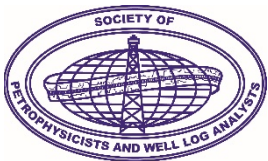


SPWLA and Boston Chapter welcome you to

# SPWLA 62nd Annual Symposium

Online

MAY 17-20 2021



## Contact Information

SPWLA

8866 Gulf Freeway, Suite 320

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# Symposium Organizing Committee

## General Chair

Paul Craddock – Schlumberger

## Technical Sessions

Tegwyn Perkins – Lloyd's Register

Lin Liang – Schlumberger

## Plenary

Tegwyn Perkins – Lloyd's Register

Adam Haecker – Continental Resources

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## Symposium Advisors

Sharon Johnson – SPWLA

Stephanie Turner – SPWLA

## Virtual Event Liaison

Paul Craddock – Schlumberger

# Welcome to the SPWLA 62<sup>nd</sup> Annual Logging Symposium

You are invited...

Thank you for your interest in joining the SPWLA 62<sup>nd</sup> Annual Logging Symposium! Your participation is critical to the advancement of log analysis, petrophysics, and formation evaluation in the oil and gas industry, and to the success of our organization.

The Boston Chapter of the SPWLA is honored to join the tradition of hosting the Annual Logging Symposium. SPWLA has partnered with PheedLoop to bring you an integrated online Symposium comprising live-streaming plenary and technical sessions and virtual exhibit halls running across four days, May 17–20. The technical sessions will share new developments across conventional reservoir, deep-water reservoir, unconventional resource, and brownfield exploration and field development, new logging technologies for open and cased-hole, case studies, and applications for machine learning in formation evaluation. In addition, we are pleased to bring back technical workshops covering four topics of: petrophysical rock-typing; uncertainties in petrophysics; machine learning and artificial intelligence; and petrophysics in the energy transition. Each workshop will be taught online by a formidable cast of industry experts and colleagues. Bringing these Symposium events online in 2021 makes our flagship annual event open to our entire community at a time when we cannot connect in person. Details of these events are found in this brochure.

I express my sincere gratitude to the many SPWLA members and colleagues who have dedicated their time and effort to make these events possible and the 62<sup>nd</sup> Annual Logging Symposium a success, especially during the previous 12 challenging months. My thanks to the Boston2021 Symposium Organizing Committee, SPWLA Board of Directors and Technical Committee, Plenary speakers, Workshop instructors, Technical Session presenters, our Sponsors and Exhibitors, and to Sharon Johnson and Stephanie Turner in the SPWLA International Office whose experience in building out the Symposium every year is incalculable.

Shortly after registration opens, you can gain access through your personal registration link to the Symposium Virtual Event hosted through PheedLoop and preview all the activities that the Symposium will offer. Once more, we look forward to seeing you at the SPWLA 62<sup>nd</sup> Annual Logging Symposium Online and thank you for your support.

Paul Craddock

General Chair

Boston2021 Symposium Organizing Committee

# SYMPOSIUM HIGHLIGHTS

Registration online through SPWLA website

24-7 through Sunday, May 16

*Symposium activities will be held online through our contracted third-party partners*

*All times listed in Central Daylight Time (Houston, TX, USA)*

## **Monday, May 10 – Tuesday, May 11**

Workshop 1 – Uncertainties in petrophysics: Methods of statistical analysis 8:00 AM – 12:00 PM

Workshop 2 – Petrophysics role in the energy transition 8:00 AM – 12:00 PM

## **Wednesday, May 12 – Thursday, May 13**

Workshop 3 – Machine Learning & Artificial Intelligence 8:00 AM – 12:00 PM

Workshop 4 – Petrophysical rock typing from empirical to probabilistic methods including validation 8:00 AM – 12:00 PM

## **Sunday, May 16**

International Student Paper Contest Times to be announced

## **Monday, May 17**

Opening remarks & Plenary Events Times to be announced

Technical Sessions Times to be announced

Live Exhibitor Booths Times to be announced

Annual Business Meeting Day to be confirmed

## **Tuesday, May 18**

Technical Sessions Times to be announced

Live Exhibitor Booths Times to be announced

SPWLA Awards Ceremony Day to be confirmed

## **Wednesday, May 19**

Technical Sessions Times to be announced

Live Exhibitor Booths Times to be announced

## **Thursday, May 20**

Technical Sessions Times to be announced

Live Exhibitor Booths Times to be announced

# SYMPOSIUM SPONSORS

*SPWLA and The Boston Chapter thank our Sponsors for supporting the Symposium*

\_\_\_\_\_ Platinum Sponsor \_\_\_\_\_

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# SYMPOSIUM EXHIBITORS

*SPWLA and The Boston Chapter thank our Exhibitors for supporting the Symposium*

**Baker Hughes** 

 **CGG**

 **KAPPA**

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Register**

**Schlumberger**

**SEISPETRO**  
Geoconsulting

# REGISTRATION

Registration for the Symposium & Workshops is online through SPWLA website

## SYMPOSIUM ONLINE

**Fee:** \$200 SPWLA members (active membership 2021)  
\$300 SPWLA nonmembers  
\$25 Member students  
\$40 Nonmembers students

### SYMPOSIUM REGISTRATION INCLUDES

- Admission to Symposium Virtual Event: Technical Sessions Program & Exhibit Hall
- Symposium transactions (electronic) via personal link to [www.onepetro.org](http://www.onepetro.org)

## WORKSHOPS ONLINE

**Fee:** \$100 SPWLA members (active membership 2021)  
\$150 SPWLA nonmembers  
\$25 Students  
\$40 Unemployed members of SPWLA (Action Required: Contact Business Office for special rate)

### WORKSHOP REGISTRATION INCLUDES

- Fee per workshop
- Admission to Workshop, held over two days of four hours each (total 8 hours)

## HOW TO REGISTER

Registration is online through the SPWLA website: [www.spwla.org](http://www.spwla.org)

Full payment must accompany registration to access online activities

Pre-registration deadline: Monday, May 3

# SYMPOSIUM WORKSHOPS

*Symposium workshops will be held online through our contracted third-party vendors*

*All times listed in Central Daylight Time (Houston, TX, USA)*

## Workshop 1: Uncertainties in petrophysics: Methods of statistical analysis

**Instructors:** **Michel Claverie** (*Imperial College London*)  
**Lalitha Venkataramanan** (*Schlumberger Doll*)  
**Marco Pirrone** (*ENI*)  
**Laurent Mosse** (*Schlumberger Wireline*)  
**David Allen** (*Schlumberger Interpretation Engineering*)  
**Andrea Valori** (*Independent*)  
**Jean-Etienne Jacolin** (*Schlumberger Interpretation Engineering*)

**Date:** Monday, May 10 – Tuesday, May 11  
**Time:** 8:00 AM – 12:00 PM (CDT; GMT-6)

### About the Course

Subject matter experts will conduct short and interactive sessions on the definitions, calculation methods, applications, and visual display of uncertainty in petrophysics

*They will cover the following topics:*

- Uncertainties of machine learning processes, with petrophysics application (Lalitha Venkataramanan)
- Applications of value of information to petrophysics (David Allen)
- Sensitivity analysis for petrophysical models; PCA techniques for reducing petrophysical model uncertainty (Jean-Etienne Jacolin)
- Uncertainty propagation (measurements, methods, models) along petrophysical interpretation (Laurent Mosse)
- Log and core NMR uncertainties (Andrea Valori)
- Reservoir facies uncertainties: Laminated reservoirs and petro-elastic models (Marco Pirrone)
- Common petrophysics uncertainties examples (Michel Claverie)

We will start and finish on time – plus/minus the tiniest possible standard deviation – guided by the principle that smaller uncertainties are better

## Workshop 2: Petrophysics role in the energy transition

**Organizers:** **Robert (Bob) Gales** (*Halliburton*)  
**Kelly Skuce** (*Core Petrophysical Consulting*)  
**Katerina Yared** (*SM Energy*)

**Instructors:** **Jamie Beard** (Executive Director, The Geothermal Entrepreneurship Organization, University of Texas)  
**Jim Hollis** (Founder, Geothermal Technologies, Inc.)  
**Manika Prasad** (Professor, Colorado School of Mines)  
**Hamed Soroush** (CEO, Petrolern, LLC.)

**Date:** Monday, May 10 – Tuesday, May 11  
**Time:** 8:00 AM – 12:00 PM (CDT; GMT-6)

### About the Course



Carbon Net Zero by 2050 is a major goal of countries that have signed the Paris Accord. To accomplish this, it will take a continued shift of the energy mix and CO<sub>2</sub> capture and storage. Although there is activity in rare earth mining and hydrogen storage, we will focus on resurgence in Geothermal and Carbon Capture Utilization and Storage

#### Day 1

- Introductions and high-level overview (Katerina Yared, Kelly Skuce, Bob Gales)
- Geothermal: Status of industry (Jamie Beard; alternative Will Pettit)
- Geothermal: subsurface challenges (Jim Hollis)

#### Day 2

- CCUS: Status of the industry (Manika Prasad)
- CCUS: Subsurface challenges (Hamed Soroush)
- CCUS: Monitoring, verification, and accounting (t.b.d.)

## Workshop 3: Machine learning & artificial intelligence

**Instructors:** **Lalitha Venkataramanan** (*Schlumberger Doll*)  
**Chicheng Xu** (*Aramco*)  
**Andy McDonald** (*Lloyd's Register*)  
**Vikas Jain** (*Schlumberger*)

**Date:** Wednesday, May 12 – Thursday, May 13  
**Time:** 8:00 AM – 12:00 PM (CDT; GMT-6)

#### About the Course

This workshop will focus on the applications of Artificial Intelligence (AI) and Machine Learning (ML) to the upstream O&G industry. Consisting of two half-days, the workshop will provide an introduction to machine learning, lay out sample workflows and steps for ML applications and summarize some of the used cases in the industry

The workshop will cover both supervised and unsupervised learning and highlight applications such as QA/QC, outlier detection, facies mapping and learning complex functional mapping

Hands-on tutorials with Python codes to analyze a publicly available data set will also be provided

## Workshop 4: Petrophysical rock typing from empirical to probabilistic methods including validation

**Instructors:** **Gary W. Gunter** (*Schlumberger*)  
**David F. Allen** (*Schlumberger*)  
**Mohamed Y. Sahar** (*Schlumberger*)  
**Eduardo J. Viro** (*Consultant*)

**Date:** Wednesday, May 12 – Thursday, May 13  
**Time:** 8:00 AM – 12:00 PM (CDT; GMT-6)

#### About the Course

This remote delivered short course/workshop presents a practical overview of “Rock Typing” including empirical based methods, deterministic, statistical, probabilistic and automatic predictive methods. The course also includes single well and multi-well examples. This short course includes two core-log examples, with documented workflows, applied calculations, references, and the corresponding Excel solutions for a typical single well analysis and a multi-well analysis.

# SYMPOSIUM PLENARY EVENTS

*Symposium activities will be held online through our contracted third-party vendors*

*All times listed in Central Daylight Time (Houston, TX, USA)*

## PLENARY: KEYNOTE with NIAL MCCOLLAM

**Date:** Monday, May 17

**Speaker:** **Nial McCollam** (*CTO, Lloyd's Register*)

Nial is LR's Chief Technology Officer with responsibility for LR's commercial software business; the data digital innovation strategy and technology related corporate development.

He co-ordinates and directs the LR Group technology and innovation programs through its international teams, the LR Safetytech Accelerator and the Maritime Decarbonisation Hub; as well as working in close collaboration with the Lloyd's Register Foundation which funds extensive, industry focused, research and education activities in support of its mission to make the world a safer place.

Nial became part of LR in 2013, through the acquisition of the Senergy Group, a high growth energy services and technology business. He joined the Senergy Group as Managing Director of Senergy Alternative Energy in 2007; ultimately becoming a director and shareholder in the business with responsibility for software, technology and innovation. Previously, he held roles as CEO of ITI Energy, Consultant with Bain & Co., and senior management positions with ExxonMobil.

## PLENARY: FUTURE OF PETROPHYSICS PANEL DISCUSSION

**Date:** Monday, May 17

**Organizer:** **Adam C. Haecker** (*Continental Resources*)

**Moderator:** **Siddarth Misra** (*Texas A&M University*)

**Panelists:** **Michel Claverie** (*Imperial College London*)  
**Robert (Bob) Gales** (*Halliburton*)  
**Essi Kwabi** (*Apache Corporation*)  
**Shouxiang (Mark) Ma** (*Aramco*)  
**Tom Neville** (*Consultant Formation-Evaluation Asia*)

Join us for a global discussion on the Future of Petrophysics. Format will be a 60-minute moderated discussion and 30-minute town-hall-style question and answer. Topics to be discussed include:

- How is petrophysics currently being used in different regions of the globe?
- What new technologies are affecting petrophysics?
- How does the changing energy landscape affect us?
- What technical challenges have remained unchanged since the heady early days of the SPWLA?
- What are the consequences of lack of investment?
- In what future areas will petrophysics make significant contributions?

# SOCIETY FUNCTIONS

*Symposium activities will be held online through our contracted third-party vendors*

## STUDENT PAPER COMPETITION

**Date:** Sunday, May 16

This event will allow students competing to engage with colleagues from other schools and with industry professionals. Graduate and undergraduate students will share their work and research, for the opportunity of being awarded “best paper presentation”. The competition will be held in three categories: Bachelors (B.S.), Masters (M.S.), and Doctorate (Ph.D.)

## SPWLA ANNUAL BUSINESS MEETING

**Date:** Monday, May 17

The SPWLA Annual Business Meeting is a meeting open to all delegate attendees. During this event, the 2020-21 President and Board Members will share accomplishments made during their tenure, followed by introduction and welcoming of the 2021-22 President and Board Members.

## SPWLA AWARDS CEREMONY

**Date:** To be announced

The SPWLA Annual Awards ceremony is an event to honour and reward individuals for their outstanding achievements and contributions to the Society and the industry.

# SPWLA Board of Directors 2020-2021

## President

James "Jim" Hemingway  
Consultant  
Manitou Spring, CO, USA

## President-Elect

Katerina Yared  
SM Energy  
Highlands Ranch, CO, USA

## VP Technology

Tegwyn Perkins  
Lloyds Register  
Houston, TX, USA

## VP Education

Fransiska Geonawan  
Halliburton  
Houston, TX, USA

## VP Publications

Mayank Malik  
Chevron  
Houston, TX, USA

## VP Finance, Secretary & Admin

Doug Patterson  
Baker Hughes  
Houston, TX

## VP Information Technology

Lin Liang  
Schlumberger Doll-Research  
Cambridge, MA, USA

## SPWLA Regional Directors

### North America I

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Schlumberger  
Houston, TX, USA

### North America II

Kelly Skuce  
Core Petrophysical Consulting  
Calgary, AB, Canada

### Europe

Craig Lindsay  
Core Specialist Services LTD  
Aberdeenshire, United Kingdom

### Middle East/Asia

Nelson Suarez  
Dubai Petroleum Co  
United Arab Emirates

### Latin America

Bruno Menchio Faria  
ENEVA  
Rio de Janeiro, Brazil

### Asia Pacific/Australia

Jennifer Market  
MPC Kinetic  
Perth, Australia

### Executive Director

Sharon Johnson  
SPWLA  
Houston, TX, USA

# SPWLA Technology Committee

## Vice-President of Technology

Tegwyn Perkins, Lloyd's Register

## Committee Members

Vanessa Mendoza Barron, *Norske Shell*  
Sap Basu, *ConocoPhillips*  
Richard Bootle, *Consultant*  
Glen Brabham, *Woodside*  
Tom Bradley, *Baker Hughes*  
Andy Brickell, *BHP*  
Emmanuel Caroli, *Total*  
Jinhong Chen, *Aramco Americas*  
Michel Claverie, *Imperial College London*  
Ben Clennell, *CSIRO*  
Lara Demirezen, *Chrysaor*  
Sandrine Donnadieu, *Equinor*  
Bob Gales, *Halliburton*  
Giuseppe Galli, *ENI SpA*  
Eva Gerick, *Neptune Energy*  
Weijun Guo, *Halliburton*  
Adam Haecker, *Continental Resources*  
Terry Hagiwara, *Aramco Americas*  
Caren Harris, *Consultant*  
Marianne Iversen, *Equinor*  
Matt Jameson, *Glencore*  
Mark Ma, *Saudi Aramco*  
Natasa Mekic, *Weatherford International*  
Bruno Menchio, *Eneva*  
Alberto Mendoza, *Lytt*  
Javier Miranda, *DeGolyer and MacNaughton*  
Brian Moss, *Mantra Petrophysics*  
Marco Pirrone, *ENI SpA*  
Hendrik Rohler, *OMV Petrom*  
Marvin Rourke, *GoWell*  
Kelly Skuce (RD), *Core Petrophysical Consulting*  
Paul Spooner, *Lloyd's Register*  
Nelson Suarez (RD), *Dubai Petroleum*  
Lalitha Venkataramanan, *Schlumberger*  
Haijing Wang, *Chevron USA Inc*  
Chicheng Xu, *Aramco Americas*  
Tetsuya Yamamoto, *JAPEX*  
John Zhou, *Maxwell Dynamics*

# TECHNICAL PROGRAM ABSTRACTS

*NOTE: Tentative Program: Selected papers listed below may not be in the order in which they will be presented. The final technical program may differ from that shown due to paper withdrawals. All technical sessions will be held Online. Photography and video/audio recording of any kind is strictly prohibited in all platforms, including technical sessions, workshops, and exhibition hall.*

## ADVANCES IN MACHINE LEARNING

### **A Deep-Learning Approach for Lithological Classification Using 3D Whole-Core CT-Scan Images**

Kurdistan Chawshin, Carl Fredrik Berg, Damiano Varagnolo, Norwegian University of Science and Technology; and Olivier Lopez, Equinor ASA

### **An AI-Based Approach to Enhanced Fracture Resolution in Image Logs**

James Howard, Joe Tracey and Shawn Zhang, DigiM

### **Automated Selection of Inputs for Log Prediction Models Using Experienced Eye**

Ravi Arkaigud, Helio Flare Ltd; Andrew McDonald and Ross Brackenridge, Lloyd's Register

### **Automated Workflow to Indicate Reservoir Connectivity Through Asphaltene Equilibrium**

Melanie Jensen, Lalitha Venkataramanan, Li Chen, Sandip Bose, Peter Tilke and Oliver C. Mullins, Schlumberger

### **Automatic Logging-While-Drilling Dipole Sonic Shear Processing Enabled by Physics-Driven Machine Learning**

Lin Liang, Ting Lei and Matthew Blyth, Schlumberger

### **Auto-Navigation on Pressure and Sampling Location in Wireline and LWD: Big Data Challenges and Solutions**

Mehdi Alipour Kallehbasti, Bin Dai, Jimmy Price, Christopher Michael Jones, Darren Gascooke, Anthony VanZuilekom, Hoda Tahani and Fahad Ahmed, Halliburton

### **Data Quality Considerations for Petrophysical Machine-Learning Models**

Andrew McDonald, Lloyd's Register

### **Deep-Learning-Based Automated Sedimentary Geometry Characterization From Borehole Images**

Marie Lefranc, Zikri Bayraktar, Morten Kristensen, Isabelle Le Nir, Philippe Marza and Josselin Kherroubi, Schlumberger

### **Doppler vs. Spinner PLT Sensing for Hydrocarbon Velocity Estimate by Deep-Learning Approach**

Klemens Katterbauer and Alberto Marsala, Saudi Aramco; Virginie Schoepf and Eric Donzier, Openfield Technology

### **Efficient Petrophysical Uncertainty Propagation via Data-Driven Analytics**

Carlo Cristiano Stabile and Marco Pirrone, ENI S.p.A.

### **Enhanced Mineral Quantification and Uncertainty Analysis From Downhole Spectroscopy Logs Using Variational Autoencoders**

Paul Craddock, David Rose, Tong Zhou, Harish Datir, Laurent Mosse and Lalitha Venkataramanan, Schlumberger

### **Facies Classification of a Complex Reservoir Using Machine Learning: A Case Study From Volcanic Formation, the Yurihara Oil Field, Japan**

Yuki Maehara, Schlumberger; Takeaki Ohtani and Tetsuya Yamamoto, Japan Petroleum Exploration Co., Ltd.

### **Machine Learning for Productivity Prediction in Heterogeneous Carbonate Gas Reservoirs, Central Sichuan Basin, China**

Zuoan Zhao, PetroChina SWOGC; and Dali Wang, Schlumberger

### **Novel Methodology for Automation of Bad Well-Log Data Identification and Repair**

Ryan Banas, PetroRes Consulting; Andrew McDonald and Tegwyn J. Perkins, Lloyd's Register

### **Prediction and Analysis of Geomechanical Properties of Jimusaer Shale Using a Machine-Learning Approach**

Liu Zhonghua\*, Li Chaoliu and Ning Congqian, Petro China Co. Limited; Qiong Zhang\*, Yanru Zhang, Yan Wang, Yating Hu, Yan Zhuang and Wei Tang, University of Electronic Science and Technology of China (\*Liu Zhonghua and Qiong Zhang are co-first authors)

### **Real-Time 2.5D Inversion of LWD Resistivity Measurements Using Deep Learning for Geosteering Applications in Fractured Media**

Kyubo Noh, The University of Texas at Austin; David Pardo, University of the Basque Country, BCAM, and Ikerbasque; and Carlos Torres-Verdín, The University of Texas at Austin

### **The Application of Pattern Recognition and Machine Learning to Determine Cement Channeling and Bond Quality From Azimuthal Cement Bond Logs**

Andrew Imrie, Halliburton

### **Theoretical Method and Experimental Research on High-Precision Four-Detector Density Logging**

Shanqing Cai, Juntao Liu, Zhuodai Li, Wei Liao, Chang Zong, Xiangping Qian and Zhiyi Liu, Lanzhou University

## **CASE STUDIES**

### **3D Petrophysics for Hawe: Case Studies**

Alexander Kolomytsev, GazpromNeft; and Yulia Pronyaeva, Schlumberger

### **A Skill Set Guideline Document for Future Petrophysicist**

Zach Liu, Kinder Morgan; and Mark Ma, Saudi Aramco

### **Acquisition, Analysis, and Integration of Wellbore Logs to Characterize a Fractured Geothermal Reservoir: The Case of Rittershoffen, France**

Giovanni Sosio, Andreia Mandiuc and Annalisa Campana, Schlumberger; Jeanne Vidal, Universidad de Chile; Régis Hehn, GéoPlusEnvironnement; and Clément Baujard, ÉS Géothermie

### **An Integrated Petrophysical Characterization of Siliciclastic Tight Gas Reservoirs in Neuquén Basin**

Nicolas Carrizo Paez and Emiliano Santiago, YPF; Pablo Saldungaray, Schlumberger

### **Identification of Natural Open Fractures, Induced Fractures, and Matrix Permeability in Carbonates While Drilling**

Jalal Dashti, Bader Al-Ajmi and Hawas Farwan, Kuwait Oil Company; Ahmad Shoeibi, Milton Sanclemente, Alberto Martocchi and Eliana Russo, Geolog International

### **Integrated Evaluation of Laminated Sand-Shale Gas-Bearing Reservoir Using Tensor Model: A Case Study Combining Data From Triaxial Resistivity, Image, Sonic, and Reservoir Testing in B-Field, Malaysia**

Aditya Arie Wijaya, Mohammad Iffwad, Ivan Zhia Ming Wu and Sarvagya Parashar, Halliburton; Amirul Afiq B Yaakob, William Amelio Tolioe, Adib Akmal Che Sidid, Nadhirah Bt. Ahmad, M. Hilman B Roslan, So Seng Hui, Shahul Hameed B Sheikh and Azlan Shah B Johari, Petronas Carigali

### **Interpretation of LWD Acoustic Borehole Image Logs: Case Studies From North American Shale Plays**

Bo Gong, Ela Manuel, Youfang Liu, David Forand, Tom Malizia, Vahid Tohidi and Alex Saldana, Chevron

### **Multiscale LWD Data Integration Unveiled Complex Geological Scenario While Geosteering**

Filippo Chinellato, Maurizio Mele, Andrea Leone and Francesca Arata, Eni S.p.A.; Caterina Cappannelli, and Matteo Medaglia, Mizamtec Operating Co. S. de R.L. de C.V.

### **Rapid Crossplot Discrimination of Commercial Potash Mineralization—Case Histories**

Donald G. Hill, Consulting Petrophysicist; Emeritus Adjunct Professor of Petrophysics, The University of Southern California, and E.R. Crain, Consultant and Mentor

### **Stress Measurement Campaigns in Scientific Deep Boreholes**

Jean Desroches, GPCI; Emilie Peyret, Adriaan Gisolf, Ailsa Wilcox, Mauro Di Giovanni and Aernout Schram de Jong, Schlumberger; Siavash Sepehri, Independent; Rodney Garrard and Benoit Garitte, NAGRA

### **Successful Sand Production Management Through Advanced Analysis of Well Integrity Logs in Casabe Field, Colombia**

Cristian Andrés Escarraga and Marcia Benavides, Schlumberger; Emiro Leon Pallares, Ecopetrol; Tatiana Taborda Ruiz, Schlumberger

### **The Impact of Overbalanced Drilling From Exploration/Appraisal Wells to Field Development Plan**

Mohammadhossein Mohammadlou, Matthew Guy Reppert, Roxane Del Negro and George Jones, Neptune Energy

### **Utilizing Ultrasonic and Pulsed-Eddy Current Technologies to Map the Location of Fiber-Optic Cable and Clamps: A Case Study**

Roddy Hebert, Rojelio Medina, JC Pinkett and Tyler Costa, Halliburton

## **X-ray Diffraction, X-ray Fluorescence, and Neutron-Induced Spectroscopy-Based Correction to an Ivar Aasen Geomodel: An Oil Field From the Norwegian North Sea**

Egil Romsås Fjeldberg, Yngve Bolstad Johansen, Geir Frode Kvilaas, Lodve Hugo Olsborg and Tor-Ole Jøssund, Aker BP; Harish Datir, Schlumberger

## **COMPLETION PETROPHYSICS AND RESERVOIR SURVEILLANCE**

### **An Advanced Petrophysical-Oriented Numerical Method for Reliable Assessment of Mechanical Properties in Anisotropic and Heterogeneous Carbonates at the Pore-Scale Domain**

Mehdi Teymouri and Zoya Heidari, The University of Texas at Austin

### **Case Studies on Multistring Isolation Evaluation in P&A Operations**

Jun Zhang, Probe; Dan T. Mueller, ConocoPhillips; David Bryce, Probe; Tom A. Brockway, ConocoPhillips; and Fady Iskander, Probe

### **Field-Wide Dynamic Pressure Surveillance While Drilling via Study of Interference Pattern From Offset Wells**

Yon Blanco, Schlumberger; Ben Fletcher and Robert Webber, CNOOC; Velerian Sanjao Lopes and Alistair Maguire, Schlumberger

### **Lessons Learned From Cross-Validation of Fiber Optics and Microsensor Production Logging Measurements in Unconventional Wells**

Yegor Se, Chevron; Michael Sullivan, Chevron retired; Michael Lazorek and Vahid Tohidi, Chevron

### **Production Optimization of Sanding Horizontal Wells Using a Distributed Acoustic Sensing (DAS) Sand Monitoring System: A Case Study From the ACG Field in Azerbaijan**

Zahid Hasanov, Parviz Allahverdiyev and Fuad Ibrahimov, BP; Alberto Mendoza, Pradyumna Thiruvengatanathan, Lilia Noble and Jonathan Stapley, LYTT Ltd.

## **DEEPWATER RESERVOIR ANALYSIS**

### **A Practical Guide to Effective Deepwater Fluid Sampling While Drilling**

Steve Smith, Baker Hughes; Matt Wandstrat and Jerry Simms, LLOG; Femi Adegbola and Vincent Liaw, Baker Hughes

### **Deep Transient Testing Digital Products Create Novel Real-Time Reservoir Insight**

Lorenzo Villalobos, Teresa Polo Naranjo, Karl Perez, Alejandro Martin Vicente, Jansen Oliveira and Ricard Fernandez Torrent, REPSOL; Francois Xavier Dubost, Luis Manuel Lavin, Adriaan Gisolf, Richard R. Jackson, Simon Edmundson, Hadrien Dumont, Hugo Hernandez Espinosa and Javier Espinosa, Schlumberger

### **Digital Fluid Sampling in Deepwater Reservoirs Using Reservoir Fluid Geodynamics: The Beginning of the Digital Fluid Sampling Revolution**

Camilo Gelvez, The University of Texas at Austin; Gerardo Cedillo, Eric Soza, Doris Gonzalez, Benjamin Slotnick, Wilson Pineda and Sol Moreno, BP America; Oliver C. Mullins, Scotty Paul, Jesus Cañas and Alok Kulkarni, Schlumberger

### **Enhancing the Understanding of Asphaltene Precipitation: A Novel Approach Under In-Situ Conditions**

Rohin Naveena-Chandran, Farrukh Hamza and Jason Rogers, Halliburton; John Meyer and Sara Chapman, Kosmos Energy

### **Taming the Thunder Horse With Axes and Vectors**

Bernd Ruellicke, Andras Uhrin and Zbynek Veselovsky, Eriksfiord

## **FORMATION EVALUATION BEHIND CASING**

### **A Novel Method for Formation Density Measurement in Cased Wells**

Xinguang Wang, China University of Petroleum (East China); Dong Li, China Oilfield Services Limited; Lei Zhang, China National Offshore Oil Corporation International Limited; Feng Zhang and Wenhao Wang, China University of Petroleum (East China); Hui Gao, Xi'an HuiNeng Electronic Equipment Co. LTD

### **A Novel Through-Casing Correction Algorithm for a Four-Detector Gamma Density Tool**

Jin Ya\* and Shang Jie, China Oilfield Services Limited; Chen ZengHai, CNOOC China Limited Pengbo Operating Company; Qiong Zhang\*, Yulian Li, Yating Hu, Qinzhong Zhang, Lvlin Lin and Wei Tang, University of Electronic Science and Technology of China (Jin Ya\* and Qiong Zhang\* are co-first authors)

### **Determining Density of Multiple Layers Using Gamma Spectroscopy**

Mayir Mamtimin and Jeffrey Crawford, Halliburton



**Identification of Breakout Behind Casing: Methodology to Obtain Openhole-Equivalent Caliper Measurements Through Slotted Liner Using the Density Tool**

Laurent Mosse, Schlumberger; Stephen Pell, Santos Ltd. and Tom Neville, Asia-Pacific Formation Evaluation Services

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Isa Silveira Araujo, Archana Jagadisan and Zoya Heidari, University of Texas at Austin

**A New Look at the Dual Depth of Investigation Phenomenon of LWD Propagation Resistivity Logging**

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**Analytical Uncertainty Propagation in Facies Classification With Uncertain Log Data**

Fabio Ciabbari, Marco Pirrone and Cristiano Tarchiani, Eni SpA

**Anisotropy Quantification Using High-Resolution Whole-Core 3D CT-Scan Images**

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Ruijia Wang, Jiajun Zhao and Taher Kortam, Halliburton

**Automatic Flow-Calibrated Permeability Log Estimation Through Dual Random Forest Algorithm: How Predictive Analytics Enhances the Characterization of Heterogeneous Carbonate Reservoirs**

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**Deciphering Low-Resistivity Pay to De-Risk a Commercial Prospect: A Case Study From the Norwegian Sea**

Mohammad Ibrahim Khan, Equinor Norway ASA; Harish Datir, Schlumberger Norway AS and Bjarne Rafaelsen, Equinor Norway ASA

**Deep Dielectric-Based Water Saturation in Freshwater and Mixed Salinity Environments**

Ping Zhang, Wael Abdallah and Gong Li Wang, Schlumberger; Shouxiang Mark Ma, Saudi Aramco

**Enhancing the Reservoir Performance by Accessing the Hydrocarbon Sweet Spots Guided by Far-Field Sonic Imaging: An Integrated Case Study From the Norwegian North Sea**

Harish B. Datir, Schlumberger; Knut Arne Birkedal and Nils Andre Aarseth, Aker BP ASA

**Exploiting Well Test Logging to Endeavor Mapping the Cretaceous Carbonates Permeability, Offshore Abu Dhabi**

Antoine Jacques and Vincent Jaffrezic, TOTAL SE; Amr Mohamed Serry, Shafiq Naseem Ahmed, Yann Bigno and Raymond Nguyen, ADNOC; Benoit Brouard, Brouard Consulting

**Formation Pressure Estimation in Ultralow Permeability Reservoirs Employing Formation Rate Analysis (FRA) and Artificial Intelligence-Controlled Tools**

Yamal Askoul and Gavin J Sibbald, Baker Hughes; Art Hooker and John Banks, TOTAL

**From Plug Measurements to Dynamic Simulations: Upscaling Effects on Modeled Hydrocarbon Volumes**

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**Gamma Ray Index–Shale Volume Transforms**

David Kennedy, QED Petrophysics LLC

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Zulkuf Azizoglu, Artur Posenato Garcia and Zoya Heidari, The University of Texas at Austin

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Kresimir Vican, Venkat Jambunathan, Nacer Guergueb and Ehab Negm, Halliburton; Francis Eriavbe, Al Dhafra Petroleum; Reinaldo Jose Angulo Yznaga, Consultant

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### **Unraveling the Production Mysteries of the Wafra Maastrichtian Carbonates Through Advanced Borehole Measurements and Analysis**

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Tom Bratton, Tom Bratton LLC

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Junchen Wu, Yiren Fan and Shaogui Deng, School of Geosciences, China University of Petroleum (East China); Ruokun Huang, Research Institute of Petroleum Exploration and Development, PetroChina Tarim Oilfield Company; Fei Wu, Suzhou Niumag Analytical Instrument Corporation; Zhongtao Wang, China Petroleum Logging CO.LTD.

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Jimmy Price, Darren Gascooke, Anthony van Zuilekom and Christopher Jones, Halliburton

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Shaina Kelly and Ron J.M. Bonnie, ConocoPhillips; Micheal J. Dick and Dragan Veselinovic, Green Imaging Technologies

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Nazanin Jahani, NORCE Norwegian Research Centre AS; Joaquín Ambía Garrido, The University of Texas at Austin; Kristian Fossum, Sergey Alyaev and Erich Suter, NORCE Norwegian Research Centre

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John Degenhardt, W. D. Von Gonten Laboratories; Safdar Ali, W. D. Von Gonten & Co.; Mansoor Ali and Brian Chin, W. D. Von Gonten Laboratories; W. D. Von Gonten, W. D. Von Gonten & Co.; and Eric Peavey, Texas A&M University

### **Revising the Interpretation of Complex Carbonate Reservoirs With the Use of Novel Advanced Logs Integration Techniques**

Harish B. Datir, Schlumberger Norway AS; Laurent Mosse, Schlumberger; and Terje Kollien, Lundin Energy

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Andrew Barry and Adam Haecker, Continental Resources

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Daria Olszowska, Gabriel Gallardo-Giozza and Carlos Torres-Verdín, The University of Texas at Austin

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Tianhua Zhang, Shiduo Yang, Chandramani Shrivastava, Adrian A and Nadege Bize-Forest, Schlumberger

### **A Resonance-Based Through-Tubing Cement Evaluation Technology**

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### **An Enhanced Method for Crack Evaluation Using Neutron Gamma Tracer Imaging Logging Technology in a Carbonate Reservoir**

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Qixuan Liang, Feng Zhang, Xiaoyang Zhang, Qian Chen and Jilin Fan, China University of Petroleum (East China)

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Xuelian Chen, Xiaoming Tang, Shengqing Li and Yuanda Su, China University of Petroleum

**Application of Electromagnetic Technology for Corrosion Monitoring in Wells With Dual Completions**

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**Deciphering the Capabilities of Look-Ahead Methods in LWD**

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**Enhancing Wellbore Leak Localization With Continuous Logging Data From a Sonic Sensor Array**

Yao Ge, Ruijia Wang, Xiang Wu and Freeman Hill, Halliburton

**Evaluation of LWD High-Resolution Ultrasonic Imaging Technology and Applications in Slimhole Size**

Mohamed Hashem, Saudi Aramco; Mohamed Fouda, Ahmed Taher and Rehab Alkhalifah, Halliburton

**Field Testing an Ultralim High-Definition Electrical Borehole Imager for Oil-Based Mud**

Richard Bloemenkamp, Elia Haddad, Peter Schlicht, Nadege Bize-Forest, and Laetitia Comparon, Schlumberger

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Adam Donald, Schlumberger; Olusegun Akinyose, Saudi Aramco; Rajeev Kumar, Firas Al Shaikh, Nicholas Bennett, Nobuyasu Hirabayashi, Sherif Ghadiry, Toshihiro Kinoshita and Edgar Velez, Schlumberger

**NanoTags for Improved Cutting Depth Determination**

Martin Poitzsch, S. Sherry Zhu and Marta Antoniv, Aramco Americas: Aramco Research Center-Boston; Nouf M. Jabri and Alberto F. Marsala, EXPEC ARC, Saudi Aramco

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German Garcia, Schlumberger; Brett Wendt and Adam Lewis, ConocoPhillips; and Hadrien Dumont, Schlumberger

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Supriya Sinha, Karol Riofrio Rodriguez, Arthur Walmsley and Nigel Clegg, Halliburton; Stig Sviland-Østre, Constantijn Dejongh and Nicolas Gueze, Aker BP

**Robust Sonic-Log Tracking Using a Multiresolution Approach**

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**Through-Tubing Casing Deformation and Tubing Eccentricity Image Tool for Well Integrity Monitoring and Plug Abandonment**

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**Toward Three-Dimensional Reservoir Mapping—A New Approach for Mapping Reservoirs with Advanced Ultradeep Azimuthal Resistivity Measurements**

Haifeng Wang, Michael Thiel, Diogo Salim, Soazig Leveque, Jean-Michel Denichou and Vera Krissetiawati Wibowo, Schlumberger; Chris Woods and Darren Baker, Woodside Energy Ltd.

**Using Proxy Simulator for Reservoir Zone Selection and Reducing the Formation Tester Cleanup Operational Time**

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**Vendor-Neutral Stochastic Inversion of LWD Deep Azimuthal Resistivity Data as a Step Toward Efficiency Standardization of Geosteering Services**

Mikhail Sviridov, Anton Mosin, Sergey Lebedev, Igor Kuvaev and Igor Uvarov, ROGII Inc.

**Wellbore Images Digital Fusion: Behind Single Sensors Physical Constrains**

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**Wellsite Full-Waveform Sonic Interpretation**

J. Adam Donald and Erik Wielemaker, Schlumberger; Chris Holmes, Denison Gas; Tom Neville, Asia-Pacific Formation Evaluation Services Pty Ltd

**PETROPHYSICS IN BROWNFIELDS****Deriving Synthetic Bulk Density Using Fast Neutron Cross Section in a Log-Integrated Approach From Slim Pulsed Neutron in a Casedhole Environment**

Khaled Saleh, Chiara Cavalleri and Aly Morad, Schlumberger

**Determination of Residual Oil Saturation in a Waterflooded and Gasflooded Giant Oil Reservoir Using Core, Conventional, and Pulsed-Neutron Logs**

Mike Davenport, BP; Kasim Sadikoglu, Former BP; Adrian Zett and Pavel Gramin, BP

**Intrinsic Carbon-Oxygen Logging for Enhanced Consistency of Reservoir Saturation Monitoring**

Shouxiang Mark Ma, Saudi Aramco; Nacer Guergueb, Weijun Guo and Mahmoud Eid, Halliburton

**Side Fault Mapping Enabled by 2D Transverse Inversion on New Ultradeep Azimuthal Resistivity Measurements**

Michael Thiel, Haifeng Wang, Dzevat Omeragic and Jean-Michel Denichou, Schlumberger; Barry Goodin, Vermilion Oil & Gas Australia Pty Ltd

**Utilizing Near- And Far-Field Borehole Measurements for a Comprehensive Carbonate Fracture Characterization**

Amr M. Serry, Sultan D. Al-Hassani, Shafiq N. Ahmed, Owais A. Khan, Hassan F. Aboujmeih, Hassan Zakaria and Olivier P. Pippi, ADNOC Offshore; Adam Donald, Amro Abdel-Halim and Israa A. Salim, Schlumberger