2017.

C. Arson, "Damage and Healing Rock Mechanics," Workshop L3SR-Georgia Tech, Université Grenoble Alpes, L3SR Lab, Grenoble, France, February, 2017.

C. Arson, L.F. Patino-Ramirez, W. Jin, "Bio-inspired design of subsurface flow networks," Workshop L3SR-Georgia Tech, Université Grenoble Alpes, L3SR Lab, Grenoble, France, February, 2017.

C. Arson, L.F. Patino-Ramirez, W. Jin, "Bio-inspired models for infrastructure and flow network optimization, deployment and adaptability," Seminar of the Engineering Research Center on Bio-inspired and Bio-mediated Geotechnics, January, 2017.

D. Frost and Seth Mallett, "Experimental studies of thigmomorphogenetic response of root analogues," Workshop L3SR-Georgia Tech, Université Grenoble Alpes, L3SR Lab, Grenoble, France, February, 2017.

Liu Visits Chengdu University of Technology for Joint Research Program



CBBG graduate student researcher, Fangzhou Liu, rappelling down a loess slope in Shanxi Province as part of an emerging collaboration between researchers from GT/CBBG and the State Key Laboratory for Geo-Hazard Prevention and Geo-Environmental Protection at Chengdu University of Technology (CDUT) in China. The joint research program includes, laboratory, centrifuge and field scale studies of landslide triggering mechanisms in loess slopes. The long-term objective of the research program is to identify stabilization techniques which may include bio-inspired techniques.

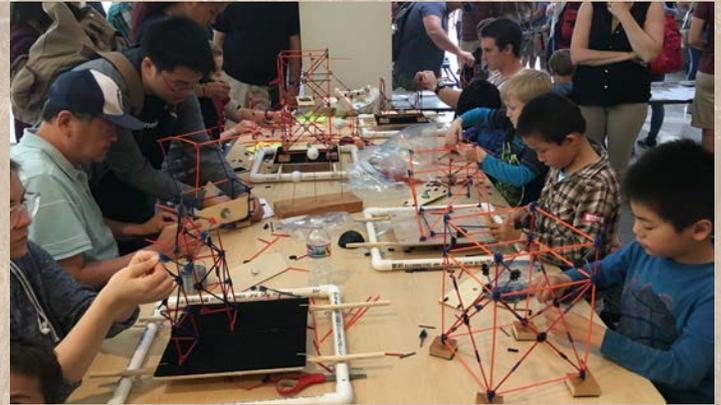
Dalal Presents at ASEE Conference



Medha Dalal, ASU Graduate Student, presented her paper entitled, "Supporting Engineering Education with Instructional Design: The Case of an Introductory Module on Biogeotechnical Engineering" at the American Society for Engineering Education's Pacific Southwest Region Conference, Tempe, AZ, April 20-22, 2017. Authors include: Medha Dalal, Dr. Jean Larson, Dr. Willhelmina Savenye, Dr. Claudia Zapata, Dr. Nasser Hamdan, and Dr. Ed Kavazanjian.

UCD Participates in 103rd Picnic Day

CBBG was well represented at Picnic Day 2017, which was held on April 22nd at the University of California, Davis. This family friendly event was free for all to come and experience the richness of diversity and achievement at UC Davis and the surrounding community in the areas of research, teaching, service and campus life. More than 200 events took place throughout campus and included exhibits, shows, competitions, demonstrations, entertainment, animal and athletic events, Student Organization Fair, Children's Discovery Fair, Parade and much more.



The CBBG researchers, faculty and students hosted over 500 people who participated in several interactive exhibit. To learn more about UCD's Picnic Day, click here: <https://picnicday.ucdavis.edu/#about>



Publications

Paper Published in Journal of Structural Integrity and Maintenance



CBBG graduate student researchers, Mahdi Roozbahani and Seth Mallett, along with Dr. David Frost and two other researchers, are co-authors on a paper that has been accepted for publication in a Special Issue of the Journal of Structural Integrity and Maintenance on "The Evolving Role of Materials in Geotechnical Infrastructure Systems" that details some recent research findings from CBBG projects at Georgia Tech on ants and roots.

American Society of Engineering Education (ASEE) Conference Proceedings

Larson, J., Dalal, M., Savenye, W., Zapata, C., Hamdan, N., & Kavazanjian, E. (2017). Implementation of an Introductory Module on Biogeotechnics in a Freshman Engineering Course. Proceedings of the ASEE Annual Conference & Exposition, Columbus, OH, June 25 -28, 2017.

Dalal, M., Larson, J., Savenye, W., Zapata, C., Hamdan, N., & Kavazanjian, E. (2017). Supporting Engineering Education with Instructional Design: The Case of an Introductory Module on Biogeotechnical Engineering. Proceedings of the ASEE-PSW Annual Conference, Tempe, AZ, April 20-22, 2017.

Honors & Awards

Rittmann Inducted as Fellow of National Academy of Inventors

Dr. Bruce Rittmann, CBBG senior investigator, ASU Ira A. Fulton Schools of Engineering, was recently elected as a Fellow of the National Academy of Inventors (NAI). Election to NAI Fellow status is the highest professional distinction accorded solely to academic inventors who have demonstrated a prolific spirit of innovation in creating or facilitating outstanding inventions that have made a tangible impact on quality of life, economic development, and welfare of society.

Rittmann Receives 2017 Daniel Jankowski Legacy Award

Dr. Bruce Rittmann, CBBG Senior Investigator, received the 2017 Daniel Jankowski Legacy Award from the ASU Ira A. Fulton Schools of Engineering. This award is given biennially to a deserving professor whose long term commitment to research, teaching, and service has significantly contributed to the advancing the mission and values of the Fulton Schools. Since arriving at ASU in 2005, Rittmann has served as the principal investigator or co-principal investigator on 123 funded research projects, representing more than \$14.8 million in research expenditures.

Cromwell Participates in ASCE "Road to Success" Program



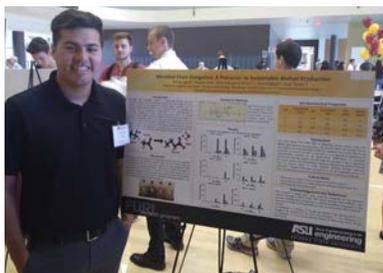
Cori Cromwell's research at NMSU focuses on bio-inspired earthen construction.

Cori Cromwell, a CBBG undergraduate research student at NMSU, is one of three students chosen to participate in the ASCE's "Road to Success" Program. She presented her personal portfolio and research project to the engineering community at the ASCE New Mexico Section Gala Night, held

on April 19, 2017. This professional outreach event included ASCE National President, Norma Jean Mattei, as keynote speaker.

Cori is an accomplished civil engineering senior at NMSU, and a member of the NMSU NCAA Women's Equestrian Team. She will intern for fourth time this summer in Geotech projects with Kumar & Associates in Colorado, and is applying to graduate school to specialize in geotechnical engineering.

Aguiar Participates in FURI Symposium



Sammy Aguiar, CBBG undergraduate student, presents his poster entitled, "Microbial Chain Elongation: A Precursor to Sustainable Biofuel Production" at the ASU Fulton Undergraduate Research Symposium that was held on Friday, April 24th. This event gives undergraduate students the opportunity to

present their research to faculty, students, family and friends.

Larson Nominated for Outstanding Contribution and Achievement Award



CBBG Education Coordinator, Dr. Jean Larson, was nominated for the ASU Commission on the Status of Women's 2017 Outstanding Contribution and Achievement Award. The purpose of this award is to identify and recognize those individuals, groups, or teams who most exemplify and further the mission of the ASU Commission on the Status of Women (CSW). The mission of the ASU CSW is to identify, advocate for, and increase awareness of needed changes in order to enhance opportunities for women and other underrepresented groups.

NMSU Masters' Student Successfully Defends Thesis

Tsegaye (TJ) Gebremariam successfully defended his Masters' thesis at NMSU. TJ's CBBG project was on the experimental evaluation of the effects of moisture on adobe material strength and wall behavior. This summer, TJ will join an engineering design firm for which he interned last year. His advisors are Drs. Brad Weldon and Paola Bandini.



Tsegaye (TJ) Gebremariam during his experimental testing

NMSU Graduate Student Presents Poster to NM Legislature

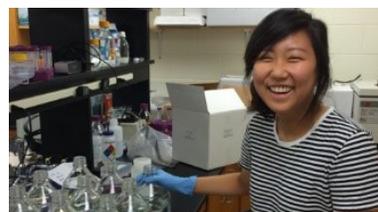


Saman Mostafazadeh-Fard presenting at the Graduate Student Legislation Day Poster Session

Saman Mostafazadeh-Fard of NMSU was selected to present his CBBG research at the Graduate Student Legislation Day Poster Presentation. Graduate students from universities across New Mexico were invited to present their research to New Mexico legislators in the capital building

in Santa Fe, NM in early April. The aim was to showcase the research accomplishments and work of state-funded universities to the state legislators. Saman is also one of five finalists of the LAUNCH, a four-month proof of concept competition that accelerates technologies from NMSU students to the market.

Chu Receives President's Undergraduate Research Award (PURA)



Georgia Tech undergraduate student, Lena Chu, received a President's Undergraduate Research Awards (PURA) to conduct CBBG research under the direction of Dr. Joel Kostka. She also was supported by Georgia Tech in Fall 2016.

Education & Outreach

2017 Summer Programs Recruitment



CBBG will again welcome high school students, K-14 teachers, and undergraduates this summer to over twelve different research projects across all four CBBG partner universities. The recruitment for the programs was extended for an even broader and more inclusive participation, which attracted 20 Young Scholar applicants, 18 Research Experience for Teachers (RET) applicants, and 160 Research Experience for Undergraduates (REU) applicants. At least 60% of the Young Scholar and RET applicants were from CBBG educational partner schools.

2016 CBBG Summer REU Intern Placements

Two of the 2016 CBBG Summer Research Experience for Undergraduate (REU) participants will be continuing their research experiences this coming summer.



Chelsea Obeidy, 2016 Summer REU at UCD, accepted a position (REU) at North Carolina State University, working with Brian Montoya on Microbial Induced Calcite Precipitation (MICP). She is excited to spend a second summer working to better understand this process, and is grateful for the opportunity to work in the CBBG labs last summer.

Gabriela Irra, 2016 Summer REU at ASU, will be spending her summer at New York University's Center for Neural Science in their undergraduate research program. She was one of ten students out of a pool of over 500 who applied! Gaby is very excited about this opportunity, and credits her experience with CBBG and support from her CBBG mentors.



ASU Night of the Open Door



Every year, ASU invites the local community to visit any of its five campus locations, allowing visitors to explore the innovative spaces accessible only to ASU students. Visitors of all ages had the opportunity to participate in hundreds of interactive activities and talk to students, faculty and staff. Thrill seekers, lifelong learners, science gurus, arts enthusiasts and adventure seekers explored laboratories, living collections, museums and classrooms and participated in hands-on activities.

CBBG Attends AISES Conference

Dr. Jean Larson, CBBG Education Coordinator (ASU), and Dr. Martha Mitchell, Associate Diversity Director (NMSU), participated in the Career Fair at the Region 3 American Indian Science and Engineering Society (AISES) Conference in Flagstaff, Arizona on April 1, 2017.

They collaborated with two other ASU Engineering Research Centers, QESST, represented by K-12 Education and Outreach Coordinator, Tiffany Rowlands, and NEWT, to present students with information about research at all three engineering centers.

The student conference participants, who came by the table, were very interested in the CBBG inspiration by nature, the focus on water by NEWT, and the renewable energy focus of QESST.



Students ranged in level from high school to community college to four-year college/university. Many of the students indicated that they are the first in their families to attain their level of education. In addition to questions about CBBG research, they also had questions about applying to college from high school, about how transitions from community college to four-year institutions work, and about how to apply to graduate school.

Drs. Larson and Mitchell had a chance to talk with the conference attendees about the Young Scholars (YS) program, the Research Experiences for Teachers (RET) program, the Research Experiences for Undergraduates (REU) program, and to describe the opportunities for graduate students to work on research in the engineering centers.

Martha and Jean also had a chance to talk to Michael Ray, the Director of American Indian Programs at NMSU, who had met Dr. Wilhelmina Savenye last year, when she had attended this same conference. There is a possibility that NMSU will offer to host the AISES Region 3 conference in 2018.



Capitol Science Fair

On Wednesday, April 19, 2017, CBBG faculty, staff, and students hosted a demonstration table at CBBG Education Partner, Capitol Elementary School's Annual Science Fair. Students, along with their families, enjoyed an interactive liquefaction demonstration and learned about more sustainable solutions to this and other geotechnical problems. All of the 4th – 8th grade students also presented their own research projects at the event. One of the Capitol teachers has already requested a CBBG demonstration for her first grade class, which is studying rocks and soil in a few weeks!



ASU ERC Education Consortium

The education team from each of the three Engineering Research Centers (ERC) at ASU have joined together to form a consortium that meets bi-weekly to share ideas, resources, and strategies. Both the Center for Bio-mediated and Bio-inspired Geotechnics (CBBG) and the Quantum Energy and Sustainable Solar Technologies (QESST) ERC are headquartered at ASU, while Nanotechnology-Enabled Water Treatment (NEWT) ERC is headquartered at Rice University, with ASU as one of its subawards.



CBBG Collaborates with QESST on Evaluation of STEM Saturdays

A team of students from Dr. Willi Savenye's graduate evaluation course volunteered to help evaluate the STEM Saturdays program for Dr. Michelle Jordan and Ms. Tiffany Rowlands, of the QESST ERC, as their class project. The education students developed a proposal for evaluating the final STEM Saturday in April, observed the solar workshop for students at Barcelona Middle School, and surveyed the students, teachers and the principal to help QESST assess the effectiveness of this program, and make suggestions for improving the program.

CBBG Collaborates with Glendale Community College Partners in Chemistry Day

On March 3, 2017, CBBG Education Director, Dr. Willi Savenye, volunteered at Chemistry Day with our partners at Glendale Community College. In an indication of the deep STEM involvement of our REUs, Gabriela Ira, 2016 Summer REU at ASU, also volunteered at this event for families. As you can see, Gaby and her GCC student and faculty colleagues made STEM amazing for students!



Education Director Savenye and Colleagues Present Provost Teaching Workshops for Faculty



Barbara Lafford and James Wermers

Dr. Willi Savenye, CBBG Education Director and Provost Teaching Fellow, and her colleagues presented several professional development workshops for new and continuing faculty this spring. She and Karen Bruhn presented "Facilitating Discussions," which was attended, by almost 100 faculty across the four ASU campuses (in person and via videoconferencing). She and Barbara Lafford, Peter Lafford, and James Wermers also presented several workshops on the "Flipped Classroom 2, Developing Video Options for the Flipped Classroom."

Lafayette College Collaboration with CBBG at UC Davis

Lafayette College, an undergraduate-serving institution in Easton, PA, is collaborating with CBBG researchers at UC Davis on several joint projects. In fact, two undergraduate students from Lafayette College will be participating in CBBG's REU this summer.



Dr. Mary Roth of Lafayette College

CBBG Collaborates with Center for Gender Equity in Science & Technology (CGEST)



Dr. Kimberly Scott, Director of CGEST

GEST, the Center for Gender Equity in Science and Technology, is a collaborating partner with CBBG. Dr. Willi Savenye, as a member of the CGEST Affiliates Board, was invited to attend the CGEST-sponsored conference on Women of Color in STEM Entrepreneurship, on March 25, 2017. She participated in sessions and workshops related to entrepreneurship, inclusion and design thinking.

IDEA Working Group at CBBG Mid-Year Meeting

On April 5-7, 2017, the CBBG research team at UC, Davis hosted a spectacular meeting of all the CBBG researchers, faculty, and students at the CBBG Mid-Year Meeting. The IDEA, Innovation, Diversity, and Education Activities Working Group took the opportunity to work together intensely one day of the meeting to share and improve all our initiatives.

Evaluation - Dr. Megan O'Donnell, CBBG's outside evaluator from CREST, assisted by Dr. Willi Savenye, Education Director, led a highly interactive session on strengthening our assessment activities, evaluating and strengthening diversity, working on follow-up evaluations and evaluating outreach events, and improving our long-term tracking strategies for participants. Dr. O'Donnell also led the discussion on ways to build pathways for our Young Scholar participants, and presented to the entire CBBG on the results and recommendations from our Year 1 evaluation.

Bridge Programs - Dr. Wendy Newstetter, Education Lead for Georgia Tech, led a session on recommendations for "Bridge" programs to support high-school students to enter and succeed in college.

Innovation and Entrepreneurship – Dr. Colleen Bronner invited Dr. Cleveland Justis, Executive Director of the Institute for Innovation and Entrepreneurship at UC Davis, to facilitate an engaging session on the elements of a successful innovation and entrepreneurship program.

Safe Zone Training - Dr. Colleen Bronner, Education Lead for UC Davis, and her students facilitated a highly engaging interactive session on Safe Zone Training. IDEA group participants learned ways to better support the LGBTQIA community in engineering fields, and strategic plans for outreach to students.

Summer Programs and Ongoing IDEA programs for Year 2 and into Year 3 – Dr. Jean Larson, Education Coordinator, and Dr. Susan Brown, Pre-College Director, along with Dr. Bronner and Dr. Newstetter, led a working discussion of activities planned and developed at each partner institution, along with planning for our Summer 2017 Research Experience programs for teachers, high-school students and undergraduates.

High School Student Verma Wins Women in Geoscience Award

Alisha Verma, an Arizona high school student, working with CBBG graduate student, Miriam Woolley, on research through the SCENE project, created a poster and presentation for the Arizona Science and Engineering Fair, and won a Women in Geoscience Award for her project, "The Use of Enzyme-Induced Carbonate Precipitation for Erosion Control!"

Krajmalnik-Brown Receives Research Funds from Simons Foundation



Dr. Rosa Krajmalnik-Brown, CBBG Thrust 2 Leader, received \$82,126 from the Simons Foundation for her research project, "Targeting Immune System Activation in ASD Models with Probiotic Therapies." The Simons Foundation funds projects that advances research in basic science and mathematics.



Dr. Ed Kavazanjian kicking off the Mid-Year Meeting



Dr. Dan Wilson shows the CGM centrifuge at UC Davis



CBBG students sharing research work

Diversity & Inclusion

Saenz Named CBBG Diversity Director



Dr. Delia Saenz of Arizona State University agreed to become the new Diversity and Inclusion Program Director for the CBBG ERC. Dr. Saenz has extensive experience with diversity enhancement, including enhancing diversity within the structure of an ERC.

Dr. Saenz is an Associate Professor of Psychology and was formerly Vice Provost for Undergraduate Education at ASU. Dr. Saenz has disciplinary expertise in the diversity space and extensive experience in advancing inclusion at Center and institutional levels. She conducts research and publishes on diversity and inclusion, and is a frequent consultant to higher education institutions, industry and other NSF ERC's in this area.

Dr. Martha Mitchell of New Mexico State University will work with Dr. Saenz as Associate Director for Diversity and Inclusion Programs.

The CBBG Diversity Team has been developing a center-wide diversity and inclusion strategic plan that engages transformational thinking and aspirations in all areas/functions of the Center, including measurements, group dynamics, workforce development, evaluation, curriculum development and leveraging with organizations and university partners, to effect institutional changes and address underserved students' challenges.

Diversity Webinars Presented at CBBG

"Strategies for Supporting Veteran Students for Academic Success" was presented on February 6, 2017, by Steve Borden, Director of Veteran Services at the ASU Pat Tillman Veteran's Center, and Nancy Dallett, Assistant Director, ASU Office for Veteran and Military Academic Engagement.

"Exploring Diversity and Equity Issues Emerging in Higher Education Across the Nation" was presented by Mary Prentice, Educational Leadership and Administration at NMSU and Monica Torres, Dona Ana Community College on February 27, 2017.

"Mentoring Presentation for Center for Bio-mediated and Bio-inspired Geotechnics" was presented on November 30, 2016 by Dr. Erika Camacho, Associate Professor & Barrett Honors College Faculty, School of Mathematical & Natural Sciences, Arizona State University.

Engaging Individuals with Disabilities in ERC Video

Please take a few minutes of your time to view this new video about engaging people with disabilities in our ERC: <http://www.washington.edu/doi/videos/index.php?vid=70> Dr. Delia Saenz, CBBG Diversity Director, and Dr. Wilhelmina (Willi) Savenye, CBBG Education Director, are featured in the video.

This video produced by AccessERC was funded by the National Science Foundation (NSF), and is led by the CSNE Diversity Director, Sheryl Burgstahler, and CSNE Diversity Manager, Scott Bellman, at the University of Washington. The goals of AccessERC are: (1) to make ERC activities and products welcoming to, accessible to, and usable by people with disabilities; and (2) to increase the engagement of individuals with disabilities in ERCs.

As Dr. Raj Rao shares in the video, "ERCs are designed to have huge impact in society by solving some of the major challenges in engineering that society is currently facing. And in order to have that kind of impact and to solve these important problems, we need to include every section of society, including people with disabilities, in all aspects of ERCs."

Bandini Honored with Endowed Professorship

Dr. Paola Bandini received the Wells-Hatch Family Endowed Professorship in Civil Engineering, starting January 2017. The Wells-Hatch Professorship recognizes an associate or full professor in the NMSU Civil Engineering Department, who exemplifies excellence in teaching, research and service.



Dr. Paola Bandini and her husband, Williams E. Romero, at the NMSU College of Engineering Awards Banquet Spring 2017.

Industry & Innovation

Industry Partner Webinars

Several CBBG Industry Partners and friends have presented webinars to CBBG during Year 2:



November 10, 2016: "Evaluation of the Combined Use of BOF Slag and Sugarcane Bagasse for the Passive Remediation of Acid Mine Drainage" – Dennis G. Grubb, PHD, PE, Vice President for Research, Development and Technical Sales at Phoenix Services, LLC.



November 21, 2016: "Protecting Your IP: What, When and How" – Dr. Phil Dowd, Director of Intellectual Assets, Arizona Technology Enterprises, LLC, Arizona State University.



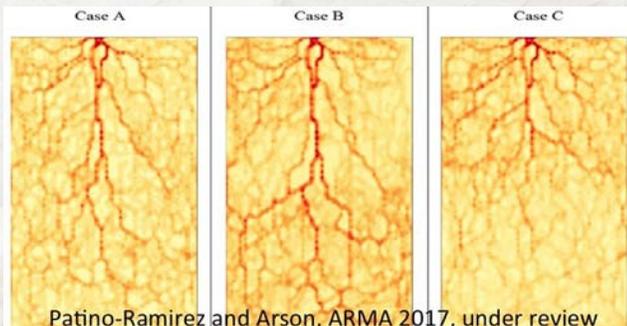
February 24, 2017: "Quantitative Passive Vapor Sampling with the Waterloo Membrane Sampler" – Dr. Isaac B. Roll, Senior Staff Engineer, Geosyntec Consultants.

GT Researchers Visit ORNL



GT CBBG researchers Fernando Patino, Wencheng Jin and Dr. Chloe Arson visited collaborators at ORNL in March 2017. They can be seen in the photo, fully equipped to visit the clean room, where researchers design materials by

assembling molecules and flowing electrons through them. This work is part of the CBBG project that Dr. Arson is leading on Bio-inspired design of subsurface networks.



In the past few months, Dr. Arson and her colleagues and collaborators have been working on the calibration of the Root System Architecture (RSA) software program against images of plant root growth experiments conducted at ORNL and this has led to improvements in the RSA code to account for the presence of obstacles in the ground and for the flow of water and nutrients both in the soil and in the xylems.

CBBG Attends Phoenix Indian Center Silver & Turquoise Ball



Dr. Nasser Hamdan, CBBG Industrial Collaboration & Innovation Director, and his wife, Dr. Abeer Hamdan, attended the Annual Silver & Turquoise Ball, a signature fundraising event hosted by the Phoenix Indian Center, an education partner of the Center for Bio-mediated & Bio-inspired Geotechnics (CBBG).

This year's event was held at the beautiful Hyatt Regency in Downtown Phoenix. The event featured a silent auction, followed by a live auction, after dinner in the luxurious main dining room. Guests enjoyed a delicious three-course dinner reflecting the unique tastes of American Indian cuisine that was prepared by American Indian Chef Freddie Bitsoie.

After dinner, guests were treated to live performances featuring traditional and modern cultural entertainment. Indeed, the highlight of the evening was the American Indian dancers adorned in brightly colored and intricate American Indian clothing and regalia. These performers skillfully displayed their traditional dance and singing, immersing the audience completely in the evening's cultural experience.

However, the most impressive aspect of the Silver & Turquoise Ball was the Phoenix Indian Center youth who attended this event. These young high school students served as hosts and greeters throughout the evening. Elegantly dressed, these young professionals exhibited exceptional enthusiasm and sincerity, which added to the wonderful experience. These youths are indicators of the incredible work the Phoenix Indian Center undertakes in its mission to serve the American Indian community.

Jose N. Pasillas-Rodriguez of NMSU is featured in the "Dream Big New Mexico" video. In this 25-minute video of the New Mexico Section of the American Society of Civil Engineers, Jose shares his motivations to become an engineer, and his experiences throughout the journey. The video was unveiled at the 62nd Transportation Engineering Conference. Watch it at: <https://www.youtube.com/watch?v=ow3nAFSi2Vs>



Partner Universities

UC DAVIS
UNIVERSITY OF CALIFORNIA

ASU ARIZONA STATE
UNIVERSITY

NM
STATE
UNIVERSITY

 **Georgia Institute
of Technology**



How does nature do it?

Nature has developed elegant, efficient and sustainable biologically-based solutions to many challenges that vex geotechnical infrastructure systems. Examples include ant excavation processes that are 1000 times more energy efficient than man-made tunneling machines, carbonate cemented sand that is exceptionally resistant to erosion and earthquakes, and self-sensing and self-healing tree root structures that are 10 times more efficient than any mechanical soil reinforcing/foundation system yet devised.

The NSF Engineering Center for Bio-mediated and Bio-inspired Geotechnics (CBBG) will focus on ecologically friendly, cost-effective solutions, inspired by nature, for development and rehabilitation of resilient and sustainable civil infrastructure systems. It will serve as a nexus for two transformative trends in engineering: biologically-based design and sustainability.



CBBG is a National Science Foundation (NSF) Engineering Research Center funded in 2015 under cooperative agreement EEC-1449501, and headquartered at Arizona State University.



biogeotechnics.org

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Engineering
Arizona State University