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Message from the Program Committee Chairperson

On behalf of the program committee, I welcome you to the SPE Hydraulic Fracturing Technology Conference and Exhibition. This event continues to be one of SPE’s most popular and I am excited that you are participating.

This year’s conference includes more than 50 technical presentations, multiple Knowledge Sharing ePosters, and 120+ exhibiting companies – all focused on providing the latest approaches and technical advancements. We also have thousands of E&P professionals from across the industry in attendance so the conference provides a chance to expand your network and gain insights from peers and others experts.

We are also presenting the Legends of Hydraulic Fracturing Award to two honorees this year. Both Michael Smith and Norm Warpinski will be recognized for their contributions to the technology and industry.

The conference is an excellent way for you to collaborate with others on industry challenges and explore solutions to help advance your business goals. I encourage you to take advantage of all the opportunities available over the next three days.

Thank you for attending and enjoy the conference!

Richard B. Sullivan
Program Committee Chairperson
Anadarko

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### Program Committee

**CHAIRPERSON**
- Richard Sullivan  
  Anadarko Petroleum

**VICE CHAIRPERSON**
- Martin Rylance  
  BP Exploration

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<td>Kirk Bartko</td>
<td>Saudi Aramco</td>
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<td>Kathryn Briggs</td>
<td>Pioneer Natural Resources</td>
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<td>Craig Cipolla</td>
<td>Hess Corporation</td>
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<td>Paul Weddle</td>
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<td>Xiaowei Weng</td>
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<td>Junjing Zhang</td>
<td>ConocoPhillips</td>
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<td>Ding Zhu</td>
<td>Texas A&amp;M University</td>
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### About the Society of Petroleum Engineers

The Society of Petroleum Engineers (SPE) is a not-for-profit professional association whose more than 164,000 members in 143 countries are engaged in oil and gas exploration and production. SPE is a key resource for technical knowledge providing publications, events, training courses, and online resources at [www.spe.org](http://www.spe.org).

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# Conference Schedule at a Glance (as of 11 January 2018)

## TUESDAY, 23 JANUARY

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<th>Time</th>
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<tr>
<td>0900-0930</td>
<td>Morning Coffee</td>
<td>(Town Center/Town Center Foyer)</td>
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<tr>
<td>0900-1800</td>
<td>Exhibition</td>
<td>(Town Center/Town Center Foyer)</td>
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<tr>
<td>0930-1130</td>
<td>Welcome, Legends Award, and Plenary Session</td>
<td>(Waterway 1-8)</td>
</tr>
<tr>
<td>1130-1245</td>
<td>Networking Lunch</td>
<td>(Montgomery Ballroom, Level 3 and Town Center Foyer, Level 1)</td>
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<tr>
<td>1300-1700</td>
<td>Session 01: Fracture Diagnostics I</td>
<td>(Waterway 1-4)</td>
</tr>
<tr>
<td>1500-1545</td>
<td>Coffee Break</td>
<td>(Town Center/Town Center Foyer)</td>
</tr>
<tr>
<td>1700-1800</td>
<td>Tuesday Night Reception</td>
<td>(Town Center/Town Center Foyer)</td>
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<tr>
<td>1700-1800</td>
<td>Legends Award Photo Booths</td>
<td>(Town Center)</td>
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## WEDNESDAY, 24 JANUARY

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<th>Time</th>
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<tr>
<td>0800-0830</td>
<td>Morning Coffee</td>
<td>(Waterway 4-5 Foyer)</td>
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<tr>
<td>0830-1230</td>
<td>Session 03: Frac Performance and Design</td>
<td>(Waterway 1-4)</td>
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<tr>
<td>0900-1630</td>
<td>Exhibition</td>
<td>(Town Center/Town Center Foyer)</td>
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<tr>
<td>1030-1115</td>
<td>Coffee Break</td>
<td>(Town Center/Town Center Foyer)</td>
</tr>
<tr>
<td>1230-1330</td>
<td>Networking Lunch</td>
<td>(Montgomery Ballroom, Level 3 and Town Center Foyer, Level 1)</td>
</tr>
<tr>
<td>1400-1730</td>
<td>Session 05: Unconventional Fracturing</td>
<td>(Waterway 1-4)</td>
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<tr>
<td>1530-1615</td>
<td>Coffee Break</td>
<td>(Town Center/Town Center Foyer)</td>
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<th>Time</th>
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<tr>
<td>0800-0830</td>
<td>Morning Coffee</td>
<td>(Waterway 4-5 Foyer)</td>
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<tr>
<td>0830-1200</td>
<td>Session 07: Frac Diagnostics II</td>
<td>(Waterway 1-4)</td>
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<tr>
<td>1010-1040</td>
<td>Coffee Break</td>
<td>(Waterway Foyer)</td>
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TUESDAY, 23 JANUARY
0900–0930 Morning Coffee (Town Center/Town Center Foyer)
0900–1800 Exhibition (Town Center/Town Center Foyer)
0930–1130 Welcome, Legends Award, and Plenary Session (Waterway 1–8)
1130–1245 Networking Lunch (Montgomery Ballroom, Level 3 and Town Center Foyer, Level 1)
1300–1700 Session 01: Fracture Diagnostics I (Waterway 1–4)
1500–1545 Coffee Break (Town Center/Town Center Foyer)
1700–1800 Tuesday Night Reception (Town Center/Town Center Foyer)
1700–1800 Legends Award Photo Booths (Town Center)

WEDNESDAY, 24 JANUARY
0800–0830 Morning Coffee (Waterway 4–5 Foyer)
0830–1230 Session 03: Frac Performance and Design (Waterway 1–4)
0900–1630 Exhibition (Town Center/Town Center Foyer)
1030–1115 Coffee Break (Town Center/Town Center Foyer)
1230–1330 Networking Lunch (Montgomery Ballroom, Level 3 and Town Center Foyer, Level 1)
1400–1730 Session 05: Unconventional Fracturing (Waterway 1–4)
1530–1615 Coffee Break (Town Center/Town Center Foyer)

THURSDAY, 25 JANUARY
0800–0830 Morning Coffee (Waterway 4–5 Foyer)
0830–1200 Session 07: Frac Diagnostics II (Waterway 1–4)
1010–1040 Coffee Break (Waterway Foyer)
0830–1200 Session 08: Case Histories (Waterway 5–8)
General Information

Registration and Badge Pick
- **Monday, 22 January** 1300–1700
- **Tuesday, 23 January** 0700–1800
- **Wednesday, 24 January** 0730–1600
- **Thursday, 25 January** 0730–1000
  - Location: Waterway 1 Foyer, Level 3

Coffee Breaks
- **Tuesday, 23 January**
  - 0900–0930, 1500–1545
  - Location: Town Center/Town Center Foyer
- **Wednesday, 24 January**
  - 1030–1115, 1530–1615
  - Location: Town Center/Town Center Foyer
- **Thursday, 25 January**
  - 1010–1040
  - Location: Waterway Foyer

Exhibition
- **Tuesday, 23 January** 0900–1800
- **Wednesday, 24 January** 0900–1630
  - Location: Town Center/Town Center Foyer

Speaker Check-In
- **Monday, 22 January** 1600–1700
- **Tuesday, 23 January** 0730–1730
- **Wednesday, 24 January** 0730–1730
- **Thursday, 25 January** 0730–1215
  - Location: Cochran’s Crossing, Level 3

Knowledge Share ePosters
- **Tuesday, 23 January**
  - 1500–1545
- **Wednesday, 24 January**
  - 1030–1115, 1530–1615
  - Location: College Park, Level 3

Speakers are requested to check in prior to reporting to their assigned session room.

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Pre-Conference Training Courses

22 JANUARY

Critical Geomechanics Concepts and Applications to Unconventionals Completions
Instructors: Neal Nagel, Marisela Sanchez-Nagel

Fracturing Fundamentals for Non-Fracers
Instructor: Carl Montgomery

Multistage Completions, Fracturing, and Refracturing in Shales
Instructors: W. Aaron Burton, Sergey Kotov

Design of Fiber-Optic DTS and DAS Well Installations
Instructors: Dennis Dria, Bill Shroyer

26–27 JANUARY

Shale Selection, Completions, Fracturing and Production
Instructor: George King

Water Treating for Shale Operations
Instructors: John M. Walsh, Krishan Bansal

Hydraulic Fracturing – Design and Treatment
Instructors: Michael Smith, Carl T. Montgomery

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Michael B. Smith is the President of NSI Technologies, Inc., a petroleum engineering firm in Tulsa. He has more than 30 years of experience in rock mechanics, well completions, and hydraulic fracturing, both with a major operator and as a consultant. He has served as an SPE Distinguished Lecturer multiple times and authored two chapters in the SPE Monograph *Recent Advances in Hydraulic Fracturing*. Most recently, he was awarded the Lester C. Uren Award for his technical contributions to hydraulic fracturing.

Norm Warpinski is a retired Halliburton Technology Fellow. He worked previously as a Chief Technology Officer at Pinnacle Technologies and a Senior Scientist at Sandia National Laboratories. His primary areas of expertise are hydraulic fracturing, hydraulic fracture diagnostics, rock mechanics, and formation evaluation. He has been an SPE Distinguished Lecturer, contributed chapters to the SPE Monographs on hydraulic fracturing and solids injection, served a term as Executive Editor of SPE Productions and Operations, and worked on numerous program committees. He has received the 2012 Robert Earl McConnell Award and the 2008 Drilling and Completions Award.
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Convention Center Floorplan
### Technical Program (as of 11 January 2018)

**TUESDAY, 23 JANUARY 2018**

**1300–1700 | 01 Frac Diagnostics I | Waterway 1–4**

**Session Chairpersons:**
Ding Zhu, Texas A&M University; Paul M Weddle, Liberty Resources LLC

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<td>1345-1410</td>
<td>Delineating Stacked Pay With Existing and Emerging Diagnostic Tools</td>
<td>K. Haustveit, H. Greenwood, Devon Energy</td>
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<td>1410-1435</td>
<td>Diagnostic Testing and Analysis of Hydraulically Fractured Dual-Porosity Formations</td>
<td>Y. Elwaziry, M.Y. Soliman, University of Houston</td>
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<td>1435-1500</td>
<td>Estimating Unpropped Fracture Conductivity and Compliance from Diagnostic Fracture Injection Tests</td>
<td>H. Wang, M.M. Sharma, The University of Texas At Austin</td>
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<td>1545-1610</td>
<td>Improved Well Stimulation Through the Application of Downhole Video Analytics</td>
<td>G. Roberts, T.B. Lilly, T.R. Tymons, EV</td>
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<td>1610-1635</td>
<td>Flowback-Based Minimum Stress Estimate in Low-Permeability Environment: Procedure, Interpretation, and Application in the Vaca Muerta Shale</td>
<td>S. Pichon, Schlumberger; R. Varela, Tecpetrol; J. Manire, Consultant; J. Hasbani, E. d’Huteau, YPF S.A.</td>
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<td>Wavelet Analysis of Fracturing Pressure Data</td>
<td>E. Unal, F. Siddiqui, M.Y. Soliman, University of Houston</td>
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<td>1345-1410</td>
<td>189892</td>
<td>Visual Analysis on the Effects of Fracture-Surface Characteristics and Rock Type on Proppant Transport in Vertical Fractures</td>
<td>H. Huang, Xi’an Shiyou University; T. Babadagli, H. Li, University of Alberta; K. Develi, Istanbul Technical University</td>
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<td>1410-1435</td>
<td>189846</td>
<td>Applying Subsurface DNA Diagnostics and Data Science in the Delaware Basin</td>
<td>J. Silva, Anadarko Petroleum Corporation; L. Ursell, L. Percak-Dennett, Biota Technology</td>
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<td>1435-1500</td>
<td>189899</td>
<td>The Impact of Stress on Propped Fracture Conductivity and Gas Recovery in Marcellus Shale</td>
<td>M.N. El Sgher, K. Aminian, S. Ameri, West Virginia University</td>
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<td>1545-1610</td>
<td>189876</td>
<td>Enhancing Delaware Basin Stimulation Results Using Nanoparticle Dispersion Technology</td>
<td>F.E. Syfan, Syfan Engineering LLC; D.L. Holcomb, Pentagon Technical Services; T. Lowrey, Rhino Chemical, Inc; A.B. Sam, Caza Petroleum Inc; R.L. Nickerson, Caza Petroleum; Y.K. Ahmad, Nissan Chemical America, Inc.</td>
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<td>1635-1700</td>
<td>189841</td>
<td>Proppant Transport by a High Viscosity Friction Reducer</td>
<td>Y. Hu, D. Fisher, P. Kurian, Nalco Champion; R.L. Calaway, QES Pressure Pumping LLC</td>
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<td>Alternate</td>
<td>189839</td>
<td>Fracture Conductivity, Geochemical, and Geomechanical Monitoring of the Niobrara Formation under Triaxial Stress State</td>
<td>J.G. Iriarte, Colorado School of Mines &amp; Well Data Labs; D. Katsuki, A.N. Tutuncu, Colorado School of Mines</td>
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<td>189895</td>
<td>Proppant Transport in Complex Fracture Networks</td>
<td>K. Shrivastava, M.M. Sharma, The University of Texas At Austin</td>
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## Technical Program (as of 11 January 2018)

### WEDNESDAY, 24 JANUARY 2018

**0830–1230 | 03 Frac Performance and Design | Waterway 1–4**

**Session Chairpersons:**
Karen Olson, Southwestern Energy Company; Junjing Zhang, ConocoPhillips Co

| 0830-0915 | KEYNOTE: Extending Laboratory EOR Experiments to Well Performance in Unconventional Plays  
D.S. Schechter, Texas A&M University |  
| 0915-0940 | Impact of Near Well-Bore Geology on Hydraulic Fractures Geometry and Well Productivity: a Statistical Look Back at the Utica Play  
E. Gourjon, A. Bertoncello, Total E&P USA, Inc. |  
| 0940-1005 | Geometry and Failure Mechanisms from Microseismic in the Duvernay Shale to explain changes in Well Performance with Drilling Azimuth  
B. Stephenson, E. Galan, W. Williams, J. Macdonald, A. Azad, R. Carduner, Shell Canada; U. Zimmer, Shell (SEPCO) |  
| 1005-1030 | Laboratory Measurement of Microproppant Placement Quality using Split Core Plug Permeability under Stress  
B. Kim, I. Akkutlu, Texas A&M University; V.N. Martysevich, R.G. Dusterhoft, Halliburton |  
| 1115-1140 | Production Performance of Infill Horizontal Wells vs. Pre-existing Wells in the Major US Unconventional Basins  
G.J. Lindsay, G. Miller, T. Xu, D. Shan, J.D. Baihly, Schlumberger |  
| 1140-1205 | Benefits of Engineering Fracture Design. Lessons Learned From Underperformers in Midland Basin.  
S.G. Parsegov, G. Niu, D.S. Schechter, Texas A&M University; M. Laprea-Bigott, Texas Oil and Gas Institute |  
A.G. Sivon, G.J. Moridis, T.A. Blasingame, Texas A&M University |
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<th>Alternate</th>
<th>189845</th>
<th>Hydraulic Fracture Design In the Presence of Highly-Stressed Layers: A Case Study of Stress Interference in A Multi-Horizontal Well Pad</th>
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<td>Alternate</td>
<td>189896</td>
<td>Fracturing in a Tectonically Stressed Area under Anomalously High Gradients</td>
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<td>D. Abdrazakov, Schlumberger Logelco Inc; N.T. Bolyspayev, SPE; G. Voigtländer, T. Nauruzov, A. Bigeldiyev, Zhaikmunai LLP</td>
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WEDNESDAY, 24 JANUARY 2018

0830–1230 | 04 Frac Modeling | Waterway 5–8

Session Chairpersons:
Michael Smith, NSI Technologies Inc.; Xiaowei Weng, Schlumberger

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| 0830-0915| 189890 | **KEYNOTE:** Modelling Near-Wellbore Hydraulic Fracture Branching, Complexity and Tortuosity: A Fully Coupled Geomechanical Modelling Approach  
W. Ferguson, G. Richards, A. Bere, Rockfield Software; U. Mutlu, Rockfield Global Technologies America; F. Paw, Rockfield Software |
| 0915-0940| 189889 | 3D Hydraulic Fracture Simulation Integrated With 4D Time-Lapse Multicomponent Seismic and Microseismic Interpretation, Wattenberg Field, Colorado  
A. Alfataierge, J.L. Miskimins, T.L. Davis, R.D. Benson, Colorado School of Mines |
| 0940-1005| 189864 | **Mechanisms for the Formation of Complex Fracture Networks in Naturally Fractured Rocks**  
K. Shrivastava, M.M. Sharma, The University of Texas At Austin |
| 1005-1030| 189834 | Development of Acid Fracturing Model for Naturally Fractured Reservoirs  
A. Ugursal, D. Zhu, A.D. Hill, Texas A&M University |
| 1115-1140| 189861 | **Hydraulic Fracture Height Growth Under the Combined Influence of Stress Barriers and Natural Fractures**  
J. Huang, J.P. Morris, P. Fu, R.R. Settgast, C.S. Sherman, F.J. Ryerson, Lawrence Livermore National Laboratory |
| 1140-1205| 189883 | **Mitigating Risks in Hydraulic Fracture Design for a Complex Carbonate Reservoir**  
G. Izadi, C.A. Barton, L. Cruz, J.A. Franquet, T. Hoeink, Baker Hughes, a GE company; P. Van Laer, ADNOC |
| 1205-1230| 189852 | **Hydraulic Fracture Interaction with Cemented Natural Fracture: A Three Dimensional Discrete Element Method Analysis**  
H.P. Lee, O. Razavi, J.E. Olson, The University of Texas At Austin |
| Alternate | 189874 | **Benchmark Modeling of Hydraulic Fracture Interaction with Pre-Existing Fractures: Impact on Fracture Geometry, Proppant Distribution and Microseismic Response**  
S.C. Maxwell, IMaGE; J. Hazzard, W. Pettitt, Itasca Consulting Group Inc. |
## Technical Program (as of 11 January 2018)

**WEDNESDAY, 24 JANUARY 2018**

### 1400–1730 | 05 Unconventional Fracturing | Waterway 1–4

**Session Chairpersons:**
Mukul Sharma, The University of Texas At Austin; Kathryn Briggs, Pioneer Natural Resources

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<td><strong>KEYNOTE:</strong> Effectiveness Of Geometric Versus Variable Shot Clusters To Stimulate A Percolating Crack Network Capable Of Sustaining Flow</td>
<td>E.P. Ardakani, A.M. Baig, T.I. Urbancic, ESG Solutions; D. Kahn, J. Rich, D. Langton, K. Silver, Devon Energy</td>
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<td>1440-1505</td>
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<td>An Engineered Approach to Hydraulically Fracture The Vaca Muerta Shale</td>
<td>H.H. Buijs, Wintershall GmbH; J.E. Ponce, Wintershall Energia SA</td>
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<td>Optimizing Well Completion Design and Well Spacing with Integration of Advanced Multi-Stage Fracture Modeling &amp; Reservoir Simulation - A Permian Basin Case Study</td>
<td>H. Xiong, W. Wu, S. Gao, Texas Oil and Gas Institute</td>
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<td>1640-1705</td>
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<td>Parent-Child Fracture Interference: Explanation and Mitigation of Child Well Underperformance</td>
<td>R. Manchanda, P. Bhardwaj, J. Hwang, M.M. Sharma, The University of Texas At Austin</td>
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<td>Interaction Between Hydraulic Fracture and a Preexisting Fracture under Triaxial Stress Conditions</td>
<td>S. Mighani, Massachusetts Institute of Technology; D.A. Lockner, B.D. Kilgore, U.S. Geological Survey; F. Sheibani, B. Evans, Massachusetts Institute of Technology</td>
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### Technical Program (as of 11 January 2018)

#### WEDNESDAY, 24 JANUARY 2018

**1400–1730 | 06 Environmental and Re-Fracturing | Waterway 5–8**

**Session Chairpersons:**
Stephen Mathis, Chevron ETC; W. David Norman, NSI Technologies Inc.

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<td>189873</td>
<td><strong>KEYNOTE:</strong> A Summary of the US Environmental Protection Agency’s Multiyear Study of the Potential Impacts of Hydraulic Fracturing on Drinking Water Resources</td>
<td>S. Dunn-Norman, Missouri University of Science &amp; Tech; W. Hufford, Repsol; S. Almond, S. Almond Consulting</td>
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<td>New API Standards for Shale Development</td>
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<td>Choosing the “Right Products”</td>
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<td>1615-1640</td>
<td>189853</td>
<td>Frac Hit Induced Production Losses: Evaluating Root Causes, Damage Location, Possible Prevention Methods and Success of Remedial Treatments, Part II</td>
<td>M.F. Rainbolt, Apache Corporation; J. Esco, Colorado School of Mines</td>
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<td>Evaluation of Cement-Isolated Casing Liner and Degradable Particulate Diverter Refracturing Treatments in the Haynesville Shale</td>
<td>R.J. Cadotte, Z. Crowley, B.M. Elbel, Halliburton</td>
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<td>Z. Ye, V. Sesetty, A. Ghassemi, The University of Oklahoma</td>
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**THURSDAY, 25 JANUARY 2018**

**0830–1200 | 07 Frac Diagnostics II | Waterway 1–4**

**Session Chairpersons:**
Paul Huckabee, Shell Exploration & Production Co; Dan Hill, Texas A&M University

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<td><strong>KEYNOTE:</strong> Prudent Design of Experiment with Integrated Diagnostics Improves Understanding of the Effects of Multiwell Stimulation in a Complex Multibench Reservoir</td>
<td>N. Sahdev, J. Doucette, B. Bagherian, W.D. Salas, P.F. Stark, J. White, Halliburton; C. Ohlson, M. Odegard, Whiting Resources</td>
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**THURSDAY, 25 JANUARY 2018**

**0830–1200 | 08 Case Histories | Waterway 5–8**

Session Chairpersons: Martin Rylance, BP Exploration; Joram Hadden, Sierra Resources, LLC

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<td>K. Dahlgren, B. Green, B. Williams, J. Inscore, Devon Energy Corporation; M. Van Domelen, A. Fenton, Downhole Chemical Solutions</td>
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Alternate 189869 Stimulation Design and Treatment in the Sycamore Formation of the South Central Oklahoma Oil Province Area of the Anadarko Basin
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**TUESDAY, 23 JANUARY 2018**

**1500–1545 | KS01 Knowledge Sharing ePosters I | College Park**

**Session Chairperson:** Eric Davis, ConocoPhillips Co

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### WEDNESDAY, 24 JANUARY 2018

**1030–1115 | KS02 Knowledge Sharing ePosters II | College Park**

**Session Chairpersons:** Kathryn Briggs, Pioneer Natural Resources

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### WEDNESDAY, 24 JANUARY 2018

**1530–1615 | KS03 Knowledge Sharing ePosters III | College Park**

**Session Chairpersons:** Paul M Weddle, Liberty Resources LLC

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<td>J. Jackson, Ward Petroleum Corp.; J. Calvin, B.T. Drake, Halliburton</td>
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