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Welcome to Houston

Welcome to Houston and to ARMA's 50th US Rock Mechanics/ Geomechanics Symposium. These international and multidisciplinary annual symposia have become the focal point for the geomechanics and rock mechanics communities. They serve to enlighten our members with the newest developments in geomechanics and rock mechanics, to allow a level of networking within the rock mechanics and geomechanics communities not achievable elsewhere and allow our members to present their newest work.

Thanks to the submissions of our colleagues and the tireless efforts of our Technical Program Committee (Colleen Barton, Doug Stead, Ed Wellman, Gang Han, and Doug Blankenship), we have a record number of 398 technical papers to present to you. In addition, five keynote addresses will be given by world renowned scientists; six technical workshops will precede the symposium.

Houston is a dynamic and cosmopolitan city with a tremendously diverse array of things to do and places to see. We hope you take time to enjoy the city's cultural, scientific, sports, gourmet, and shopping experiences. As the international center of the petroleum industry, we hope you can take advantage to expand your interactions and contacts with the peotroleum geomechanics community.

I would like to thank the entire Organizing Committee, the sub-committee chairs, our Executive Director Peter Smeallie and his team, and the Board of ARMA for the help and support in putting together the largest and most diverse and multidisciplinary ARMA symposium yet. Growth in our symposia and membership is a sign of the effectiveness of the organization in bringing value to its members and that growth enhances the usefulness of the symposium to our members' careers and scientific endeavors.

Kind regards,
David Yale
Symposium Chair

Acknowledgements

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General Information

Exhibit Hall

3rd Level Galleria Foyer and 4th Level Prefunction Area

The exhibit hall hours are:

- Sunday, 26 June, 7:00 pm – 9:00 pm
- Monday, 27 June, 8:30 am – 5:00 pm
- Tuesday, 30 June, 8:30 am – 5:00 pm

Registration and Speaker Ready Room

Registration is open in the West Alabama Foyer during the following hours:

- Friday, 24 June, 7:30 am-8:00 am: Pre-registered packet pick-up and onsite registration *for Friday's workshops only.*
- Friday, 24 June, 8:00 am-10:00 am: Pre-registration packet pickup and onsite registration *for symposium.*
- Saturday, 25 June, 7:30 am-8:00 am: Pre-registered packet pick-up and onsite registration *for Saturday's workshops, short course and technical tour only.*
- Saturday, 25 June, 8:00 am-10:00 am: Pre-registration packet pickup and onsite registration *for symposium.*
- Sunday, 26 June, 7:30 am-8:00 am: Pre-registered packet pick-up and onsite registration *for Sunday's workshops and short courses only.*

Registration moves from the West Alabama Foyer to the Galleria Foyer on Sunday and is open during the following hours:

- Sunday, 26 June, 8:00 am-9:00 pm: Pre-registration packet pickup and onsite registration.
- Monday, 27 June, 7:00 am–6:45 pm: Pre-registration packet pickup and onsite registration.
- Tuesday, 28 June, 7:00 am–6:30 pm: Pre-registration packet pickup and onsite registration.
- Wednesday, 29 June, 7:00 am–2:00 pm: Pre-registration packet pickup and onsite registration.

The speaker ready room is located in the *Tanglewood Room* just off the Galleria Foyer. A laptop and projector will be available. The speaker ready room will be available during the same hours as the

registration desk. Please see the registration desk for access to this room.

Short Courses
Two short courses are offered:

- Saturday and Sunday, 25-26 June, Shale Gas GeoEngineering—*Kirby Room*
- Sunday, 26 June, Modeling of Coupled Hydro-Mechanical Deformation and Fracturing Processes in Geomechanics

Separate registration required for each.

Speakers Breakfast
Monarch Room, 24th Floor—Podium speakers, and session chairs are required to attend the speaker's breakfast on the day of the speaker presentation. Poster presenters are invited to attend the breakfast on the day of their presentation. Please bring the appropriate ticket. Breakfasts begin at 7:00 am in the Monarch Room 24th floor of the hotel. Tables will be identified by session number. Podium speakers will load presentations via a portable USB storage device to the session laptop. In addition to uploading presentations, podium speakers will be able to meet the session chair(s). Speakers should bring 1 or 2 written biographical sentences, so that the session chair can prepare an introduction.

Special Activities
There are four special activities offered:

Sunday, 26 June, Johnson Space Center

Monday, 27 June, Houston Museum of Natural Science/Museum of Fine Arts

Monday, 27 June, Texas Barbeque and Lab Tour

Tuesday, 28 June, Houston City Double Decker Bus Tour -

Student Career Reception
Student registrants are invited to a reception on Tuesday, 28 June from 6:00 pm-7:00 pm in the Monarch Room on the 24th Floor. There recognized rock mechanics and geomechanics ARMA members will be available to discuss career options and other issues of concern to student members.

Technical Tours
There are two technical tours offered:

- Saturday, 25 June. Introduction to Oil Well Drilling and Visit to Ocean Star Offshore Drilling Rig & Museum
- Thursday, 30 Jun, Spindletop

Workshops
There are six workshops offered:

- Friday and Saturday, 24-25 June, ARMA/AAPG SedHeat Workshop on Successful Engineering of Sedimentary Geothermal Systems—Chevy Chase
- Friday, 24 Jun, Workshop on Hydraulic Fracturing—Plaza I
- Saturday, 25 June, Geomechanics in Unconventionals Workshop for Asset Teams—Westchester
- Saturday, 25 June, How Laboratory Geomechanics Testing Adds Value to Exploration and Production—Sage
- Sunday, 26 June, Workshop on Microseismic Geomechanics from Laboratory to Field Scale Across All Industries—Westchester
- Sunday, 26 June, ARMA Future Leaders/Students Open Discussion: "What's Your Problem?—San Felipe

Separate registration required for each.

Other Scheduled Meetings

- Sunday, 26 June, ARMA Board of Directors Meeting—River Oaks
- Sunday, 26 June, Meeting of the Houston 2016 Organizing Committee—Bellaire
- Sunday, 26 June, ISRM Petroleum Geomechanics Commission Meeting—Sage
- Sunday, 26 June, Meeting of Symposium Student Assistants—Post Oak
- Monday, 27 Jun, Lunch Meeting of the ARMA Publications Committee—San Felipe
- Monday, 27 June, Lunch Meeting of the ARMA Website Committee—Kirby

- Monday, 27 June, ASCE Rock Mechanics Committee Meeting—Westchester
- Monday, 27 June, Lunch Meeting of the Houston 2016 Organizing Committee—Sage
- Monday, 27 June, ARMA Fellows Dinner and Meeting—Houston Club
- Tuesday, 28 June, Lunch Meeting of the ARMA Future Leaders—San Felipe
- Tuesday, 28 June, Meeting of the ARMA Technical Committee Chairs—Westchester
- Wednesday, 29 June, Lunch Meeting of the Houston 2016/SF 2017 Organizing Committees—Sage

Sponsors

The 50th U.S. Rock Mechanics/Geomechanics Symposium is pleased to acknowledge the following corporate sponsors. To all our sponsors, our sincere thanks.

Agapito Associates Inc., *Sponsor of the 30 June Symposium Awards Banquet*

Golder Associates, Inc., *Sponsor of three Coffee Breaks*

Itasca International Inc., *Sponsor of the Symposium Delegate Bags*

Metarock Laboratories, Inc., *Sponsor of Texas BBQ, Coffee Break, and Symposium Proceedings USB*

MTS Systems Corp., *Sponsor of the MTS Lecture and Reception*

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Exhibitors

ADAM Technology *www.adamtech.com.au*
Supplying photogrammetry software and systems for mining, civil, geotechnical, geologist sectors in aerial, terrestrial and underground applications

Altair Engineering *www.altair.com*
Altair develops simulation technology to accelerate mechanical earth modeling while optimizing recovery designs, processes and decisions for improved field performance. The Geomechanics Director allows engineers and scientists, especially the rock mechanics and Geology teams in Oil and Gas companies, to build numerical models from subsurface geology quickly, accurately and efficiently.

Association of Environmental & Engineering Geologists (AEG)
www.aegannualmeeting.org
Professional organization to advocate the professions of Environmental & Engineering Geology

DCI Corporation *www.dcitestsystems.com*
DCI offers a wide variety of systems and components for rock mechanics and core analysis. This included pulseless, continuous flow syringe pumps, core holders, accumulators, rock compressibility systems, etc. We specialize in customizing systems and components to meet your specific testing requirements.

ESG Solutions *www.esgsolutions.com*
ESG Solutions is a world leader in passive microseismic monitoring. ESG monitors and locates seismicity in mines helping engineers to understand how rockmass is responding to mining activities. ESG monitors stimulation and production activities in oil and gas operations and provides insights that help to mitigate risk and improve productivity.

GCTS Testing Systems *www.gcts.com*
GCTS provides a full line of computer servo-controlled testing systems for rocks, soils, pavements, and construction materials. Advanced systems for Triaxial, Direct Shear, Point Load, Indirect Tension, Hydraulic Fracture, Poly-Axial, Hollow Cylinder, Ultrasonic, and other specialized equipment including high-pressure/high temperature triaxial cells. For more information about our testing equipment, please visit our web site at *www.gcts.com*

GDS Instruments *www.gdsinstruments.com*
GDS Instruments (A division of Global Digital Systems Ltd) designs, develops and manufactures materials testing machines and software used for the computer-controlled testing of soils and rocks. This technology is used to evaluate the mechanical properties that are key in geotechnical and earthquake engineering design

Geomechanica *www.geomechanica.com*
Geomechanica develops innovative geomechanical simulation software (Irazu), provides simulation-aided consulting services for rock engineering applications, and offers rock mechanics laboratory testing services. Irazu is a general-purpose simulation package to model deformation and fracturing of geomaterials in petroleum, mining and civil engineering applications.

GeoMechanics Technologies *www.geomechanicstech.com*
GeoMechanics Technologies is the industry leader in the geomechanical analysis of Reservoir compaction and surface subsidence, Well damage risk analysis and design optimization, Shale fracture mechanics , Geothermal reservoir geomechanics, Gas storage geomechanics, Salt deformation and salt cavern analysis, E&P Injection Well Design, Permitting and Monitoring

Golder Associates *www.golder.com*
Golder is a global, employee-owned organization providing independent consulting, design, and construction services in our specialist areas of earth, environment, and energy.

Itasca Consulting Group *www.itascacg.com*
An engineering consulting and software development company, Itasca specializing in solving complex geomechanical, hydrogeological, and microseismic issues in mining, civil, oil & gas, and power generation. Itasca combines practical engineering with expert knowledge of advanced numerical simulation. Itasca's software products (3DEC/FLAC/FLAC3D/UDEC/PFC) are among the most popular software of their kind.

MetaRock Laboratories, Inc. *www.metarocklab.com*
A unique, diversely skilled company, MetaRock Laboratories has been providing a range of Automated Integration Solutions, Testing Systems and Services since 1996. Our custom-designed products, built to simulate and withstand very high temperatures and pressures, service a high-value segment in the Oil & Gas, Mining, Geotechnical & Medical Industry.

Mirarco Mining Innovation *www.mirarco.org*
The MoFrac software tool generates three-dimensional discrete fracture networks honouring geological observations. MoFrac DFNs are structurally plausible and visually realistic. With numerical modeling tools, these DFNs can be used for geo-engineering assessments related to excavation stability and fluid transport in fractured rock masses. MoFrac is developed by MIRARCO Mining Innovation.

MTS *www.mts.com*
MTS is a leading supplier of rock mechanic test systems. Offering extensive expertise in supporting today's most critical geological material evaluation application like ultrasonic velocity, fracture toughness, polyaxial testing and many more. MTS delivers a full range of high-performance hardware, software, and accessories required to meet challenging rock testing requirements.

Rocscience *www.rocscience.com*
Rocscience Inc. was formed in 1996 in Toronto, Ontario, Canada. The company now has over 6,500 customers and distributes 14 Windows based software packages to customers in over 115 countries. As a spin-off company from the University of Toronto, we have continued the evolution of ideas and technology over the years, creating new software products in the field of geomechanics while maintaining a close connection to the research environment.

Sandia National Laboratories *www.sandia.gov*
Introduction of Geomechanics and Poromechanics Experimental Capabilities and Research & Development Programs at Sandia

Softrock Solutions *www.softrock.com.au*
Softrock Solutions provide automated prism deformation monitoring systems for civil and mining applications. With customised software we are able to visualize datasets without the erroneous readings to reveal the true deformation.

TNO DIANA BV *www.tnodiana.com*
TNO DIANA BV was established in 2003 from the Computational Mechanics department of TNO Building and Construction Research Institute in The Netherlands. Building on over 30 years of research and experience, the company provides world-class software products and consultancy services in the field of finite element solutions dedicated to civil, geotechnical, earthquake, and petroleum engineering.

Keynote Presentations

MTS Lecture

Sunday, 26 June, 6:30 pm – 7:15 pm

Underground Rock Engineering to Match the Rock's Behaviour — A Fresh Look at Old Problems

Peter Kaiser, Professor Emeritus, Laurentian University, Sudbury, Canada

In the spirit of the conference theme of the 50th US Rock Mechanics Symposium, this lecture will address one of many prerequisites for "exciting advances in rock mechanics", i.e., the need to fully comprehend the rock mass behavior before solving "practical issues" in rock engineering. In most engineering fields it is possible to select the best fitting, artificial materials for a given engineering solution. In rock engineering however, a misfit between the behavior of a natural material, the rock, and a chosen engineering solution often leads to serious complications with costly project delays or rehabilitation works and sometimes with unacceptable safety risks. Proper rock engineering means to fit the engineering solution to the actual rock mass behavior!

Overcoming the challenge of matching the rock behavior with meaningful engineering models and design parameters is therefore a prerequisite for advances in rock mechanics and for successful rock engineering. This lecture will highlight some recent advances in understanding rock mass behavior for the design and construction of underground excavations. By building on recent experiences, the lecture will focus on: rock mass behavior of highly stressed ground, including stress and strength variability in heterogeneous rock masses; challenges in obtaining meaningful design parameters for suitable modelling tools; and deformation-based design principles for support design in stress-fractured ground. The audience will be challenged to achieve the theme of the conference by following both a qualitative and quantitative observational path of discovery, as originally promoted by Ralph Peck in 1969, i.e., to follow an "old approach" to overcome "new challenges."

Guest Speaker

Sunday, 26 June, 6:15 pm – 6:30 pm

Engineering in Fractured Rock Masses

Charles Fairhurst, Senior Consultant, Itasca Consulting Group, Inc., Minneapolis; Professor Emeritus, University of Minnesota, Minneapolis, USA

Keynote Address

Monday, 27 June, 10:00 am – 10:50 am

Jean-Claude Roegiers, Professor Emeritus, Mewbourne School of Petroleum & Geological Engineering, University of Oklahoma, Norman

In the past fifty years, geomechanics played an important role in the development of subsurface resources. In particular, the last three decades have witnessed rapid growth in applications in the energy sector, from exploration to abandonment. A selected number of diverse case studies will be presented to highlight the impact and valuable lessons that have been learned; including some technical innovations as well as observations still 'crying' for an acceptable scientific explanation.

First ARMA Distinguished Lecture

Tuesday, 28 June, 10:00 am – 10:50 am

Comments and Observations on the Analysis of Discontinuous Rock Masses in Rock Engineering

Richard Goodman, Cahill Professor of Geotechnical Engineering Emeritus, University of California–Berkeley

Keynote Address

Wednesday, 29 June, 10:00 am – 10:50 am

William L. Ellsworth, Department of Geophysics, Stanford University, Stanford, California

Industrial activities have the potential to induce earthquakes as an unintended consequence of a wide range of actions including impoundment of water, creation of voids, and the extraction or injection of fluids in the subsurface. They cause earthquakes by disrupting the balance between the natural forces that promote and resist fault slip.

Earthquake activity in the central U.S. increased dramatically since 2009 as a consequence of changing practices for the production of oil and gas from low-permeability formations. Although hydraulic fracturing has been widely discussed as a cause, it does not appear to be a significant contributor to the increased seismic activity. Rather, these induced earthquakes are caused by disposal of unprecedented volumes of wastewater by injection into deep, undepleted formations.

Unlike the hazard of natural earthquakes, the hazard of induced earthquakes and the risk they pose can be managed. A key challenge is to develop an operational earthquake forecasting capability that anticipates where activity may either initiate or shut-off in response to changing industrial drivers. This will require a deeper understanding of the physical processes and conditions that link human perturbations to the Earth system to its response in seismic events.

Technical Tours

Introduction to Oil Well Drilling and Visit to Ocean Star Offshore Drilling Rig & Museum

Saturday, 25 June 2016; 9:00 am – 5:00 pm

The first part of this tour will feature an explanation of the process of constructing a well starting with a seismic evaluation ofpotential hydrocarbon production. Drilling a well is a complex endeavor requiring the services of many technology experts. A discussion of the components of the rig, the drill string, the drill bits, and drilling fluid systems will reveal the latest techniques used to create a well bore. This background is needed to appreciate in-depth discussions of protection of all potable (fresh) water; the interaction of the drill bit/formation rock (rocks behavior is different when pressure is applied), creating drilling fluid which has a low viscosity at the drill bit but a high viscosity to bring cuttings to the surface; measurements of formation properties to reveal hydrocarbon content; how high-angle (horizontal) holes are drilled; and more.

Then it's on to Galveston where participants will board the retired jackup drilling rig Ocean Star. The museum features three floors of models and interactive displays illustrating the story of offshore oil and gas from seismic technology to exploration and production. Actual drill bits, drill pipe and collars, draw-works, cementing units, logging equipment, remotely-operated vehicles (ROVs) and scale models of production platforms, as well as videos and exhibits explain drilling, geology, seismic, well servicing and production. Visitors can take the skywalk out onto the drill floor of the rig or visit the exhibits on the pipe deck from the first floor of the museum.

Spindletop

Thursday, 30 June 2015; 9:00 am – 5:00 pm

This trip goes to the site of the "Lucas Gusher," where on 10 January 1901 the discovery at Spindletop on a salt dome formation south of Beaumont gushed 100,000 barrels per day and helped to usher in the modern petroleum age. First stop is the Texas Energy Museum, where the focus will be on the early history of the Texas oil industry and the evolution of oil and gas well drilling. Participants will hear early drillers, Lucas and Patillo talk through demonstrations on reconstructed wooden oil derricks. The bus will then take the group to the reconstructed Gladys City Boomtown in Beaumont. Visitors to Gladys City experience 15 replica buildings filled with objects from the late-nineteenth and early-twentieth centuries that depict life during the first Spindletop oil boom. The group will have lunch at the Gladys City Saloon. Participants will learn about the history and geology of Spindletop and tour the reconstructed town as it would have existed in 1901. There will also be a chance to ask questions of the drilling gurus who have accompanied the group. After lunch and the Gladys City Museum visit, the bus will visit the site of the Lucas Gusher discovery well. Then it is back on the bus for the return trip to Houston.

Special Activities

Special Activity 1—Johnson Space Center

Sunday, 26 June, 10:00 am – 3:00 pm

The Johnson Space Center features more than 400 space artifacts, permanent and traveling exhibits, attractions and theaters related to the exciting future and remarkable past of America's human space-flight program. The Houston space center has the world's largest collection of moon rocks and lunar samples for public view.

Special Activity 2—Houston Museum of Natural Science/ Museum of Fine Arts

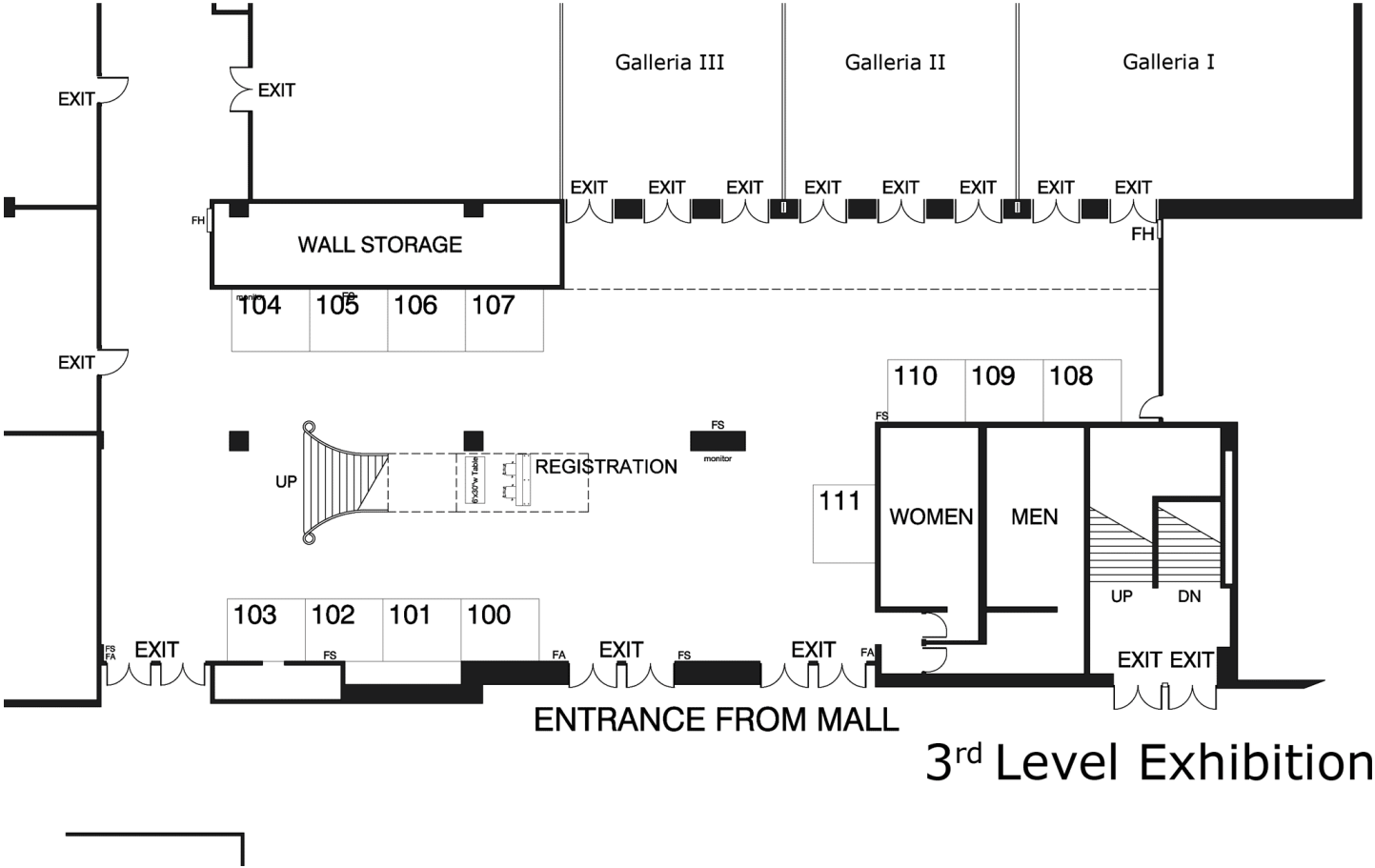
Monday, 27 June, 1:00 pm – 4:30 pm

This trip to the Houston Museum District features two of the nation's finest institutions: the Houston Museum of Natural Science and the Museum of Fine Arts. The world famous Cullen Hall of Gems and Minerals in the science museum contains more than 450 beautifully crystallized mineral specimens, including some of the world's rarest and most beautiful examples. In addition, you can explore the far reaches of outer space, roam with dinosaurs, and wander through Africa's Serengeti. Nearby, the Museum of Fine Arts is a dynamic cultural complex comprising two gallery buildings, a sculpture garden, visitors' center, library, movie theater, gift shop, café, two art schools, and two house museums.

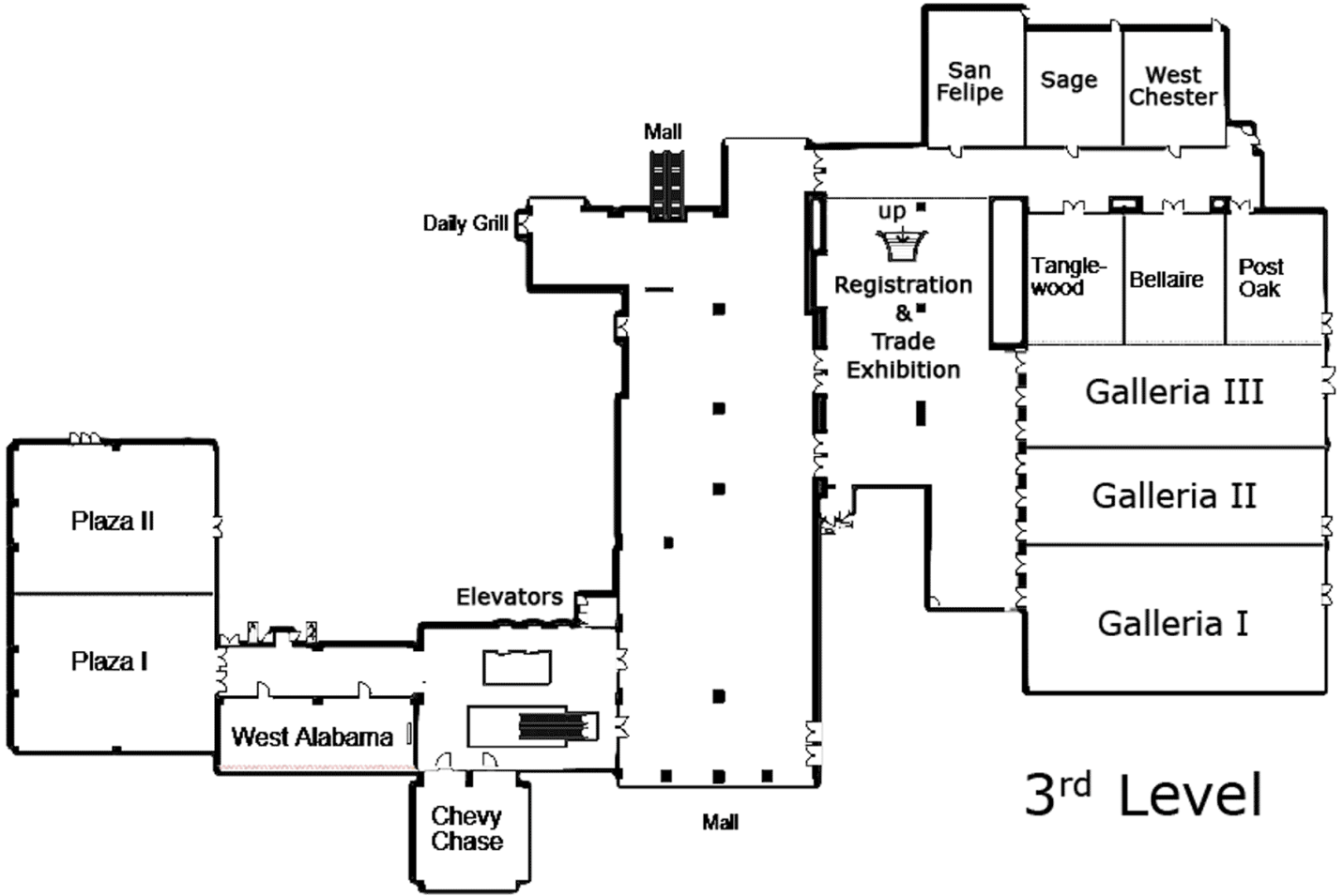
Special Activity 3—Houston City Double Decker Bus Tour

Tuesday, 28 June, 10:00 am – 12:00 noon

This open air double decker bus provides the best way to see Houston as your knowledgeable tour guide points out the highlights of America's fourth largest city. Admire the most symbolic and breathtaking Houston landmarks including: downtown city lights, Buffalo Bayou, Theater District, historic Texas Avenue, downtown city hall, Tranquility Park, Chase Tower, Market Square, stadiums, Discovery Green Park, museum district, Texas Medical Center, Rice University, monuments & fountains.



3rd Level Exhibition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Elevators
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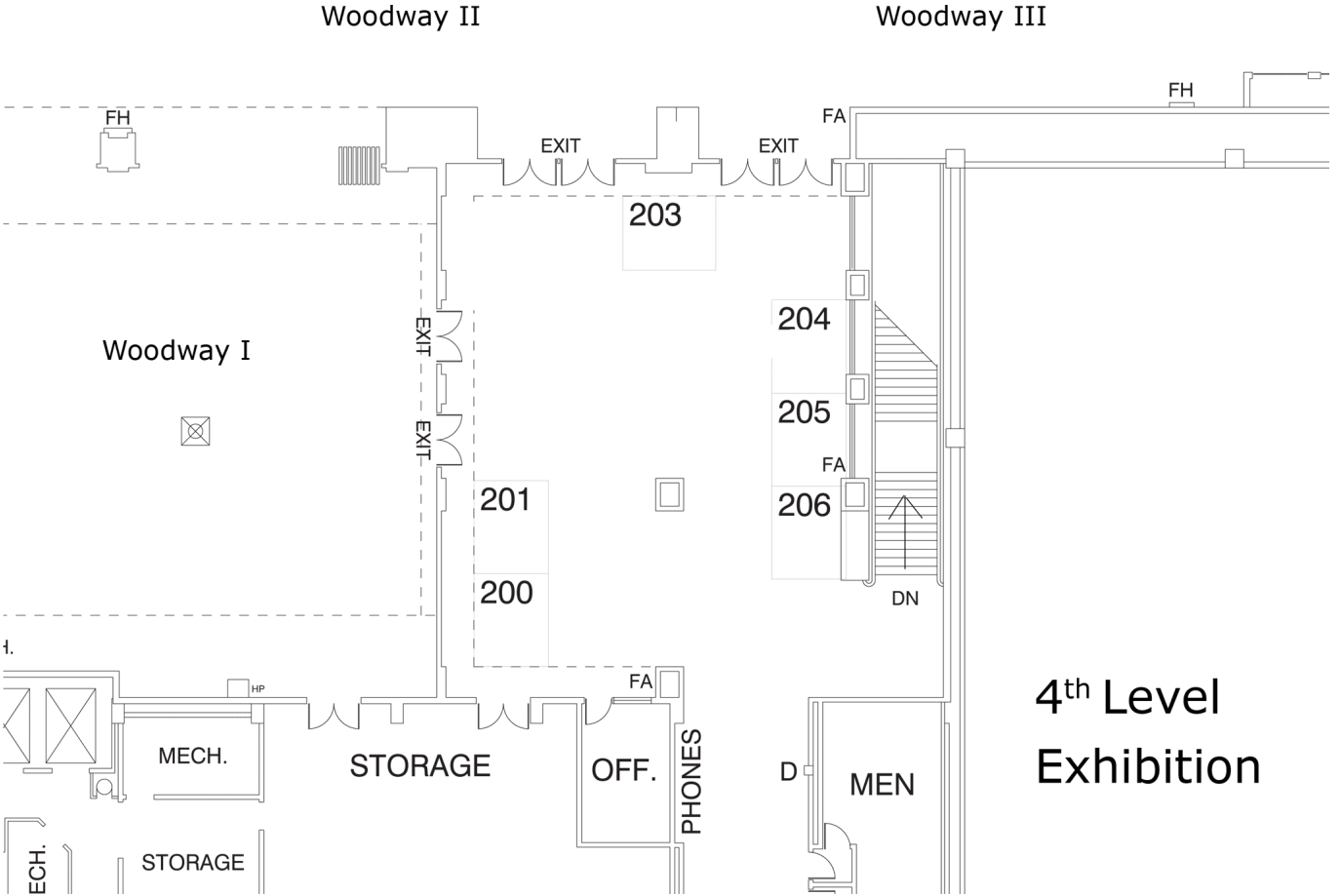
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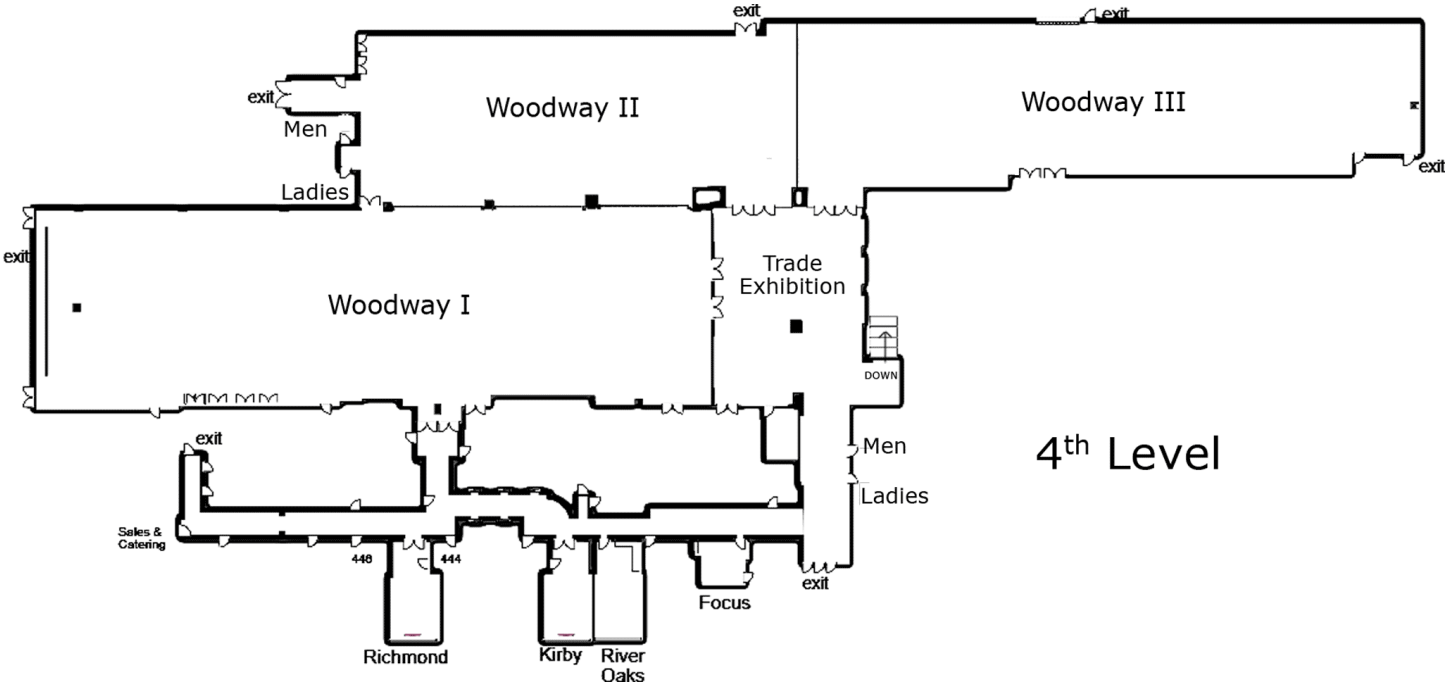
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Kirby
River
Oaks

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Monday, 27 June 2016				
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09:15 am-09:30 am	163 L. Zhuang Laboratory Study on Cyclic Hydraulic Fracturing of Pocheon Granite in Korea	49 P. Xing Experimental Study of Hydraulic Fracture Containment in Layered Reservoirs	683 L. Li Modelling Hole Failure Under Anisotropic Stresses Using Dem	371 D. Moronkeji Size Effects on Triaxial Strength Measurement and Brittle-Ductile Behavior of Carbonate Rock

Monday, 27 June 2016				
Time	Track a - Mining & Civil Technical Session 2 – Galleria III Geomechanics in Geothermal Processes 2	Track B - Fracturing and Fractures Technical Session 8 – Woodway II Fracture Mechanics - Physics and Models	Track C – Petroleum Technical Session 12 – Woodway III Drilling Geomechanics 1	Track D – Interdisciplinary Technical Session 16 – Woodway I Geology in Geomechanics
11:00 am-11:15 am	69 Q. Cheng Numerical Modeling of Newberry EGS Stimulation	32 S. Abbas Modeling Multiple Curved Fractures Connected through a Wellbore Using a Fluid-Coupled Xfem Algorithm	61 O. Oyedokun Theoretical Development on Morphology of Wellbore Toroidal Breakout	86 Y. Han Tensile Mechanical Behavior of Kerogen and Its Potential Implication to Fracture Opening in Kerogen-Rich Shales (KRS)
11:15 am-11:30 am	152 Q. Gao 3D Thermo-poromechanical Analysis of Reservoir Stimulation Using Damage Mechanics with Application to the Fenton Hill HDR Experiment	428 X. Hu Use of Coupled Geomechanics and Fluid Flow Model for Optimization of Multistage Hydraulic Fracturing and Horizontal Wells in Enhanced Geothermal System Applications	122 N. Brandao Modelling Cement Hardening in Pre-Salt Wells	437 K. Hull Modernized Mechanical Testing of Kerogen Rich Shales (KRS) by Monitoring in Situ
11:30 am-11:45 am	840 M. Plummer Primary Constraints on the Design of and Enhanced Geothermal System Reservoir	173 T. Hoeink Mechanisms-Based Fracture Model for Geological Materials	244 X. Li Numerical Modeling of Borehole Breakout in Ductile Formation Considering Fluid Seepage and Damage-Induced Permeability Change	545 B. Gao Stress and Porosity in Fold-and-Thrust Belt Systems
11:45 am-12:00 pm	841 P. Fu Revisiting Fenton Hill Phase I Reservoir Creation and Stimulation Mechanisms through the GTO Code Comparison Study	268 E. Dontsov Implementing a Universal Tip Asymptotic Solution Into An Implicit Level Set Algorithm (ILSA) for Multiple Parallel Hydraulic Fractures	318 J. Choi Effect of Non-linear Plasticity of Clay on Collapse Gradient for Deep Water Drilling	635 A. Ptaszynska Mineral and Organic Matter Constituents in Weak Interfaces in Shales
12:00 pm-12:15 pm	858 J. Bradford Application of Hydraulic and Thermal Stimulation Techniques at Raft River, Idaho: a DOE Enhanced Geothermal System Demonstration Project	531 R. Abedi Numerical Simulation of Rock Dynamic Fracturing and Failure Including Microscale Material Randomness	466 B. Wu An Experimental and Numerical Modelling Study on Stability of Boreholes with Pre-existing Breakouts	649 J. Avila Use of Borehole Images, Spectroscopy Data and Geology to Reduce Borehole Instability in Fractured Carbonates
12:15 pm-12:30 pm	860 J. Morris Parametric Study of Energetic Simulation for Geothermal Applications	792 M. Profit Applications of State of the Art Hydraulic Fracture Modelling Techniques for Optimized Design and for Enhanced Production	711 Y. Kang A Fast and Flexible Boundary Detection Algorithm for DEM Simulation	790 D. Roberts Investigation of the Coupled Mechanical-Thermal Evolution of Passive Continental Margins Incorporating Flexural Isostasy

Monday, 27 June 2016				
Time	Track a - Mining & Civil Technical Session 3 – Galleria III Rock Excavation, Breaking, Dynamic Loading	Track B - Fracturing and Fractures Technical Session 9 – Woodway II Rock Mass, Fault Zone, and Fractured Rock Characterization 1	Track C – Petroleum Technical Session 13 – Woodway III Subsurface Stress Modification	Track D – Interdisciplinary Technical Session 17 – Woodway I Coupled Processes - Flow and Thermal Responses
2:00 pm-2:15 pm	119 M. López Bendezú XFEM Simulation of Blast-Induced Crack Propagation in Rocks	88 R. Hunt Development and Application of a Site-Specific Rock Mass Classification Scheme for Wylfa Newydd New Build Nuclear Power Station in the UK	48 X. Ma Laboratory Investigation on Effective Stress in Middle Bakken: Implications on Poroelastic Stress Changes Due to Depletion and Injection	202 H. Yasuhara Predictions of Rock Permeability by THMC Model Considering Pressure Solution
2:15 pm-2:30 pm	393 M. Raffaldi Rock Mass Modeling Approach for Simulating Wave Propagation, Rock Fracture, and Rock Ejection	423 T. Ishibashi Exploring the Link between Permeability and Strength Evolution during Fracture Shearing	430 F. Rassouli A Comparison of Short-Term and Long-Term Creep Experiments in Unconventional Reservoir Formations	216 S. Broome Laboratory Gas Migration Experiments through Intact and Fractured Rock
2:30 pm-2:45 pm	424 B. Wu Influence of Hydrostatic Confining Pressure on the Dynamic Tensile Failure of Rock Material	476 A. Tsopela Hydro-Mechanical Modeling of Field Hydraulic Injection Inside a Fault Zone	35 M. Heidari Geomechanical Impacts of a Welding Salt Layer on Adjacent Sediments	517 J. Segura Estimating Drilling Conditions Based on Forward Modeling Along Wells, a Case Study including Mechanical and Chemical Compaction.
2:45 pm-3:00 pm	575 A. Adoko Developing the Ground Index (GI) for Rock Collapse Assessment in Tunneling	507 J. Park Creating a Digital Outcrop Model by using Hyper-Spectrometry and Terrestrial LiDAR	281 M. Davison The In-situ Stress Response of Reservoirs to Pressure Reduction followed by Pressure Increase: Depletion and Rebound Stress Paths from Two Case Studies	538 M. Ahmadi Feasibility Study of Heat Extraction from a Closed-loop Fractured Geothermal Reservoir; a Multiphysics problem
3:00 pm-3:15 pm	585 D. Deb Rock Failure Process in Indirect Tension using SPH Method	509 M. Petruzalek Fracturing of Migmatite Monitored by Acoustic Emission and Ultrasonic Sounding	385 y. wang Induced Stresses Around Staged Fractures and Impacts on SRV region in Low-permeability (Tight, Fractured and Shale) Formations	586 Q. Lei Influence of Stress on the Permeability of a Three-Dimensional Fractured Sedimentary Layer
3:15 pm-3:30 pm	758 N. Noraei Danesh Experimental Study of Impact of Creep on Coal Permeability	540 M. Bates Collecting Discontinuity Data at Kartchner Caverns Using LIDAR for the Purpose of Numerical Modeling	496 R. Holt Where Does the Stress Path Lead? Irreversibility and Hysteresis in Reservoir Geomechanics.	880 S. Elahi Geomechanical Simulation of Underground Coal Gasification

Monday, 27 June 2016				
Time	Track a - Mining & Civil Technical Session 6 – Galleria III Coal Mining Ground Control	Track B - Fracturing and Fractures Technical Session 10 – Woodway II Fracture Modeling of Initiation and Propagation	Track C – Petroleum Technical Session 14 – Woodway III In Situ Stress and Pore Pressure	Track D – Interdisciplinary Technical Session 18 – Woodway I Numerical Modeling of Salt and Soft Rock
04:30 pm-04:45 pm	182 P. La Pointe Mining Data in a Longwall Coal Mine to Predict Intersection Stability	412 J. Huang Hydraulic Fracture Growth and Containment Design in Unconventional Reservoirs	33 Y. Feng A Comparison Study of Extended Leak-off Tests in Permeable and Impermeable Formations	107 C. Zhu Damage and Healing Model of Stiffness and Permeability for Salt Rock: Microstructure Imaging, Fabric Processes and Continuum Mechanics
04:45 pm-05:00 pm	313 H. Maleki Application of Statistical and Computational Techniques for Analyses of Pre-Driven Longwall Recovery-Room Stability and Support Options	494 E. Gordeliy Modeling of Near-Wellbore Fracture Reorientation using a Fluid-Coupled 2D XFEM Algorithm	43 M. Nikolinakou Pore-Pressure Prediction Based on Seismic Velocities Coupled with Geomechanical Modeling	177 X. Shen Chemo-Mechanical Damage and Healing of Granular Salt: Micro-macro modeling
05:00 pm-05:15 pm	319 S. Sinha Analysis of Roof Control Plans for Improved Stability at Four-Way Coal Mine Intersections	534 F. Zhang Modeling of Hydraulic Fracture Initiation from Perforation Tunnels using the 3D Lattice Method	298 B. Sinha Determining Minimum and Maximum Horizontal Stress Magnitudes From Borehole Sonic Measurements in Organic Shales	239 C. Zhu Micro-Mechanical Analysis of Salt Creep Tests with a Joint-Enriched Finite Element Model
05:15 pm-05:30 pm	341 S. Mohanty Stability Evaluation of Two Parallel Declines Joining Multi-Seam Workings with Low Interburden Thickness	553 K. Das Multiple Intersecting Cohesive Discontinuities in 3D Reservoir Geomechanics	541 C. Chang Geomechanical characterization for the CO_2 injection test site, offshore Pohang Basin, SE Korea	581 J. Kemeny Modeling of Time-Dependent Rock Failure in Abaqus and PFC3D
05:30 pm-05:45 pm	521 D. Burkhard Properties of Immediate Above Seam Strata and their Relationship to Ground Control At San Juan Mine	439 A. Lisjak Development of a Fully-Coupled, Hydro-Mechanical Model for Finite-Discrete Element Simulations of Fluid-Driven Fracturing	691 A. Agharazi Determination of Maximum Horizontal Field Stress from Microseismic Focal Mechanisms - a Deterministic Approach	670 T. Defoort The Effect of Heterogeneities on Damage and Fracture Propagation in Rock under a Spherical Indenter
05:45 pm-06:00 pm	183 U. Alkan Investigation of Beam Specimen Geometries Under Four-Point Asymmetric Bending for Shear Mode Fracture Toughness Measurement of Rocks	175 L. Jin Including a Stochastic Discrete Fracture Network into One-Way Coupled Poromechanical Modeling of Injection-Induced Shear Re-Activation	887 J. Andrews Use of Unique Database of Good Quality Stress Data to Investigate Theories of Fracture Initiation, Fracture Propagation and the Stress State in the Subsurface	101 M. Liu Sphere Indentation - the Hertzian Stress Field and the Effect of Far-Field Confining Stress

Tuesday, 28 June 2016				
Time	Track a - Mining & Civil Technical Session 19 – Galleria III Slope Stability, Foundations, and Dams	Track B - Fracturing and Fractures Technical Session 25 – Woodway II Hydraulic Fracturing Case Studies	Track C – Petroleum Technical Session 29 – Woodway III Near-Wellbore Processes 1	Track D – Interdisciplinary Technical Session 33 – Woodway I Geophysics in Geomechanics
08:00 am-08:15 am	9 B. Lukajic Intake Slope Stabilization and Spillway Cut in Rock for Hydropower Projects	85 M. Ingraham Laboratory Scale Hydraulic Fracture of Marcellus Shale	160 B. Park Three-Dimensional Bonded-Particle Discrete Element Modeling of Transversely Isotropic Rock: Verification and Application to Laboratory Test on Shale	448 E. Um Application of Electrical and Electromagnetic Geophysical Methods for Detecting Hydraulically-Active Fractured Zones
08:15 am-08:30 am	27 Y. Fujii New Techniques for Monitoring and Analyzing the Stability of Steep Cliffs Against Rock Falls	125 E. Ghazvinian Application of 3d Random Voronoi Tessellated Models for Simulation of Hydraulic Fracture Propagation Within the Distinct Element Formulation	449 E. Martinez Numerical Investigation of Potential Cement Failure Along the Wellbore and Gas Leak During Hydraulic Fracturing of Shale Gas Reservoirs	524 S. Goodfellow Acoustic Emission Geomechanics of Hydraulic Fracturing in the Laboratory
08:30 am-08:45 am	384 N. Bar Empirical Slope Design for Hard and Soft Rocks Using Q-Slope	136 D. Kumar 3d Poroelastic Simulation and Analysis of Multiple Fracture Propagation and Refracturing of Closely-Spaced Horizontal Wells	479 B. Orlic Numerical Estimation of Structural Integrity of Salt Cavern Wells	713 A. Bilal An Investigation of Static and Dynamic Data Using Multistage Tri-Axial Tests
08:45 am-09:00 am	527 S. Zamiran Modeling of Swelling Rocks for Group Pier Foundation Applications	843 G. Kampfer A Novel Approach to Mapping Hydraulic Fractures Using Poromechanic Principles	560 A. Lavrov Coupling a Fracturing Code to a Transient Reservoir Simulator: a Hands-On Approach	729 Z. Xu Modification of Fracture Geometry by Calcite Precipitation
09:00 am-09:15 am	848 M. George Mechanics of 3d Rock Block Erodibility	481 E. Papachristos 3D Hydro-Mechanical Modeling of Multiple Injections	611 F. Kwok DEM Modeling of the Propagation of Stress-Induced Borehole Breakout in Shale Sample	803 F. Pourahmadian Active Seismic Imaging and Interfacial Characterization of Fractures
09:15 am-09:30 am	889 G. Chen Stability Analysis of Toppling Slope Using the Extended NMM	546 M. Mack Microseismic Geomechanics for Refracturing	734 A. Najafi On the Finite Element Based Uncertainty Quantification of Thermal Fracturing Using Embedded Multiple-Site Cohesive Zone Elements	879 H. Knox Imaging Fracture Networks Using Joint Seismic and Electrical Change Detection Techniques

Tuesday, 28 June 2016				
Time	Track a - Mining & Civil Technical Session 20 – Galleria III Numerical Modeling in Mining	Track B - Fracturing and Fractures Technical Session 26 – Woodway II Fracture Mechanics - Diagnostics and Measurement	Track C – Petroleum Technical Session 30 -- Woodway III Integrated Reservoir Geomechanics 1	Track D – Interdisciplinary Technical Session 34 – Woodway I Laboratory and Field Measurements - Analysis
11:00 am-11:15 am	144 A. Yardimci Crown Pillar Optimization for Surface to Underground Mine Transition in Erzincan/Bizmisen Iron Mine	90 J. Hampton AE Investigation of Multi-Wellbore Hydraulic Fractures at the Laboratory Scale	114 P. Bhardwaj A New Reservoir Scale Model for Fracture Propagation and Stress Reorientation in Injection Wells	351 T. Lokajicek Enhanced Study of Rock Elastic Anisotropy
11:15 am-11:30 am	219 D. Adhikary Estimating the Height of Mining Induced Connective Fracturing	123 J. Bai Laboratory-Scale Hydraulic Fracturing: Experiment and Numerical Modeling	141 H. Roshan On Size-dependent Uniaxial Compressive Strength of Sedimentary Rocks in Reservoir Geomechanics	502 L. Frash Comparison of Pressure, Flow Rate, Stepped, and Oscillatory Control Methods for Fracture Permeability Measurements at Triaxial Stress Conditions
11:30 am-11:45 am	225 M. Fuenzalida Case Study: Mechanisms of Dilution at Henderson Mine	191 S. Falser Reducing Breakdown Pressure and Fracture Tortuosity by In-Plane Perforations and Cyclic Pressure Ramping	172 S. Sarmiento A Novel Approach to model DFNs Validating the Geological Evolution with Present Day Fracture Distributions	620 J. Labuz Failure Criterion with Intermediate Stress and Two Friction Angles
11:45 am-12:00 pm	346 I. Tulu Roof Collapse Modeling with FLAC3D	233 F. Wan Numerical Three-point Bending Test of Fracture Process Zone in Post-peak Deformation of Rock	252 N. Barton Non-Linear Shear Strength Descriptions are Still Needed in Petroleum Geomechanics, Despite 50 Years of Linearity	651 S. Brown Sensitivity of Roughness Algorithms to Sampling Frequency for the Characterization of Weathered Limestone Specimens
12:00 pm-12:15 pm	394 M. Raffaldi Framework for Simulating Fracture, Ejection, and Restraint of Rock around a Mine Drift Subjected to Seismic Loading	503 L. Frash Notched Specimen Hydraulic Fracturing Method for Conducting Mechanical and Hydrological Experiments at Triaxial Reservoir Conditions	794 A. Pirayehgar Hydraulic Fracture Well Interconnections in Anisotropic Stress Fields	809 S. Yumsak The Predictability of Physico-Mechanical Properties of Pyroclastic Rocks From the Needle Penetration Index
12:15 pm-12:30 pm	588 L. Karimi Sharif Simulation of Rock Bridge Failure At the Laboratory Scale Using a Combined Fdem Modeling and Discrete Crack Network Approach	626 S. Maxwell Calibrated Microseismic Geomechanical Modeling of a Horn River Basin Hydraulic Fracture	455 J. Lee Comparison of Different Methods to Estimate Uniaxial Compressive Strength in a Barnett Shale	811 K. Kaklis Experimental Determination of the Maximum Indirect Tensile Stress Parameters for Dionysos Marble

Tuesday, 28 June 2016				
Time	Track a - Mining & Civil Technical Session 21 – Galleria III Slope Stability in Mines	Track B - Fracturing and Fractures Technical Session 27 – Woodway II Rock Heterogeneity Across Length Scales	Track C – Petroleum Technical Session 31 -- Woodway III Drilling Geomechanics 2	Track D – Interdisciplinary Technical Session 35 – Woodway I Hazards, Risks, and Induced Seismicity
02:00 pm-02:15 pm	206 H. Stockhausen On the Application of Rockfall Risk Assessment Techniques From Field Observation and Quarry Experience	421 S. Busetti Branch Line Analysis of Faults and Fractures	321 K. Agapiou Influence of Recycled Rubber Tire Morphology on the Mechanical Properties of Well Cements	149 M. Boltz Effects of a Three-Dimensional Velocity Structure on the Locations of Coal Mining-Induced Seismicity
02:15 pm-02:30 pm	224 R. Kaunda Data Driven Approaches to Designing Large Open Pit Slopes – Lessons From Engineering Geology	571 P. Kaiser Role of Large Scale Heterogeneities on In-Situ Stress and Induced Stress Fields	513 V. Dokhani Influence of Sorptive Tendency of Porous Medium on Hydraulic Properties of Shale	523 Z. Khademian Studies of Seismicity Generated by Unstable Failures Around Circular Excavations
02:30 pm-02:45 pm	354 P. Kulatilake 3-D Deformation Comparison Between Modeling and Field Data for An Open Pit Mine in Usa	682 J. Zhou Numerical Study of Critical Role of Rock Heterogeneity in Hydraulic Fracture Propagation	518 J. Segura Fault Stability Assessment for Well Planning: a Case Study Related to Salt Structures	525 D. Collins Use of Seismic Deformation and Stress Inversion Analysis to Help Improve the Understanding of Rock Mass Response to Excavation
02:45 pm-03:00 pm	373 D. Kumar A Fracture Mechanics Based Slope Stability Analysis with Application to Reclaimed Steep-Slopes	791 M. Bhuiyan The Influence of Rock Foliation on the Correlation Between Point Load Strength Index and Comminution Indices At Kinross Tasiast Mine	529 E. Pirayesh A Three-Dimensional Elastoplastic Finite Element Model to Determine Stress Distribution Around Boreholes Drilled in Compactible Rocks	279 F. Pereira Probabilistic Assessment of Casing Failure of a Typical Pre-Salt Wellbore Under Local Salt Dissolution Conditions
03:00 pm-03:15 pm	441 K. Andrews Improvements in Data Collection for Geotechnical Pit Slope Stability Assessment	890 N. Bahrani Strength Degradation Approach (SDA) for Estimation of Confined Strength of Micro-defected Rocks	643 S. Chen An Analytical Solution for Wellbore Stability Problem Using Strain Hardening Drucker-Prager Plasticity model	362 P. Papanastasiou Hydraulic Fracturing in CO2 Geological Storage
03:15 pm-03:30 pm	810 J. Silva Improved Signature Hole Analysis for Blast Vibration Control in Open Pit Mines	720 R. Thareja Parametric Analyses of Rock Support Design Parameters in Time Dependent Numerical Models	755 S. Elkatatny Application of Artificial Intelligent Techniques to Determine Sonic Time from well logs	169 A. Azhari Evaluating the Effect of Earthquakes on Open Pit Mine Slopes

Tuesday, 28 June 2016				
Time	Track a - Mining & Civil Technical Session 24 – Galleria III Numerical/Analytical/DEM Modeling in Geomechanics	Track B - Fracturing and Fractures Technical Session 28 – Woodway II DFN Fracture Characterization	Track C – Petroleum Technical Session 32 – Woodway III Waste Disposal and CO2 Sequestration	Track D – Interdisciplinary Technical Session 36 – Woodway I Coupled Processes: Chemical/Thermal/Biologic Influences on Geomechanics
04:30 pm-04:45 pm	99 X. Zhang Numerical Analysis of Borehole Breakouts with Size-Dependent Compressive Strength	40 M. Havaej Application of discrete fracture networks (DFN) in the stability analysis of Delabole Slate Quarry, Cornwall, UK	100 F. Pizzocolo Polymer-Gel Remediation of CO_2 Migration through Faults and Caprock: Numerical Simulations Addressing Feasibility of Novel Approaches	180 B. Lai Fracturing Fluids Effects on Mechanical Properties of Organic Rich Shale Mechanical Properties of Organic Rich Shale
04:45 pm-05:00 pm	587 Z. Bažant Vast System of Dense Intersecting Fractures: a Key Feature of Hydraulic Fracturing of Gas Shale	215 T. Hoeink Directional Permeability of Discrete Fracture Networks	410 W. Minkley Deep Borehole Disposal in Salt Rocks	300 W. Li Investigation of Thermal Effect of Fluid Injection into Unconsolidated Formation in Microscopic Numerical Modeling
05:00 pm-05:15 pm	113 M. Yetisir Up-Scaling DEM Simulations	625 D. Chorney Hydraulic Fracture Sensitivity Study with a Fully-Coupled Microseismic Geomechanics Model	495 Y. Fang Friction-Permeability Relationships for Reservoir Caprocks	710 T. Garipov Thermo-Hydro-Mechanical Model for Source Rock Thermal Maturation
05:15 pm-05:30 pm	142 D. San-Roman-Alerigi Evaluation of FEM and DEM Schemes to Model Thermal, Electromagnetic and Mechanical Effects in Laser-Rock Interaction – An Overview	777 D. Elmo Synthetic Rock Mass Modelling: Experience Gained and Lessons Learned	576 C. Wang Numerical Investigation of the Effect of Frictionally Weak Minerals on Shear Strength of Faults	267 Y. Gordin Ultrasonic Velocity and Anisotropy of Organic-Rich Chalks
05:30 pm-05:45 pm	647 A. Hedayat Stability of Circular Tunnels Excavated in Rock Masses Under Gravity Loading	878 M. Cottrell Deep Fluid Injection into Fractured Rock	120 S. Broome Laboratory Testing of Surrogate Nondegraded Waste Isolation Pilot Plant Materials	566 J. Carey Dynamic Triaxial Study of Direct Shear Fracturing and Precipitation-Induced Transient Permeability Observed by in Situ X-Ray Radiography
05:45 pm-06:00 pm	760 M. Rahjoo A Simplified Dilation Model for Modeling the Inelastic Behavior of Rock	882 S. Rogers DFN Modelling of Major Structural Instabilities in a Large Open Pit for End of Life Planning Purposes	583 Z. Sun Pore-scale Modeling of the Effect of Cementation on Rock Indentation Test	72 O. Shitrit Influence of Laboratory-Induced Maturation on Rock-Physics of Organic-Rich Chalks

Wednesday, 29 June 2016				
Time	Track a - Mining & Civil Technical Session 37 – Galleria III Mining Geomechanics	Track B - Fracturing and Fractures Technical Session 41 – Woodway II Fracture Mechanics - Fluid and Proppant	Track C – Petroleum Technical Session 45 – Woodway III Near-Wellbore Processes 2	Track D – Interdisciplinary Technical Session 49 -- Woodway I Induced/Triggered Seismicity
08:00 am-08:15 am	89 D. Dyk Open Pit Mining through Historic Underground Workings	38 K. Wu Numerical Study of Flow Rate Distribution for Simultaneous Multiple Fracture Propagation in Horizontal Wells	218 M. Tabatabei Partial Annular Cracks Around Cemented Casing Interfaces	151 D. Castineira Uncertainty Quantification and Inverse Modeling of Fault Poromechanics and Induced Seismicity: Application to a Synthetic Carbon Capture and Storage (CCS) Problem
08:15 am-08:30 am	186 C. Palleske Expansion of Geotechnical Knowledge by Data Mining of a Geology Database	121 J. Bai Coupled Geomechanics and Fluid Flow Computational Algorithm for Hydraulic Fracturing Simulation: Case Studies	417 C. Liu N-Porosity and N-Permeability Generalized Wellbore Stability Analytical Solutions and Applications	217 D. Dempsey Density of Induced Earthquake Hypocenters As a Proxy for Pore Pressure Increase During Well Stimulation
08:30 am-08:45 am	407 W. Minkley Longwall Caving in Potash Mining – Geomechanical Assessment of Damage and Barrier Integrity	444 J. Park Importance of Fluid Compressibility and Multiphase Flow in Numerical Modeling of Hydraulic Fracture Propagation	457 A. Mehrabian Wellbore Geomechanics of Extended Drilling Margins and Engineered Lost Circulation Solutions	360 Y. Mukuhira Stress State Analysis of a Fault Plane with Large Induced Seismicity
08:45 am-09:00 am	416 A. Russo A Methodology to Select Valid Results From Lab Tests to Estimate Properties of Intact Rock with Microdefects.	652 I. Tomac Particle Image Velocimetry Analysis of Proppant Settling in a Narrow Slot	482 E. Fjaer How Creeping Shale May Form a Sealing Barrier Around a Well	492 A. Stroisz Monitoring of Fracture Reopening in Sandstones
09:00 am-09:15 am	445 T. Chikande Stability Analysis and Preliminary Support Design for Longhole Stoping Prefeasibility Study of a Greenfield Platinum Project	883 X. Li Permeability Evolution and Proppant Compaction in Artificial Fractures on Green River Shale	694 O. Razavi Initiation and Propagation of Drilling Induced Fractures	589 M. Grob Effect of Fault Orientation on Induced Seismicity Associated with Multi-Stage Hydraulic Fracturing
09:15 am-09:30 am	861 C. Lu Experimental Research on Shear-Slip Characteristics of Zigzag-Type Gouge of Simulated Fault	413 R. Medina Effect of Confining Stress on Sand-Fiber Proppant Placement in a Deformable Fracture	874 K. Xia A New Perspective on Multistage Stimulation of Multiple Horizontal Wells	787 P. Selvadurai Numerical Modeling of Heterogeneous Asperity Distributions Controlling the Growth of Shear Rupture on a Frictional Fault

Wednesday, 29 June 2016				
Time	Track a - Mining & Civil Technical Session 38 – Galleria III Computational Advances in Geomechanics	Track B - Fracturing and Fractures Technical Session 42 – Woodway II Interaction of Induced and Natural Fractures	Track C – Petroleum Technical Session 46 – Woodway III Numerical Modeling in Petroleum Geomechanics	Track D – Interdisciplinary Technical Session 50 -- Woodway I Laboratory and Field Measurements- Results
11:00 am-11:15 am	135 Y. Yanagimura Optimal Sample Size for Managing Uncertainty in Hoek-Brown Strength Parameters	886 J. Morris The Combined Influence of Stress Barriers and Natural Fractures Upon Hydraulic Fracture Height Growth	150 O. Omidi Well Stimulation in Tight Formations: a Dynamic Approach	77 S. Read Geomechanics Properties From Laboratory Testing of Soft Rocks From Mount Messenger Formation, New Zealand
11:15 am-11:30 am	493 V. Baker Computational Advances and Data Analytics to Reduce Subsurface Uncertainty	363 J. Ter Heege Distribution and Properties of Faults and Fractures in Shales: Permeability Model and Implications for Optimum Flow Stimulation by Hydraulic Fracturing	237 E. Pirayesh An Algorithm for the Calculation of Material Tangent Stiffness Tensor using Extended Sandler-Rubin Cap Plasticity Model in Finite Element Analysis	108 T. Teklu Cyclic Permeability and Porosity Hysteresis in Mudrocks – Experimental Study
11:30 am-11:45 am	506 S. Nintcheu Fata Coupling Elasticity and Fluid Flow for a 3D Hydraulic Fracturing Solver	535 B. LEE Completion Optimization Using a Microseismically Calibrated Geomechanical Hydraulic Fracturing Simulation in a Naturally Fractured Formation	269 S. Akl Using Ellipsoidal Inclusion model to study shale gas mechanical anisotropy	261 J. Ding Mechanical Behavior and Microstructure Development in Consolidation of Nominally Dry Granular Salt
11:45 am-12:00 pm	516 O. Mahabadi Development of a new fully-Parallel Finite-Discrete Element Code: Irazu	582 R. Pramanik An SPH Approach to the Simulation of Hydraulic Fracture Propagation in Naturally Fractured Rock Medium	305 H. Florez A Novel Mesh Generation Algorithm for Field-Level Coupled Flow and Geomechanics Simulations	337 H. Zhao Laboratory Creep Strain Rate versus Deviatoric Stress for Sylvinite and Halite at Room and Elevated Temperatures
12:00 pm-12:15 pm	679 A. El Matarawi Load and Resistance Separation for Reliability Based Design in Rock Engineering	769 H. Lee The Interaction Analysis of Propagating Opening Mode Fractures with Veins using Discrete Element Method	520 J. Segura Coupling a Fluid Flow Simulation with a Geomechanical Model of a Fractured Reservoir	498 P. Boyd Creep Experiments on Welded Nonlithophysal Topopah Spring Member Tuff - Atypical Crystalline Rock Behavior
12:15 pm-12:30 pm	739 J. Simulation of Hydraulic and Natural Fracture Interaction Using a Coupled DFN-DEM Model	829 Z. Moradian Shear Reactivation of Natural Fractures in Hydraulic Fracturing	820 I. Gil The Combination of Innovative Completion Hardware and 3D Non-planar Fracture/Reservoir Simulation in Shale Completion Optimization	686 M. Dessouki The Impact of CEC, Silt Content, and Salinity on Multistage Triaxial Tests of Reconsolidated Mudrocks

Wednesday, 29 June 2016				
Time	Track a - Mining & Civil Technical Session 39 – Galleria III Underground Storage and Structures	Track B - Fracturing and Fractures Technical Session 43 – Woodway II Fracturing and Brittleness	Track C – Petroleum Technical Session 47 – Woodway III Depletion Induced Surface Subsidence	Track D – Interdisciplinary Technical Session 51 -- Woodway I Subsurface Integrity
02:00 pm-02:15 pm	320 S. Sobolik Implementation of a Full-Dome, Sonar-Based Finite Element Geomechanical Model to Analyze Cavern and Well Stability at the West Hackberry SPR Site	369 H. Fernau Load-Rate Dependence of Rock Tensile Strength Testing: Experimental Evidence and Implications of Kinetic Fracture Theory	47 L. Louis Using Maximal Inscribed Spheres for Image-Based Compaction Forecasting	37 R. Schultz Critical Issues in Subsurface Integrity
02:15 pm-02:30 pm	345 B. Park Omission of Wellbore Block for Computational Efficiency in Big Hill Strategic Petroleum Reserve Model	782 T. Suppachoknirun Evaluation of Multistage Hydraulic Fracture Patterns in Naturally Fractured Tight Oil Formations Utilizing a Coupled Geomechanics-Fluid Flow Model – Case Study for an Eagle Ford Shale Well Pad	355 P. Kulatilake 3-D Discontinuum Numerical Modeling of Ore Extraction, Backfilling and Subsidence in An Underground Iron Mine in China	71 S. Li Numerical Studies of the Deformation of Salt Bodies with Embedded Carbonate or Anhydrite Stringers
02:30 pm-02:45 pm	632 P. Berest Thermomechanical Effects of a Rapid Depressurization in a Gas Cavern	429 H. Munoz Rock Brittleness Capacity Upon Compressive Fracture Energy Dissipation to Assess Drilling Efficiency	370 J. Roholl Translating Laboratory Compaction Test Results to Field Scale	365 I. Mohamed Accurate Forecasts of Stress Accumulation During Slurry Injection Operations
02:45 pm-03:00 pm	662 F. ARTHUR Pillar Stability Analysis at Missouri S&T Dolomitic Limestone Experimental Mine	181 V. Sesetty Numerical Modeling of Hydraulic Fracture Propagation from Horizontal Wells in Anisotropic Shale	409 G. Marketos Rocksalt Creep, Uncertainties, and their Implications for Surface Subsidence above a Producing Rocksalt-Capped Reservoir	614 S. Gheibi Stress Path Evolution during Fluid Injection into Geological Formations
03:00 pm-03:15 pm	837 H. Kheradi Numerical Analysis of Seismic Behavior of Existing Rectangular Underground Structure Enhanced with Ground Improvement	243 Y. Boneh Wear of Geo-Materials by Mechanical Impulse	434 H. De Waal Lessons From Larger Than Expected Subsidence Due to Production of Halite and Natural Gas in Frysl^An	658 B. Wassing Modelling of Fault Reactivation and Fault Slip in Producing Gasfields Using a Slip-Weakening Friction Law.
03:15 pm-03:30 pm	783 A. Seiphoori Microstructural Characterization of Opalinus Shale	168 W. Jin Simulation of Mode II Unconstrained Fracture Path Formation Coupled with Continuum Anisotropic Damage Propagation in Shale	680 J. Cornet Shear Enhanced Borehole Closure.	668 P. Roy Studying the Impact of Thermal Cycling on Wellbore Integrity During Co_2 Injection

Wednesday, 29 June 2016				
Time	Track a - Mining & Civil Technical Session 40 – Galleria III Rock Properties for Underground Excavation	Track B - Fracturing and Fractures Technical Session 44 – Woodway II Rock Mass, Fault Zone, and Fractured Rock Characterization 2	Track C – Petroleum Technical Session 48 – Woodway III Integrated Reservoir Geomechanics 2	Track D – Interdisciplinary Technical Session 52 -- Woodway I Coupled Processes - Mechanical Responses
04:00 pm-04:15 pm	117 K. Hashiba Factors Affecting the Loading Rate Dependence of Rock Strength	397 R. Goteti Evolution of Relay Zones in Normal Faulted Terranes: Integrating Field Geological Studies with Forward Geomechanical Models	200 B. Lin Evaluating Constitutive Models for Simulation of Water Injection in Land Facies Karamay Oil Sand Reservoirs	229 C. David Water Weakening Triggers Mechanical Instability in Laboratory Fluid Substitution Experiments on a Weakly-Consolidated Sandstone
04:15 pm-04:30 pm	411 W. Roggenthen Acoustic Velocities and Pillar Monitoring on the 4850 Level of the Sanford Underground Research Facility	648 P. Shi Rock Mass Grouting in Major Weakness Zones During Subsea Tunneling	205 H. Stockhausen Multidisciplinary Interpretation of a Tight Gas Reservoir to Understand Its Production Behavior, Northwestern Africa. a Change of an Old Paradigm Model	364 G. Ren Fully Coupled Geomechanics and Reservoir Simulation for Naturally and Hydraulically Fractured Reservoirs
04:30 pm-04:45 pm	475 W. Liang Study on Hydraulic Fracturing of Large-Size Coal Mass Containing Natural Macro-Fractures	678 W. Greenwood UAV-Based 3-D Characterization of Rock Masses and Rock Slides in Nepal	209 T. Berard 3D Geomechanics Completion Quality Mapping	419 J. Nopola Mitigation of the Thermo-mechanical Impacts of the Rock Melt Borehole Sealing System
04:45 pm-05:00 pm	613 S. Akutagawa On-Site Visualization methods of axial forces in ground supporting members without using electricity	705 A. Nolting Spatial and Temporal Characterization of Mechanical Rock Properties From West Caicos, British West Indies	294 y. wang Simulations and Case Studies for Enhancing Production in a Stress-sensitive Fractured Carbonated Reservoir	450 H. Yoon Rigorous Modeling of Coupled Flow and Geomechanics in Largely Deformable Anisotropic Geological Systems
05:00 pm-05:15 pm	688 S. Warren Empirical Ground Support Design Recommendations for Underground Gold Mines in Nevada	41 W. Hu The Effect of Smooth-Joint Parameters on the Macro Mechanical Behavior and Failure Modes	324 U. Prasad Integrated Evaluation of Haynesville Shale with Special Emphasis on Anisotropy	451 N. Thorp Characterization of a Pulsating Drill Bit Blaster
05:15 pm-05:30 pm	763 M. Rahjoo Stress-Induced Spalling Analysis of Extraction Level Pillars Using a 3-D Extensional Strain Failure Criterion	569 A. Modiriasari Monitoring Rock Damage Caused by Cyclic Loading Using Seismic Wave Transmission and Reflection	285 B. Crawford Incorporating Universal Scaling of Fracture Stiffness and Surface Roughness Effects for Improved Productivity Prediction in Naturally Fractured Reservoirs	864 S. Zhi A Parametric Study on Gas Outbursts Induced by Gas Desorption

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