# Society of Petrophysicists and Well Log Analysts
# 65th Annual Symposium
# Rio de Janeiro, Brazil, May 18-22, 2024

## SPWLA
### BRAZIL CHAPTER

Contact Information

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The information in this Brochure may change as planning progresses, and it is recommended that delegates check the symposium website https://www.spwlaworld.org/

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# Welcome to Rio - The 65th Annual SPWLA Symposium

It is with great pleasure and enthusiasm that the SPWLA Chapter Brazil extends its warmest welcome to the SPWLA 65th Annual Symposium in Rio de Janeiro, Brazil. Set against the backdrop of breathtaking landscapes and the vibrant energy of the city, this event marks the 10 years of official existence of the Brazil Chapter, being the first SPWLA international symposium held in Brazil and the second in South America. This promises to be a remarkable gathering of industry professionals and experts from around the world.

In recent decades, Brazil has emerged as a prominent player in the oil and gas industry, ranking among the top ten oil producers worldwide. The exploration and production of the turbidite reservoirs in the Campos Basin and the pre-salt carbonates in the Santos Basin have led to numerous advancements in technology, revolutionizing various aspects of geosciences and engineering, particularly in petrophysics and formation evaluation. Brazil's onshore infrastructure, coupled with the revival of production by major operators, has created a new market for mature fields, fostering the growth of specialized companies and revitalizing the sector.

Moreover, Brazil's potential extends beyond traditional oil and gas endeavors. The onshore infrastructure already in place can represent a new frontier for the development of CCUS and hydrogen storage projects. The petrophysics community has a lot to contribute to these areas, leveraging their expertise to explore the potential of geological carbon capture and storage, as well as the production and storage of hydrogen, which are vital components in the transition to a more sustainable energy future. Brazil's vast resources and expertise make it a promising candidate for advancing these technologies on a larger scale.

Furthermore, the recent oil discoveries in Guyana have transformed the Brazilian Equatorial Margin into an exciting frontier for oil and gas ventures. This new exploration area opens opportunities for further growth and innovation in the industry. Brazil's oil and gas sector stands out as one of the most prolific globally, attracting industry professionals and experts from around the world.

During the symposium, first-class speakers will delve into a wide range of topics, including formation evaluation, exploration, production, CCUS and hydrogen storage, and emerging technologies. Engage in enlightening panel discussions, informative workshops, and presentations that will foster innovation, collaboration, and drive the industry forward.

We have carefully selected the ***Sheraton Grand Rio Hotel & Resort*** as the venue for this important event, which will take place from ***May 18th to 22nd, 2024***. The hotel offers an excellent selection of meeting rooms for dual sessions, workshops, society events, and luncheons. With its breathtaking views of Leblon and Ipanema beaches, the hotel provides accommodation that can cater to all attendees. Additionally, field trips and social events will be organized providing ample opportunities for networking, and forging valuable connections.

Beyond the professional endeavors, we invite you to immerse yourself in the beauty and cultural richness of Rio de Janeiro. Known as the "Marvelous City," Rio captivates visitors with its iconic landmarks, vibrant neighborhoods, and warm hospitality. Take a moment to explore the world-famous Christ the Redeemer statue, which overlooks the city from atop Corcovado Mountain. Stroll along the stunning beaches of Copacabana and Ipanema, where you can savor the beauty of the coastline and experience the lively Carioca lifestyle.

As you embrace the symposium, we encourage you to take advantage of the exceptional networking opportunities with colleagues and peers. Share insights, exchange ideas, and establish connections that will shape the future of the oil and gas industry. In addition, Rio de Janeiro offers a wealth of cultural experiences, from samba shows and traditional Brazilian cuisine to the historical charm of the Santa Teresa neighborhood and the exhilarating atmosphere of the Carnival.

We are honored to host the 65th Annual Symposium in such a captivating destination and look forward to your support and participation. Join us in Rio de Janeiro in 2024 as we unlock new horizons in the oil and gas industry and immerse ourselves in the warmth and beauty of this remarkable city.

Warm regards,
Lucas Abreu Blanes de Oliveira
President of SPWLA Brazil Chapter and Symposium General Chair

# SYMPOSIUM AGENDA

All functions will be held in the Sheraton Grand Rio Hotel & Resort unless otherwise indicated. Please confirm exact location and timing prior to event from information provided at registration.

### *Saturday, May 18 – 7:00am – 5:00pm*
Registration
Field Trip: Pre-salt reservoir analogues: lagoon and subaerial carbonate
Workshop 1: Advanced Borehole Image Applications – Reservoir characterization beyond dips
Workshop 2: Optimized Reservoir Performance:  UDAR-Well Placement and High Angle /Horizontal Well Petrophysics
Workshop 3: Digital rock Applied to Formation Evaluation – upscaling insights from pore to well log scale
Workshop 4: New Advances in NMR Techniques and Applications

### *Sunday, May 19 – 7:00am – 5:00pm*
Registration
Field Trip 2:  Core Workshop -Exploring Pre-Salt Carbonate Reservoirs:
A Comprehensive Tour of Petrographic, Geochemical, and Petrophysical Insights
Workshop 5: Towards the effective use of borehole acoustics; Understanding, validating and utilizing sonic measurements
Workshop 6: Data Analytics – Understanding the Tools – Limitations and Opportunities
Workshop 7: Energy Transition Petrophysics – What is new, What is the Same
Workshop 8: Petrophysics Surveillance – Technologies and Best-in Class Applications
Student Paper Competition (ISPC)
Speaker Preparation Center
Technology Committee Meeting
Icebreaker Reception

### *Monday, May 20 – 7:00am – 5:00pm*
Speaker Meeting with VP Technology and Session Chairs
Speaker Preparation Room
Registration
Exhibition
Opening Remarks and Keynote Address
Spouse/Partner Tour:
Dual Technical Sessions AM
Annual Business Meeting and Lunch
Dual Technical Sessions PM
Poster Session Area
Monday Evening Social Event 6:30pm – 9:30pm

### *Tuesday, May 21 – 7:00am – 5:00pm*
Speaker Meeting with VP Technology and Session Chairs
Speaker Preparation Room
Registration
Exhibition
Spouse/Partner Tour
Dual Technical Sessions AM
Awards Ceremony Luncheon
Dual Technical Sessions PM
Poster Session Area
Tuesday Evening Social Event 6:30pm – 9:30pm

### *Wednesday, May 22 – 7:00am – 5:00pm*
Speaker Meeting with VP Technology and Session Chairs
Speaker Preparation Room
Registration
Exhibition: 8:30am – 3:00pm
Spouse/Partner Tour
Dual Technical Sessions AM
Leadership Luncheon
Dual Technical Sessions PM
Poster Session Area
Closing Remarks and Door Prize Drawing

### *Thursday, May 23 – 8:00am – 5:00pm (Post Symposium)*
NMR SIG Conference; Brazil at the Baker Hughes Rio Energy Technology Innovation Center (RETIC)

# GENERAL INFORMATION

Note: All events will take place at the Sheraton Grand Rio Hotel & Resort unless indicated otherwise.

**REGISTRATION**

Registration for all attendees, spouses and guests will be located in the Sheraton Grand (Lobby)

**DATE AND TIME:**
Saturday, May 18        7:00 a.m. - 5:00 p.m.
Sunday, May 19          7:00 a.m. - 5:00 p.m.
Monday, May 20          7:00 a.m. - 5:00 p.m.
Tuesday, May 21         7:30 a.m. - 5:00 p.m.
Wednesday, May 22       7:30 a.m. - 12:00 noon

**STUDENT PAPER COMPETITION**
Sunday, May 19. 8:00 a.m. – 5:00 p.m.
Papers will be judged and cash prizes will be awarded to the winners at the end of the competition. Students are encouraged to attend the Tuesday luncheon to be recognized during the Annual Awards Ceremony.

**EXHIBITION**
Pmema, Foyer, Vidigal A-C
Exhibit hours are:
Monday          8:30 a.m. - 5:00 p.m.
Tuesday         8:30 a.m. - 5:00 p.m.
Wednesday       8:30 a.m. – 3:00 pm.
**Please note:** For safety consideration, no one under the age of 13 will be allowed in the exhibit hall.

**OPENING SESSION AND KEYNOTE ADDRESS**
Monday, May 20, 8:00 a.m.
Join us as General Chair, Lucas Abreu Blanes de Oliveira delivers the SPWLA 65th Annual Logging Symposium opening remarks and the introduction of Keynote Speaker; Jonilton Pessoa. Immediately following the address, SPWLA Vice President of Technology, Robert "Bob" Gales will officially open the technical sessions.



Jonilton Pessoa is a geologist, graduated from the Federal University of Rio Grande do Norte, with a master's degree in Geophysical Sciences from the Federal University of Bahia and an MBA in Economics from FGV in Rio de Janeiro. He joined and began his professional career at Petrobras in 1987, working as an Interpretation Geophysicist in the Campos Basin, offshore Brazil. In 1998, he took over management of the seismic processing team, having been appointed as manager of Deep Water Interpretation in 2000, still in the Campos Basin. From 2004 to 2007, at the company's headquarters, he led the interpretation teams for the Campos and Espírito Santo basins, on the Brazilian East Margin, when he was appointed General Manager of Exploratory Interpretation for the Southeast Basins. From 2016 to 2020, he served as General Manager of Applied Geophysics. In 2020, he assumed the General Management of Geological and Geophysical Data Processing Technology. He is currently the Executive Exploration Manager.

**SPEAKER MEETING WITH VP TECHNOLOGY AND SESSION CHAIRS**
Pre-conference meeting for All Speakers and Session Co-Chairpersons on the morning of your presentation. The Committee will have a Q&A session, test the equipment, and explain the program procedures. Monday through Wednesday, 7:00 a.m. – 8:00 a.m.

**SPEAKER PREPARATION CENTER**
All speakers are encouraged to view their presentation in the Preparation Center and have their file checked by the projectionist at their earliest convenience. The Preparation Center will provide a computer for speakers to load their PowerPoint® presentations onto the symposium's computer network and verify compatibility and consistency with the system. The Preparation Center is open Sunday 9:00 a.m. to 5:00 p.m., Monday through Wednesday, 7:00 a.m. to 5:00 p.m.

**POSTER PRESENTATIONS**
Posters are on display Monday, Tuesday and Wednesday with a dedicated session each day.

# EXHIBITORS

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Rodolfo Victor, Petrobras
Chicheng Xu, Aramco Americas
Irada Yusufova, Equinor
Qiong Zhang, UESTC
John Zhou, Maxwell Dynamics

# TENTITIVE TECHNICAL PROGRAM
## May 20-22, 2024

**Full Abstracts:** [https://www.spwlaworld.org/wp-content/uploads/2024/02/65th-Annual-Symposium-Abstracts-for-Newsletter.Final_.pdf](https://www.spwlaworld.org/wp-content/uploads/2024/02/65th-Annual-Symposium-Abstracts-for-Newsletter.Final_.pdf)

*NOTE: 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 at the **Sheraton Grand Rio Hotel & Resort**. Photography and video/audio recording of any kind are strictly prohibited in all areas, including technical sessions, workshops, and exhibition hall.*

## ACOUSTICS TECHNOLOGY AND APPLICATIONS

**A Case Study Utilizing Cost-Effective LWD Ultrasonic Imaging Technology in Unconventional Asset Development**
Pingjun Guo, Brett Zastoupil, Laurin Musso, Steven Sowers, and Mohammed Bousaleh, ExxonMobil

**A Novel Method for Evaluating Hydraulic Fracturing Effect Utilizing Acoustic Logging**
Siyi Li, Wenhui Chen, Hao Zhang, Liming Jiang, Xuekai Sun, Kun Shao, Hao Sun, Yanwei Zhao, and Peng Shi, Acoustic Research Center, China National Logging Corporation

**A Stabilized Real-Time Slowness Estimation Method for Compressional Waves by Using Kalman Filtering**
Hao Sun, Chunhao Yu, Xuekai Sun, Liming Jiang, Husong Ling, Xianping Liu, and Siyi Li, China National Logging Corporation, CNPC

**Biot Coefficient From Sonic Logs With Laboratory Data Calibration – A Brazillian Presalt Field Case Study**
Marcio José Morschbacher, Guilherme Fernandes Vasquez, Marcos Pozzato Figueiredo, Julio Cesar Ramos Justen, and Flavia de Oliveira Lima Falcao, Petrobras

**Calibration of the Anisotropic Rock Physics Model and Its Petrophysics and Geomechanics Applications**
Sergey Vorobiev, ITOIL-SV; Timur Zharnikov, Aramco Innovations; Vladimir Vorobyev, ITOIL-SV; Christopher Ayadiuno and Zainab Ibrahim, Saudi Aramco

**Enhanced LWD Quadrupole Shear Processing Provided Reliable Shear for Reservoir Characterization: A Case Study From Deepwater Gulf of Mexico**
Lei Wu and Alisa Kukharchuk, Baker Hughes; Gary Ostroff and Brian LeCompte, Murphy Oil

**Formation Acoustic Properties Analysis Workflow Based on an Innovative Cement Evaluation Log Behind Multiple Casing Strings**
J. Adam Donald, Kamaljeet Singh, and Erik Wielemaker, SLB; Amr Serry and Sultan Budebes, ADNOC

**High-Resolution Peripheral Imaging Around a Borehole With a Source-Independent TV-Constrained Full Waveform Inversion Approach**
Zhilong Fang, School of Resources and Environment, University of Electronic Science and Technology of China; Meng Li, School of Earth Sciences and Engineering, Xi'an Shiyou University; Hua Wang, School of Resources and Environment, University of Electronic Science and Technology of China

**Looking for Producible Fractures on Different Scales**
Fernando Gomes de Mello e Silva, Antonio Persio Silvestre, and Alexandre Kolisnyk, Petróleo Brasileiro S.A.

**Real-Time LWD Sonic Processing Enabled by Data-Driven Machine Learning**
Lin Liang, Ting Lei, Yixin Wang, Matt Blyth, Michiko Hamada, and Naoki Sakiyama, SLB

**The Evaluation and Correction of Photoelectric Factor in the Presence of Large Standoff and Heavy Muds**
Bair V. Banzarov, Andreas Vogt, and Nicklas Ritzmann, Baker Hughes

## CASED-HOLE FORMATION EVALUATION AND RESERVOIR SURVEILLANCE

**A Data-Driven Method for Formation Slowness Estimation Behind Casing**
Xuekai Sun, Acoustic Research Center, China National Logging Corporation; Haochun Yu, Jun Zhou, and Jingqi Lin, China National Logging Corporation; Siyi Li, Acoustic Research Center, China National Logging Corporation; Hao Chen, China National Logging Corporation; Xianping Liu, Hao Sun, and Ran Zhang, Acoustic Research Center, China National Logging Corporation

**An Evaluation Cement Method Using Gamma-Gamma Density Imaging Logging in a Double Casing Well**
Yiming Yu, Feng Zhang, Luyu Zhong, and Zhenghua Hu, School of Geoscience, China University of Petroleum (East China); Yuexiang Dai, CNPC Logging (CPL)

**Borehole Effect Correction in Pulsed-Neutron-Neutron Logging for Formation Capture Cross-Section Determination**
Guofeng Yang, Wenzheng Peng, Hongfa Ye, Zhengyan Wang, Meng Chen, and Xiangjun Liu, School of Geoscience and Technology, Southwest Petroleum University

**Cement Bond and Corrosion Logging With Ultrasonic Phased-Array Transducer**
Roel Van Os, Izabela Titton, Zheng Li, Hiroshi Hori, Patrick Girolami, Gilbert Tardivel, Orland Guedes, Gulnara Ishberdina, and Kamaljeet Singh, SLB

**First-Ever Seven Pipe Corrosion Evaluation for Comprehensive Assessment of Pipe Integrity in Complex Well Completions**
Ahmed E. Fouda, Junwen Dai, Huiwen Sheng, Mahmoud Saada, Neil Ostermann, and Sushovon Roy, Halliburton

**From Leak Path Detection to Quantitative Flow Profiling: The Exciting Journey of the Noise**
Giuseppe Galli, Marco Pirrone, and Saida Machicote, Eni SpA

**Managing a Unique Subsea Field Through Depressurization – An Update on the North Sea Machar Field After Five Years of Acquiring Cased-Hole Surveillance**
Alexandra Love, Xiaogang Han, Thomas Harpley, and James Hoad, BP

**Novel Through-Tubing Casing Measurement With Azimuthal Sensitivity for Game-Changing Proactive Multi-Casing Corrosion Measurement**
Matthew Gavin, Andrew Smith, Marc Ramirez, Sushant Dutta, Jun Zhang, and Joseph Olaiya, Baker Hughes; Johan Kverneland, TotalEnergies EP Norge

**Obtaining Johan Sverdrup Field Remaining Oil Saturation From a Variety of Logging Data**
Brice Fortier, Hege Christin Widerøe, Margarete Kopal, and Eirik Berg, Equinor; Tom Bradley and Tor Eiane, Baker Hughes

**Overcoming Cased-Hole Logging Challenges to Assess Waterflood Conformance in Clair Ridge Segment 2B**
Alexandra Love, Xiaogang Han, James Hoad, and Laurence Burchell, BP

**Successful Avoidance of Production Hazards From Subseismic Faults on a Multiple Horizontal Well Project in Permian Basin, Texas**
Karim Sabaa, Baker Hughes; Derek Buster, Consultant; Amer Hanif, Ehsaan Nasir, and Eduardo Cazeneuve, Baker Hughes

**Surpassing the Challenges of Cement Evaluation on Presalt Wells**
Janio Cornelio, Kamaljeet Singh, and Emerson Rodrigues, SLB; Lorena Bicalho and Diego Brasil, Petrobras

**The Technology of Magnetic-Pulse Flaw Detection-Thickness Measurement of Multistring Wells by the Transient Method**
Gulnara Golovatskaya and Aleksandr Potapov, JSC Research and Production Enterprise VNIIGIS; Aleksandr Shumilov and Mingjun Xie, Perm State University

**The Road Through Microannuli: Advanced Ultrasonic Log Analysis and Mechanistic Modeling for Leak Rate Quantification**
Saida Machicote, Marco Pirrone, and Giuseppe Galli, Eni S.p.A.

**Through-Tubing Casing Deformation Inspection Based on Data-Driven Koopman Modeling and Ensemble Kalman Filter**
Lijian Jiang, Linh Ho Manh, Qinshan Yang, Alexander Tarasov, Jinsong Zhao, Marvin Rourke, and Neil Sookram, GOWell; Mohamed Larbi Zeghlache, Saudi Aramco

**Unlocking Reservoir Potential: Strategic Role of Saturation Logs in Cased Hole for Waterflooding Optimization**
Patricio Zamora, SLB

# CORE AND PVT – LOG VALIDATION AND RESERVOIR UNDERSTANDING

**Core Cleaning for Wettability Restoration – How Clean Is Clean?**
Hussain Al Qatari, Halliburton; Shouxiang (Mark) Ma, Aramco; Ahmed Hafez and Taha Okashah, Halliburton

**Experimental Study on the Change of Resistivity of Synthetic Methane Hydrate Under Different Saturation and Clay Composition Conditions**
Yin Lu, Wang Meng, and Zhu Jiangmei, China Oilfield Services Limited

**Investigation of Wettability of Rock Components via Water Adsorption Isotherms**
Isa Silveira de Araujo and Zoya Heidari, The University of Texas at Austin

**Pore System Analysis in the Golfo San Jorge Basin: A Regional Overview**
Juan Javier Fabiano, Alejandro D´odorico, and Sergio Bosco, YPF

**Practical Model For Estimating Reservoir Crude Oil-Water Interfacial Tension**
Mohammed Fadhel Al-Hamad and Sharath Chandra Mahavadi, SLB; Shouxiang (Mark) Ma, Saudi Aramco; Wael Abdallah, SLB

# DATA ANALYTICS AND AUTOMATION IN WELL-CENTRIC GEOLOGIC EVALUATION

**A Machine-Learning Approach to Predict and Characterize Evaporites for $H_2$ Storage in Salt Cavities**
Perrine Baron, Emmanuel Caroli, and Sabine Delahaye, TotalEnergies; Alexandre Pichat, AKKODIS

**An Automatic Approach for Core-To-Log Depth Match in Presalt Carbonate Reservoirs**
Adna Grazielly Paz de Vasconcelos, Danilo Jotta Ariza Ferreira, Rodrigo Bittencourt de Aguiar, Luciana Velasco Medani, Giovanna da Fraga Carneiro, and Lin Liang, SLB

**An Autonomous Workflow to Evaluate Acoustic-Logging Waveform Quality**
Gengxiao Yang and Hua Wang, University of Electronic Science and Technology of China

**Cascaded Machine Learning in NMR: Unveiling a Continuous Grain-Size Distribution Approach for Tackling Sand Production Challenges**
Muhamad Saiful Hakimi Daud, SLB; Seyed Mehdi Tabatabai, PETRONAS

**Data-Driven Petrophysics: An Automated Approach to Parameter Optimization in Well-Log Interpretation**
Kjetil Westeng, Aker BP ASA; Christian Lehre, Sopra Steria; Yann Van Crombrugge, Inmeta; Peder Aursand and Tanya Kontsedal, Aker BP ASA

**Describing the Porosity of Presalt Carbonate Rocks Using Machine Learning**
Gisella Roza Nunes, Jeferson Santos, Gilberto Raitz Junior, and Leonardo Borghi, Federal University of Rio de Janeiro

**Enhanced AI-Driven Automatic Dip Picking in Horizontal Wells Through Deep Learning, Clustering, and Interpolation in Real Time**
Alexandre Perrier, Alexis He, Nadège Bize-Forest, and Daniel Quesada, SLB

**Fault Reactivation in Presalt Carbonate Reservoirs Based on Geomechanical Modeling – Case Study: Sapinhoá Field**
Maria Juliana Jauregui Suárez, Universidad industrial de Santander; Daniel Mauricio Rojas Caro, Alessandro Batezelli, Emilson Pereira Leite, Gelvam André Hartmann, and Maria Liceth Cabrera, Universidade Estadual de Campinas

**Integrating Statistical Significant Laboratory Information in Variable $T_2$ Cutoff Logs for NMR Interpretation in Presalt**
Bernardo Coutinho Camilo dos Santos, Willian Andrighetto Trevizan, Thais Fernandes de Mato, Edmir Ravazzi Franco Ramos, Leonardo Gonçalves, and Lucas Abreu Blanes de Oliveira, Petrobras

**Novel Machine-Learning-Driven Framework for Rock Typing and Permeability Prediction Using Borehole and Spatial Data – A Case Study From a Supergiant Carbonate Reservoir in Abu Dhabi**
Gennady Makarychev, Alaa Maarouf, Lulwa Almarzooqi, Luisa Ana Barillas Cortez, Midhun Madhavan, and Hussein Mustapha, SLB; Nader Gerges and Chakib Kada Kloucha, ADNOC

**The Impacts of Bed Boundaries, Bed Thickness, and Sensor Measurement Resolution on Machine-Learning Facies Prediction**
Andrew McDonald, Geoactive Limited; Edward Downer, Axis Well Technology; Ryan Banas, PetroRes Consulting; Tegwyn Perkins, Geoactive Limited

## SPORSE: DIGITAL ROCK PHYSICS FOR FORMATION EVALUATION: ARE WE THERE YET?

**Empirical Determination of the Effective Solid Modulus in Organic-Rich Shales**
K. Larkin Spires, Lori Hathon, and Michael T. Myers, University of Houston; David Myers, MetaRock Laboratories; John Castagna, University of Houston

**Evaluation of Genetic and Geometric Features Extracted Using Automatic Segmentation for the Characterization of Porosity and Permeability of Reservoir Facies From Tartaruga Verde Field, South of Campos Basin**
Matheus Augusto Alves Cuglieri, Paulo Henrique de Oliveira, Marcelo Ramalho Albuquerque, and Leonardo Alencar de Oliveira, Petrobras

**Fast and Automatic Extraction of Fracture Apparent Attitude Based on CT Images of Full-Diameter Cores**
Ying Zhou and Xin Nie, Yangtze University

**Influence of Salt Concentration and Type on Dielectric Permittivity of Rocks**
Zullkuf Azizoglu and Zoya Heidari, The University of Texas at Austin

**Insights of Core Analysis Data Interpretation by Use of Digital Rock Physics**
Mohammed Fadhel Al-Hamad and Denis Klemin, SLB; Shouxiang (Mark) Ma, Saudi Aramco; Wael Abdallah, SLB

**Mapping Mineralogy to 3D Digital Rock Using Multimodal Multidimensional Image Registration**
Mohamed Sarhan, Lori A. Hathon, and Michael T. Myers, University of Houston; Alon Arad, Automated Analytics

**Predicting Rock Compressibility Based on the Statistical Data From Micro-CT and Thin Sections**
Ghaleb Al-Gobi, Michael T. Myers, and Lori Hathon, University of Houston

**Synchrotron Source Zoom-Tomography of Porous Media at the Mogno Beamline**
Nathaly Lopes Archilha, Daphne Silva Pino, Talita Rosas Ferreira, Victor Ramon Martinez Zelaya, Everton Lucas de Oliveira, Aluizio Jose Salvador, Bruno Becker Kerber, Murilo de Carvalho, Gabriel Schubert Ruiz Costa, Paola Cunha Ferraz, Larissa Macul Moreno, Otávio Moreira Paiano, João F.G. de Albuquerque Oliveira, and Eduardo Xavier Miqueles, Brazilian Synchrotron Light Laboratory; Rodrigo Surmas, Petrobras; Harry Westfhal, Jr., Brazilian Synchrotron Light Laboratory

## ENERGY TRANSITION – REDUCING SUBSURFACE RISK IN MODELING AND MONITORING

**Creep-Cyclic Stress Tests in Salts for Underground Storage**
Talha Hassan Khan, Michael T. Myers, Lori A. Hathon, and Gabriel C. Unomah, University of Houston

**Dynamic Reservoir Rock Typing and $CO_2$ Flow Characteristics on Supercritical $CO_2$-Brine System in Reservoir Rocks**
Muhammad Nur Ali Akbar and Rolf Myhr, Prores AS

**Importance of Well Integrity Measurements Throughout the CCS Project Life Cycle**
Dirk Valstar, Robert Laronga, Andrew Dodds, Alec Nettleton, and Casey Chadwick, SLB

**Incorporating Emissions Into Wireline Formation Evaluation Risk Assessments**
Lee Hyson, Hamish Munro, Ron Ford, and Guy Wheater, Gaia Earth Group

**Quantifying the Impacts of Reservoir Geochemistry and Pore Structure on the $CO_2$ Diffusion and Leakage in Organic-Rich Mudrock Formations and Caprocks**
Ibrahim Gomaa, Zoya Heidari, and D. Nicolas Espinoza, The University of Texas at Austin

**Shallow Aquifer Sampling for Carbon Capture and Storage (CCS) – Development of a Low-Toxicity Tracer to Enable Low Contamination Water Sampling in a Water-Based Mud (WBM) System**
Michael Taplin, BP; Emilie Peyret, SLB; Phillip Jackson and Kirsty Hitchen, BP

## FORMATION TESTING – RESERVOIR DYNAMICS AND FLUID CHARACTERIZATION

**Asphaltene Characterization Using Downhole Fluid Mapping While Drilling – Fluid Characterization Case Study for Completion Optimization**
Yon Blanco and Julian Pop, SLB; Rolando di Primio and Oyvind Stiro, AkerBP; Scotty Paul, Velerian Sanjao Lopez, and Marat Khaziev, SLB

**Combination of Borehole Image Logs and Downhole Fluid Analysis Logs to Assess Reservoir Connectivity**
Oliver C. Mullins, SLB; Bernd Ruehlicke, Zbynek Veselovsky, and Carsten Vahle, Eriksfiord; Peter Schlicht and Robert J. Laronga, SLB; Brandon Thibodeaux and Bilal Hakim, Talos

**Disparate Fluid Distributions of Stacked Gas-Washed Reservoirs Are Successfully History-Matched via Forward Modeling of Fluid Mixing Processes**
Tarek S. Mohamed, The University of Texas at Austin; Morten Kristensen, SLB; Carlos Torres-Verdín, The University of Texas at Austin; Oliver C. Mullins, SLB

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Aldrick Garcia Mayans, Alan Keith Fernandes, Andrea Di Daniel, Aleksandar Gligorijevic, and Ivan Fornasier, SLB; Siti Najmi Farhan Bt Zulkipli and Calvin Lowrans, Petronas Carigali

**Estimation of Permeability From Electrical Resistivity Response Determination in Carbonate Rocks From the Sergipe Sub-Basin**
Marcus Vinícius Corrêa, Maria Rosilda de Carvalho, Fernando Sergio de Moraes, and Victor Hugo Santos, CCT/LENEP/UENF/INCT-GP

**Integrating Dual-Flowline Fluid Property Measurements for Guided Focusing and Cleanup Monitoring During Fluid Sampling**
Melton Hows and Thomas Pfeiffer, Shell Exploration and Production Co.; Richard Jackson, Kai Hsu, Hua Chen, Evgeniya Deger, and Jules El-Khoury, SLB

**Raman Spectroscopy for Gas Composition Analysis With a New Logging Tool for EOR, New Energy, and Scope 1 Applications**
A. Ballard Andrews and Andrew Speck, SLB

**Real-Time Fluid Monitoring and Classification Using Downhole Spectrometer Measurements**
Kai Hsu, Richard Jackson, Hua Chen, Evgeniya Deger, Yoko Morikami, and Jules El-Khoury, SLB

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**A Fast Forward Modeling Method for Gamma LWD Using 1D Equivalent Integral in High Inclination or Horizontal Well**
Cairui Shao and Zhiqiang Ma, China University of Petroleum (East China); Miantao Yu, China Oilfield Services Limited

**Dielectric Permittivity From LWD Electromagnetic Measurements – Methods Comparison and Results Validation**
Salah Al-Ofi, Baker Hughes; Shouxiang (Mark) Ma, Saudi Aramco; Jun Zhang, Baker Hughes

**Energy and Spectrum of Transient Induction Measurements for Deep-Reading Looking Ahead** Pengfei Liang, Qingyun Di, Wenxuan Chen, Wenxiu Zhang, Xinghan Li, and Ranming Liu, Institute of Geology and Geophysics, Chinese Academy of Sciences

**Exploring Propagation Resistivity Measurements With Two Receiver Pairs**
Holger Thern and Jun Zhang, Baker Hughes

**High-Resolution 3D Reservoir Mapping and Geosteering Using Voxel-Based Inversion Processing of UDAR Measurements**
Saad Omar, Diogo Salim, Mikhail Zaslavsky, and Lin Liang, SLB

**Improved Detection and Description of 3D Sandstone Injectites in the Grane Field, Central North Sea via 1D Stochastic Inversion of UDAR Measurements**
Nazanin Jahani, NORCE Norwegian Research Centre; Carlos Torres-Verdín, The University of Texas at Austin

**Look-Ahead-While-Drilling Technology Assessment for Early Hazards Identification in Presalt Offshore Brazil**
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**Optimizing Well Placement Using Real-Time Ultradeep Resistivity Look-Around Inversion – Deepwater GOM Case Study**
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**Predicting the Future With UDAR 3D Resistivity Modeling – A New Key to Unlock Multidimensional Reservoir Steering**
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**Proactive Geosteering With New Multilayer Mapping Technology for Optimal Well Placement on the Edges of Mature Fields**
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**Production Sustainability of a Challenging Heterogeneous, Mature Carbonate Reservoir: An Integrated Solution Comprising Near- and Far-Field LWD Measurements**
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**The Integration of Shallow to Ultradeep LWD Data: The Key to Geosteering and Improved Reservoir Understanding**
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**Uncertainty Estimation for Ultradeep Azimuthal Resistivity Measurements Using Machine Learning**
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**Use of Multilayer Mapping-While-Drilling Technology for Field Exploration Strategy Optimization While Increasing Production**
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**Assessing the Impact of Image Data on Enhancing Rock Typing and Formation Evaluation**
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**Assessment of Petrophysical Heterogeneity Based on Image Data**
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**High-Definition Acoustic and Resistivity Imaging-While-Drilling Technologies: Experiences in the Brazilian Presalt Carbonate Reservoirs**
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**Image Data: The Unexplored Potential for Reservoir Characterization, Brazilian Presalt**
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**Integrated Application of Advanced Logging While Drilling for Understanding Altered Basement Rocks: A Case Study From the Norwegian North Sea**
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**Optimizing Petrophysical and Geological Evaluation on Tight Oil Reservoir in a Braided Delta Fault-Nose Structure, Pearl River Mouth Basin, Offshore South China**
Bo Liu, Huanling Bian, and Chenglong Wang, Baker Hughes; Lipeng He and Jian Li, CNOOC Shenzhen Ltd.

**Petrophysical Characterization of Volcanic in the Presalt Interval: Image Log and NMR Data, Potential Tools for Characterizing Reservoirs With a Focus on CCUS**
Gilberto Raitz Junior, Carolina Ribeiro, Michele Arena, Fernando Neves, and Leonardo Borghi, Laboratory of Sedimentary Geology (Lagesed)

**Reflection Sonic Imaging Using Slimhole Pipe-Conveyed Sonic Tools**
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**Weak Reflection Extraction in Borehole Acoustic Reflection Imaging Using an Unsupervised Machining-Learning Method**
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**A New Saturation Model for Tight Sandstones Based on Complex Resistivity Spectra**
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**An Automated Approach for Presalt Carbonate Depth-By-Depth Elastic Pore Geometry Characterization at Well-Log Scale**
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**An Integrative Approach Utilizing Well Logs, Thin Sections, Sidewall Core Samples, and Geochemical Data to Characterize and Evaluate the Reservoir of a Well in the Atapu Field, Santos Basin**
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**Applications of a New Multiphysics Inversion Technique: Optimized Petrophysical Evaluation of Advanced Dielectric and Spectroscopy Logs in Unconventional Reservoirs**
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**Enhancing the Thomas-Stieber Model With Sonic Log Data for Improved Prediction of Clay Geometries and Total Porosity in Shaly Sands**
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**Estimation of Permeability Combining NMR-Derived Viscosity and Downhole Fluid Mobility: A Case Study From Offshore Mexico**
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**High-Angle Formation Evaluation in Layered Formations Using Dual-Arrival Sonic, Borehole Image, and Geosteering Electromagnetics Measurements**
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**Implementation of a Laminated Sands Data Acquisition Strategy Delivers Improved Accuracy of Reserves and Rate Forecasting: A Case Study From Trinidad and Tobago**
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**Integrated Workflow Utilizing LWD GR-Resistivity, Advanced Mudlogging, and Well Dynamic Data Enabled Petrophysical Parameters Modeling to Assist Geosteering in UBCTD**
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**Inversion-Based Multiwell Petrophysical Interpretation of Well Logs and Core Data via Adaptive Rock Physics Models**
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**Novel Method for Estimating Water Saturation in Gas Reservoirs Using Acoustic Log P-Wave and S-Wave Velocities**
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**Perched Water Observations in Deepwater Miocene Fields Using Well Logs, Core, and Production Data**
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**Petrophysical Joint Inversion for the Estimation of Compositional and Storage Properties of Thinly Bedded Reservoirs: A Fully Statistical Approach**
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**Physics-Based Probabilistic Permeability Prediction in Thin-Layered Reservoirs: Transport Theory, Dielectric Dispersion Logging, and Core-to-Log Bayesian Statistics**
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**Research and Application of Fracability Evaluation Method for Tight Sandstone Reservoirs Based on Logging and Experimental Data**
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**Thomas-Stieber Plots Viewed as the Source Data for Staged Effective Medium Models**
Michael Myers and Lori Andrea Hathon, University of Houston

**Use of A-Priori Information to Improve Automatic Electrofacies Classification: A Case Study in Brazilian Presalt Carbonates**
Eduardo Oliveira, Petrobras S.A.

**Validating the Need for Quantitative Estimates of the Properties of the Various Shale Components in the Thomas-Stieber Plot**
William Horvath, Lori Hathon, and Michael T. Myers, University of Houston

**Wireline Cable Dynamics and Wellbore Diagnostics in the Deepwater Logging Environment**
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**A Benchmark Well-Logging Database From Brazilian Terrestrial Basins**
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**A Novel Approach to Estimate TOC in Unconventional Reservoirs: The Case of the Pimenteiras Shale, Parnaíba Basin, Brazil**
Luis Miguel Rojas, Lilian S. Silveira, Frederico Miranda, and Jose Roberto Correa, ENEVA S.A.

**An Automated Workflow to Optimize Parameters for Formation Pressure Measurements Utilizing Memoization**
Pontus Loviken, Yon Blanco, and Tianjun Hou, SLB

**An Image-Based Artificial Intelligence Approach for the Determination of Analog Petrophysical Rock Properties From Drill Cuttings**
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**Assessing Well Integrity and Water Injection Performance in Selective Completions With Injection Logs and Distributed Temperature Surveys**
Cristian Escarraga, SLB; Alejandro Castaneda and Zhully Ortiz, Ecopetrol; Marcia Benavides, Andrea Ordonez, and Diego Garcia, SLB

**Automated Identification of LRLC Reservoirs Using Regression Machine Learning in South Sumatra Basin, Indonesia**
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**Core Scanner for Electrical Profiling of Full-Bore Cores at the Wellsite With Advanced Pulse Electromagnetic Technology**
Dler Mirza and Kristofer Birkeland, Aker BP; Lars Øy, Roland Chemali, and Benjamin Barrouillet, WELL ID

**Deep Insight Into Presalt Carbonates: Advanced AI Multi-Regression Technique for Depth-By-Depth Elastic Pore Geometry**
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**Investigating the Impact of Ion Movement Dynamics in the Electrical Double Layer on Dielectric Permittivity Measurements**
Zulkuf Azizoglu and Zoya Heidari, The University of Texas at Austin

**Lateral Geosteering Using Multidimensional Inversion Helps in Unlocking Reservoir Reserves in Complex Geological Environment**
Mauro Viandante, Janine Maalouf, and Valeria Vergani, SLB; Michael Rabinovich, BP America, Inc.; James Davidson, Luke Magarinos, Kelsey Lovell, and Zakaria A. Hassan, BP Exploration Operating Company Limited, UK

**Maximizing Look-Ahead Sensitivity to Presalt Reservoir in a Near-Vertical Scenario in the Presence of Intra-Salt Intercalations: A Case Study in Bacalhao Field, Offshore Brazil**
Armando Vianna, Enrico Ferreira, Sergey Martakov, and Warren Fernades, Baker Hughes; Katharine Sandler Klein, Equinor

**Maximizing Mudlogging Data Value: SW and Porosity Prediction for the Cabeças Formation – Parnaíba Basin, Brazil**
Vitoria Flores, Henrique Padoves, Marcia Nunes, Gustavo Pimentel, and Frederico S. De Miranda, ENEVA

**Molecular Dynamic Simulation of $CO_2$ Flooding Into Mineral Nanopores in the Presence of Residual Oil**
Isa Silveira de Araujo, Ibrahim Gumma, and Zoya Heidari, The University of Texas at Austin

**New Experimental Method for Enhanced and Fast Saturation of Tight Rock Samples**
Sabyasachi Dash and Zoya Heidari, The University of Texas at Austin

**Pseudo Borehole Images From Outcrop Photographs: Improving Geological Interpretations**
Sofia Alves Fornero, Petrobras and Federal University of Rio Grande do Sul; Candida Menezes de Jesus, Pamella Paiva Fernandes, and Willian Andrighetto Trevizan, Petrobras

**Pushing the Envelope of Casing and Cement Inspection: Logging Two Casing Sizes Simultaneously and Setting a Cement Plug in a Single Run**
Andrew Hawthorn, Baker Hughes; Tonje Winter, Var Energy; Laurent Delabroy, Aker BP; Nina Girneata, Mats Ingebretson, Iain Leslie, and Roger Steinsiek, Baker Hughes

**Quantitative Evaluation for Fluid Components on 2D NMR Spectrum Using Image Boundary Tracking and Modified GMM Clustering Method**
Jiawei Zhang, Guangzhi Liao, Lizhi Xiao, and Sihui Luo, China University of Petroleum, Beijing

**Simultaneous Correction of Shoulder-Bed and Anisotropy Effects on LWD Propagation Resistivity Logs in HAHZ Wells**
Xizhou Yue, Guoyu Li, and Mingxue Ma, China Oilfield Services Ltd; Shanjun Li and John Zhou, Maxwell Dynamics, Inc.

**Synergies Between RCAL, SCAL, and DRP to Obtain Faster, Cheaper, and More Accurate Rock Characterizations**
Rodrigo Surmas and Marcelo Ramalho Albuquerque, Petrobras

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**Characterizing Thin-Bed Responses in Horizontal Wells Using LWD NMR Tools: Insights From a Water Tank Experiment**
David Allen, Zeyad Ramadan, and Ahmed Allam, SLB

**Comparison of PCA and Autoencoder Compression for Telemetry of Logging-While-Drilling NMR Measurements**
Wolfgang Weinzierl, Oliver Mohnke, Lucas Kirschbaum, Radu Coman, and Holger Thern, Baker Hughes

**NMR Characterization Solving Oil-Water Contact Uncertainty: A Presalt Case Study**
Moacyr do Nascimento, Jefferson Farrapo, Leonardo Gonçalves, Augusto Rego, and Frederico Schuab, Petrobras

**Method for Shortening Echo Interval of Nuclear Magnetic Resonance Downhole Instruments**
Wei Liu, Wenxiu Zhang, and Wenxuan Chen, Institute of Geology and Geophysics, Chinese Academy of Sciences; Guangzhi Liao, College of Geophysics, China University of Petroleum-Beijing

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**A Novel Determining Borehole Fluid Density and Imaging Method Using X-ray Source**
Luyu Zhong, Feng Zhang, Yiming Yu, Zhenhua Hu, and Yimula Abulahai, China University of Petroleum (East China)

**A Novel Method for Obtaining Formation Water Salinity Utilizing Elemental Spectroscopy Logging** Jilin Fan, Wenhui Chen, and Aizhong Yue, China National Logging Corporation; Qiong Zhang, University of Electronic Science and Technology; Feng Zhang, China University of Petroleum (East China)

**Advancements in Mudlogging Automation and Identification of Facies Using XRF and Automated Sampling Machine**
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**Description and Benefits of Drilling Horizontal Exploration and Delineation Wells, Supported by Deployment of New Sensors and Digital Technologies**
Jean Michel Denichou, SLB; Torstein Skorve, Artur Kotwicki, and Aasmund Olav Lovestad, Aker BP; Sigurd Nyboe, Mathias Horstmann, Martine Wenang, and Motaz Zeidan, SLB

**Enhancing Lithological Evaluation in Complex Triassic Reservoirs: A Comparative Analysis of LWD Spectroscopy and Standard Cuttings Examination**
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**Experimental Validation of a Sensitivity Functions Sigma Simulator in a Cased-Hole Environment With Calibration Facility and Production Well Data**
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**Geochemical Logging to Anticipate CO₂ Reactions: New Reactivity Estimates and CO₂ Storage Simulations**
Paul R. Craddock, Jeffrey Miles, and Sangcheol Yoon, Schlumberger-Doll Research; Soham Sheth and Laurent Mosse, SLB

**Geochemistry and Saturation Applications Utilizing a New Slim Pulsed-Neutron Technology**
John Savage, Weijun Guo, Fransiska Goenawan, Hernan Mora, and Sushovon Roy, Halliburton

**The Cased Oil Saturation Determination Method Based on Gamma-Thermal Neutron Response**
Guofeng Yang, Wenzheng Peng, Hongfa Ye, Zhengyan Wang, Meng Chen, and Xiangjun Liu, School of Geoscience and Technology, Southwest Petroleum University

**The Neutron-Porosity Logging Method Based on D-D Generator With Dual Pulse Mode in Sidetracking Well**
Xiaoyang Zhang, Xuelian Chen, Hui Zhang, and Feng Zhang, School of Geoscience, China University of Petroleum (East China); Linhua Guan, Jingli Dong, and Qian Chen, Sinopec Matrix Corporation

**Use of Spectral Gamma Ray and Lithogeochemical Logs Combined With XRD Data to Identify Mg-Clay Mineral Sequences in Barra Velha Formation (BVE) – Lower Cretaceous of the Santos Basin**
Paulo Roberto Alves Netto, Petrobras, and Manuel Pozo, Universidad Autónoma de Madrid

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**A New Method to Compute Formation Density and Pe Values With a Thru-Bit Density Tool**
Yang Wang and Qiong Zhang, University of Electronic Science and Technology of China; Qiang Li, Beijing Xinyuan Huayou Tech Co. Ltd

**A Novel Multiphysics Interpretation Method for Quantifying Mineral Using a Pulsed-Neutron Element Logging Tool**
Yi Ge and Qiong Zhang, University of Electronic Science and Technology of China; Ya Jin, Quanwen Zhang, Decheng Niu, and Lu Yin, China Oilfield Services Limited

**Best Practices for Porosity Estimation in Karstified Presalt Carbonate Reservoirs**
Candida Menezes de Jesus, Frederico Bastos Schuab, Lucas Abreu Blanes de Oliveira, and Rodrigo Dos Santos Maia Correa, Petrobras

**Developing a Novel Petrophysical Rock Typing (PRT) Classification Using Machine Learning Applied in a Supergiant Oil and Gas Field in Southern Iraq**
Mohammed A. Abbas, Basra Oil Company

**Digital Rock Physics for Geomechanics – Examples and Challenges Ahead**
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**Innovative Igneous Rock Presalt Classification Method via TAS Workflow, Well-Log Clustering, and Sidewall Core Analysis**
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**Mechanical Properties of Carbonate-Rich Mudrocks Through the Coupling of Microindentation, Acoustic Microscopy, SEM Imaging and Image Analysis, and Elemental Analysis With Emphasis on the Cement Phases Present**
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**Multi-Technique Characterization of Carbonate Lithotypes and Evaluation of the Impact of Fine Grains on Barra Velha Formation Reservoirs, Sepia Field, Santos Basin**
Guilherme Santos, Petrophysics Laboratory of National Observatory (LabPetrON/ON); Gabriel Ribeiro, Advanced Oil Recovery Laboratory (LRAP/UFRJ); Leonardo Ventura Andrade de Souza and Giovanni Stael, Petrophysics Laboratory of National Observatory (LabPetrON/ON)

**Static-to-Dynamic Permeability Ratio Provides Valuable Insight of Reservoir Architecture and Heterogeneity in Complex Hydraulically Fractured Reservoirs**
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**LiOBIA: Object-Based Cuttings Image Analysis for Automated Lithology Evaluation**
Tetsushi Yamada, Simone Di Santo, Karim Bondabou, Laura Su, and Romain Prioul, SLB

**MICP-Based Petrophysical Classification of Complex Carbonate Reservoir Rocks**
André Luís Fernandes da Silva de Souza and Rodolfo A. Victor, Petrobras; Fábio A. Perosi, Universidade Federal do Rio de Janeiro

**Optimize Drilling Decisions Based on Real-Time Detected Alkene and Hydrogen at Surface**
Amjad Kharaba and Khalid Qubaisi, Saudi Aramco; Richard Hewitt and Milton Sanclemente, Rawabi Geolog
**Reservoir Fluid Properties From Cuttings: An Innovative Synergy of Gel Permeation Chromatography and Data Analytics**
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**Using Machine Learning to Improve Rock Mechanical Properties Estimation: Correlating UCS From Scratch Test and Geophysical Loggings**
Francisco Henriques Ferreira, Paulo Fernando Villafane Garcia, Anselmo Machado Borba, and Flavia de Oliveira Lima Falcao, Petrobras

## LATEST INNOVATIONS IN ULTRADEEP AZIMUTHAL RESISTIVITY FOR 3D APPLICATIONS

**A New Short Source Distance Transient Electromagnetic LWD Tool For Geosteering and Formation Evaluation**
Xiaozhuang Wang, Jie Gao, and Shizhen Ke, China University of Petroleum-Beijing; Jun Zhu and Zhanshan Xiao, China National Logging Corporation; Wei Su and Yanxin Zhou, China University of Petroleum-Beijing

**Adaptive Multidimensional Inversion for Borehole Ultradeep Azimuthal Resistivity**
Wardana Saputra and Carlos Torres-Verdín, The University of Texas at Austin; Sofia Davydycheva and Vladimir Druskin, 3D EM Modeling&Inversion JIP; Jörn Zimmerling, University of Uppsala

**Adding Value to Ultradeep Azimuthal Resistivity Data: How UDAR Can Support Reservoir Characterization and Geomodeling**
Fabio Berton, Mauro Ribeiro, David Xavier, José Fernando Caparica, Jr., Luan Oliveira, and Vinicius Lacerda, Equinor

**Enhanced Reservoir Characterization and Horizontal Well Placement With the Use of High-Definition and Three-Dimensional Reservoir Mapping-While-Drilling Systems in Campos Basin, Offshore Brazil**
Antonio Mainieri Vieira da Cunha, Caio Coutinho, Joao Antenor, Abel Hermida, Eduardo Mezzomo, Fabio Pimenta, Munir Koosar, and Elisangela Pessoa, Petrobras; Guillermo Marcelo Cuadros, Ligia Naia de Matos, Charles Silva, and Mauro Viandante, SLB

**Enhancing Local Anisotropy Characterization With Ultradeep Azimuthal Resistivity Measurements**
Hsu-Hsiang (Mark) Wu, Dagang Wu, Yijing Fan, Jin Ma, Clint Lozinsky, and Michael Bittar, Halliburton

**Fast Stochastic Inversion of UDAR Measurements Using Adaptive Multi-Grid Simulated Annealing Guided by Model Parameter Error Estimation**
Nazanin Jahani, NORCE Norwegian Research Centre; Wardana Saputra and Carlos Torres-Verdín, The University of Texas at Austin

**High-Definition-Mapping UDAR Inversion Provides Accurate Geobody Geometries in a Complex 3D Reservoir**
Karol Riofrio, Nigel Clegg, and Hsu-Hsiang (Mark) Wu, Halliburton; Joanna Mouatt and Fanny Dominique Marcy, Aker BP

**Mapping Historical Waterflooding and Facilitating Production Strategy With the Use of New Reservoir Mapping-While-Drilling Systems: A Case Study From Offshore Norway**
Yazil Abbas, Mauro Viandante, Emmanuel Ebuka Uzuegbu, Ahmed Zarroug El Sedeq, and Jean-Michel Denichou, SLB; Per Erik Wærum, Sven Severin Gundersen, Silje Agnethe Kommedal, Andrea Trollsås Liverød, and Bjørn Matre, Respol Norge AS

**Revealing Subsurface Structures in Ultra-High Definition With UDAR (Ultradeep Azimuthal Resistivity) Measurements – A Case Study From Brazil**
Armando Vianna, Enrico Ferreira, and Sergey Martakov, Baker Hughes; Antonio Mainieri, Petrobras

# WORKSHOPS

## WORKSHOP 1: Advanced Borehole Image Applications – Reservoir characterization beyond dips

**Date:** Saturday, May 18, 2024
**Time:** 8:00 am – 4:30 pm
**Place:** Room-TBA
**Fee:** $375.00 for registered attendees; $475.00 non-registered (includes lunch)
**Maximum Capacity:** 50

**Instructors:** Candida Menezes de Jesus (Petrobras), Andre Luis Martins Compan (Petrobras), Camilla Bazzarella (Petrobras), Peter Barrett (Halliburton).

**Description:** The workshop will present the main applications of image logs beyond structural and facies interpretation, with the application in the extraction of geomechanical and porosity/permeability properties. Case studies of pre-salt carbonates in the Santos Basin will be presented.

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## WORKSHOP 2: Optimized Reservoir Performance: UDAR-Well Placement and High Angle /Horizontal Well Petrophysics

**Date:** Saturday, May 18, 2024
**Time:** 8:00 am – 4:30 pm
**Place:** Room-TBA
**Fee:** $375.00 for registered attendees; $475.00 non-registered (includes lunch)
**Maximum Capacity:** 50

**Instructors:** Nigel Clegg (Halliburton)

**Description**: A review of the principles, benefits, and latest innovations in Deep and Ultra-Deep Azimuthal Resistivity technologies with case studies focused on well placement for optimal reservoir performance. Although UDAR helps us place wells, we also need to utilize near well data to understand the reservoir details for completion optimization and reservoir performance.

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## WORKSHOP 3: Digital rock Applied to Formation Evaluation – upscaling insights from pore to well log scale

**Date:** Saturday, May 18, 2024
**Time:** 8:00 am – 4:30 pm
**Place:** Room-TBA
**Fee:** $375.00 for registered attendees; $475.00 non-registered (includes lunch)
**Maximum Capacity:** 50

**Instructors:** João Paulo Nunes (Petrobras), Rodrigo Surmas (Petrobras)

**Description:** The workshop will present techniques for simulating petrophysical properties - such as porosity, permeability, capillary pressure, relative permeability, and geomechanics - at the pore scale through digital rock and will show upscale examples for application in conjunction with well logs.

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## WORKSHOP 4: New Advances in NMR Techniques and Applications

**Date:** Saturday, May 18, 2024
**Time:** 8:00 am – 4:30 pm
**Place:** Room-TBA
**Fee:** $375.00 for registered attendees; $475.00 non-registered (includes lunch)
**Maximum Capacity:** 50

**Instructors:** Nate Bachman (SLB), Kris Farmer (Core Labs), Jesus P Salazar (BakerHughes), Willian Trevizan (Petrobras)

**Description:** For this 2024 nuclear magnetic resonance (NMR) educational workshop we will get "back to basics" with three sub-topics: Core NMR, formation evaluation NMR (both wireline and LWD), and Core to Log integration. There will also be a brief introduction to NMR, so there is no prerequisite for this course. However, attendees will benefit from already having some basic familiarity with NMR.

## WORKSHOP 5: Towards the effective use of borehole acoustics; Understanding, validating and utilizing sonic measurements

**Date:** Sunday, May 19, 2024
**Time:** 8:00 am – 4:30 pm
**Place:** Room-TBA
**Fee:** $375.00 for registered attendees; $475.00 non-registered (includes lunch)
**Maximum Capacity:** 50

**Instructors:** Brian Hornby (Hornby Geophysical Services, LLS), Matt Blyth (SLB), Tiago de Bittencourt Rossi (Petrobras)

**Description:** This course aims to provide a grounding in the principles of borehole acoustic measurements in both simple and more complex conditions, along with quality control techniques and tools to ensure reliable data is obtained, and case studies showing how the results can be used for a variety of applications. This course will cover both wireline and LWD conveyances and explore the different acquisitions, capabilities, and applications of each and the case studies presented will cover both Brazil and international examples. Additionally, attendees would also be encouraged to bring their own case studies and examples for group analysis and discussion.

## WORKSHOP 6: Data Analytics – Understanding the Tools – Limitations and Opportunities

**Date:** Sunday, May 19, 2024
**Time:** 8:00 am – 4:30 pm
**Place:** Room-TBA
**Fee:** $375.00 for registered attendees; $475.00 non-registered (includes lunch)
**Maximum Capacity:** 50

**Instructors:** Kjetil Westeng (AkerBp), Lalitha Venkataramanan (slb), Others to be confirmed.

**Description:** The Petrophysical Machine Learning Workshop holds significance as it equips professionals with essential skills to harness the power of machine learning in petrophysical analysis. By addressing both the capabilities and constraints of these tools, the workshop fosters a comprehensive understanding, empowering participants to leverage data analytics for enhanced decision-making in various petrophysical challenges.

## WORKSHOP 7:  Energy Transition Petrophysics – What is new, What is the Same

**Date:** Sunday, May 19, 2024
**Time:** 8:00 am – 4:30 pm
**Place:** Room-TBA
**Fee:** $375.00 for registered attendees; $475.00 non-registered (includes lunch)
**Maximum Capacity:** 50

**Instructors:** Adam Haecker (Milestone Geoscience), Sami Eyuboglu (Halliburton)

**Description:** Large investments are being made in the energy transition, from the energy generation side (geothermal) to energy storage (hydrogen) and sequestration (carbon dioxide).  In each case there is subsurface data required to reduce uncertainty to build a viable project.  This workshop will focus on components that are specific to CO2 projects but also relate to storage projects – reservoir evaluation for storage capacity, injectivity and containment, testing programs and monitoring.  One section will discuss the additional challenges for high temp geothermal projects.

## WORKSHOP 8: Petrophysics Surveillance – Technologies and Best-in Class Applications

**Date:** Sunday, May 19, 2024
**Time:** 8:00 am – 4:30 pm
**Place:** Room-TBA
**Fee:** $375.00 for registered attendees; $475.00 non-registered (includes lunch)
**Maximum Capacity:** 50

**Instructors:** Javier Miranda (DeGolyer and MacNaughton), Mark Ma (Saudi Aramco)

**Description:** Although exploration is exciting because of the amount of data acquired to understand reservoirs, it is the data acquired and integrated over the years that allows us to effectively understand and manage mature assets. This workshop will discuss evaluation for changes in saturation, sweep efficiency and injection conformance.

# FIELD TRIPS

## TRIP 1:

**Pre-salt reservoir analogues: lagoon and subaerial carbonate deposits analysis and petrophysical quality impacts to Alagoas Age carbonate deposits – Campos and Santos Basin**

**Date:** Saturday, May 18, 2024
**Time:** 7:30 a.m. – 6:30 p.m.
**Fee:** $250 for registered attendees.
**Maximum capacity:** 30 people
**Location:** Itaboraí e Araruama, Rio de Janeiro, Brazil
**Included:** Transportation, picnic/lunch, field guide. Pick-up and return from Sheraton Grand Hotel
**Sponsor:** Petrobras

### FIELD TRIP LEADERS:

Candida Menezes, petrophysicist; Ednilson Freire, reservoir geologist advisor; Humberto Calfa, exploration geologist; Julia Guerrero, reservoir geologist; Marcelle Erthal, sedimentologist R&D; Paulo Moretti, sedimentologist advisor; Willy Bohn, petrophysicist.

### DISCIPLINE:

Sedimentology, Stratigraphy, Petrophysics

### MAIN GOALS:

The one-day field trip aims to provide a better understanding of carbonate sedimentation produced by various biotic or abiotic agents, through the study of an ancient travertine deposits and a recent lagoon in the stunning Lakes Region of Rio de Janeiro State. Furthermore, a discussion on the analogy between the observed sedimentary deposits and the main carbonate Pre-salt reservoirs of the Barra Velha



Formation (Alagoas age) will be promoted during the field trip. The approach will comprise sedimentological, stratigraphic and petrophysical aspects.
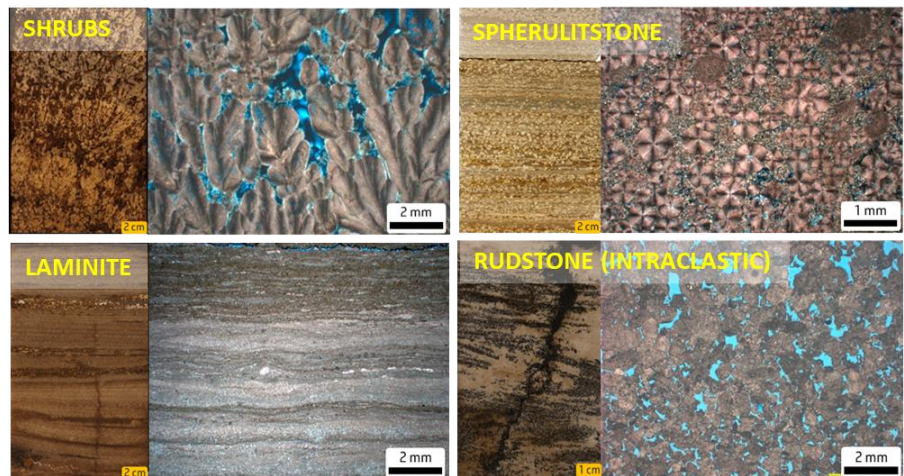


### THE FIELD TRIP:

The discovery of large oil accumulations in the Pre-Salt of both Campos and Santos Basins raised the interest in the understanding of lacustrine carbonate sedimentation. The oil production from the pre-salt lacustrine carbonate reservoirs (Alagoas age) currently corresponds to seventy-eight percent of total Brazilian production. This proposed field trip will allow the analysis of sedimentological (generation) and stratigraphic (preservation) aspects to the main carbonate reservoirs observed in the Pre-Salt. In the Araruama region, located north of Rio de Janeiro city, recent organic and chemical sedimentary structures (stromatolites and microbial mats) will be observed and typical carbonate reworking structures. This observation will allow discussions about the base level controls on the formation and preservation of these structures, as well as the physical, chemical and climatic controls for formation and areal distribution. In the Itaboraí region, preserved ancient travertine and tufa

deposits will be analyzed, where it will be possible the facies study, geometries and lateral variations of these deposits, also present in the Pre-Salt reservoirs in the East Brazilian Margin. Finally, a conclusion will be made with discussions about the petrophysical and geochemical characteristics from the point of view of the analyzes carried out along the outcrops visited and of the aspects observed in the reservoirs found in the Pre-Salt - Alagoas Age.

## TRIP ITINERARY:

| From | Time | To | Distance | Time |
|------|------|-----|----------|------|
| Sheraton Grand Hotel | 7am | P1 - Itaboraí Park | 73 km | 9am |
| P1 - Itaboraí Park | 10:30am | Lunch - Araruama Lagoon | 98 km | 12:30pm |
| Lunch - Araruama Lagoon | 1:30pm | P2 – Vermelha Lagoon | 14 km | 2pm |
| P2 – Vermelha Lagoon | 4pm | Sheraton Grand Hotel | 135 km | 6:30pm |



## RECOMMENDATIONS:
It is recommended to wear a hat or cap, light clothing, sunscreen, nautic aqua shoes (neoprene), extra slippers.

## THE FIELD TRIP LEADERS:
The field trip leaders are composed by specialist and advisor geologists from Petrobras that has extensive experience in sedimentology, stratigraphy, reservoir geology and petrophysics of carbonate rocks and Pre-Salt reservoirs. The group has worked with rock samples analysis, petrography, log interpretation, sedimentological e diagenetic modeling, stratigraphic correlation, and field activities.

## TRIP 2:
**Core Workshop - Exploring Pre-Salt Carbonate Reservoirs: A Comprehensive Tour of Petrographic, Geochemical, and Petrophysical Insights**

**Date:** Sunday, May 19th, 2024
**Time:** 8 am – 2:30 pm
**Fee:** $250 for registered attendees.
**Maximum capacity:** 30

**Location:** Petrobras Research Center (CENPES), University City, Rio de Janeiro
**Includes:** Transportation, brunch, pick-up and return from Sheraton Grand Hotel

Join us on a comprehensive field trip during the upcoming SPWLA meeting in 2024, as we delve into the intricate world of Pre-Salt carbonate reservoirs. Our workshop, titled "Exploring Pre-Salt Carbonate Reservoirs: A Comprehensive Tour of Petrographic, Geochemical, and Petrophysical Insights", is scheduled for Sunday, May 19, 2024, from 8:00 am to 2:30 pm at the Leopoldo Américo Miguez de Mello Research, Development, and Innovation Center (CENPES, PETROBRAS) in Rio de Janeiro, RJ.

**Goals**: This workshop aims to provide participants with a deep understanding of Pre-Salt carbonate reservoirs, focusing on geological, petrographic, geochemical, and petrophysical aspects. The course will include an evaluation of cores, thin sections, geochemical analyses, and digital rocks from the Barra Velha and Itapema formations in the Santos Basin.

**Key Topics to be Covered:**



1. Conceptual geological aspects of Pre-Salt reservoirs, including depositional environment, facies, diagenetic processes, and sedimentological/ stratigraphic characteristics.

2. Challenges in petrophysical assessment, encompassing data acquisition, laboratory measurements, and petrophysical calculations.

3. Critical reservoir properties of Pre-Salt carbonates.

4. State-of-the-art laboratory techniques for core rock characterization.

**Basis for the Course:**

Our course is grounded in the ongoing exploration of the Pre-Salt across diverse areas in the Campos and Santos basins. Drawing from a spectrum of research papers, we delve into the intricate understanding of lacustrine Pre-Salt carbonate reservoirs, focusing on analyses and studies in petrography and petrophysics. The selected papers, representative of a broader pool of relevant literature, collectively unravel the depositional, diagenetic, and hydrothermal influences shaping porosity and permeability distribution.

Specifically, these studies explore the complexities of petrophysical assessments, laboratory measurements, and calculations essential for understanding Pre-Salt carbonate reservoirs. By synthesizing insights from diverse sources, our course aims to offer a nuanced exploration of petrography and petrophysics, fostering a profound comprehension of reservoir properties. Engage with experts, explore innovative research, and gain hands-on experience in the laboratory, enhancing your ability to navigate the intricate details of these challenging reservoirs.

# SOCIETY FUNCTIONS

**STUDENT PAPER COMPETITION**
Date: Sunday, May 19
Time: 8:00 a.m. – 5:00 p.m.

This event will allow students competing to engage with colleagues from other schools and 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 groups: Bachelor, MSc and PhD.

**SPWLA ANNUAL BUSINESS MEETING AND LUNCH**
Date: Monday, May 20

The SPWLA Annual Business Meeting is a lunch meeting open to all delegate attendees. During this lunch the 2023-2024 President and Board Members will share the accomplishments made during their tenure. Followed by the introduction and welcoming of the 2024-2025 President and Board Members.

**SPWLA AWARDS PRESENTATION LUNCH**
Date: Tuesday, May 21

The Annual Awards luncheon is open to all symposium delegates, their spouses and guest. During the lunch, individuals will be honoured and rewarded for their outstanding achievements and contributions to the Society and the industry.

**SPWLA LEADERSHIP LUNCH***
Date: Wednesday, May 22
Fee:  Complimentary with registration (check the box on the form to reserve a ticket)

*All current SPWLA Chapter Presidents (outgoing and incoming), SPWLA Parent, Past and Present Presidents, SPWLA Parent Regional Directors and SIG coordinators are invited to join this luncheon.

**SPWLA NMR SIG CONFERENCE (POST SYMPOSIUM)**
Date: Thursday, May 23

The SPWLA NMR SIG is pleased to invite you to participate in the SPWLA 2024 NMR SIG Conference, which will take place on **May 23, 2024**, in **Rio de Janeiro, Brazil at the Baker Hughes Rio Energy Technology Innovation Center (RETIC)**. This conference offers a unique platform for experts, professionals, and researchers to share their insights, experiences, and innovations in the field of NMR petrophysics.

# SOCIAL EVENTS and FUN RUN

**EVENING RECEPTIONS**
*You are invited to spend your evenings while at SPWLA 2024 at receptions proudly hosted by our sponsors. We thank our loyal sponsors for their generous contributions and hospitality during our program.*

## ICEREAKER RECEPTION

**HALLIBURTON**

*Hosted by*

Date: Sunday, May 19
Fee: Complimentary with registration

Join your colleagues at the Halliburton Ice Breaker event on Sunday evening. Event location to be announced.

## MONDAY EVENING SOCIAL

**Baker Hughes**

*Hosted by*

Date:   Monday, May 20
Fee: Complimentary with registration

Enjoy an evening with industry friends and new acquaintances. Event location to be announced.

## TUESDAY EVENING SOCIAL

**slb**

*Hosted by*

Date:   Tuesday, May 21
Fee: Complimentary with registration

Make plans to attend. Event location to be announced.

## BEACH FUN RUN!!
Fee: Complimentary with registration

# <u>SPOUSE/PARTNER PROGRAM</u>

## Christ the Redeemer and Sugar Loaf Mountain

**Date:** Monday, May 20, 2024
**Time:** 10:00 am – 5:00 pm
**Places**:
- Christ the Redeemer (by train*)
- Sugar Loaf Mountain (fast pass ticket*)

**Fee**: $ 150.00
**Includes transportation** (Meals not included)

Christ the Redeemer is one of the Seven Wonders of the World, is a unique and unforgettable experience. Located at the top of Corcovado Hill in the Tijuca National Park, this iconic monument is a tourist attraction that draws millions of visitors annually.

The Sugarloaf Mountain is a magical and unforgettable experience
The cable car provides a gradual ascent, revealing breathtaking views of Guanabara Bay, famous beaches, and the Christ the Redeemer statue.
* The group do not face normal queue for both attractions





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# National Park, Stadium and Museum

**Date:** Tuesday, May 21, 2024
**Time:** 9:00 am – 5:00 pm
**Places**:
- Tijuca Forest (National Park)
- Maracanã Stadium (Internal visit)
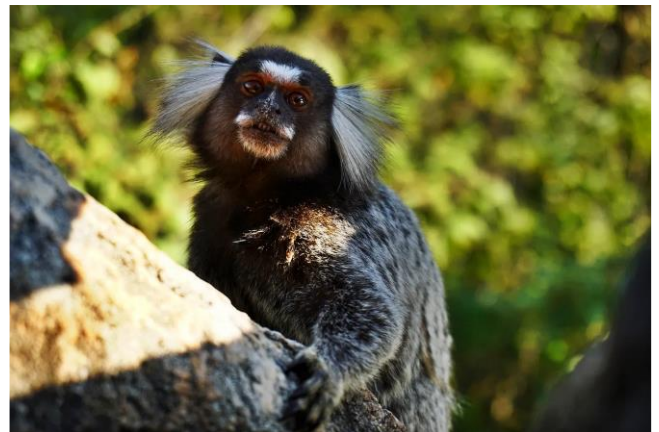- Museum of Tomorrow (Internal visit)

**Fee:** $ 110.00
**Includes transportation** (Meals not included)



The Tijuca National Park (urban forest) is all that's left of the Atlantic rainforest that once surrounded Rio de Janeiro. This 39-sq-km tropical-jungle preserve is an exuberant green, with beautiful trees, creeks and waterfalls, animals of different species.

Taking the Maracanã tour provides a fascinating and immersive experience at the legendary football stadium in Rio de Janeiro. Guided by experts, visitors gain access to exclusive areas such as locker rooms and the press room. The tour also includes historical insights and interesting facts about the stadium, along with the opportunity to explore a dedicated football museum. Interactive experiences and the chance to walk on the pitch add a special touch. Visitors can purchase souvenirs at the stadium's shop.



The Museum of Tomorrow provides an innovative and technological experience, combining modern architecture with interactive exhibits. Addressing themes such as sustainability and technology, it encourages reflection on human impact on the future. With multimedia installations and active visitor participation, it stands out for fostering critical thinking about building a sustainable future.
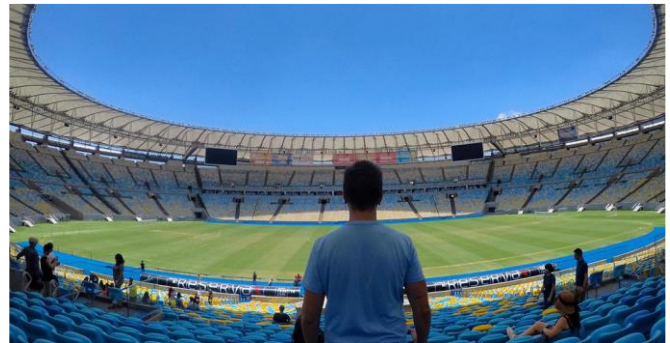
# Botanical Garden, Lage Park and Historical Tour

**Date:** Wednesday, May 22, 2024
    **Time:** 9:00 am – 5:00 pm
    **Places**:
- Botanical Garden
- Lage Park
- Historical Tour (Colombo Confectionery/ National Library/ São Bento Monastery/ Municipal Theater (external)/ CCBB / Praça XV/ Teles Arch/ Selarón Steps)

**Fee**: $ 100.00
**Includes transportation** (Meals not included)

The Botanic Garden houses a vast collection of tropical and exotic plants, some of which are endangered. Amidst a rich botanical diversity, it is a tranquil refuge, perfect for nature and history enthusiasts.

Beautiful Lage Park offers a unique experience that combines nature, architecture, and culture. The historic palace, surrounded by lush gardens, stands out in the backdrop of the Atlantic Forest scenery.

The Historic Center of Rio de Janeiro is an area rich in history and culture. It houses iconic monuments such as the Imperial Palace and *Confeitaria* Colombo, as well as historic churches like the São Bento Monastery. The cobblestone streets and colonial architecture offer a journey back in time. *Praça* XV and the National Library are also prominent landmarks, connecting visitors to Brazil's imperial past. While exploring the center, visitors immerse themselves in centuries of history that have contributed to the formation of the country.

Accommodation in Rio
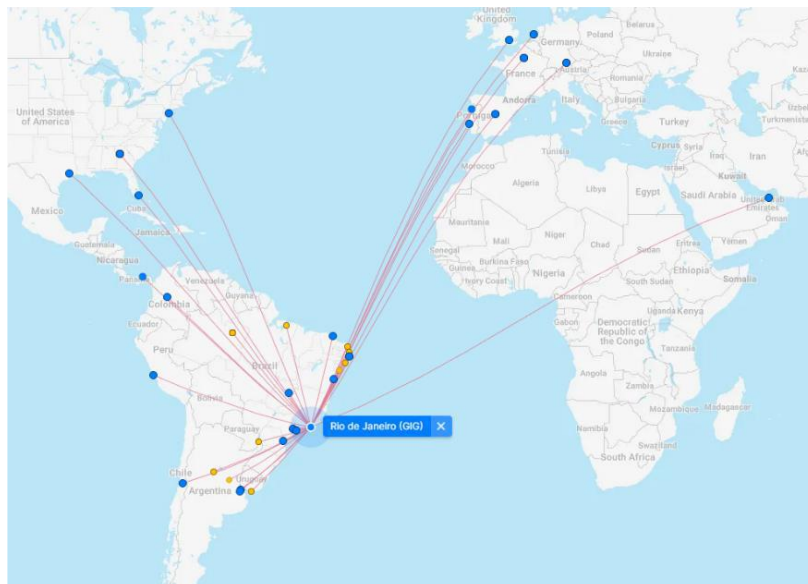# Sheraton Grand Rio Hotel & Resort
Av. Niemeyer, 121 - Leblon, Rio de Janeiro - RJ, 22450-220



**For reservations:**
Direct link to the Sheraton website: https://www.marriott.com/en-us/hotels/riosi-sheraton-grand-rio-hotel-and-resort/overview/

## AREA AIRPORTS



**Travel**
**Flights to Rio de Janeiro**
- The Tom Jobim International Airport (RIOgaleão - GIG) is in the Ilha do Governador district, only 25 minutes from downtown and 30 minutes from the tourist-hotel sector (South Zone).

- Santos Dumont Airport – SDU), located in the heart of the city, which serves mainly the Rio de Janeiro-São Paulo air shuttle and state and regional flights. Therefore, Santos Dumont Airport can be a good option for international flights to São Paulo.

**GROUND TRANSPORTATION FROM Rio de Janeiro-São Paulo air shuttle.**

Mobility in Rio de Janeiro is easy, especially in the regions indicated for the symposium and tourist attractions. There are connected public transport with ample coverage (sub-way, bus, train, and LRT) and individual transport options such as taxis and app services (e.g., Uber).

# Registration Information

Pre-registration Deadline: **May 6, 2024**

**WAYS TO REGISTER**
**By Mail:**

> **SPWLA Symposium**
> **8866 Gulf Freeway, Suite 320**
> **Houston, TX 77017**

**By Fax:** **+1-713-947-7147**
The fax line is open 24 hours. **Mailed copy not necessary.**

**Online:** **www.spwla.org**

**Full payment must accompany registration. Delegates may not register as a spouse or guest.**

**REGISTRATION TYPE/PACKAGE INCLUDES**
**DELEGATES:**
- Admission to technical program and exhibits
- Symposium transactions digital link
- Complimentary Ticket to Social Events

**SPOUSE/PARTNER:**
- Admission to Spouse Hospitality Suite
- Admission to the Exhibition Hall
- Complimentary Ticket to Social Events

**STUDENT:**
- Admission to technical program and exhibits
- Symposium transactions digital link
- Complimentary Ticket to Social Events

**DAY PASS:**
- $500.00 per day
- Admission to technical program and exhibits
- Symposium transactions digital link

**HOW TO PAY FOR REGISTRATION**

**Registration cannot be processed unless full payment is received with your registration form**. Please register one attendee per form. If your spouse or guest is attending, be sure to include that person's full name for a personalized custom badge. **Delegates cannot register as a spouse or guest.** Methods of payment accepted:

- Check or Money Order payable in the U.S. to:
  SPWLA Symposium
- Credit Card (Visa, MasterCard, Discover, or American Express)
- Wire transfer (Bank information must be requested by sending an email to stephanie@spwla.org)

## REGISTRATION*

**Before  May 6, 2024**                                    **On-site**
   $  950.00 SPWLA Member                       $1050.00 SPWLA Member
   $1050.00 Non-member                          $1150.00 Non-member
   $ 100.00 Spouse                              $ 100.00  Spouse
   $   30.00 Student                            $   30.00  Student

Registrations made after May 6, 2024 are subject to on-site pricing.

**On-Site Registration Hours**
Saturday, May 18                 7:00 a.m.-5:00 p.m.
Sunday, May 19                   7:00 a.m.-5:00 p.m.
Monday, May 20                   7:00 a.m.-5:00 p.m.
Tuesday, May 21                  7:00 a.m.-5:00 p.m.
Wednesday, May 22  7:00 a.m.-2:00 p.m.

## CONFERENCE PROCEEDINGS
Conference Proceedings are included with full registration fee. Accessed through a digital link hosted on OnePetro© library. Additional copies may be purchased for $50.00 each at the conference site.

## CONFIRMATION
You will receive a confirmation notice by email listing your registration fees and activities. Please check confirmation for accuracy. Should you need assistance email stephanie@spwla.org

## REQUEST FOR NAME CHANGE
All name substitutions addressed to stephanie@spwla.org  before May 1, 2024, will be processed at no extra charge. Requests made thereafter and on-site will be subject to a $50.00 processing fee.

## CONFERENCE CANCELLATION POLICY
General conditions - All cancellations notices must be made in writing to stephanie@spwla.org.
Refunds will be issued after the Symposium in accordance with the Cancellation Terms and Conditions.

## HOTEL CANCELLATION POLICY
Hotel reservations sold during the SPWLA pre-sale promotion are non-refundable.
Hotel direct reservations, contact the hotel for their cancellation policy.

## CANCELLATION TERMS AND CONDITIONS
*Registration, field trip, paid lunches, spouse/partner tours and workshop fees:*
Cancellation notices received on or before May 1, 2024, 11:59pm: Full refund (less 25% admin fee).
Cancellation notices received after May 2, 2024, 12:00am: **No refund.**

## COMPLIMENTARY FUNCTIONS
Admittance to complimentary functions is by registration badge.
- 1 entry per registered guest.
- Events may have limited access due to safety concerns.
- Admittance is first come, first serve basis.
- Access is not guaranteed.

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