# 2017 MOUNTJOY CARBONATE RESEARCH CONFERENCE

# Carbonate Pore Systems

**June 25-29, 2017**
**Austin, Texas USA**

# 2017 MOUNTJOY CONFERENCE

SEPM (Society for Sedimentary Geology) and CSPG (Canadian Society of Petroleum Geologists) convened the 2017 Mountjoy Carbonate Research Conference – Mountjoy II – in Austin, Texas, from June 25-29. This conference is convened in honor of Eric Mountjoy and his numerous contributions as a geologist and graduate student supervisor. [*See Tribute to Eric Mountjoy*] The theme for the second conference, *Carbonate Pore Systems*, follows the general concept to have topics that are relevant to the petroleum industry and therefore blend the best of cutting-edge geoscience research with industry needs.

The conference included a mix of technical sessions, field trips, and a core workshop with a broad focus centered on the overall theme. [*See Introduction to Conference*] As such, the hope of the sponsoring societies and the large group of committee members responsible for organizing all aspects of the conference was to bring together geoscientists from industry, academia, and government to share the latest advances in their fields, interact within this unique opportunity for networking that the format of the conference provides, and build new and lasting research partnerships and friendships.

This summary report was prepared on behalf of the committee members –

**Paul (Mitch) Harris**
**General Chair, 2017 Mountjoy Conference**

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# CONFERENCE COMMITTEES

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# CONFERENCE PRESENTATIONS - CARBONATE PORE SYSTEMS

[*See Abstract Volume*]

## Oral Presentations

### Sedimentologic, Stratigraphic, and Diagenetic Controls on Development of Carbonate Pore Systems

***Facilitators: Michael Grammer/James Bishop/David Budd***

**Neil Hurley (Keynote)**: Characterization and modeling of carbonate pore systems

**James Bishop, Steve Bachtel, Alex Parker, and Marina Borovykh:** Facies and diagenesis on a steep-sided Late Paleozoic isolated platform: Karachaganak Field, Republic of Kazakhstan

**Jessica Saïag, Pierre-Yves Collin, Jean-Pierre Sizun, Bruno Caline, and Éric Lasseur:** A classification of chalk microtexture to better understand petrophysical properties

**Rebekah Simon and David Budd:** Diagenetic controls on the spatial variability of carbonate pore systems within the Niobrara chalk-marl reservoirs of the Denver-Julesberg Basin, Colorado

**Aurelien Pierre, Tara Branter, Annie Cox, and Kevin Mageau:** Integrated reservoir characterization of the Duvernay play (Alberta, Canada): Economic sweet spot in unconventional source rock play

**J.A.D. (Tony) Dickson:** The growth of calcite cement—porosity's nemesis!

**Steve Bachtel, Charlie Kerans, Neil Hurley*, and Nathaniel Miller**: Confocal and transmitted light petrography of cementation and grain types in a high-energy upper shoreface to foreshore carbonate strand line, Pleistocene (MIS 5e) West Caicos Island, Turks and Caicos, B.W.I.

### Multiscale Prediction and Upscaling of Carbonate Porosity and Permeability

***Facilitators: Neil Hurley/Ralf Weger/Beth Vanden Berg***

**Cathy Hollis (Keynote)**: Upscaling, modelling and predicting porosity and permeability in carbonate systems: How good are we?

**Kazumi Nakamura, Neil Hurley, and Tao Sun**: Carbonate pore system characterization and porosity prediction using multi-scale data

**Mark Skalinski, Robert Mallan, Paul Theologou, Rafael Salazar, and Mason Edwards**: Carbonate pore types – from pore scale to the reservoir model

## Interactions in Multi-Modal Pore Systems

***Facilitators: Charles Kerans/Alex MacNeil***

**Sebastian Geiger (Keynote):** Quantifying the dynamic behavior of multi-porosity systems in carbonates–challenges, perspectives and opportunities

**Yulun Wang, Taylor Thompson, and Michael Grammer:** Characterizing and predicting natural fractures in the "Mississippian Limestone" play, U.S. southern mid-continent

**Hans Machel**: Complex, extensive karstification of Pleistocene carbonates of Barbados, West Indies—lessons for karstified petroleum reservoirs elsewhere

**Stephen Hasiotis, Alexa Goers, and Eugene Rankey**: Ichnological, sedimentological, and petrophysical characteristics of bioturbated Pleistocene carbonate shoreface strata: Implications for reservoir quality and development

**John Dunham**: Comparison of sedimentological, stratigraphic, and diagenetic controls on development of fracture porosity in dolostones of the Miocene Monterey Formation of California and Devonian Slave Point Formation of Western Canada

**PJ Moore, Christine Bachtel, Tony Buono, Shawn Fullmer, Brian Kelley, Jason Gulley, and Charles Kerans**: Evaluating multiscale permeability in modern carbonate settings: implications for flow in carbonate reservoirs

## Microporosity in Conventional and Unconventional Carbonate Reservoirs

***Facilitators: Steve Kaczmarek/Gregor Baechle/Bob Loucks***

**Ida Lykke Fabricus (Keynote):** Porosity in chalk

**Stephen Kaczmarek, Franek Hasiuk, and Shawn Fullmer**: The fundamentals of limestone microporosity

**Shawn Fullmer, Stefaan Van Simaeys, Benjamin Rendall, PJ Moore, Brian Kelley, Antonio Buono, and Bo Gao**: Micro-pore type controls on hydrocarbon displacement and recovery

**Volker Vahrenkamp, Joao Barata, Pierre van Laer, Peter Swart, and Sean Murray**: Micro-porosity creation in a Lower Cretaceous carbonate sequence of the Arabian Plate - initiated during early and finalized during burial diagenesis driven by tectonically driven regional subsurface flow

**Lucy Tingwei Ko, Bob Loucks, and Stephen Ruppel**: Argillaceous lime Eagle Ford Chalk resource play; Preservation of an original mineral pore network by emplacement of bitumen - Interplay between mineral pores and organic-matter pores

**Gregor Baechle, Gregor Eberli, and Ralf Weger**: Effects of micropores in limestones and dolostones on seismic rock properties – a review

**Ibukun Bode, Michael Grammer, and Chi Zhang**: NMR characterization of microporosity in the Mississippian-aged carbonates of the southern mid-continent

**Bob Loucks**: A review on the multiple origins of nano- and micropores in limestones and dolostones

**Stacy Lynn Reeder, Austin Boyd, Diana Acero-Allard, Ahmed Shoman, Ahmed Fotoh, Sergio De Aleida Netto, Bovan George, Omar Al-Jaaidi, Deborah Bliefnick, Weishu Zhao, Mohammed Al-Ali, and Emhemed Abousrafa**: Characterizing microporosity: a case study from an offshore field in Qatar

**Jim Buckman, Elma Charalampidou, Stephanie Zihms, Helen Lewis, Gary Couples, Patrick Corbett, and Zeyun Jiang**: High-resolution large area low vacuum scanning electron microscopy (LV-SEM) imaging for microporosity and diagenesis of carbonate rock systems, and carbonate cemented sandstones

**Tiffany Dawn Jobe, Shuo Zhang, and Susan Agar**: A machine learning method for microporosity prediction in carbonate reservoirs

## Visualization, Quantification, and Modeling of Carbonate Pore Systems and Their Fluid Flow Behavior

***Facilitators: Paul (Mitch) Harris/Gregor Eberli/Gareth Jones***

**Rachel Wood and Aleksandra Hosa**: Modelling the evolution of permeability in carbonates

**Jeroen Soete, Ophelie Faÿ-Gomord, Catherine Davy, Nick Janssens, David Troadec, Bruno Caline, and Rudy Swennen**: Tight chalk: Applying digital rock physics to unravel the 3D pore network and its fluid pathways

**Antonio Buono, Shawn Fullmer, Hubert King, Mike Sansone, Bill Lamberti, and Keith Peterson**: Quantitative digital petrography: Thin section to plug scale quantification of pore space, grains, and connectivity

**William Mills, Claire Gill, Edward Jarvis, Michael Harrison, Michael Bent, and Ceri Davies**: The creation of diagenetic facies utilizing core, thin section and MICP data as an input into reservoir rock typing and subsurface modelling studies

**Aurelien Meyer and Cathy Hollis**: Reconstruction of porosity evolution through digital image analysis

**Hisham Alqassab, Shawn Fullmer, Manal Alharbi, PJ Moore, and Brian Kelly**: Pore system heterogeneity: Impact on reservoir modeling and field development

## POSTER PRESENTATIONS

**J. Richard Kyle, Raeann Garcia, and Nathan Miller:** Solution-collapse breccia development and multi-scale protracted pore filling, Lower Ordovician Knox Group, Tennessee-Kentucky

**Nancy Chow, Matthew Braun, and Derek Armstrong**: Unconformity-related porosity evolution in the Devonian Kwataboahegan Formation of the Moose River Basin, Northern Ontario, Canada

**Aurelien Meyer, Peter Frykman, and Lars Stemmerik**: Dual pore system in Upper Cretaceous chalk, onshore Denmark

**Francis Witkowski, Peter Gutteridge, Ivar Grunnaleite, Niels Bo Jensen, and Gunnar Saelen**: Variations in karsted and fractured outcrop porosity analysed in Lower Cretaceous shelf carbonates, Gargano Peninsular, Apulia, Italy

**Lucy Manifold, Ahmed el-Bozie, Stefan Schroeder, and Cathy Hollis**: Flow unit heterogeneity of a rimmed shelf, Santanyí Limestone, Miocene of Mallorca

**Miaomiao Meng, Tailiang Fan, and Ian James Duncan**: Characterization of carbonate microfacies and reservoir pore types based on formation microimager logging: A case study from the Ordovician in the Tahe Oilfield, Tarim Basin, China

**Mike Lacey, Cathy Hollis, Mart Oostrom, and Nima Shokri**: Effects of pore size on polymer flooding efficiency in microfluidic pore networks

**Liu Wei, Huang Oingyu, and Hu Suyun**: Sedimentary characteristics of intra-platform microbial mounds and their controlling effects on the development of reservoirs: A case study of the Lower Cambrian in Tarim Basin, China

**Tyler Hauck, Hilary Corlett, Matthias Grobe, Erin Walton, and Pierre Sansjofre**: Dedolomitization of primary dolomicrites in a carbonate-sulphate system and implications for porosity evolution

**Nabil Shawwa, Valentin Chesnel, Branimir Šegvić, Óscar Merino-Tomé, Luis Pedro Fernández, and Elias Samankassou**: Diagenetic influences on the Pennsylvanian platform-top karstic system of Valdorria, northern Spain

**Cole Alexander McCormick and Brian Jones**: Unconformity derived controls on the development of porosity and permeability; A case study from the Miocene Cayman Formation, Grand Cayman, British West Indies

**Jinmin Song, Shugen Liu, Ping Luo, Hairuo Qing, Di Yang, and Zhiwu Li**: The characteristics and controlling factors of the microbial carbonate pore systems in the Middle Triassic Leikoupo Formation (Anisian) in the west Sichuan Basin, China

**Ismail Omer Yilmaz and Oguz Mulayim**: Porosity and diagenetic evolution of the Upper Cretaceous–Tertiary slope carbonates, Northern Arabian carbonate platform, SE Turkey

**Maxwell Pommer and J. Frederick Sarg**: Biochemical and stratigraphic controls on pore-network evolution: The Phosphoria rock complex (Permian), Rocky Mountain region, USA

**Siyang Zhang, Hairuo Qing, Shaonan Zhang, Qiang Zheng, Ning Ye, and Ziye Lu:** Lithofacies, diagenesis and reservoir development of the pre-salt Mississippian carbonate rocks in the Rozhkovsky structure, Fedorovsky Block, Northern Pre-Caspian Basin, Kazakhstan

**Yasin Makhloufi, Elme Rusillon, Jean-Pierre Sizun, Michel Meyer, and Elias Samankassou**: Impact of diagenesis on reservoir properties of the Upper Jurassic carbonate sediments in the Greater Geneva Basin (Switzerland and France)

**Lei Jiang, Ian Duncan, and Zhaoqi Li**: Diagenesis of the San Andres Formation in the Seminole Unit in the Central Basin Platform, West Texas

**Sahar Mohammadi, Taylor Ewald, and Jay Gregg**: Cement diagenesis of Mississippian carbonates in the southern midcontinent of the USA

**Abel Carrasquilla and Raphael Silva**: Petrophysical characterization of Albian carbonate reservoir in Campos Basin using a multivariate approach with well logs and laboratory measurements

**Hannah Hubert, Christopher Omelon, and Eugene Rankey**: Influence of organic matter type and abundance on depositional textures and associated pore attributes of hypersaline lacustrine microbial deposits (Holocene, Bahamas)

**Hamilton Goodner, Eugene Rankey, and Chi Zhang**: Sedimentologic influences on pore evolution and porosity-permeability trends in oolitic grainstones

**Georgina Lukoczki, Jay Gregg, and János Haas**: Multi-phase dolomitization and recrystallization of Middle Triassic shallow marine–peritidal carbonates of the Mecsek Mountains (SW Hungary)

**Jacob Proctor, Heath Hopson, André Droxler, Naum Derzhi, Jeffrey Dravis, Paul (Mitch) Harris, Pankaj Khanna, and Daniel Lehrmann**: CT Scanning Analysis for Porosity and Development of a Permeability Log: Upper Cambrian Microbial Build-Ups, Mason County, Texas

**Ning Ye, Shaonan Zhang, Yingtao Li, Siyang Zhang, and Ziye Lu**: Hydrothermal chert reservoir in Middle-Lower Ordovician Carbonate in the Shunnan area, Tarim Basin, NW China

**Ziye Lu, Hairuo Qing, Honghan Chen, and Siyang Zhang**: Hydrothermal silicification in deeply buried Ordovician carbonate reservoirs in the Shunnan area, Tarim basin, NW China: Insights from fluid inclusion and isotope studies

**Stephen Hasiotis, Hassan Eltom, Eugene Rankey, and Dave Cantrell**: Effect of bioturbation on the porosity and permeability of shelf carbonates: Examples from the Middle to Upper Jurassic Tuwaiq Mountain and Hanifa Formations, central Saudi Arabia

**Franciszek Hasiuk, Muhammad Firdaus Ahmad Ridzuan, Evelyn Hussey, and M. Robert Dawson**: Understanding how carbonate micropores affect the Iowa Pore Index method for evaluating crushed carbonates for use as highway aggregate

**Cameron Manche and Stephen Kaczmarek**: High-frequency cyclicity in dolomite stoichiometry in the Glen Rose Formation: Implications for penecontemporaneous dolomitization

**Cathy Hollis, Aisha Al Hajri, Nathaly L. Archilha, Marco Ceia, Michael Lacey, Peter Lee, Sam McDonald, and Roseane Missagia**: Pore topology and rock physical properties of microporosity in Lower Cretaceous carbonate sediments: Insights from X-ray CT imaging

**Hammad Tariq Janjuhah, Ahmed Mohamed Ahmed Salim, Deva Parsed Gosh, and Mumtaz Muhammad Shah**: Approach towards the classification of micropores and their effect on reservoir quality, Miocene carbonate platform offshore, Sarawak, Malaysia

**Adam Roland Boehlke and Justin Birdwell**: Thermochemical alteration of an immature calcareous mudstone by hydrous pyrolysis

**Benoit Vincent, Andrew Horbury, Joanna Garland, Peter Gutteridge, Christoph Lehmann, and Omran Al-Zankawi**: Microporous nodular beddings in the carbonate reservoirs of the Cretaceous in the Middle East: A review

**Neil Hurley**: Microporosity quantification using confocal microscopy

**Priyank Jaiswal, Rohit Raj, Beth Vanden Berg, and Michael Grammer**: Rock properties versus elastic properties in fine-grained tight carbonates

**Katherine Whidden and Adam Boehlke**: Episodic, energetic event beds and their relationship to brittle, carbonate intervals in the Triassic Shublik Formation, North Slope, Alaska

**Beatriz Garcia-Fresca and Bob Loucks**: Pore types and pore system characterization of the Late Devonian Three Forks Formation, Williston Basin

**Mohammed Alsuwaidi and J. Frederick Sarg:** Pore network characterization of a tight carbonate reservoir from the Middle East using dynamic and static methods

**Hilary Corlett, Tiffany Playter, Michelle Tappert, Ralf Tappert, and Tenea Dilman**: The use of micro-Fourier-transform infrared (Micro-Ftir) reflectance spectroscopy for evaluation of composition, texture, and porosity in carbonate-rich shales and fine-grained carbonates

**Shuyuan Shi, Hu Suyun, Fu Qilong, Liu Wei, and Huang Qingyu**: Lithofacies and diagenetic controls on dolostone reservoir quality for the Lower Cambrian Longwagmiao Formation in central Sichuan Basin, SW China

**Georgina Lukoczki, János Haas, Kinga Hips, Tamás Budai, Orsolya Győri, Sándor Kele, Attila Demény, and Zsófia Poros**: Processes and controlling factors of polygenetic dolomite formation in the Transdanubian Range, Hungary

**Ping Luo**: Meso-Proterozoic dolomite reservoir texture within peritidal microbialite successions in northeast China

## CORE WORKSHOP PRESENTATIONS

**Lauren Eggie, Nancy Chow, and John Miller:** Evolution of a carbonate ramp and unconformity-related microporosity in the Mississippian Pekisko Formation, Northern Alberta, Canada

**Xavier Janson, Charlie Kerans, Bob Loucks, Seay Nance, and Scott Hamelin:** Spectrum of gravity flow deposits on carbonate slopes and basin, Permian Basin, West Texas

**Yulun Wang, Ibukun Bode, Beth Vanden Berg, and Michael Grammer:** Multi-scale characterization of pore systems and natural fractures of the “Mississippian Limestone”, southern mid-continent, U.S.A.

**Heath Hopson, Andre Droxler, Pankaj Khanna, Brian Kubik, Pulkit Singh, Roberto Trotta, Jacob Proctor, Paul (Mitch) Harris, Dan Lehrmann, and Jeff Dravis:** Distinct growth phases of an Upper Cambrian microbial reef complex (Mason County, Texas)

**Laura Rueda-Sánchez, Gregor Eberli, Donald McNeill, Ralf Weger, Max Tenaglia, Leticia Rodriquez Blanco, and Peter Swart:** Short-cores from proximal and distal positions in the prograding Vaca Muerta Formation, Neuquén Basin, Argentina

**Bob Loucks and Charles Kerans:** Evidence for earlier lower Cretaceous Valanginian shelf margin complexes in the onshore North-Central Gulf of Mexico

**Neil Hurley, James Bishop, and Greg Hurd:** Carbonate Pore Systems Core Workshop: Tengiz Field, Kazakhstan

**Laura Zahm, Charles Kerans, Xavier Janson, Jim Jennings, and F. Jerry Lucia:** Depositional system evolution of the Smackover Formation across the onshore Northern Gulf of Mexico

## FIELDTRIPS

**T1 – Laura Zahm:** Pipe Creek - Albian-age Pipe Creek rudist build-ups and impact of touching and non-touching vugs on reservoir characterization

**T2 – Chris Zahm and Bob Loucks:** Fractures and pores within evaporite paleokarst systems: an example from the Cretaceous of Texas

**T3 – Bob Loucks:** Fractures, faults, and karst caverns: architecture of the non-matrix reservoir elements, Longhorn Caverns, Texas

**T4 - David Ferrill, Ronald McGinnis, Alan Morris and Kevin Smart:** Fault zone deformation and displacement partitioning in mechanically layered carbonates: the Hidden Valley fault, central Texas