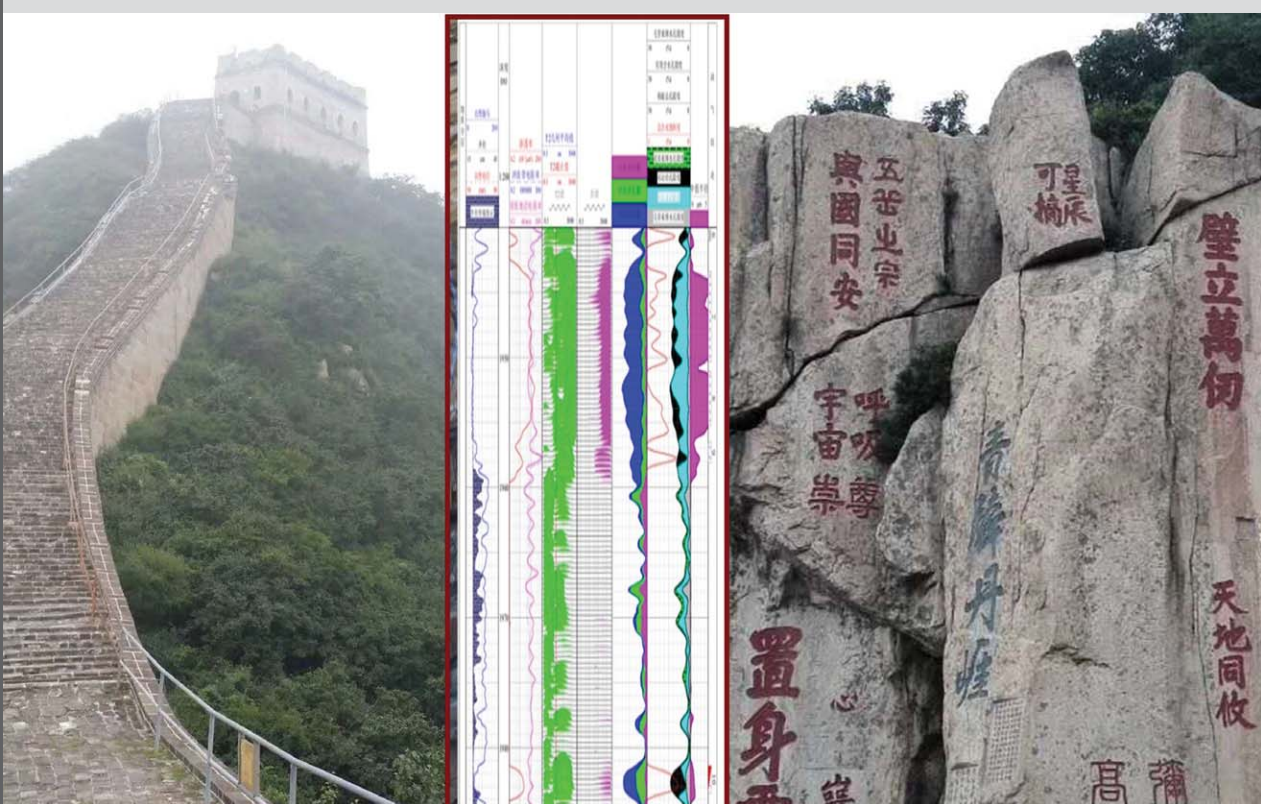


THE SPWLA TODAY

NEWSLETTER

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CALENDAR OF EVENTS

January 10, 2019

New Technology Seminar
London Petrophysical Society (LPS)
The Geological Society – London, England
www.lps.org.uk

February 1–2, 2019

Two Day Industry Short Course
SPWLA Texas Tech Student Chapter
Day 1: Unconventional 1, Rick Lewis
Day 2: Unconventional 2, Dr. George B. Asquith
Texas Tech University Campus, Lubbock, Texas
www.spwla.org

March 6, 2019

The 2019 Formation Testing SIG Technical Meeting
BP Westlake campus in Houston, Texas
The meeting agenda will be posted on the SPWLA FT SIG webpage

June 15-19, 2019

SPWLA 60th Annual Symposium
The Woodlands Waterway Marriott
The Woodlands, Texas
www.spwla.org

About the Cover

SPWLA is working to expand its outreach to students around the world through the creation of chapters at various universities. See the "Overview of Education in Well Logging, Formation Evaluation, and Petrophysics in China."

Notice: Articles published in SPWLA Today are not subject to formal peer review but are subject to editorial review and are verified for technical consistency and relevance.

From the President



Zhipeng "Z" Liu
2018-2019 SPWLA President
zliu@spwla.org

Dear SPWLA members and friends,

Happy New Year! I would like to wish you and your family a safe, healthy, and prosperous 2019. In early November, I gave a welcoming message to the SPWLA Asia Pacific Technical Symposium 2018.

well the oil and gas industry continues to fulfill its mission, as our industry seeks to produce hydrocarbons from more challenging reservoirs. Technical and innovative challenges exist in both conventional and unconventional reservoirs. Petrophysics as a discipline is focused on measurements and data analytics is poised to contribute to resolving the new challenges associated with these reservoirs, more general challenges within the oil and gas industry, and also applying these techniques and skills in the transformation towards renewable and other energy sources. These challenges and transformations also offer current and the future generation of petrophysicists a great opportunity for a successful career. Our petrophysics community, being highly technical as it is, should be very proud of what we bring to society. We present a positive image of our industry, and can educate the public about the benefits our industry brings to peoples' daily lives.



I was not fortunate enough to travel to the symposium, however, I recorded a video. I would like to share part of the message with our general petrophysics community: With the cyclical nature of commodity prices, the oil and gas industry has currently fallen out of favor with the public and investors. In the history of mankind, the quality of life is directly related to the per capita consumption of energy. The relentless growth of oil demand to supply world energy needs is especially noted in the rising per capita consumption in Asia, Africa and South America as more people move up to a more comfortable lifestyle. Oil and gas currently account for 55% of the world energy mix and are projected to decline slightly through 2040. However, the quantity of oil and gas required to meet the demand will continue to increase, especially in transportation, industrial and petrochemical sectors, even as renewable and other energy sources share growth in the power generation sector. The work we do as petrophysicists impacts how



2019 is big year for SPWLA. We will host our 60th Annual Symposium in The Woodlands, Texas, which is conveniently located just north of Houston. The Houston Chapter organizing committee has been working since early 2018 to put on a great show with dual session technical presentations, workshops, field trips, social functions, and much more. You can also catch up with your friends and business connections in Houston. This is the one symposium you won't want to miss. Mark your calendar for June 15-19, 2019, and stay tuned. The latest information can be found on the SPWLA website at www.spwla2019.com.

Best,
Zhipeng "Z" Liu, P.E.



Carlos Torres-Verdín
2018–19 VP Publications
cverdín@mail.utexas.edu

By the time this new issue of *SPWLA Today* is emailed to our esteemed SPWLA members it will already be a new year, 2019! First of all, I would like to wish you a healthy, happy and memorable new year. *SPWLA Today* is not yet one year old but it is already becoming a much-needed channel of information to communicate across the vast and varied geographical and professional confines of SPWLA. But the process is far from complete: we are constantly looking for content and commentary that can build, strengthen, and sustain bridges among our members. Your January 2019 issue of *SPWLA Today* is another example of the formidable assets that are unique to SPWLA. We are a dynamic and transformative professional society that, like all of our sister societies, is experiencing growing pains resulting from the fast evolution of technology tied to the landscape of low oil prices. This is a unique moment that can help further define the role that SPWLA plays and will play in the world of Geosciences; I personally see it as a forest of great opportunities.

It is also fun to run into colleagues around the world and be told that they enjoyed reading the last issue of *SPWLA Today*. And I don't think twice about asking them for feedback and ideas for improvement—that's what we are here for! Let the pages of this new issue of *SPWLA Today* bring forth excitement and inspiration about the very unique and enduring family that makes SPWLA one of the best professional societies of its kind...

Thanks for your continued support and I wish you all the best for 2019!
Carpe Diem!

Sincerely,
Carlos Torres-Verdín

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Hardman.The.Great@AOL.com

Save the raw data.
See US Patent 9,250,352.

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Up Next



Jesús M. Salazar
2018–2019
SPWLA President-Elect

I wasn't planning on writing an article for this issue, with work and family you feel sometimes like you're juggling with too many things in your hands. However, I could not resist the temptation of informing the membership how we selected the host city for the 2020 SPWLA Symposium.

It all started back in July 2018 when I sent the invitation to chapters to bid for the symposium. Traditionally, we have held the symposium outside the United

States every other year, so after the 2019 Symposium in Texas, the 2020 is supposed to be overseas, or maybe overland ☺. After countless back and forth emails with Chapter leaders around the world, we received three formal proposals to host the 61st Symposium. I want to thank the professionalism and collaboration of Kevin Pike at the Canadian Well Logging Society in Calgary, Nelson Suárez from the Dubai SPWLA Chapter, and Paul Craddock from the Boston SPWLA Chapter for putting together outstanding proposals. If you talk about volunteerism and dedication to the SPWLA community, these guys can teach you a master class.

On December 5, the BOD selected the city of Calgary in the Canadian province of Alberta to host the 2020 SPWLA Symposium. It was a very tight race against two great cities. I believe that this event will empower the CWLS membership to work closely with the SPWLA office to bring a successful event. Even though Calgary will be the host city, the actual venue of the Symposium could actually be outside of the city, specifically in Banff, a beautiful town about an hour west of Calgary in the heart of the Canadian Rocky Mountains. We are still in the process of working out budget and other details to select the final venue; we'll keep you posted.



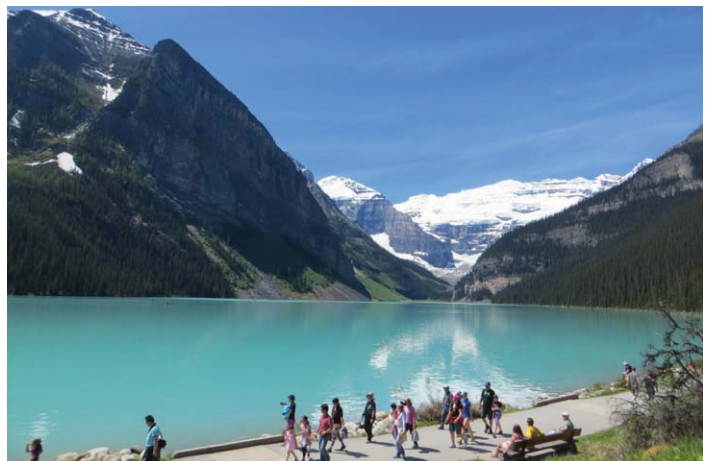
Group of Royal Canadian Mounties during the famous Calgary Stampede.



View of the Canadian Rockies from Canmore near Banff.

As I write this note, it's not even Christmas yet. So, I want to wish all our membership and colleagues around the world a very merry Christmas and Happy 2019, or just happy holidays and end of the year regardless of your beliefs. The SPWLA had a very successful 2018 that started with the spinoff of the social and anecdotal section of *Petrophysics*, which comprises this newsletter, *SPWLA Today*, *Petrophysics* has become a purely technical journal with a larger number of papers published on every issue; its impact factor keeps on increasing as our editor mentioned in the last issue. Last but not least, the 2018 Symposium in London was a huge success, the quality of the papers was outstanding, the organization was second to none and we finished with great blue numbers on the financial side.

I'm excited about the 2019 symposium at The Woodlands and the continuous improvements of benefits to our members. I hope you enjoy the pictures from Calgary and Banff and that they warm you up for the 2020 Symposium.



Lake Louise in Banff around the same time of the year when the symposium will be held; a potential view from your hotel.

Regional Understandings – Latin America



Nadege Bize Forest
2018–20 Latin America
Regional Director

Dear SPWLA Members,

At the beginning of 2019, I would like to appraise SPWLA's 2018 activity in Latin America. I'm first pleased to announce that our SPWLA community has widened with the opening of the professional Argentina SPWLA Chapter and the Columbian UIS SPWLA Student Chapter. Henceforth, Latin America counts three affiliated professional chapters in Argentina, Brazil and Columbia; and two student chapters, in Brazil and Columbia. In 2018, the Mexico Chapter started to seek volunteers to consolidate its board. We soon hope to again see this chapter affiliated with SPWLA. Please contact me if you are interested in being part of the Mexican board.

Some highlights in the Latin America Chapters in 2018:

The Argentina Chapter signed its affiliation with the SPWLA in July 2018. Besides several technical meetings organized in Buenos Aires, the chapter promoted and actively supported the 10th Hydrocarbon Exploration and Development Congress, which was organized by the Argentina Oil and Gas Institute (IAPG), in Mendoza, November 2018. To contact the Argentinian Chapter: spwlacapituloargentina@gmail.com

The Brazil Chapter holds technical meetings on the third Tuesday of the month in Rio de Janeiro. In June, the chapter was part of the technical committee for the Brazilian Petroleum Conference (BPC2018), an international event with 400 participants. Five international SPWLA presenters were invited to talk about carbonate formation evaluation. In August, the Brazil Chapter, with the help of the UFRJ Student Chapter, promoted our organization at the SPWLA booth during the 49th Brazilian Congress of Geology held in Rio de Janeiro. To contact the Brazil Chapter, please access their Facebook page: fb.me/SPWLABrazil.



The SPWLA booth at the 49th Brazilian Congress of Geology held in Rio de Janeiro. Left: Nadege Bize-Forest, Latin America regional director. Right: Giovanna Carneiro, SPWLA Brazil, communication board member, Renata Leonhard, and Fernanda Senra, Vice President and President of the SPWLA UFRJ student chapter.

The Brazil UFRJ Student Chapter organizes regular lab visits at Petrobras and technical presentations by academy and Oil & Gas industry speakers. They have actively supported the organization of the international BPC2018 in June, and were at the SPWLA booth for the 49th Brazilian Congress of Geology in August. They also organized the 2nd Petroleum Geology Week in September 2018 with more than 20 technical presentations and mini-courses.

The Colombian UIS SPWLA Student Chapter signed its affiliation with the SPWLA in November 2018. We wish them all the best for 2019! Please contact them at: spwlacafeuischapter@gmail.com

Finally, I would like to thank all Chapter board members for volunteering and spreading the SPWLA spirit within the Oil & Gas industry, professional communities and our universities. Many thanks for their commitment to the SPWLA.

Yours sincerely,
Nadege Bize Forest

Regional Understandings – North America 1



Adam Haecker
Regional Director
North America 1

Excelsior True Believers!
(Homage to Stan Lee's recent passing)

Another eventful year in the oil patch has gone by. This was my first year on the board and it has been interesting, to say the least. I was able to go to Japan and give the keynote at the symposium held in October. It was a good turnout, with many good student papers. I was encouraged to see how many young(er) people are taking an interest in formation evaluation. The two-day event was held in Chiba Prefecture and I was able to present the SPWLA Best Paper Award to Hiroaki Sakai, Waseda University, for his paper on a double permeability simulator in coalbed methane. Hiroaki was invited to present at the 2019 SPWLA Annual Logging Symposium. Another paper of interest, and awarded best paper by the chapter, was a paper on cross-borehole radar given by Tsogtbaatar Amarsaikhan from Tohoku University. Since many of us only get to see one another at the annual symposium it is important to attend these regional conferences if your company will allow it. Get out there and socialize, people!

I think commodity prices are weighing on everyone's mind as we move into the New Year. Please continue to support the SPWLA with your membership dues. Member dues and income from the annual symposium provide our primary revenue stream. We thrive only with members' support. As always, if you have ideas about how to improve the society please let someone know.

I am very excited about the dual-track compromise the Technology Committee decided upon for the Annual Symposium. Instead of going for all papers or nothing in a given session, they have decided to try dual sessions on Tuesday to test the concept and see whether the members approve it for future conferences. In addition, it will put less pressure on Jim Hemmingway to schedule papers on the same subject matter in a way that they don't compete with one another. The issue of course is most SPWLA members are always interested in every topic that is presented. I know I love a good NMR fight. Seems like every year someone from one service company makes a bold claim about NMR processing and someone from another service company gets up and says "you can't do that" and he responds with "I just did!". Anyway, it will be interesting to see how it turns out. If you have ideas or feedback on these dueling dual sessions, please contact one of the board or Jim Hemmingway, VP of Technology.

Finally, to honor my Japanese hosts I thought I would end with a Haiku and give a big thanks to Tetsuya Yamamoto and the rest of the organizing committee for putting on a great event. Also, I'm including some fun pictures from the land of the rising sun.

Capillary Pressure Curves
Threshold Entry Pressure is
Too Damn High in Shales



(Left) And you thought Godzilla was monstrous. Look at the size of this Ramen—there is over a kilo of noodles alone. (Right) I managed to find the "angry on fire Buddha" in Narita town.



(Left) View from on top of the Tokyo Sky Tree. That's some urban jungle. (Right) I think they meant me. Found this sign outside a bar in Tokyo. Needless to say I came back later to have a beer at this joint.

Regional Understandings – Middle East and Africa



S. Mark Ma
SPWLA Middle East and Africa
Regional Director

Dear Colleagues, Happy New Year!

Einstein's relativity theory says that if you enjoy what you do, time passes quickly!

By the time you see this newsletter, year 2018 will be gone and 2019 arrived. In the last year, the SPWLA Middle East and Africa region has achieved several milestones. First, the Saudi Arabia Chapter won the Outstanding Chapter Award, congratulations team! Second, several professional and student chapters joined or rejoined the SPWLA International community, a warm welcome! Third, the regional technical events, be it a short technical exchange, such as knowledge-sharing luncheons, or longer duration workshops, have been very successful. We need to keep the momentum going and encourage more in the new year. And last, we have started to communicate IR4.0-related topics to the regional community and explore potential impacts on what we do tomorrow.

At the beginning of 2019, we should pause a bit and reflect last year's achievements and lessons learned, so that our 2019 program will be stronger and have a more significant impact on us and those around us.

The following items are at the top of our to-do list:

- Increase membership. Members are the base of the society, we need to do our very best to recruit new members to join us, especially young professionals.
- Expand technical activities. Try to think-out-of-the-box and be innovative in arranging technical activities to attract professionals to become part of the family.
- Enhance the quality of technical events. For every technical event, the primary objective is the transfer of knowledge to the participants. The content delivered needs to be customized, and noncommercial.
- Outreach to a broader audience. It is essential to improve the image and profile of SPWLA by reaching out to universities, sister societies, and the general public, to demonstrate the value of petrophysics and character of petrophysicists.

Again, happy New Year, and I wish you and your family a prosperous 2019!

S. Mark Ma

Regional Understandings – Europe



Mike Webster
Europe Regional Director

As another year draws to a close I always wonder where the time went.

The industry is showing slow signs of recovery from a slump in commodity prices and the ripple effect of this is still playing out. Operators are understandably more cost conscious than ever and still nervous to loosen the purse strings. This impacts everything from training and renewal of staff, the number of wells and well work, and what they're willing to pay for services. Financial stress in the system will inevitably precipitate change, which will drive the evolution of the industry. This is where professional organizations like the SPWLA help keep its members current and updated. Travel budgets have been cut and we need to leverage technology to help maintain connectivity to the wider industry and promote networking. Key examples of how SPWLA is leveraging technology in service of the wider petrophysical community are the monthly webinars and online sessions during the symposium. These offer access to the global petrophysical community as part of your annual membership. Webinars could also be used to leverage local events. Having local chapter members spread over a wide geographic area is no longer a barrier to participation in local technical meetings. As we move into 2019 we need to

increasingly use this technology.

Interpretation and processing technology is also moving at pace. It has been noticeable this year with the huge increase in "big-data" and "machine-learning" papers submitted to the annual symposium, and of course those published in the recent special edition of our journal *Petrophysics* covering the topic. Clearly, this is an expanding part of our industry and will play an increasing role in our future. These new techniques help us squeeze every last drop of value from the data we've purchased, which in a cost-conscious environment helps provide tangible evidence to management as to how we've used the data and creates the case for gathering more.

As Regional Director for Europe it was great to see the success of the Annual Symposium in London. A huge effort from the organizing committee and the hosting London Petrophysical Society. That hard work paid dividends in the quality of the venue, the events and technical posters and papers.

Reflecting back on 2018, on a more personal note, I was deeply saddened by the loss of Chris Cade, a colleague and friend for many years and an enthusiastic petrophysicist. He was always a keen supporter of SPWLA. He will be greatly missed but his contribution to petrophysics will endure.

I'll look forward to continued advancements in petrophysics in 2019. We still have a huge amount to contribute to our industry.

Mike Webster

Learning Opportunities



Katerina Yared
Vice President Education

Dear SPWLA Colleagues,
Happy New Year!

I hope the New Year started off on a great note for you and will continue to bring you great opportunities for growth and prosperity along the way.

I want to thank everyone for attending and actively participating at our monthly webinars and the classes we had in 2018 and I hope you continue to enrich our training offerings with your attendance and contributions.

I want to take this opportunity to also thank our Regional Distinguished Speakers and our Distinguished Speakers for taking the time to travel to visit chapters and for presenting at our monthly webinars. If you would like to have any of our Distinguished Speakers visit your chapter, please find the list of speakers and their contact information here:

https://www.spwla.org/SPWLA/Chapters_SIGs/Distinguished_Speaker_List/SPWLA/Annual_Symposium/Distinguished_Speakers/Distinguished_Speaker_List.aspx?hkey=360f599e-0caf-45c3-a28f-dafb6a65ad29

Starting in 2019, our highly popular Distinguished Speakers monthly webinar series will be open to non-SPWLA members. So please let all your friends and colleagues know that is now easier to participate and join our Distinguished Speakers webinar series at a nominal fee of \$25.

The next webinar speakers are as follows:

Date	Speaker	Title
January 16–17	Artur Posenato Garcia (The University of Texas at Austin)	An Integrated Workflow to Estimate Permeability Through Quantification of Rock Fabric Using Joint Interpretation of Nuclear Magnetic Resonance and Electric Measurements
February 12–13	Michael Thiel (Schlumberger)	Azimuthal Imaging Using Deep-Directional Resistivity Measurements Reveals 3D Reservoir Structure
March 12–13	Alberto Mendoza (Imperial College London)	Statistical Methods to Enable Practical Onsite Tomographic Imaging of Whole-Core Samples
April 23–24	Stefan Hertel (Shell)	Upscaling of Digital Rock Porosities by Correlation With Whole-Core CT-Scan Histograms
May 7–8	Nicholas Bennett (Schlumberger)	Borehole Acoustic Imaging Using 3D STC and Ray Tracing to Determine Far-Field Reflector Dip and Azimuth
June 10–11	Hani Elshahawi (Shell)	Novel Smart Cement for Improved Well Integrity Evaluation

Make a note in your calendars and don't miss them!

Also, in 2019 we will launch our series of video blogs that I hope will start to leverage discussions and further knowledge sharing from anyone who wants to participate. We will have those readily available on our webpage under "SPWLA Nuggets of Wisdom." Feel free to contact me with any ideas for "Nuggets of Wisdom" you would like to share with our members. You can email me at VP-Education@spwla.org.

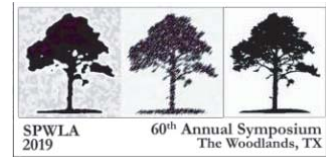
Our SPWLA 2019 Spring Topical Conference is going to be dedicated to the topic of High-Angle/Horizontal Well-Log Analysis organized by our own HA/HZ SIG. Keep an eye out for more information about it in your inbox and on our social media channels!

STUDENTS LISTEN UP! Our International Student Paper Competition (ISPC) is in full swing. Deadlines are fast approaching so don't miss a chance to be able to represent your university and compete at our 60th Annual Logging Symposium's ISPC on Sunday June 16, 2019. The SPWLA offers \$500 to eligible SPWLA student chapters to have an internal paper competition and select the top candidates to send to the ISPC at the Symposium. If you are a SPWLA student member you don't want to miss this unique chance to participate. You can find more information about the ISPC here: <https://www.spwlaworld.org/student-papers/>.

Do you feel the desire to share your knowledge with the rest of the world? Contact me and we can see how we can help you. Teach a class in person or have people attend your training classes via web conference. We can make it happen!

Since we are in the membership renewal time of the year, I would like to personally thank everyone who continues to be a loyal SPWLA member and welcome all our new members! Let me know how I can make your SPWLA membership more valuable to you.

Respectfully yours,
Katerina Yared



Society of Petrophysicists and Well Log Analysts

8866 Gulf Frwy., Suite 320 ♦ Houston, Texas 77017 USA ♦ 713-947-8727 ♦ www.spwla.org

SPWLA International Student Paper Contest 2019

Dear Students:

SPWLA would like to announce the guidelines for participation in the 2019 international student paper contest. Due to the increase in student involvement across the international SPWLA community, the SPWLA board of directors and the 2019 SPWLA Annual Symposium Student Paper Committee have decided to conduct Internal Student Chapter Paper Contests (ISCPC) as a preselection step for participants of the 2019 SPWLA International Student Paper Contest (2019 SPWLA ISPC). Both of the ISCPC and the 2019 SPWLA ISPC will have separate categories for Undergraduate, MSc, and PhD level students. In order to compete in the 2019 SPWLA ISPC, students should either win the nomination of their SPWLA student chapter, or submit an abstract.

Students who have a local student chapter at their university must win the nomination of their SPWLA student chapter per each degree level, Undergraduate, MSc, and PhD Student Chapters must finish their competitions, submit their abstracts and deliver their nominations to the SPWLA Student Paper Contest Committee at papercompetition@spwla.org on or before **March 31, 2019**. Each Student chapter is allowed three nominees for each degree level. The guidelines for the internal paper contests can be found in **Appendix A**, attached to this announcement. You may contact the Student Paper Contest Committee for more information about the ISCPC.

Students who do not have a local student chapter at their university are also welcome to participate in the international paper contest. To be eligible to compete in the international competition, these students must submit an abstract and the abstract submittal form to papercompetition@spwla.org on or before **March 31, 2019**.

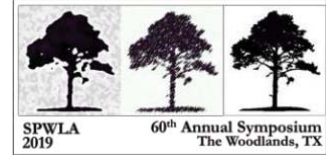
When submitting an abstract, please follow the guidelines on the attached Student Paper Contest Entry Form and submit the completed form with your abstract. The student paper contest committee will announce the list of participants in the ISPC by **April 15, 2019**. Students may be selected to participate in either an oral or poster contest. The 2019 SPWLA ISPC will take place during the annual symposium in Woodlands on Sunday, **June 16, 2019**. Monetary awards will be given to the top presenters within each category Undergraduate, MSc, and PhD for both oral and poster contests.

For more information about the 2019 SPWLA ISPC, please contact papercompetition@spwla.org.

We would like to thank you for your time and interest in the SPWLA organization and we look forward to seeing you at the 2019 SPWLA Annual Symposium in Woodlands, Texas.

Sincerely,

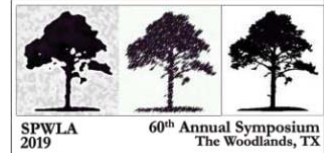
Jiixin Wang, Chair of the Student Paper Contest Committee
Katerina Yared, SPWLA VP-Education



Appendix A: Guidelines for the SPWLA Internal Student Chapter Paper Contests

The guidelines for the Internal Student Chapter Paper Contests are listed as follows:

- SPWLA Student Chapters are expected to hold internal paper contests.
- SPWLA Student Chapters are expected to share their plans for holding internal paper contest with the SPWLA VP of Education.
- Each SPWLA Student Chapter should submit a plan for the use of this financial support to the SPWLA VP of Education to gain approval before receiving the funds. The financial support of \$500 USD is reimbursed for approved plans. The plans should be submitted to the SPWLA VP of Education no later than **November 30, 2018** to qualify for the financial support.
- Each SPWLA Student Chapter has the responsibility of announcing the internal paper contest within their university. This includes a call for abstracts.
- Each SPWLA Student Chapter must also select at least three judges for their internal contest. The judges assigned for internal student paper contests should include at least one professor and one member from the local SPWLA chapter or from the industry. Students are not allowed to serve as a judge for the internal student contests.
- Each SPWLA Student Chapter is required to send a list of the three top student presentations within each category of PhD, MSc, and Undergraduate to the SPWLA VP of Education and the Chair of the student paper contest committee.
- The SPWLA VP-Education and the student paper contest committee will select among the nominees from each school for participation in either oral or poster presentations in the SPWLA International Student Paper Contest, upon availability of the spots and based on the technical content of the submitted abstracts.
- Financial support to those selected to present at SPWLA 2019 may be available to help students attend. This will be discussed with students once they have been selected.



Student Paper Contest Entry Form Return by March 31st, 2019

Date: _____

Full Name: _____ SPWLA Member Number: _____

Address: _____

Telephone: _____ E-Mail: _____

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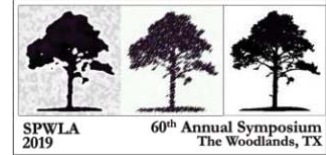
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I confirm that the above Student will present the paper, described below, if accepted for presentation.

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Student Paper Contest Entry Form

Student Paper Contest Abstract Information

Please make sure that the abstract includes the following:

1. **Problem Statement:** Describe the problem that motivates the paper proposal.
 2. **Methodology:** Describe approach to problem solution, with particular emphasis on innovative procedures that differentiate the method.
 3. **Results and Conclusions:** Describe significant results and major technical contributions, lessons learned from the study, application of findings, and opportunities to further deploy methods.
 4. The Abstract should be longer than 200 words and no more than one page.
 5. **Return your abstract on or before March 31, 2019 to papercompetition@spwla.org**
-

Attach Abstract by Separate File



Jenny LaGesse
Consultant

“Petrophysics is a blend of art and science,” our instructor said with a wink and a shrug. “Complex tool designs and physics equations only get you so far. These are indirect measurements of reservoirs, taken through a slurry of mud or oil, thousands of feet below the logging truck, at high temperatures and pressures, all while your laboratory equipment is speeding along at 30 to 60 ft/min.” I shifted in my seat. He continued: “Your job is to distill

the science about the reservoir, the pores, and the fluids from the art of interpreting borehole washouts, changes in R_w , limitations in technology and software, and unexpected changes mineralogy—and then be able to stand by it.”

“Tammy Wynette didn’t write a verse for this,” I thought.

The instructor wasn’t wrong. Throughout my career I’ve thought about what he said when I’m tweaking R_w , fine-tuning cutoffs for pay flags, or (gulp) artfully interpolating a missing section of a curve. At the end of the day, I have to stand by my science and defend what I’m doing. What he forgot to mention are the sometimes more perilous calculations a petrophysicist, and all champions of science must make in the name of logic, outside the confines of equation brackets in software packages. I’m talking about navigating discussions with yourself, vendors, drillers, colleagues, or supervisors in meetings and board rooms about scientific and personal integrity. Not everyone holds scientific truths and logic to be self-evident when no one else is looking. There are times when your pursuit of science must be tempered with the realities of best business practices, times when you should stand by your scientific processes, and times when you should stand up and advocate for science in the face of systemic adversity. Here are examples from my career of each dilemma.

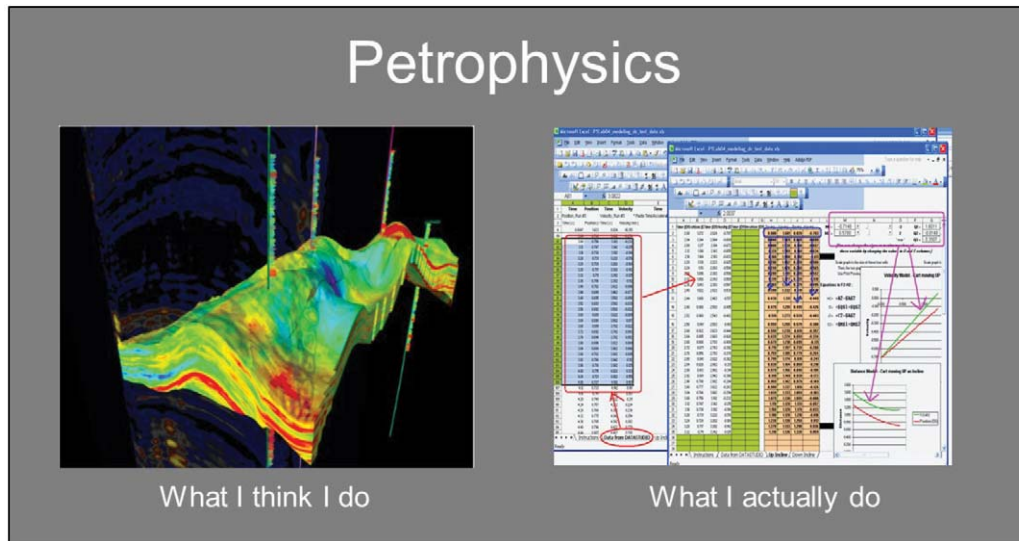
Drilling Pressure > Reservoir Pressure

Logging was supposed to start around noon. But now it’s 3 AM and we’ve finally reached TD for our first run. These thin-bedded, shaly sand East Texas reservoirs have been a

challenge to characterize, and I’ve talked my manager into running a new low-resistivity-pay tool for the first time on our team, on our tight budget. It’s my first assignment as a development geologist and I have big plans of finally getting the right measurements to really understand what is pay in this brown field. But drilling has been rough. The clays have swelled. The reservoir is pressure depleted. Reamers have gone through again and again, and the hole has been treated. Less than a quarter of the way through the first attempt at a logging run, the tool is stuck. The driller calls – what to do? Spend safety, time, and money trying to clean up the hole for science? “Yes!” I proclaim. “Science! Answers!” My cape flaps triumphantly in the wind behind me, a gleaming “S” is on my chest. Now it’s 4:45 AM and the tool is stuck—again—halfway through the logging run. The phone rings. “Yes?” I stammer. “Science? Truth?” But I can hear ticking clock of well costs, and I am anticipating the meeting with my boss in a few hours. The wind has fallen out of my cape. The next time the phone rings I answer “No. Safety, time, and cost.” The academic quest for science was amended for the best business decision. In this instance, I stood up to my own ego and best laid plans and was honest about the reality of the situation. It was a decision I am glad I eventually found my feet underneath me to stand for.

QC ≠ Quick Calculations

Running a mineral model, comparing saturation curves to core, printing off a borehole image log with your carefully picked fractures—these brief shining moments are the tips of the icebergs peaking above a deep dark sea of data Quality Control (QC). None of these right answers is possible without building on a foundation of data quality control. It is tedious. It is time consuming. It is Necessary. It is the piece of petrophysics that we likely all spend the most of our time on, and I know that it’s the part I spend the most effort defending. Managing the database, renaming and aliasing curves, normalizing logs, performing tool corrections, correcting for bad hole, depth shifting core data, chasing down missing DLIS and LAS files—and then communicating the quality of the data through histograms, regressions, and spreadsheets. Dull, yes. Optional, no.



Yet nearly every project I've worked on I spend some portion of my time explaining and standing up for the vital science that goes into examining, cleaning, and disregarding bad data. It's easy to understand the perspective of a colleague who thinks that QCing isn't that important, they need the answer now and I mean, how "off" could it really be? When interpretations have been made, maps printed, and economics run by well-meaning, eager colleagues it isn't comfortable to point out that a porosity map includes washed-out sections and the actual average porosity is much lower. But stand up you must to colleagues and supervisors in meetings and represent the defendable truth that your tools, processes, and experience can provide.

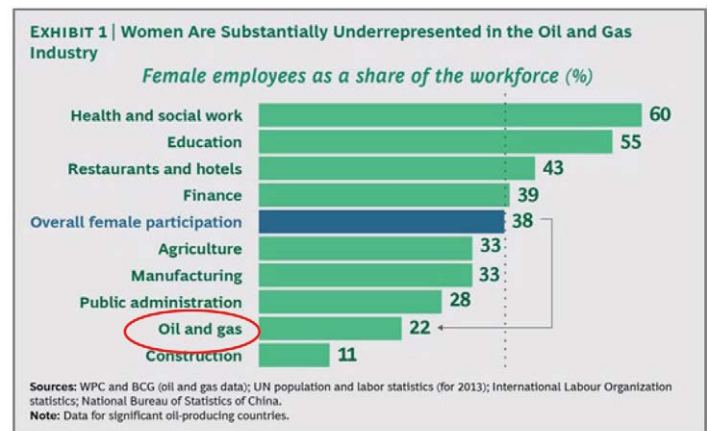
Quality controls exist to keep teams honest when making economic risking decisions, and at the end of the—we want the most accurate assessments, not the most optimistic. This science is something the entire team and business unit should stand by.

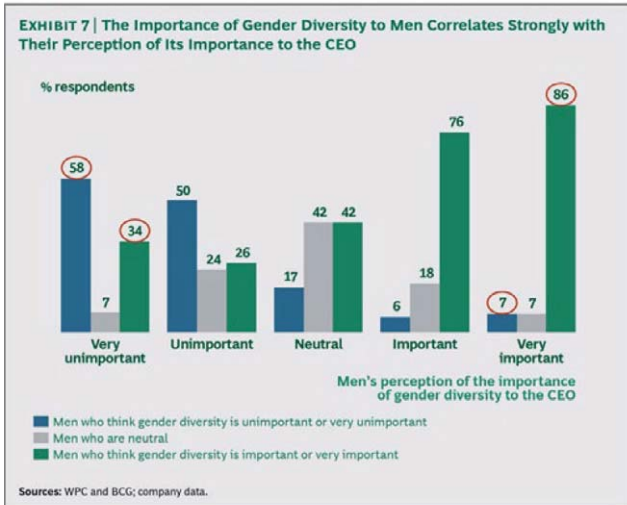
Profitability = f(Diversity)

When I started my career as a geologist 13 years ago, women comprised about 30% of my peer colleagues, and most of them were white. My supervisors at the time were almost completely male and white. As my career has progressed, my female peer geoscience colleagues have thinned, few have reached higher managerial roles and even less are on executive tracks. My supervisors are still almost exclusively male and white, as are the Board of Directors of most energy companies. Data gathered from recent scientific studies (Rick et al., 2017) indicates that the proportions of women and minorities represented in the oil and gas industry specifically, and STEM roles in general are substantially underrepresented

compared to the rest of the national workforce. These are facts and the art of interpreting these facts cannot exclude our history and current culture of oppression.

Other facts include the demonstrated profitability that is associated with increased gender and racial diversity, and the powerful responsibility that those currently in leadership and BOD positions have in shaping the tone, focus, and drive in their organizations to address these corporate social responsibility imbalances (Lee et al., 2015; Noland et al., 2016; Hunt et al., 2018). I recently presented these facts to a supervisor in an effort to stand by the facts and as a female in STEM to stand up to the larger system and advocate for science and ethically supported change. The response left me looking to recalibrate my tools—I need a stronger source. I need you. This complicated social equation needs more privileged, rigorous scientific voices in positions of leadership and power to solve this serious lack of logic. I think this is something we should all stand by.





Stand By Your Science:

Sometimes it's hard to be a petrophysicist
 Givin' all your calcs to one reservoir analyst
 You'll have bad times
 And they'll have worse times
 Doin' things that Archie had no portend
 But if you love it you'll QC it
 Even though others find it hard to understand
 And if you love it you'll be proud to speak up for logic
 'Cause sometimes you'll be the only one who can
 Stand by your science
 Give yourself two equations to cling to
 And a mineral model to point to
 When meetings are cold and lonely
 Stand by your science
 And show the world you know how to lead with facts
 Keep giving all the ethical rigor you can
 Stand by your science
 Stand by your science

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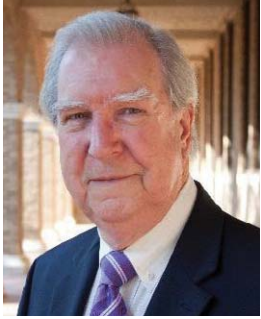
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Jenny LaGesse is an independent geoscience consultant in Denver, Colorado. Jenny began her petroleum industry career in Houston with Chevron in 2005, working a variety of development and exploration opportunities as a geologist and petrophysicist. In 2016 she moved to Denver and is working as a geo- and petrophysical consultant for small and mid-sized independents in the Rockies and the Permian Basin. She is a board member of DWLS-SPWLA and an active RMAG (Rocky Mountain Association of Geologists) volunteer. She has BS in Geology from the University of Kansas (2000), an MS in Geology from Virginia Tech (2003), and a Professional Master's in Petroleum Reservoir Systems from Colorado School of Mines (2005).

Great Moments in Formation Evaluation, Part 4: Geology and Drilling Do Not Always Mix



Richard Bateman

One day I was asked to evaluate a farm-in proposal. The operator of an offshore block in West Africa had provided us with a data package that included seismic surveys, geologic maps, drilling reports, well logs and tests. These were shared out among various departments for proper scrutiny.

To me fell the task of reviewing the data from the existing wells in the block. I read the drilling reports, looked over the well logs and studied the well-test results. By far the most interesting part of the whole package was contained in one of the well reports. These documents customarily contain a blow-by-blow account of the drilling operations complete with details of footage drilled each day, depths at which casing is set etc. Sometimes such reports contain a little extra. This particular one told a complete story in a single line. I reproduce it here for both drilling engineers and geologists to learn from.

- | | |
|---------|---|
| 5-8-71 | Completed repairs to No. 3 engine which had been inoperative since April 28. |
| 5-12-71 | Drilled 12-1/4-in. hole to 7,126 ft.

Had leak in 4-in. valve in pump room while testing BOP. |
| 5-13-71 | Driller ran amuck. Beat up Geologist. |
| 5-15-71 | Drilled 12-1/4-in. hole to 7,388 ft. Ran W7R bit to drill up tip of cone left in hole by S-88 bit. |
| 5-17-71 | Established radio communication between boats and rig for first time. |
| 5-20-71 | Drilled 12-1/4-in. hole to 7,900 ft. Picked up core barrel and started in hole with 8-7/16-in. diamond core head. |



Where were you on the 13 of May 1971?

“A Diamond is Forever”¹: Petrophysical Software is Not



Dan Krygowski
Senior Petrophysical Advisor
The Discovery Group,
Denver, Colorado, USA

In this last (at least for now) look at petrophysical software issues, I'd like to expose some issues regarding changing one software package for another. Once again, I've had experience on both sides—on a software team trying to sell our product into a company and in an operating company considering whether to keep existing software or to move to a new platform.

There are many reasons to change software, including (but not limited to):

- A company-wide move to an integrated set of technical software;
- A change in computing hardware technology that is not adopted by the software company.
- The software company gets purchased and loses its focus.
- Your company is a minor client of the software company and requests are secondary to those of others or are ignored.
- The software gets old and is difficult to enhance and maintain.
- The software company doesn't do any maintenance or enhancements and/or just ignores you.

The first bullet, above, is different from the other bullets in that it is a situation in which you may be completely satisfied with the software that you have, and the change is being driven by others, usually above you in the organization. You can prevail, that is, you can keep your software, but it will be an uphill battle and requires you to be very specific in showing that the existing software has functionality (and perhaps efficiency and utility) over that which is being thrust upon you. A tough fight, but able to be won...

The other bullets represent cases where you or members of your technical team are dissatisfied with what you have and are ready to look around. You may get questions or pushback from your management or others on your team, with the first question being, “What will it cost to change the software?” Those costs may include

- Integration with existing databases and/or movement to new databases
- Information and data exchange with other software systems
- Training in the new software and its links to other software (measured in days and weeks, not hours)
- Loss of productivity until familiarity and comfort is reached with the new software (perhaps measured in weeks or months).

The costs above can be estimated. Perhaps with some difficulty, but some ballpark numbers can be determined.

The question that is rarely, if ever asked, and is more difficult to answer is, “What will it cost if the software isn't changed?” This is a much more difficult question because the comparisons to some new software are largely subjective and not objective:

- How quickly can the team come up to speed with the new software?
- How much more productive will the team be?
- How many more people will use the functionality in the new software?
- Will the accuracy of our results improve, affecting the company's financial performance?

And finally, if you've decided to change your software, you must remember that your work isn't over, but that a significant phase is just beginning. The selection process for software is critical.

Product demonstrations are the usual place to start but remember that every software company has people that can successfully and easily demonstrate nonfunctioning software. The demo should be cold; that is, the demo should be with your data and your workflow, with the data delivered to the software provider at the time of the demo (not before), with you or your colleagues at least directing the workflow, if not using the software with no prior experience. In this worst-case environment you will get the best feel as to how the software can recover from user mistakes, and how long it might take to learn the software. This step may help you eliminate some packages but shouldn't be used to select one out of many.

Once you've narrowed your choices down to two or three software packages, have them all installed on your systems and use them on your data, with as much variety in the data as possible. This should be done over a month or two, not

¹One night in 1948 an overworked, exhausted copywriter, Frances Gerety, had been working late on a De Beers advertisement. She finished her work and was putting things away when she realized she had forgotten the signature line. “Dog-tired, I put my head down and said, ‘Please God, send me a line,’” Gerety recalled. Then she sat up and wrote “A diamond is forever” (Hart, 2002).

“A Diamond is Forever”¹: Petrophysical Software is Not

days or weeks. Training on the systems should be immediate upon installation, with help on demand and responsive. Have people trained on one system, not all, with continual informal comparison of the systems until your organization is comfortable in selecting one.

The last step is to get written agreements with the software company about additions to the software that are required by you. These can include the number of copies of the software, how they are accessed, training, support, enhancements, links to other software etc. The agreement should have specific time and financial deadlines. And most importantly, the vendor (and probably your management) should understand that if the terms of the agreement aren't fulfilled, that you will be willing to walk away and go to another vendor and be willing to explain details of the failure to other companies who may ask.

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Frank Antonsen¹



Monica Vik Constable²



Steen Agerlin Petersen³

INTRODUCTION

Equinor (formerly Statoil) recently presented its roadmap for the Norwegian continental shelf (NCS) over the coming two decades. The plans include drilling of up to 3,000 wells by 2040 and extending the lifetime of more than 20 installations. This is almost as many wells as the company has drilled since it was established, close to 50 years ago, and is an important measure to extract more profitable barrels from the fields Equinor is operating. The plan is targeting a recovery rate of 60% from NCS oil fields.

Transforming the NCS will require new measures to tackle future challenges of declining production from big fields, aging installations and the need for reduced CO₂ emissions. One of many actions to help achieve the ambitious goal described above is development of new solutions for geosteering and well placement.

Innovative interpretation methods based on efficient measurements to map structure and fluids around high-angle and horizontal wells while drilling, are critical to future success in a marginal, but increasingly strategic business on the NCS. A high number of infill wells is expected to prolong the operational life of assets. The success of horizontal infill wells

targeting bypassed zones is challenged by uncertainties in the subsurface description and by variation in fluid content generated by differences in sweep efficiency over time. Optimizing the placement of such producer wells has a direct impact on cost and recovery. This could potentially unlock targets not accessible today using current methods and technologies.

The ultradeep directional resistivity tool, which has a

depth of investigation of tens of meters around the borehole has been around for a decade now. This technology has been a step change in imaging capability linking reservoir-scale near-wellbore structures with features from seismic interpretation. The multilayer structure interpretation within the measurement depth of investigation relies on inversions whose results are used to generate images of the formation resistivity while drilling (Seydoux et al., 2014).

A new deep 2D azimuthal inversion algorithm was presented at the annual SPWLA Annual Logging Symposium in London earlier this year (Antonsen et al., 2018b; Thiel and Omeragic, 2018). This algorithm takes advantage of the full 3D sensitivities of ultradeep directional resistivity measurements to map the 2D resistivity distribution in a 2D plane at an arbitrary angle to the trajectory (Fig. 1). Continuous deep azimuthal 2D imaging along the well path generates a 3D resistivity distribution in the proximity of the wellbore, which can be used to populate local 3D models of the subsurface. Continued improvement of inversion results is expected in the coming years.

However, these inversion results are not unique and therefore need to be validated and integrated with other information around the well. Equinor has worked on model-based workflows for prejob planning and reservoir characterization when using ultradeep directional resistivity technology. These efforts are continuing, now in a collaboration with Schlumberger, to try to establish workflows to do real-time model updating based on information recorded while drilling. Real-time model updating requires a tight collaboration between the operator and service company to efficiently use and interpret all the measurements and inversions in a

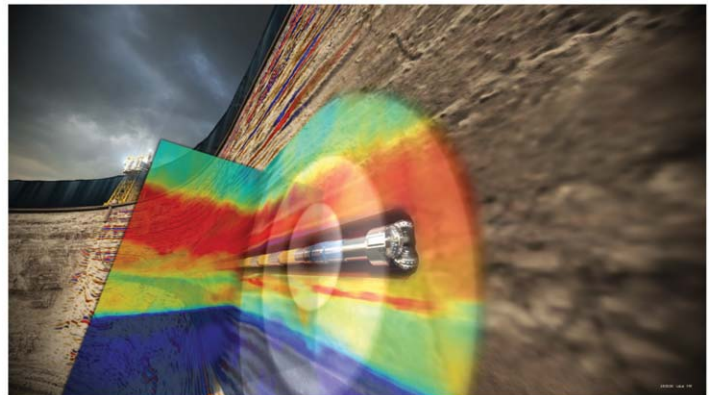


Fig. 1—Ultradeep 1D inversion profile along the well together with the new 2D azimuthal inversion, which combined gives a 3D interpretation of the surrounding structure and formation properties.

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consistent way. This technical note describes how Equinor is trying to solve the challenging task of updating a geomodel around the well to be consistent with all the measurements in the wellbore. The updated geomodel is then becomes the foundation for real-time geosteering decisions for optimized well placement and for doing reservoir characterization.

INTEGRATED WORKFLOW FOR OPTIMIZED WELL PLACEMENT AND PERSPECTIVES TOWARDS THE FUTURE GOAL: 3D REAL-TIME GEOSTEERING AND OPTIMIZED WELL PLACEMENT

The key for real-time geosteering and optimized well placement is to get a good understanding of structure, properties and fluids around the drilled wellbore. The information available for a “good understanding” of the subsurface is measurements in the wellbore with a resolution on the centimeter scale (gamma ray, density, neutron, and resistivity measurements), deep directional resistivity measurements measuring 20 to 40 meters away from the wellbore with meter-scale resolution, and finally, seismic measurements seeing large areas around the wellbore with tens-of-meters-scale resolution. Finally, we have a regional geological understanding and often a local geological concept for what we are drilling into.

The link between the measurements at different scales is that they are measuring the same rock (Fig. 2a). However, due to different measurement volumes they are affected by the surrounding rock in different ways. The big uncertainty is of course the subsurface formation surrounding the well. We have an idea about how this subsurface formation looks based on our geological understanding. The basic idea is to build a realistic model of the subsurface formation, create synthetic data at all the different scales, and then iterate on the geomodel until the synthetic data are consistent with the real measurements at all the three scales discussed here. Then the geomodel is the final interpretation (Fig. 2b). Finding this model is the challenging part in this workflow, in addition to getting access to tools for creating the synthetic data. During the last couple of decades Equinor has developed an internal process-based geomodeling tool to create realistic geomodels (Antonsen et al., 2018a). However, when constructing the geomodel you start to learn how the different measurements at different scales are related in a given environment and you suddenly have a powerful tool to understand what you can and cannot interpret from the different measurement and inversions. In the near future, with access to high computing power and storage capacity in, for example, cloud solutions, this geomodeling tool could be exploited in the direction of machine learning by creating consistent datasets at multiple scales by changing the structure and formation properties in a

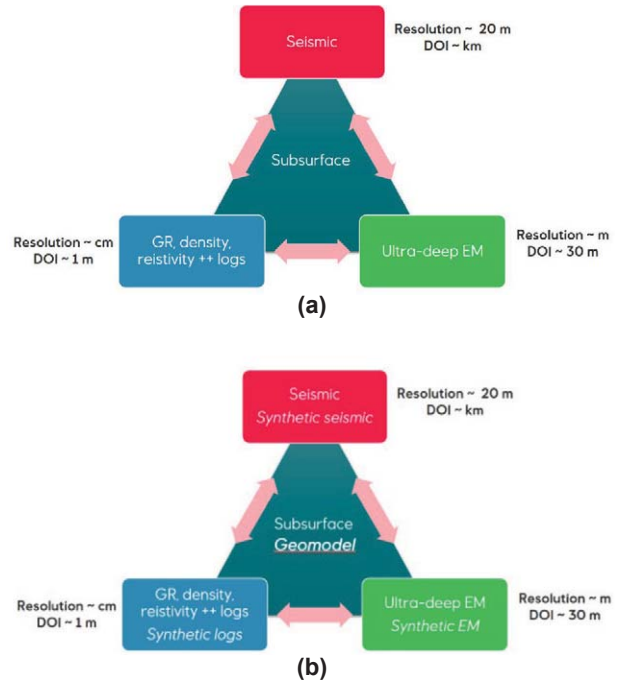


Fig. 2—(a) At the wellbore there is a relationship between all the multiscale measurements defined by the subsurface rocks. However, the subsurface is not known in detail. (b) Multiscale synthetic data, to be compared with real data, can be generated by building a detailed geomodel around the well. The geomodel is then a good model of the subsurface when synthetic data are consistent with the multiscale real data.

geologically consistent way constrained by the location of the well target.

An example of the workflow discussed above is presented in Antonsen et al. (2018a). The subsurface geomodels are validated by creating synthetic wellbore and seismic data and compare synthetic with real data. Geomodel scenarios and corresponding synthetic observations are fundamental for understanding how geologic structure, properties, and fluids are affecting the measurement responses on different scales. This fundamental understanding can be exploited in all phases of the well-placement job. The possibility of generating synthetic data at multiple scales directly related to geomodel scenarios is a very good exercise which also generates a very good crossdisciplinary discussion, and also a tool for doing more quantitative high-angle and horizontal well evaluations.

In Antonsen et al. (2018a) is used in the pre-and post-job phase of a well placement of a two-branched producer on NCS to land correctly above an oil-water contact (OWC) and at the same time-map top reservoir. The asset learned how to use the 1D inversion results to see the top reservoir with low-resistivity contrast and how to interpret the OWC in a transition zone by investigating synthetic ultradeep resistivity inversion results on realistic geomodels in the prejob phase. In the post-job phase, the workflow was useful

for further investigations regarding the depth of the OWC and the top reservoir, especially in the second branch that was drilled. The geomodel was updated based on the LWD data, and the final geomodel generated synthetic data consistent with real wellbore measurements throughout most of the well (Fig. 3). However, an area where consistency between synthetic and real seismic was not achieved was identified in the post-job phase. This area coincided with the area of the main discrepancy between the prejob synthetic inversion results and the real-time inversion results. This identification challenged the established velocity model for seismic depth conversion, which could be valuable information for the asset.

The workflow discussed above has been applied in 2D models along the well trajectory in the pre- and post-job phases due to a time-consuming manual “model-compare-update” workflow. Future real-time 2D azimuthal inversions, i.e., both lateral and vertical, relative to the wellbore, will require 3D geomodels with 3D forward modeling of responses to create synthetic 2D azimuthal inversions. Our geomodeling tool is updated and the first 3D geomodels are already generated. Another improvement of the in-house geomodeling tool is to automate the scenario generation and the subsequent generation of synthetic data. The automated generation of 3D geomodel scenarios and synthetic data is going to be the core of a future real-time automated geomodel update. Instead of having possibly 2 to 5 prejob models to handle manually, we can now generate hundreds of realistic 3D geomodels and the synthetic data belonging to each model. This is the a-priori solution space before drilling. During drilling, one can look into machine-learning techniques or pattern-recognition methods to find the geomodel using synthetic data that is closest to representing the real-time data coming in. Adjustments to the most likely geomodels are most likely required to better match the real-time data, and generation of new likely scenarios ahead of bit is also expected based on the new information measured while drilling.

The automated workflow described above is not a vision any more but can already be implemented today based on the access to a large amount of computing power and storage capacity through cloud computing. Future 3D geosteering and well placement will be an important enabler to push for increased production on the Norwegian Continental Shelf where more marginal and complex targets are a natural consequence of an increasing number of infill wells. However, the devil is in the details and there are some requirements to keep in mind in order to implement the kinds of integrated

workflows described above:

- The operator needs to have geomodeling capabilities available to build multiple realistic models with synthetic seismic and necessary resolution and complexity to also model synthetic LWD data.
- There must be close collaboration between operator and service companies to create synthetic LWD data based on the realistic models and use this in all phases of a well-placement job. Service companies need to establish solutions for operators to be able to generate synthetic data and inversions on operator geomodels.
- Large amounts of data will be created in the cloud within operator and service company organizations. Efficient solutions for transfer and use of data and models between operator and service company will be necessary for real-time geosteering applications.

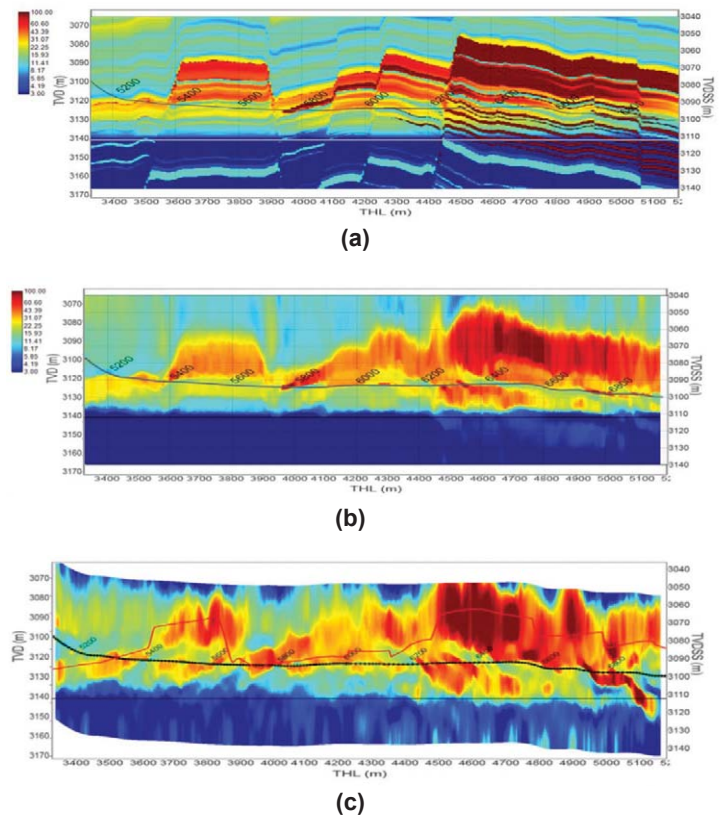


Fig. 3—(a) Updated resistivity model along the well trajectory based on all available data. (b) Ultradeep 1D deterministic inversion profile of the resistivity model in (a). (c) The same 1D deterministic inversion of the real data recorded in the wellbore. This example is taken from the case study presented in Antonsen et al. (2018a).

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Overview of Education in Well Logging, Formation Evaluation, and Petrophysics in China

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The teaching of a course in well logging, formation evaluation, and petrophysics in China started at 1953 when China University of Petroleum (named 'Beijing Petroleum Institute' prior to 1969) was founded.

In 1955, Yuecai Wang, who received his education in Japan and had work experience in Taiwan, created China's first well-logging section of teaching and research at Beijing Petroleum Institute. In the same year, 143 undergraduates who had been admitted to Beijing Geology Institute in 1953 were transferred to Beijing Petroleum Institute, majoring in geophysical well logging. These students graduated in 1957 as the first group of senior well-logging professionals in China. The nearly 600 college students who had graduated by 1965 have played an important role in the development of geophysical logging and geological exploration in China.

The education of graduate students in geophysical logging in China began in 1955. A former Soviet Union well-logging expert, Professor Chenemisky, had worked at Beijing Petroleum Institute for a few years and supervised five graduate students during the 1950s. He also wrote some textbooks in Chinese with the help of his Chinese colleagues. Three of them—Zuoyuan Shang, Zhoubo Li, and Guangui Wang—had become well known experts in well logging in China. The graduate students in geophysical well logging were supervised by Professor Yucai Wang and Professor Renshou Zhao in 1960, after the China–Soviet split.

When the Cultural Revolution started in 1966, education in China went through a difficult period and its progress slowed. In November 1969, Beijing Petroleum Institute was moved to Dongying, Shandong Province, where Shengli oil field is located. During this movement, the institute experienced countless losses of experimental instruments, facilities, books and literature, and most important, the faculty. The institute was renamed East China Petroleum Institute after it was moved.

The Cultural Revolution ended in 1976, and China started to experience economic reform and to open up. Universities started to admit new undergraduate and graduate students. However, very few students applied to East China Petroleum Institute at Dongying. To attract better students, the graduate school of East China Petroleum Institute was established in Beijing, in 1981.

Separation of the East China Petroleum Institute and its Beijing graduate school occurred in 1988 during the wave of "returning to Beijing" for universities that had originally been

located there. The institute was thus split into Petroleum University (East China) and Petroleum University (Beijing), with headquarters in Beijing. In 1989, the Petroleum University (Beijing) began admitting undergraduate students. Both institutes belonged to the Ministry of Petroleum Industry.

In 2000, when the China National Petroleum Corporation (CNPC), which was transformed from the Ministry of Petroleum Industry, was split into two parts, the China National Petroleum Corporation (CNPC Group) and the China Petrochemical Corporation (Sinopec Group), both Petroleum University (Beijing) and Petroleum University (East China) were switched to the education system under the management of the Ministry of Education, China.

In 2005, the Petroleum University (Beijing) was renamed China University of Petroleum (CUP) (Beijing), and Petroleum University (East China) was renamed China University of Petroleum (East China). Now CUP has two separate and independent sister universities, located at historic Changping, about 20 miles north of downtown Beijing, and at beautiful Qingdao, Shandong Province.

China has found its own way in education and research in well logging, formation evaluation, and petrophysics. In the past 60 years, thousands of professionals and experts in well logging have been cultivated in China. At present, most of the oil and gas industry-related colleges and universities in China have undergraduate majors and graduate majors in well logging, formation evaluation, and petrophysics (independent enrollment or enrollment with other majors) in the country, including, China University of Petroleum (Beijing), China University of Petroleum (East China), Jilin University, China University of Geosciences (Beijing), Southwest Petroleum University, Yangtze University, Chengdu University of Technology, Northeast Petroleum University, Xi'an Petroleum University, Liaoning Petrochemical University, etc. The undergraduate students of most colleges and universities enroll with the major of exploration technology and engineering, and the graduate students enroll with the major of geological resources and geological engineering.

As a case of the education of in well logging, formation evaluation, and petrophysics in China, CUP offers one BS program, two MS programs, one PhD program, and a postdoctoral research program. The undergraduate program is exploration technology and engineering. The master's programs are geological resources, which is focused more on academic research, and geological engineering, which is engaged in joint training by enterprises. The doctoral program is also geological resources and geological engineering, and

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the same is offered in the postdoctoral research program. There also some international students from Middle East, South Asia and Africa are studying in CUP.

The four-year undergraduate programs require students to complete 181 credits, including some common courses, a few skills courses, and several professional courses. English language, humanitarian, and social science courses must make up more than 20% of all the credits. Practical training and field trips are a must, and every undergraduate must spend four weeks in practical training or field visits in the first year, four weeks in the second year, two weeks in the third year, and 12 weeks in the last year. This curriculum is somewhat distinct from that offered by many other universities.



Field trips and summer school of undergraduate students in Shengli oil field in East China.

Each year, about 30% of outstanding undergraduates go to graduate school; 40 to 50% of them become employed by large-scale enterprises, such as PetroChina Company Limited (PetroChina), China Petrochemical Corporation (Sinopec) and China National Offshore Oil Corporation (CNOOC); 5 to 10% choose to study abroad; and the rest start their careers in other sectors of society. Generally speaking, CUP's undergraduate employment rate always remains higher than 95%.

In the three-year master's programs, the first year is fully designated for a comprehensive group of courses, including English-language, humanitarian, and social science courses as well as professional courses, which are worth 35 credits. In the following two years, master's students will be supervised by an academic adviser and will participate in a research project and receive systematic academic training. The choice of research subject is made jointly by the student and supervisor. In this way, great interest can be stimulated and grow into fruitful

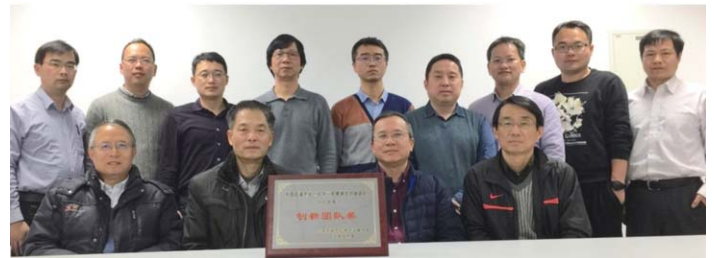
research work.

Outstanding master's students can continue their study by applying for the PhD program in China or abroad. The percentage of these students is about 20%. Other students mostly obtain relevant jobs in enterprises, such as PetroChina or Sinopec after successfully defending their theses and earning their master's degrees.

The PhD program requires at least three years of research work. The first year is also spent on comprehensive courses similar to those in the master's programs. However, PhD students have to finish only 21 credits at a higher level. In the next two to three years, PhD students are expected to participate in a research project and to work out a research plan relating to the project. They must make independent contributions to an innovative theme and be able to integrate theory with practice.

To meet the basic requirements of the doctoral degree, students are required to publish innovative research papers in academic journals with high international reputations, to attend high-level international academic conferences (such as SPWLA, SPE, SEG, EAGE etc.), to complete a dissertation with anonymous peer review, and to pass the defense before they can receive the degree.

At present, the main research work includes all aspects of petrophysics and well logging, such as new methods of electric logging, acoustic logging, nuclear logging, nuclear magnetic resonance logging, data processing and interpretation.



The Research Team of Well Logging, Formation Evaluation, and Petrophysics at CUP.

The disciplines and degree modules at the China University of Petroleum have gradually come into formalization and maturity. Education concepts and ideas, teaching content and methods, and the standard of faculty enrollment and academic evaluation have been brought in line with international practice with compatibility. CUP also communicates and cooperates with many internationally recognized universities, such as Harvard University, MIT, Stanford, UT Austin, Texas A&M, University of Houston etc.

Overview of Education in Well Logging, Formation Evaluation, and Petrophysics in China



Harvard University-China University of Petroleum Joint Laboratory on Petroleum Science.



National well logging contest for College students in China, which has been held annually since 2015.



International communication with Professor Carlos T. Verdin from UT Austin.



2018 SEG Workshop in Rock Physics and Digital Rock Application.



2018 SPWLA Boston Digital Rock and Unconventional Petrophysics Workshop.

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Estimating In-Situ Relative Permeability and Capillary Pressure from Wireline Measurements¹



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ABSTRACT

Relative permeability and capillary pressure parameters play a vital role in reservoir modeling because they govern the spatial distribution and the flowing behavior of multiphase fluids, which coexist in the pores. We developed a comprehensive workflow, in the presence of water-based-mud drilling fluids, to estimate in-situ relative permeability and capillary pressure curves by integrating

multiphysics wireline measurements including array resistivity, dielectric, nuclear magnetic resonance (NMR), and formation testing and sampling data. This workflow demonstrates an efficient method to obtain in-situ relative permeability and capillary pressure parameters, which fill the gap in reservoir modeling and simulation. The method has been successfully applied to different reservoir formations including shaly sands, carbonates, and unconsolidated siliciclastic reservoirs.

INTRODUCTION

Efficiently obtaining representative relative permeability and capillary pressure parameters remains a long-standing challenge for the oil industry. To date, special core analysis (SCAL) in the laboratory is still the most-applied method for determining these parameters. This technique has obvious limitations. First, the length scale of the cores is usually much smaller than the scale required for reservoir modeling. Therefore, one upscaling step is needed to apply the core measurement to reservoir modeling, which is another challenging issue. Also, the process is costly and time-consuming. The experiments often require months to complete depending on resource availability and other logistics. Another critical issue is that the cores are often contaminated and altered and so do not represent the reservoir conditions. These factors make the relative permeabilities and capillary pressure measurements from SCAL unreliable for reservoir performance prediction. Fine-tuning on those parameters is often needed for history matching the production data before using them for forecasting. Another emerging technique for relative permeability and capillary pressure estimation is digital rock, which, however, also faces the same issues, i.e., cost, much smaller scale, and contamination (Fig 1).

Comparison of Methodologies for Deriving Kr & Pc

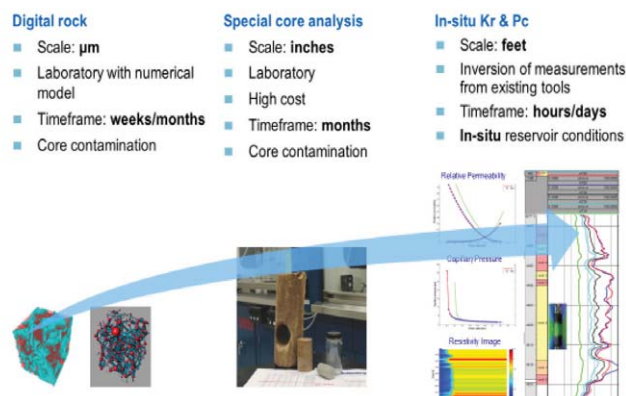


Fig.1—Comparison of methodologies for deriving relative permeability and capillary pressure measurements.

It is of great advantage to develop a method to estimate relative permeability and capillary pressure parameters from in-situ downhole measurements so that the obtained parameters are under reservoir conditions, i.e., not subjected to contamination and alteration and ideally, with a more representative scale. There have been a number of works along this direction, for example, Ramakrishnan et al. (1999), Alpak et al. (2004, 2008), Cig et al. (2014, 2015), Liang et al. (2011, 2017, and 2018), and Rashid et al. (2017). We develop a comprehensive workflow, in the presence of water-based-mud drilling fluids, to estimate in-situ relative permeability and capillary pressure curves by integrating multiphysics wireline measurements including array resistivity, dielectric, nuclear magnetic resonance (NMR), and formation testing and sampling data. The inverse problem associated with the workflow is highly nonunique when inverting for relative permeability and capillary pressure from the formation testing and sampling data, which means multiple solutions could be obtained, with all of them being able to reconstruct the measurements almost equally well. Therefore, uncertainty is always a concern when using the workflow for field-data processing. To overcome this, we integrate additional measurements to effectively narrow down the solution space for the improved certainty of the interpretation. Array resistivity logs are widely used for estimating the radial invasion profile and formation connate water saturation. However, they are not sensitive to the residual oil saturation because these measurements are relatively deep, whereas the movable oil is not completely displaced by mud-filtrate invasion. Dielectric logs have a shallow depth of investigation

¹This article contains highlights of two papers: Paper SPE-187193 presented at the SPE Annual Technical Conference and Exhibition, San Antonio, Texas, USA, October 9–11, 2017; and Paper QQQQ presented at the SPWLA 59th Annual Logging Symposium, London, UK, June 2–6, 2018.

and hence are ideal for estimating residual oil saturation. Also, they can be used to determine Archie’s parameters m and n . NMR data can be used to estimate the irreducible water saturation, and, from the T_2 distribution, we can estimate a pore-size-distribution index (PSDI), which can help constrain the solution when inverting for relative permeability and capillary pressure curves. NMR data can also be input to the computation of a continuous permeability log that can be calibrated to permeabilities from cores or formation tests. With that, we can build the near-wellbore reservoir model for simulation. Based on the derived PSDI, we can further narrow the physical bounds for Corey’s exponents in the relative permeability model, i.e., the curvatures of relative permeability curves for the water phase and the oil phase.

Integration of multiphysics wireline measurements produces a reliable workflow for the determination of relative permeability and capillary pressure parameters with less uncertainty. The representative scale of these estimated parameters can be inches to feet, depending on the filtrate invasion depth. The time needed for data processing is negligible compared with laboratory core analysis experiments. Importantly, the relative permeability and capillary pressure parameters are estimated from downhole measurements, hence at in-situ reservoir conditions, which eliminates the need for further calibration or corrections for reservoir modeling. The method has been successfully applied to different reservoir formations including shaly sands, carbonates, and unconsolidated siliciclastic reservoirs with heavy oil.

GENERAL FRAMEWORK

We have previously developed a general framework for estimating in-situ relative permeability and capillary pressure from array resistivity logs and formation testing and sampling data, as shown in Fig. 2. In the workflow, a near-wellbore reservoir model is built based on all acquired data and prior knowledge. The mud-filtrate invasion process is modeled based on the actual job sequence. Wireline resistivity logging and formation testing and sampling processes can be simulated based on the scenario models generated from the mud-filtrate invasion simulation. The inversion process tunes the identified unknowns, which include parameters defining relative permeability and capillary pressure curves, until all the simulated data match the measurements. The inversion workflow is adaptive, depending on the data availability and the parameters to be estimated. Usually, the invasion profile and the irreducible water saturation can be estimated from array-resistivity logs by coupling with the invasion simulation. This inverse problem is usually convex and can be solved reliably using a deterministic optimization method, such as Gauss-Newton. Inversion of relative permeability and capillary pressure-relevant parameters from formation testing and sampling data is highly nonunique. Therefore, hybrid methods

combining stochastic and deterministic methods are needed to ensure proper exploration of the solution space.

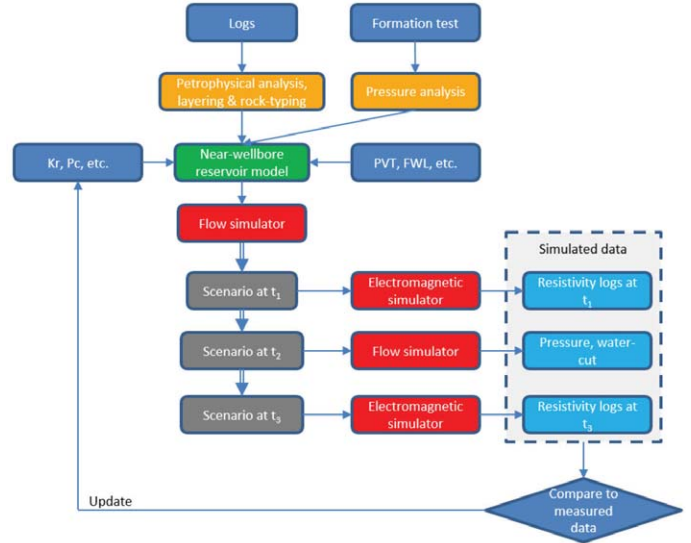


Fig. 2—Framework for estimating relative permeability and capillary pressure from in-situ measurements.

Different formulations have been developed to describe the relative permeability and capillary pressure curves. We choose one widely used in reservoir modeling, i.e., the modified Brooks-Corey model (Brooks and Corey, 1964):

$$S_w^* = \frac{S_w - S_{wr}}{1 - S_{wr} - S_{or}} \tag{1}$$

$$p_c(S_w) = p_{ce}(S_w^*)^{-\frac{1}{\lambda}} \tag{2}$$

$$k_{rw}(S_w) = k_{rw}^0 (S_w^*)^{n_w} \tag{3}$$

$$k_{ro}(S_w) = k_{ro}^0 (1 - S_w^*)^{n_o} \tag{4}$$

where λ is assumed to be equal to PSDI. Note that this formulation is more suitable for a water-wet system, but the formulation for relative permeability is still widely used for mixed-wet and oil-wet systems. Other formulas can be adopted easily whenever necessary. A typical set of relative permeability and capillary pressure curves from the modified Brooks-Corey model is shown in Fig. 3, in which the parameters n_w , n_o , and λ are controlling the curvatures of water-phase relative permeability, oil-phase relative permeability, and capillary pressure curves, respectively. These curves are defined by eight parameters, as denoted in Fig. 3. If we define the formation absolute permeability as the effective oil permeability at irreducible water saturation, k_{ro}^0

can be normalized to a unity, and we reduce the number of parameters to seven.

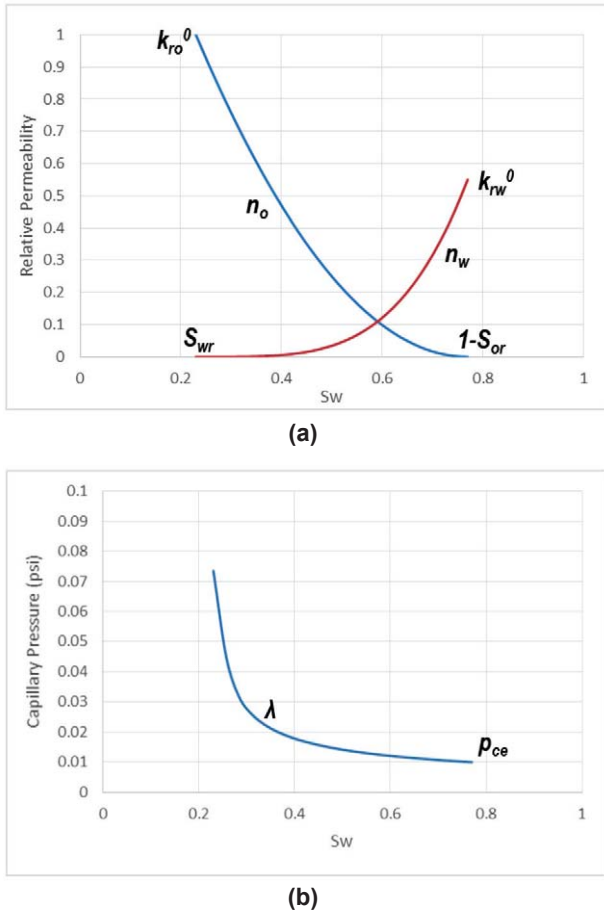


Fig. 3—(a) Relative permeability, and (b) capillary pressure curves defined by eight parameters.

NUMERICAL EXAMPLES

The integrated workflow has been successfully applied to a few field studies including the heavy-oil field in Kuwait and a carbonate oil field in Saudi Arabia. Here, we demonstrate the concept using a numerical example. The structure of the model is based on the numerical example used in Liang et al. (2017) with modifications to some parameters, especially for Facies 0, which are listed in Table 1. In this example, the formation model is composed of eight layers, which can be categorized into three facies. Array induction logging is carried out for the entire depth interval two days after drilling, immediately followed by dual-packer formation testing and sampling in the interval 5,021.67 to 5,025 ft with an offset probe set at 5,017 ft for observing the pressure transient. An in-situ fluid analyzer is used to record the water-cut information (WCT) from the dual-packer pumping.

Table 1—Input Parameters for the Numerical Example

Parameters	Facies 0	Facies 1	Facies 2
Q (rb/day/ft)	0.05	0.015	0.005
ϕ	0.25	0.2	0.15
k_h (md)	300	80	5
k_v/k_h	0.25	0.1	0.05
S_{wr}	0.1	0.2	0.25
S_{or}	0.15	0.2	0.25
k_{rw}^0	0.3	0.4	0.6
k_{ro}^0	1.0	1.0	1.0
n_w	5.5	4.7	4.0
n_o	3.5	2.7	2.3
λ	0.8	1.2	1.5
p_{ce} (psi)	0.67	0.89	1.6
s_d	0.15	0.1	0.05
m	1.8	1.9	2.0
n	1.9	2.0	2.1

Q , ϕ , k_h , k_v/k_h , and s_d denote average invasion rate, porosity, horizontal permeability, permeability anisotropy, and damage skin factor, respectively.

We first invert the array resistivity logs using the deterministic method, then invert the formation testing and sampling data using the Monte Carlo Gauss-Newton method. From the first step inversion, we obtain invasion rates for each layer and the irreducible water saturation for each facies, as shown in Fig. 4. The inverted residual oil saturations usually deviate from the true values due to the weak sensitivity of array resistivity logs to the shallow region of the formation. Hence, it is necessary to determine the residual oil saturation from other sources, such as dielectric logs, which have an investigation of 1 to 4 in. into the formation. In the second step, assuming the residual oil saturations have been obtained from dielectric logs, we invert for a list of unknown parameters for the target layer, where the formation testing and sampling is performed, from the recorded pressure transient and sampling data. As stated, this inverse problem is highly nonunique. To avoid trapping in a local minimum, we start from 48 initial models generated by random sampling from normal distributions and run Gauss-Newton optimizations to search for the best solution from each initial model to fit the measured pressure and water-cut data. In this example, the target layer is the sixth layer from the top, as shown in the left track of Fig. 4, which belongs to Facies 0, colored in blue. The inverted relative permeability and capillary pressure curves for Facies 0 are shown in Fig. 5. It shows that there are multiple solutions (the top 12 solutions are plotted) fitting the formation testing and sampling data almost equally well.

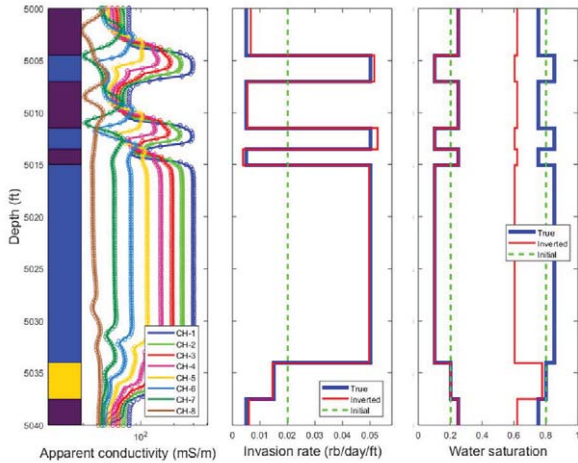
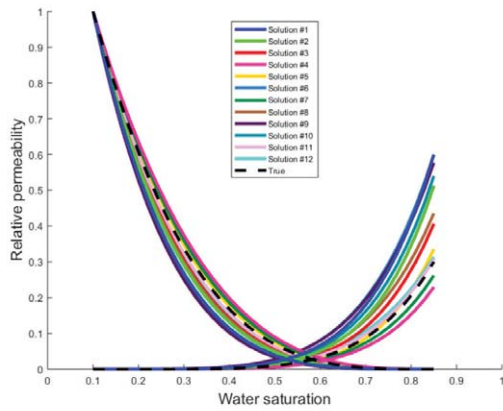
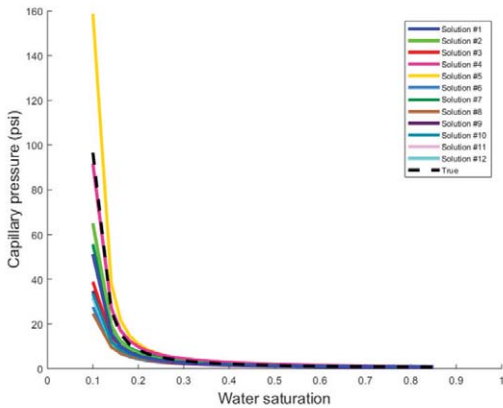


Fig. 4—Inversion of array resistivity logs constrained by fluid flow. The first track shows the actual facies model and data-fitting on array resistivity logs. The second track shows the inverted invasion rates compared to the truth. The third track shows inverted irreducible water saturation compared to the truth (left part) and the inverted residual oil saturation compared to the true values (right part).



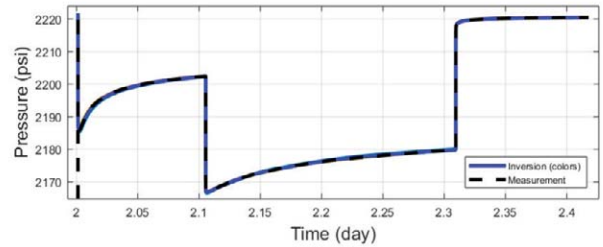
(a)



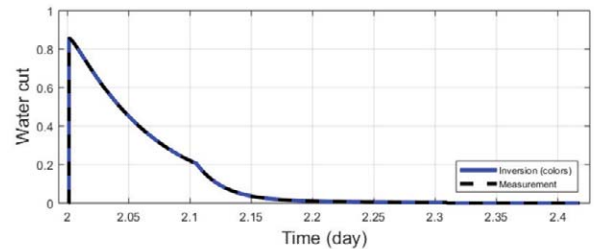
(b)

Fig. 5—Inverted relative permeability and capillary pressure for Facies 0 using loose bounds compared to the true model. Multiple solutions are shown in different colors except that the true model is shown with the black dashed line.

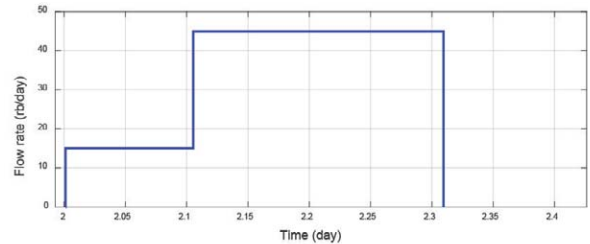
Figure 6 shows the comparison between the measurements and the dual-packer pressure and water-cut data reconstructed from different solutions. The discrepancies between the results from different solutions are visually negligible and overlap with measurements. Figure 7 plots all inverted parameters with error bars shown in red presenting the variations from the selected top 12 solutions. Horizontal green lines denote the corresponding true value of each parameter used in the synthetic model. The top axis shows the physical bounds of each parameter we employed during the inversion. Here we used very loose bounds for the parameters n_w , n_o , and λ assuming we do not have any prior information from other sources. According to the recommendation from experimental data, the ranges of n_w and n_o can be confined in a range from 2 to 8 for most cases.



(a)



(b)



(c)

Fig. 6—Comparison of reconstructed sink-pressure from 12 solutions to the measured sink pressure (a) and reconstructed water cut from 12 solutions to the measured water cut (b). The data are visually identical. (c) The flow rate during the formation testing and sampling process.

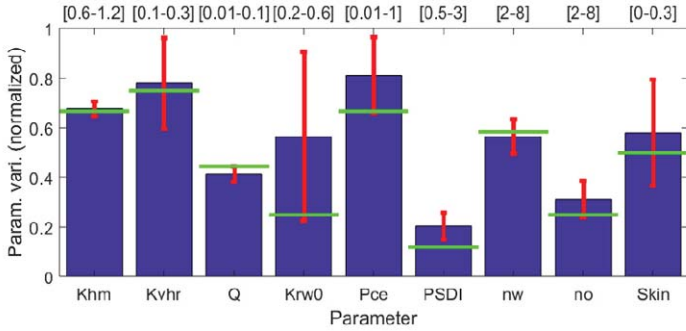


Fig. 7—Bar plot for all inverted parameters normalized to [0 to 1] by the corresponding physical bounds shown on the top axis. The horizontal green lines represent the true values of parameters used for generating the synthetic data. *Khm*, *Kvhr*, and *Krw0* denote horizontal permeability multiplier, permeability anisotropy ratio, and endpoint relative permeability for the water phase, respectively.

If we can estimate the PSDI from NMR data, the physical bounds of λ , n_w , and n_o can be narrowed down for the inversion. Here we assume that the range of λ can be narrowed down to the range 0.7 to 0.9, based on the computation from the relationship between the Corey’s exponents and PSDI for a water-wet case; n_w could be limited to ~4.5 to 5.8; and n_o can be limited to ~3.3 to 4. The new inversion results (top 12 solutions) are shown in Fig. 8. Figure 9 plots all inverted parameters with the applied physical bounds during inversion shown on the top axis. As expected, the solutions are still nonunique, but have been effectively narrowed down.

CONCLUSIONS

We developed an integrated workflow for estimating in-situ relative permeability and capillary pressure curves from the wireline measurements including a variety of well logs and the formation testing and sampling data. Among the data, array resistivity logs characterize the invasion profile and the irreducible water saturation. The dielectric log provides information on residual oil saturation and, by combining with NMR logs, provides insight on Archie’s parameters m and n . The NMR log can be used to estimate PSDI, which could be used to narrow down the feasible range of a few parameters including Corey’s exponents n_w and n_o . With these parameters being confined a-priori, we can effectively reduce the solution space and the uncertainty in the interpretation. This workflow has been applied to a few field data studies including the heavy-oil unconsolidated sandstone in Kuwait and the carbonates in Saudi Arabia. It needs to be noted that, although the water-based-mud invasion refers to an imbibition process, the inverted relative permeability and capillary pressure curves are dominated by the drainage process induced by the formation testing and sampling operation. The hysteresis effect has not been considered in this study.

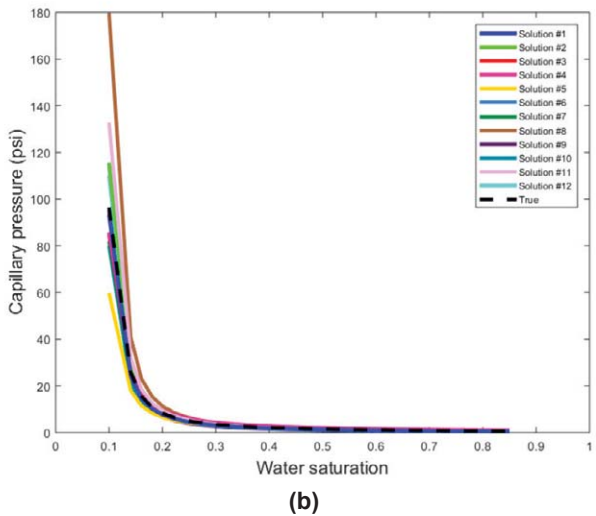
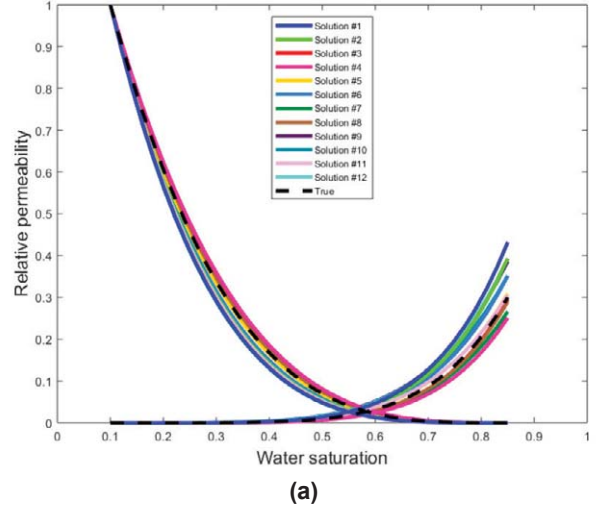


Fig. 8—Inverted relative permeability (a) and capillary pressure (b) for Facies 0 using confined bounds compared to the true model. Multiple solutions are shown in different colors except that the true model is shown with the black dashed line.

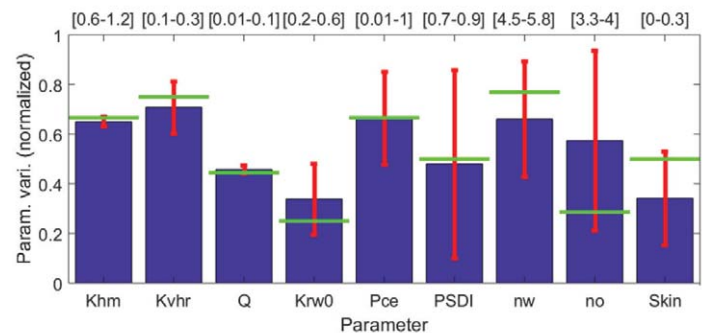


Fig. 9—Bar plot for all inverted parameters normalized to 0 to 1 by the corresponding physical bounds shown on the top axis. The horizontal green lines represent the true values of parameters used for generating the synthetic data.

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SPWLA Houston Chapter Software Show - December 12, 2018

The SPWLA Houston Chapter recently hosted its annual Software Show. Members had the opportunity to learn about recent innovations and advancements in technology and software for formation evaluation and data interpretation. Jeff Crawford, Chapter President, was the moderator for this event while members of Houston Chapter board volunteered to host the seminar. The program included an exhibition with 10 vendors who presented their innovations during a robust program. Topics included formation-test analysis and pretest QC, TI anisotropic effects on acoustic logs, coupled stratigraphy-based and real-time resistivity forward-modeling geosteering, automated log editing with machine learning, wellsite decision-management tool, among others.

Professionals with varying backgrounds and experience attended this event. Attendees included Zhipeng “Z” Liu, 2018–2019 SPWLA President, Jesus Salazar, SPWLA President-Elect, and Javier Miranda, SPWLA YP Chairman. A networking social event that followed the show at a nearby venue was also well attended.

Below are photos of some of the vendor presentations given at the Houston Chapter Software Show.



Schlumberger Techlog multiwell workflow



INT Inc. cloud-based E&P visualization



Harvey Rock Physics Logscope Fiber QuickLook



Antaeus Technologies GeoFit



ROGII Inc. StarSteer

SPWLA Boston Workshop on Digital Rocks and Unconventional Petrophysics November 28–29, 2018

After months of preparation, the SPWLA workshop on “Digital Rocks and Unconventional Petrophysics” was held on November 28–29, 2018, at Schlumberger-Doll Research in Cambridge, Massachusetts. The focus of the workshop was the use of modern imaging and digital rock technology to enhance understanding of structure and flow in porous media, in particular, in unconventional reservoirs. The workshop attracted 105 delegates from 28 institutions worldwide, from as far as Brazil, Australia, and China; The breakdown was 40% from academia and 60% from industry. The intense interaction between academic researchers in the areas of complex fluids and multiphase flow and the petroleum industry scientists was the highlight of this conference.

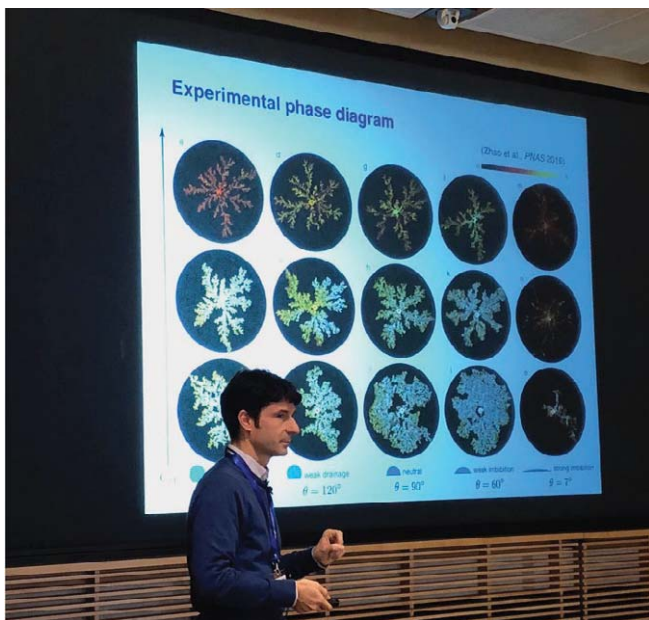


Eight keynote talks were delivered by academia and industry experts. Dr. Smit (Shell) opened the conference with his vision of digital rock imaging and physics to provide a fundamental understanding of the many subsurface processes relevant to a broad range of applications in petroleum exploration. Professor Weitz (Harvard University) highlighted the tremendous progress in visualizing multiphase flow in porous samples using confocal microscopy and observing processes important to the understanding of residual oil and capillary pressure effects. Professor Xiao (China University of Petroleum Beijing) presented the impressive development of a novel NMR system for quantitative wellbore imaging of petrophysical parameters. NMR was the focus of several reports from imaging to understanding molecular properties of organic material in shales. Professor Torres-Verdin (UT-Austin) highlighted the critical process at the fluid-pore interfaces with a strong impact of multiphase flow property at a larger scale. Intriguing images and patterns of fluid displacement were reported by Professor Juanes (MIT) that showcased the importance of such complex phenomena for many applications.

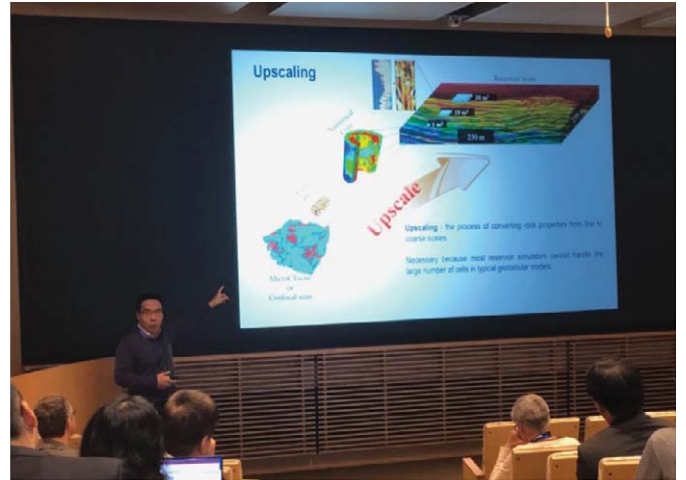
At the end of the first day’s program, a mixer provided a relaxing environment for further interaction among the attendees. Harvard Professor Rice’s talk on the mechanics of earthquake and glacier dynamics was both insightful and entertaining.

Several technology providers in digital rock imaging and core analysis showcased state-of-the-art imaging technology and facilities as well as numerical methods for digital petrophysics: Dr. Chi, iRock; Dr. Bhattad and Burt, ThermoFisher Scientific; Joel Walls, Halliburton; D. Klemin, Schlumberger. Combining different imaging modalities to achieve multiscale understanding of the pore microstructure received a great deal of attention. The discussion also touched on the challenges of new technology in term of its accuracy and relevance to approach practical petroleum applications. A key gap for a wide adoption of the technology is the small size (~1 mm) of the samples amenable to digital analysis and the difficulty and expense involved in upscaling.

Hydraulic fracturing was a major topic of the conference. Dr. Prioul (Schlumberger) reported on the understanding of fracture distribution and fracture initiation physics and modeling. Several laboratory-scale experiments were reported to initiate and monitor fracturing processes in soft and hard model materials, and rock samples with fascinating images and videos to highlight its complexity and particular sensitivity to heterogeneity. Upscaling and large-scale understanding of the fracture network and its relevance to production was also a key topic that engaged the audience. EOR was also a topic of many discussions and Professor Feng provided an overview of chemical EOR in China, which hosts the majority of global chemical EOR activities.



The workshop is a part of the semi-annual meeting series of Harvard SEAS-CUPB joint laboratory on petroleum science and jointly supported by the Boston chapters of SPWLA and SPE, Harvard University, and China University of Petroleum Beijing. The workshop was cochaired by Professor Lizhi Xiao (China University of Petroleum, Beijing) and Dr. Yiqiao Song (Schlumberger-Doll Research). The organizing committee included Ravinath Kausik, Drew Pomerantz, Lin Liang, Carlos Torres-Verdin, Christoph Arns, Shima Parsa, Xudong Jing, Joel Walls, Shoucheng Tian, Guangzhi Liao, Arash Aghaei, Emmanuel Toumelin, Jean Elkhoury and Chang-yu Hou. Additional financial support from Halliburton, Thermo-Fisher Scientific, iRock Technologies, Beijing Limecho Technology Co., Ltd, and the Materials Science and Engineering Center at Harvard is kindly acknowledged.



AUSTRALIAN CHAPTER

(Formation Evaluation Society of Australia, FESAus)

General News

FESAus, the Australian chapter of SPWLA combines the formation evaluation societies from around Australia predominantly FESQ. Technical meetings are held in Perth on the second Tuesday of each month, with webcasts of the presentations available soon after for members from other states to view. Please visit www.fesaus.org for meeting information.

2018 Committee Members

President	Adrian Manescu
Vice President/Assistant Treasurer/Newsletter Coordinator	Wesley Emery
Treasurer/Company Secretary	Callum Rideout
Website Coordinator/Data Standards Focal Point	Martin Storey
Secretary/Inter-Society Liaison/Social Coordinator/ Special Events and Awards	Leanne Brennan
Past President	Nariman Nouri
Monthly Meeting Coordinator	Meretta Qleibo
Membership Coordinator	Siobhan Lemmey
New Technology Forum Coordinator	Ben Van Deijl
New Technology Forum Coordinator	AbdelRahman Elkhateeb
Paul Pillai Education Group Leader	Matthew Josh
Audio Visual Coordinator	Nigel Deeks
Sponsorship Coordinator	Andrea Paxton
Audio Visual Coordinator	Yang Xingwang
Victoria Representative	Matthew Durrant
NSW Representative	Harris Khan

Recent Events

30 October 2018 – FESAus Master Class on Brownfield

Evaluation was conducted by the following representatives:
“Quantifying Water Free Production” – Wesley Emery (Innovative Reservoir Petrophysical Modelling Pty Ltd)
“Re-Evaluating Low-Resistivity Pay Intervals in Mature Fields” - Rick Aldred (Independent Consultant)
“Integrating Fibre Optic Surveys With Petrophysics and Geomechanics for Sand Control Decisions in a Brown Field” – Khasar Abbas (Baker Hughes GE)

“Completion Planning From a Geological Prospective Using Core, DFIT and Tracer Data to Improve “Hydraulic Fracture Modeling” – David Hume,(Corelab)

“Electrostatic Origins of Oil-Brine-Rock Interactions: Implications for Low Salinity Waterflooding” – Sam Xie (Curtin University, Western Australia School of Mines)

“Unrecognized, Denied, Ignored—The Truth About Small-Scale Faults” – Ralf Oppermann (Optimal Resource Solution)

“High-Resolution Core Measurements for Reservoir Characterization” – Thomas Richard (Epslog)

“Facies/Rock Typing: A Key Parameter in Reservoir Modeling” – Nabi Mirzee (Consultant)

All the subjects and topics presented were well received with a great deal of discussion and sharing of ideas.



FESAus October 2018 Master Class. (Left to right) Wesley Emery (Innovative Reservoir Petrophysical Modelling), Ralf Oppermann (Optimal Resource Solutions), Rick Aldred (Independent Consultant), David Hume (Corelab), Khasar Abbas (Baker Hughes GE), Sam Xie (Curtin University, WA School of Mines), Nabi Mirzee (Indeendant Consultant), and Thomas Richard (Esplog).

13 November 2018 – The monthly technical meeting was conducted by Matthew Shaw, (Senior Petrophysicist, Woodside Energy) who gave a talk on “Statistical Techniques for Petrophysics and Uncertainty.” With all the hype currently surrounding data science, and more specifically, machine learning for subsurface data analysis, it is important to recognize and remember that we, as petrophysicists, have been carrying out the basics of data science and machine learning since the inception of our discipline. This presentation (1) highlighted some of the key statistical techniques that are critical in a modern petrophysical analysis, and (2) covered covered the appropriate use of the more basic methods in our petrophysical toolkit, and (3) sought to dispel some of the negative rumors surrounding the more complex techniques. A basic explanation of some of the more

black-box methods sought to remove some of the anxieties over the use of Monte Carlo, artificial neural networks and apparently complex grouping/partitioning techniques. The application of these techniques for robust and efficient uncertainty analysis was discussed. The presentation topic was well received with a great deal of discussion and sharing of ideas



FESAus November 2018 meeting. Speaker Matthew Shaw (Senior Petrophysicist, Woodside Energy) (left) received the speaker’s gift from Adrian Manescu, President FESAus (right).

11 December 2018 – FESAus’ end of year Christmas Event was conducted by Chris Elders (School of Earth & Planetary Sciences, Curtin University) who spoke on “Large Scale Tectonic Controls on Sediment Distribution in the Northern Carnarvon Basin.” Chris’ talk was well received with a great deal of discussion and sharing of ideas.



FESAus December 2018 meeting. Speaker Chris Elders (School of Earth & Planetary Sciences, Curtin University) (left) and Adrian Manescu, President FESAus (right)

BANGKOK CHAPTER

General News

The Bangkok Chapter of SPWLA holds Technical Meetings in Bangkok on the last Thursday of each month. Meetings are fully sponsored for SPWLA Members. Non-members can attend at no charge with email registration prior to the meeting. Students are always free of charge. Please visit https://www.spwla.org/SPWLA/Chapters_SIGs/Chapters/Asia/Bangkok/Bangkok.aspx for meeting information. Email: bangkok.chapter@spwla.org

2018 Chapter Committee Members:

President	Andrew Cox
Communications/Temporary Treasurer	Alexander Beviss
Secretary	Ronald Ford
Sponsorship	Peter Roden
Treasurer (outgoing)	Ammy Kamkong
Student Liaison	Kruawun Jankaew
Member-at-Large	Damrongsak Chantipna
Technical Programs Coordinator	Numan Phetttongkam

Recent Events

15 November 2018 – Joint SPWLA/SPE meeting: Rick Aldred presented “Reevaluation of Low-Resistivity Pay Intervals in Mature Fields.” Rick spoke on his work using resistivity from numerous wells drilled at different angles through a reservoir to evaluate laminated sands which were not previously identified. The meeting was well attended.



Bangkok Chapter November 2018 meeting. (left to right) Andrew Cox, Rick Aldred (speaker), Alexander Beviss, Ronald Ford, and Peter Roden.

Upcoming Events

31 January 2019 – Katherine Kho (Geophysicist, KrisEnergy Pte Ltd.) will be presenting “Cambodia’s Hydrocarbon Prospectivity an Insight From Block A.” The technical meeting will be held at the Jasmine City Hotel, downtown Bangkok.

BOSTON CHAPTER

General

SPWLA general and Boston-affiliate members are invited to browse our chapter website <http://boston.spwla.org> for up-to-date information of our mission and events, including event information and registration.

The Boston Chapter began its 2018–2019 calendar of events by hosting two SPWLA Distinguished Speakers and also contributing to the December SPWLA global webinar presentation.

Recent Events

02 November 2018 – Nicholas Bennett (Schlumberger-Doll Research, Cambridge, Massachusetts), presented his SPWLA Distinguished Lecture “Borehole Acoustic Imaging Using 3D STC and Ray Tracing to Determine Far-field Reflector Dip and Azimuth.”

28–29 November 2018 – The Boston Chapter hosted a well-attended two-day workshop on “Digital Rock and Unconventional Petrophysics”. More than 40 engaging presentations, many by members of the SPWLA, were delivered. The diverse group of delegates included representatives from operating and service companies, digital-imaging companies, and academia.

Digital Rocks and Unconventional Petrophysics Workshop
Date: Nov 28 – 29, 2018 BOSTON, MA, USA



HOSTED BY
THE BOSTON CHAPTER
OF THE SPWLA

New York and New
England Section

Theme

The workshop will focus on the progress of digital rock technology and applications, study of unconventional oil/gas resources and petrophysics. Particular interest is in the use of digital rock and imaging techniques to study unconventional rocks and the associated phenomena. Our goal is to bring academia and industrial scientists together on these novel topics.

Program: Keynote speeches; Invited talks; Social mixer; Sound-Bytes
Venue: Schlumberger-Doll Research (1 Hampshire St., Cambridge, MA)

Confirmed keynote speakers	Confirmed invited speakers
• Dirk Smit, Shell	• Connor Burt, Thermo Fisher Scientific
• David Wertz, Harvard Univ.	• Amir Taghavi, Umass Dartmouth
• Carlos Torres-Verdin, UT-Austin	• Avrami Grader, Ingrain/Halliburton
• Romain Pridou, Schlumberger-Doll	• Joel Walls, Ingrain/Halliburton
• Lihui Xiao, China University of Petroleum	• Drew Pomerantz, Schlumberger-Doll Research
• Yujun Feng, Sichuan Univ.	• Ruina Xu, Tsinghua Univ.
• Pradeep Bhattad, Thermo Fisher Scientific	• Yuntian Chen, Peking Univ.
• Ruben Jaimes, MIT	• Lu Chi, iRock
• James R. Rice, Harvard Univ.	• Will Steinhardt, Harvard Univ.
	• Shima Parsa, Harvard Univ.
	• Denis Klein, Schlumberger Reservoir Lab
	• Thomas C. Halsey, ExxonMobil

For information or need invitation letter for visa application, contact spwla_boston_2018@gmail.com

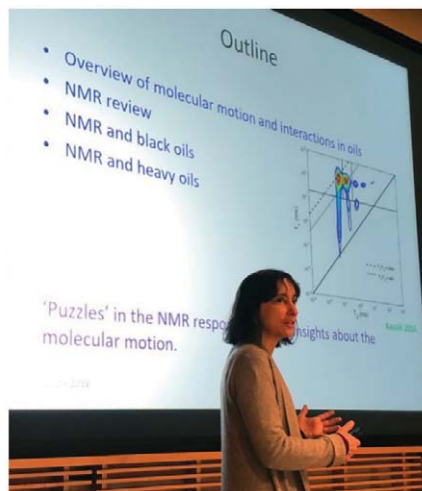
PLEASE NOTE THAT U.S.-EMBARGOED NATIONALS ARE NOT PERMITTED TO PARTICIPATE IN THIS EVENT

Organizers:
SPWLA Boston chapter, SPE New England, Harvard Univ., China Univ. of Petroleum, Schlumberger-Doll Research
Chairs: Lihui Xiao (CUP) and Yiqiao Song (SDR)

Organizing committee:
Ravinath Kausik (SDR, head), Drew Pomerantz (SDR), Lin Liang (SDR), Carlos Torres-Verdin (UT-Austin)
Christoph Amis (DNV), Shima Parsa (MIT), Yuxiang Jing (Shell), Joel Walls (Ingrain, Halliburton)
Shousheng Tian (CUP and Harvard U), Guangzhi Liao (CUP), Arash Aghaie (Thermo Fisher Scientific)
Emmanuel Toumelin (Chevron), Jean Ekhouy (SDR), Chang-Yu Hou (SDR)

Sponsors:
Schlumberger, Harvard, iRock, FEI (ThermoFisher), Ingrain (Halliburton), Lim-echo

Boston Chapter November 28–29, 2018 workshop announcement.



Boston Chapter November 28–29, 2018 workshop. Denise Freed (Schlumberger) introduces insights from NMR measurements of crude oils in shale.



Boston Chapter November 28–29, 2018 workshop. Kitty Milliken (UT-Austin) educates on mineral origins and transformations in shale derived from high-resolution petrographic imaging of shale rocks.

07 December 2018 – Michael Thiel (Schlumberger-Doll Research, Cambridge, Massachusetts), presented his SPWLA Distinguished Lecture “Azimuthal Imaging using Deep-directional Resistivity Measurements reveals 3D Reservoir Structure.”

10 and 12 December 2018 – Ravinath Kausik (Schlumberger-Doll Research), SPWLA Distinguished Lecturer presented the SPWLA December 2018 Webinar on “Frequency and Temperature Dependence of NMR T_1 - T_2 maps.”

BRAZIL CHAPTER

General News

Our monthly meeting take place every third Tuesday of the month, at 4 PM in downtown Rio de Janeiro. Anyone wishing to participate or receive information about the chapter can contact our secretary, Andre Bertolini (abertolini@slb.com). We also post chapter updates at our Facebook page (fb.me/SPWLABrazil) and our LinkedIn page – check us out!

Recent Events

28 August 2018– Xiaoming Tang (Director of Borehole Acoustic Laboratory, China University of Petroleum), presented the talk “Advanced Borehole Acoustic Reflection Imaging and Applications.” We had interesting discussions following the presentations.



Brazil Chapter August 2018 meeting. Dr. Xiaoming Tang (China University of Petroleum) was the invited speaker.

18 September 2018 – Dr. Joachim Amthor (Principal Research Carbonate Geoscientist at Shell Brasil) gave a presentation on carbonate reservoirs: “Difficult or Just Different?,” to a large and interested audience.

16 October 2018 – Rodolfo Araujo Victor (Geophysicist at Petrobras) presented part of his PhD thesis, discussing new frontiers in digital petrophysics and applications to wireline log interpretation.



Brazil Chapter October 2018 meeting. Carlos Francisco Beneduzi (left) and speaker Rodolfo Araujo Victor (right).

27 November 2018 – Luis Horta (Geologist at Ingrain/ Halliburton) presented the talk “Optimizing Sidewall Core Sampling Selection by Clustering Wireline Logs Using Machine Learning.”

16 December 2018 – At the final technical meeting of 2018 Thiago Pessoa (Geomechanics Specialist at Baker Hughes GE) gave a presentation entitled, “Borehole Stability – Managing Challenges Associated with a Low Amount of Available Data.”

DALLAS CHAPTER

Recent Events

October 2018 - Avto Tkabladze (Nuclear Advisor, Schlumberger) gave his SPWLA Distinguished Speakers talk titled “Revolutionary X-Ray Tool for True Sourceless Density Logging with Superior Performance.” Avto briefly discussed the history of attempts towards a true sourceless density measurement. He showed recent success in engineering an X-ray density pad without a radioactive source. Modeling and experimental data showing the validity of the physics of the measurement and the subsequent match of bulk density and PEF compared to traditional Cs-137 source measurements. The meeting was informative and well attended by the chapter membership.



Dallas Chapter October 2018 meeting. Avto Tkabladze (left), receiving the chapter speaker award from Steve Brackeen, VP Technology.

November 2018 – Zheng “Jon” Gan (Technical Advisor, Core Laboratories) gave his SPWLA Distinguished Speaker presentation, “Fast Pressure-Decay Core Permeability Measurement for Tight Rocks.” The new technique proposes to overcome the main limitation of measurement time for permeability using the current techniques. This is achieved using system gas pressure higher than the pore pressure of the sample. A comparative study using Marcellus and Eagle Ford shale sample permeability results from pressure-decay, pulse-decay, and steady-state experiments on these core samples was presented. It showed that the proposed pressure-decay experiment can provide accurate matrix permeability in ultratight rocks. It was also shown that the measured matrix permeability by this new pressure-decay method isn’t affected by the open, connected fractures, which can lead to overestimation of permeabilities by orders of magnitude using existing permeability measurements.



Dallas Chapter November 2018 meeting. Zheng Gan (left), receiving the chapter speaker award from Steve Brackeen, VP Technology.

Upcoming Events

Please visit the Dallas chapter webpage on the national SPWLA website for the upcoming planned chapter meeting dates and topics.

DENVER CHAPTER (Denver Well Logging Society, DWLS)

General News

Join us for the monthly DWLS meetings, which are held the third Tuesday each month, beginning in September and running through May. Meetings take place in the Mercantile Room at the Wynkoop Brewing Company in downtown Denver, Colorado. The networking social begins around 11:20 AM, lunch is served at 11:45 AM, and the technical presentation starts at 12:00 PM. The cost for the DWLS luncheon is \$20 and guests are welcome to attend. Visit the DWLS website at www.dwls.spwla.org to make your luncheon reservations, renew your membership, or join the society.

DWLS is proud to announce a \$30,000 donation to the SPWLA Foundation for 2018! This donation will support scholarship and grant opportunities for graduate students attending a college in the United States Rocky Mountain region, which includes the states of North Dakota, South Dakota, Colorado, Wyoming, Utah, Idaho, Montana, New Mexico, Arizona, and Nevada.

Recent Events

13 November 2018 – Paul Devine (Resource Analytics, LLC) presented a lecture on incorporating information theory into petrophysics as a new tool for assessment of resource plays. His talk was titled: “Information Theory as a Guide to Probabilistic Log Evaluation Without Petrophysics: Focus on Effective Porosity and a Revised Volumetric Paradigm that Eliminates Recovery Factor.” It was well attended.



DWLS November 2018 meeting. Paul Devine (Resource Analytics, LLC) was the speaker.

04 December 2018 –The DWLS Annual Holiday Social was held at the Rialto Café. This year we celebrated with three guest speakers: Michael Holmes (Digital Formation), Jack Bowler (Bowler Petrophysics), and Dick Merkel (Denver Petrophysics), who shared some war stories about their trials and tribulations in the industry back in “The Good Old Days.”



DWLS December 2018 meeting. DWLS members were entertained by speakers at the 2018 Holiday Social.

Upcoming Events

15 January 2019 – Aidan Blount (Shell E&P Company) will give his 2018–2019 SPWLA Distinguished Speaker presentation, “Maintaining and Reconstructing In-Situ Saturations: A Comparison Between Whole Core, Sidewall Core, and Pressurized Sidewall Core in the Permian Basin.” Aidan will speak on the critical nature of fluid saturations in petrophysical analysis, and the challenges vendors and operators alike face to improve and develop core analytical techniques to accurately measure the quality of unconventional reservoir rocks.



DWLS January 2019 meeting. Aidan Blount (Shell E&P Company) will speak.

19 February 2019 – Jesus Salazar (Marathon Oil Corporation), 2018–2019 SPWLA President-Elect will give his lecture “A Practical Petrophysical Model for a Source Rock Play: The Mancos Shale.” He will speak about recent advances made in developing a model that predicts hydrocarbon generation potential based on geochemical, core, and triple-combo suites to generate fairway maps, locate sweet spots, and for landing lateral wells.



DWLS February 2019 meeting. Jesus Salazar (Marathon Oil Corporation) will speak.

02 April 2019 – DWLS will host a Spring Workshop on “Data Analytics in Reservoir Evaluation” at the American Mountaineering Center in Golden, Colorado. The theme includes data mining, predictive analytics, and different algorithms in artificial intelligence, such as machine-learning, neural networks, and genetic algorithms. Register online and learn more about the speaker lineup at www.dwls.spwla.org.

FRANCE CHAPTER

Recent Events

27 November 2018 – In conjunction with the first EAGE/IGA/DGMK workshop on deep geothermal energy, held on November 8–9, 2018 in Strasbourg (France), SPWLA France organized a technical session that focused on logging and formation evaluation in the context of geothermal drilling. The session, which was held in Paris at Société Géologique de France and streamed live via weblync, gathered 50 participants (including students) in person plus 20 people on the web. The topic was introduced with a general talk about the geothermal regimes of sedimentary basins and followed by two case studies: the Paris Basin with the recent drilling of the Cachan pilot (Paris region, France), and the Rhine graben

(East region, France) with fractured reservoirs. The second part of the session was technology oriented and dealt with two methods to estimate rock mechanical properties from drilling parameters. The session closed with a general overview of the geothermal market and some thoughts about well logging in such a challenging context. The variety of the participants to this event was a real opportunity for numerous debates between loggers, tool providers, drilling and geothermal companies. The presentations included:

Introduction: “What Do We Know About the Thermal Regime of Sedimentary Basins?” Jean-Luc Rudkiewicz (IFP-EN)

Case Studies Session:

Paris Basin: “Towards a New Standard in Well Architecture and Wireline Logging in the Paris Basin: The Cachan Pilot Site Approach”

“Well Architecture, Drilling/Geosteering,” Mélanie Davaux (GPC-IP) and Pierre Ungemach (GeoFluid)

“Logging and Formation Evaluation” Chiara Cavalleri* and Erik Wielemaker (Schlumberger)

Rhine Graben Case Studies

“Wellbore Logs in Rittershoffen, Alsace: Acquisition, Analysis and Integration for Fractured Reservoir Characterization,” Giovanni Sosio (Schlumberger) and Régis Hehn (ES Géothermie).

Technology Session

“DRIMP and Pseudo Impedance as a Proxy of Rock Properties,” Alfazazi Dourfaye (VAREL)

“Using the Bit to Measure How Rock Reacts to Force: An In Situ Rock Mechanical Measurement,” Josh Ulla* (FRACTURE-ID)

Conclusions on the Geothermal Market

“The Geothermal Industry” and “Geothermal Well Logging and Analysis: Opportunities and Challenges,” Roger Henneberger* (GeothermEx-Schlumberger).

*Talks given via webync.



Jean-Luc Rudkiewicz



Mélanie Davaux



Giovanni Sosio



Alfazazi Dourfaye

INDONESIA CHAPTER

General News

The SPWLA Indonesia Chapter was successful in organizing the SPWLA Asia Pacific Technical Symposium 2018. Two new student chapters will be established in this year: Trisakti University and Pertamina University. Another four student chapters will be established in early 2019: STT Migas Balikpapan, Bandung Institute of Technology (ITB), Padjajaran University, and Hasanuddin University. The New Board of Directors of SPWLA Indonesia also will be rearranged and announced in early February 2019.

Recent Events

Several technical events preceded the SPWLA Asia Pacific Technical Symposium 2018.

15 September 2018 – A Petrophysical Student Competition was successfully held in Halliburton Office in Tangerang City with 19 teams participating from various universities. The best five teams were chosen to present their work. As a result, the 1st place winner was Trisakti University A, 2nd place, Trisakti University B; 3rd place, Brawijaya University; 4th place was Hasanuddin University; and 5th place was Bandung Institute of Technology.



SPWLA Indonesia Asia Pacific Technical Symposium 2018. Winners of the student paper competition with the board of judges and SPWLA Indonesia Committee.

25 October 2018 – We held a Technical Discussion Forum (TDF). Albertus Ditya presented his research on “Acoustic Velocity and Resistivity and Their Relationship to Porosity-Permeability of Pliocene-Pleistocene Reefal Carbonates.”

5–6 November – Two petrophysical short courses were presented in Jakarta and Bogor City. Dr. Abbas Khaksar (Baker Hughes GE) presented “Geomechanics for Sanding Prediction and Sand Management,” and Abraham Simanjuntak (Pertamina E&P) presented “Best Practices in Identification and Evaluation of LRLC Pays (with Case Examples).”



SPWLA Indonesia November 2018 Short Course 5 presented by Dr. Abbas Khaksar (Baker Hughes GE).



SPWLA Indonesia November 2018 Short Course 6 presented by Abraham Simanjuntak (Pertamina E&P).

7–8 November 2018 – SPWLA Indonesia held the SPWLA Asia Pacific Technical Symposium 2018 in Bogor City, Indonesia. The theme of this symposium was “Empowering Applied Petrophysical Concept and Technology: Unlocking Hidden Potentials in Mature Fields.” Approximately 30 technical papers on various topics were presented in this event and supported by five keynote and five invited speakers from industry experts, academics, and governments. There were approximately 200 attendees from Indonesia and various countries that include USA, China, Malaysia, India, Hungary, Australia, and several Middle East countries.



Indonesia Chapter 2018 Asia Pacific Symposium. Opening Speech by SPWLA Indonesia President Muhammad Nur Ali Akbar with video recording of a presentation by SPWLA President Zhipeng “Z” Liu.



Indonesia Chapter 2018 Asia Pacific Symposium. Group photo of symposium participants Day 1.



Indonesia Chapter 2018 Asia Pacific Symposium. Group photo of symposium participants at networking night.

13 December 2018 – Our final event in 2018 was a core workshop on “Core Evaluation for Petrophysical Analysis,” This workshop was held at the Core Lab offices and was presented by Agus Priyantoro (LEMIGAS) and Sapta Sahputra (INTERTEK).

JAPAN CHAPTER (Japan Formation Evaluation Society, JFES)

General News

Toshikazu Ebato, executive vice president of Japan national oil and gas organization (JOGMEC). gave the opening speech at the 24th JFES annual symposium, which was held on 11–12 October 2018. In his speech (reproduced below) he recognized the activity and value of JFES reminded us of our mission to take the lead in formation evaluation in Japan. There is no annual fee to be a member of JFES, please feel free join us!

*Good evening, ladies and gentlemen. Welcome to the 24th Formation Evaluation Symposium of Japan. I am **Toshikazu Ebato, Executive Vice President of JOGMEC**. On behalf of JOGMEC, thank you all for coming and joining us to Technology & Research Center. It is a great pleasure for me to participate and co-host this exciting symposium, covering a wide range of interesting topics relating geology, geophysics and reservoir engineering with more than 50 distinguished participants.*

This year we have a special session on “Complex Reservoirs”. I’d like to take this opportunity to thank the keynote speaker;

***Mr. Adam Haecker** for giving us interesting talk about North America Continental Resources, and three invited speakers;*

***Dr. Shimamoto (INPEX), Dr. Yokoi (JAPEX) and Dr. Akkurt (Schlumberger)** for sharing their thorough knowledge and experience with us.*

I would also like to thank those involved in the administration of the symposium. This symposium would not have happened without your hard work and kind support.

JOGMEC also accelerate to proceed several research projects for complex reservoirs targeting also unconventional like shale and volcanic reservoirs collaborated with laboratory analyses. I strongly believe that raising efficiency in development and production from the complex reservoirs would become more and more important, regarding technology maturity in this research field. It is a wonderful opportunity for JOGMEC to hold the symposium under such circumstances.

I hope this two-day symposium becomes a great time for all of you to share knowledge and experience, and to build your own understanding in formation evaluation of complex reservoirs.

*In conclusion, I would like to thank again, all of you for coming to the Technology & Research Center. I wish you the best on every possible success in your work, starting from this icebreaker with a toast... Wishing you and your family good health, happiness and prosperity. Please follow me in Japanese “**Kanpai**”. [toast]*



JFES Annual Symposium October 2018. Toshikazu Ebato, Executive Vice President of JOGMEC giving the symposium opening remarks.

Recent Events

07 December 2018 – The 106th Chapter Meeting was held on at the Mitsubishi Corporation Exploration Co., Ltd., Tokyo Japan. Two presentations on petrophysical and completion engineering techniques for unconventional reservoirs were attended by a total 35 people from various companies and universities.

Tsuta Takeuchi (MCX) spoke on “Petrophysics Interpretation with Mineral Composition Analysis in US Shale Gas Reservoirs”

Kazuhiko Matsumoto (MCX) spoke on “Completion Design Optimization Using Frac Simulation and Reservoir Simulation in a North American Shale Gas Field.”

Upcoming Events

March 2019 – The 107th chapter meeting will be held at the Schlumberger Tokyo office. Speaker details and the date will be announced shortly. Participation is free of charge. Please feel free to join us!

Please visit <http://jfes-spwla.org/> for additional details.

**London Chapter
(London Petrophysical Society, LPS)**

General News

2018 was a momentous year for the LPS. We negotiated a new Charter with SPWLA and had overwhelming acceptance of the amendments to the LPS Constitution in our first electronic vote. We helped to deliver a very successful Annual Symposium in London for SPWLA. And we continued with our outstanding technical program of evening talks and seminars. The outgoing LPS President wishes to say a sincere thank you to his colleagues on the Executive Committee for all their hard work and support throughout 2018. That we were able to deliver so much for our members in 2018 was a testament to their commitment, patience and perseverance.

At the AGM in November, among the business conducted, a new Executive Committee for 2019 was voted in, and we are looking forward to another outstanding year under the leadership of our new President Dawn Houliston.

The new Executive Committee for 2019 will be:

President	Dawn Houliston
Past President	Mike Millar
Treasurer	Ian Draper
Secretary	Barry Setterfield
Vice President Technology	Rebecca Holyer
Vice President Publications	Henry Mortley
Vice President Arrangements	Ruza Gagnon
Vice President Data Protection and Membership	Jusmell Graterol
Vice President External Liaison	Kanad Kulkarni
Vice President Sponsorship	Ross Kerr

Many of the committee are new faces, so the LPS is looking forward to welcoming these new committee members to the society. We have a full and exciting technical program planned for 2019, including five one-day seminars, so the new committee will be busy!

Recent Events

20 November 2018 – Annual General Meeting, the business part of the meeting was followed by a truly fascinating talk from Professor Jane Evans on “Richard III: His life from his bones.” Many thanks to Jane for coming down from Nottingham from the BGS to present to us.

26 November 2018 – The inaugural Young Professionals Summit, jointly hosted by PESGB, AAPG, SPE and EAGE was held in London. The LPS supported this event with a technical presentation by Mike Millar titled, “Innovation and Inspiration—How Evolving Technologies Have Improved the Working Life of Petrophysicists and Other

Subsurface Disciplines.”

13 December 2018 – The seminar on “Resistivity-Free Saturation” offered a full and exciting agenda investigating the alternatives to Archie-based water saturation evaluations. The seminar was followed by our annual President’s Evening, Christmas party.

Upcoming Events

10 January 2019 – “New Technology” Seminar

12 February 2019 – Alberto Mendoza (Imperial College) will present “Statistical Methods to Enable Practical Onsite Tomographic Imaging of Whole-Core Samples,” at the evening meeting.

07 March 2019 – “Petrophysics 101” Seminar

See our website www.lps.org.uk for details of all our events.

THE NETHERLANDS CHAPTER (Dutch Petrophysical Society, DPS)

Recent Events

06 December 2018 – The DPS had a technical seminar focused on cement evaluation and depth control. Marcelo Cenena (Schlumberger) gave a presentation on “Cement Evaluation with LWD Sonic: Methodology Description and Comparison to Conventional Cement Evaluation,” and Harald Bolt (ICT) presented on “Along-Hole Depth Measurement and Reducing Uncertainty.” The meeting was well attended, and the DPS would like to thank the speakers and all those joining the lectures.

Upcoming Events

11 March 2019 – Our next event will be a joint event with SPE in Den Haag.

As usual the news about our chapter is on our website: <http://www.dps-nl.org/event/march-11-2019-shared-event-with-spe/>



DPS December 2018 meeting. Marcelo Cenena (left) receiving a speaker’s gift from DPS President Iulian Hulea.



DPS December 2018 meeting. Harald Bolt receiving a speaker’s gift from DPS President Iulian Hulea.

SAUDI ARABIA CHAPTER

22 October 2018 – Muhammad Abrar Manzar (BHGE - Geosciences Advisor) gave a technical presentation entitled, “Production Array Imager—An Innovative Approach in Horizontal Production Logging.” Abrar’s talk covered production logging objectives, applications and importance in the entire life cycle of a producing well. He also summarized the main measurements needed to compute flow rates, i.e., hold-up sensors and velocity of each phase, flow regimes of multiphase flows in vertical and deviated/horizontal and technology evolution in horizontal production logging. The talk was based on a paper just published in the August 2018 issue of *Petrophysics*.



SPWLA SAC August 2018 meeting. A token of appreciation from SPWLA SAC officers was presented to the speaker Abrar (3rd from left).

29 October 2018 – After almost two decades of supporting Saudi Aramco’s formation evaluation and reservoir engineering operations, Dr. Murat Zeybek, (Schlumberger - Reservoir Engineering Advisor), gave his farewell talk entitled, “Two Decades of Formation Testing and Production Logging in Saudi Arabia.” He started his talk by highlighting the major challenges in reservoir description resulting from reservoir complexity. He also emphasized

that technology is an integral part of what we do routinely, through demonstrations with several key applications of advanced formation testing for enhanced reservoir understanding. He closed his talk with an example of data integration across several wells and multiple evaluation techniques (formation testing, reservoir saturation, production logging and crosswell electromagnetics) that helped diagnose crossflow due to pressure differential in a part of the field. A token of appreciation was presented to Murat by Khalid Zainalabedin, manager of Reservoir Description & Simulation Department, Saudi Aramco, and Faisal Enezi, President of SPWLA SAC, to recognize his long service to the local petrophysical community.



SPWLA SAC 29 October meeting. (Top) Murat Zeybek receiving a speaker’s gift and giving his farewell talk. (Bottom) A group photo with the speaker.

30 October 2018 – SPWLA SAC participated in 2018 Saudi Aramco Young Professional annual meeting held in Kempiniski, Al Khobar.

CHINA UNIVERSITY OF PETROLEUM BEIJING STUDENT CHAPTER

Recent Events

08 December 2018 –The 11th Youth Scholars Forum and the Third Student Papers Competition were held at China Petroleum University Beijing (CUPB). Four young researchers from the Geophysical Institute and the Unconventional Natural Gas Research Institute of the China University of Petroleum in Beijing gave academic presentations. In addition, four researchers also served as judges for the student paper competition. More than a dozen doctoral, master and undergraduate students from two institutes competed fiercely. Distinguished student speakers will be recommended to participate in the 2019 SPWLA Student Paper Competition.

Upcoming Events

January 2019 – The 2018 CUPB Well Logging Annual Conference will be held at in early January. The teachers and students of the Well Logging Department of CUPB, together with the well logging practitioners in Beijing, will gather to exchange the latest developments in the field of well logging. Distinguished speakers from the CUPB Third Student Paper will also give English-language presentations at the annual meeting.



SPWLA SAC participated in 2018 Saudi Aramco Young Professional annual meeting

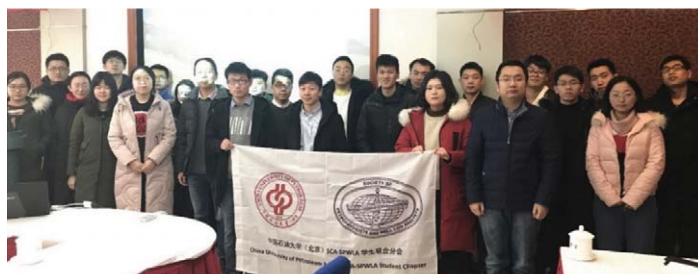
19 November 2018 –SPWLA SAC conducted a topical workshop titled: “Formation Testing and Sampling (FTS): Fundamentals and Latest Advancements.” This workshop was designed to review FTS fundamentals, discuss business challenges and best practices, showcase latest technology advancements and their applications and highlight emerging technologies. To enhance learning, some young professionals were selected to give talks and a poster session was arranged for informal discussions during coffee breaks. The workshop was considered a huge success with over 180 participants, ranging from students, young professionals, academia, researchers, to senior management.



06 December 2018 – To wrap up 2018 activities and plan for 2019, the-SPWLA SAC technical team held a year-end meeting. At the meeting, team members were recognized for their active contributions in the monthly events and three topical workshops. The team is committed to another successful year in 2019. Happy New year to All!



CUPB Student Paper Competition December 2018. A student speaker giving a presentation at the student paper competition.



CUPB Student Paper Competition December 2018. Group photo of all the participants.

**KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
(KFUPM) STUDENT CHAPTER**

About Us

- SPWLA-KFUPM was established in 2017.
- SPWLA-KFUPM started with only 10 members in 2017.
- Since then the number of members has increased three-fold.
- Different departments are included:
- Department of Petroleum Engineering
- Department of Geosciences
- Members comprise of both undergraduate and graduate students.

General News

The current executive committee comprises the following graduate students:

- President Amjed Hassan, PhD. in Petroleum Engineering
- Executive Officer Muhammad Said, MSc in Environmental Sciences
- Executive Officer Zeeshan Tariq, PhD in Petroleum Engineering
- Executive Officer Mohamed Elmuzafar, PhD in Petroleum Engineering
- Executive Officer Jaber Al-Jaberi, MSc in Petroleum Engineering

Recent Events

19 September 2018 – A good number of students attended and benefitted from the sessions held at the “Well Integrity Management: Challenges and Perspectives” event that was organized by the SPWLA Saudi Arabia Chapter (SAC) (see November issue of SPWLA Today for details).

20 November 2018 – Dr. Taha Okasha (Petroleum Engineering Consultant, Saudi Aramco) gave a presentation on “Challenges in Evaluating Interfacial Tension and Contact Angle in Oil Reservoirs.”



KFUPM Student Chapter November 2018 seminar. Dr. Taha Okasha (Petroleum Engineering Consultant, Saudi Aramco) taking questions from the audience in the Q&A session following his talk.

29 November 2018 – SPWLA KFUPM Student Chapter conducted a technical seminar titled “Reservoir Surveillance Petrophysics—Challenges and Technical Advancements in the Last Two Decades,” with SPWLA MEA Regional Director Dr. S. Mark Ma (Senior Petrophysics Consultant, Saudi Aramco). In his talk, Mark reviewed the latest reservoir surveillance technologies and their fit-for-purpose applications and gave a brief overview of emerging technologies for reservoir-scale surveillance technologies for students, faculty, and professionals from local petrophysics community.



KFUPM Student Chapter 29 November 2018. Dr. S. Mark Ma gave a talk on reservoir surveillance.

06 December 2018 - Dr. Guodong Jin (Petrophysics Advisor and Team Lead of Reservoir Characterization Team; Baker Hughes, GE) gave a seminar on “Recent Advances in Unconventional Core Characterization.”

Upcoming Events

January 2019 – The annual Student Paper Competition will be held to encourage students to dig deeper in the area of petrophysicist and well logging. Different researches will be presented at the competition by undergraduate and post-graduates. The winners will be qualified to compete in the international SPWLA student competition, which will be in conjunction with the SPWLA 60th Annual Logging Symposium that is being held in The Woodlands, Texas, USA 15–19 June, 2019. Monetary prizes will be awarded, and the chapter will sponsor the winners to present their research papers at the international competition. Judges for the competition are:

Dr. Mark Ma (SPWLA director for MENA and a VP of SPWLA Saudi Chapter)
 Dr. Faisal Enezi (President for the SPWLA Saudi Arabia Chapter)
 Dr. Mohamed Mahmoud (VP of SPWLA Saudi Chapter and Faculty Advisor at KFUPM)
 Mr. Nacer Guergueb (VP Students Affairs of SPWLA Saudi Chapter).

THE UNIVERSITY OF TEXAS AT AUSTIN STUDENT CHAPTER

Recent Events

- 12 September 2018 – The chapter partnered with the Petroleum Graduate Student Association to host Shahid Haq (Schlumberger) for a technical seminar entitled “Reservoir Engineering While Drilling.” The talk was very well attended and we would like to sincerely thank Shahid for his continued support of our chapter.
- 27 September 2018 – The chapter represented SPWLA at the Student Organization Fair of the Hildebrand Department of Petroleum and Geosystems Engineering.
- 17 October 2018 – The chapter hosted a special event in which the student paper contest winners Javid Shiryev and Runqi (Patrick) Han presented their award-winning work.
- 02 November 2018 – The chapter hosted a technical seminar by SPWLA 2018–2019 Distinguished Speaker Aidan Blount (Shell E&P Company) on “Maintaining and Reconstructing In-Situ Saturations: A Comparison Between Whole Core, Sidewall Core, and Pressurized Sidewall Core in the Permian Basin.” The talk was very well attended and we had a great Q&A session.



UTA Student Chapter November 2018 meeting. Chapter officers with speaker Aidan Blount (Shell E&P Company). (Left to right) Wen Pan (Webmaster), Sebastian Ramiro (Treasurer), Andres Gonzalez (Webmaster), Tianqi Deng (Secretary), Aidan Blount (Speaker), Artur Posenato (President), Mohamed Bennis (Vice-President).

- 30 November 2018 – The chapter hosted a technical seminar by SPWLA 2018–2019 Distinguished Speaker Dzevat Omeragic (Schlumberger-Doll Research) whose presentation was entitled, “Towards 3D Reservoir Mapping Using Deep Directional Resistivity.” The talk was very well attended and we would like to thank Schlumberger for supporting the event.



UTA Student Chapter November 2018 meeting. Chapter officers with speaker Dzevat Omeragic (Schlumberger-Doll Research). (Left to right) Wen Pan (Webmaster), Andres Gonzalez (Webmaster), Mohamed Bennis (Vice-President), Dzevat Omeragic (Speaker), Tianqi Deng (Secretary), Artur Posenato (President).

Upcoming Events

- 07 February 2019 – The chapter will host a technical seminar by Hani Elshahawi (Shell International Exploration and Production Inc.) entitled “Novel Smart Cement for Improved Well Integrity Evaluation.”
- 23 February 2019 – The chapter will partner with the Petroleum Graduate Student Association to participate in “Introduce a Girl to Engineering Day” at The University of Texas at Austin. Over 8,000 elementary and middle school students are expected to participate in the event, which offers students an opportunity to explore careers in science, technology, engineering, and mathematics (STEM) through hands-on activities and engaging demonstrations.
- 02 March 2019 – The chapter will again partner with the Petroleum Graduate Student Association to participate in “Explore UT” at The University of Texas at Austin. The campus-wide event is described as the “Biggest Open House in Texas,” which features engaging activities and inspiring demonstrations designed for visitors of all ages.
- 08 March 2019 – the chapter will host a technical seminar by SPWLA 2018–2019 Distinguished Speaker Paul Craddock (Schlumberger-Doll Research) entitled “Integrating Measured Kerogen Properties with Log Analysis for

Petrophysics and Geomechanics in Unconventional Resources.”

March 2019 – The chapter will host a local student paper contest to nominate members to participate in the 2019 SPWLA International Student Paper Contest which will be held at the SPWLA 60th Annual Logging Symposium at The Woodlands, Texas, USA 15–19 June, 2019. We are very excited about the event and hope that this year’s local winners can continue the outstanding success achieved at the last couple of years’ annual symposium in Oklahoma City and London, where our members won 1st place in the Bachelor’s, and PhD divisions.

12 April 2018 – The chapter will host a technical seminar by Stefan Hertel (Shell International Exploration and Production Inc.) entitled “Upscaling of Digital Porosities by Correlation with Core CT Scan Histograms.”

SPWLA Networking Happy Hour – December 2018

SPWLA members recently gathered to close a great year on a high note and celebrate the holidays. We collaborated with the SPWLA Houston Chapter to organize our last social event in 2018. The last SPWLA Networking Happy Hour was held right after the Houston Chapter Software Show at a venue nearby. Attendees learned about recent innovations and technology



Part of the attendees at the December 2018 SPWLA Happy Hour at Houston's Uptown McCormick & Schmick's.



Philippe Theys (second from left) and SPWLA members enjoyed a great evening close to the holidays in a relaxed atmosphere.

advancement in software for formation evaluation and data interpretation during the day and joined us for networking right after. This well-attended event included current and former SPWLA international and regional leadership, as it has been throughout the year. The new SPWLA board has been very enthusiastic and supportive with these activities and members have shown their appreciation through increased attendance compared to previous years. Student members from the University of Houston have also maintained their participation. More than 25 SPWLA members from the Houston area, and also those visiting or attending the software show, gathered in a convenient place to network and have a great time in a relaxed atmosphere. New and familiar faces in attendance included Jesus Salazar, SPWLA President-Elect (2018–2019); Philippe Theys, SPWLA past president; Jeff Crawford, SPWLA Houston Chapter President; and Javier Miranda, SPWLA YP Chairman. We were surprised and honored on this occasion by the attendance of Philippe Theys. Philippe is a SPWLA past president (2000–2001), recipient of SPWLA Medal of Honor for Career Service (2011) and Distinguished Technical Achievement (2005), among other SPWLA and industry accolades. Philippe delighted

us with his anecdotes about his work and assignments during his career with Schlumberger and his trips across the globe while in different postings and after retirement. While on his last assignment in Sugar Land, Texas, he had HR coming to his office with potential recruits so that they could see his travel map. Since then, he has made a lot of progress, and now stand at more than 150 countries visited according to the Traveler's Century Club list. Philippe remains very active after retirement, if we can say he is "retired", as he keeps consulting for the world's largest oil companies, stays involved with professional societies, and in the publication in Chinese of his book "Quest for Quality Data," and serving as a guest speaker for conferences and traveling.

Professionals from operating (major and independent), service, and consulting companies in addition to academia were delighted with drinks and food onboard in a beautiful evening with nice weather. Most of our members who attended previous e events continue to attend these social events with increased frequency. **Opportunities to sponsor these events are available. Please let us know if you are interested at SPWLAYP@spwla.org**



SPWLA's recent social events have been well attended and have included current and former SPWLA international and regional leadership, student members and well-recognized names in petrophysics.

January 2019

2019 Steering
Committee

Editors

Elton Ferreira

Javier Miranda

Abbie Morgan

Mehrnoosh Saneifar

Senior Editor

Siddharth Misra

SPWLAYP@SPWLA.ORG

In this edition:

SPWLA Networking
Happy Hour



SPWLA members networking during the event.



Proud SPWLA members and petrophysics enthusiasts having a great time in a relaxed atmosphere.

Don't miss our next event!

Join us for our next event to kick off our networking activities in 2019. Our first SPWLA Networking Happy Hour in the New Year will be held in a venue close to the Houston Energy corridor. Several attendees at previous events have requested this location. The social event held at this location had the highest attendance in 2018 so we hope to keep this trend in the upcoming happy hour. The entire SPWLA community is invited, no need to RSVP, come at your own leisure, no payment required. Come and mingle with fellow petrophysics enthusiasts. Recent social events have been well attended by Petrophysicists, Geologists, Geophysicists, Engineers and Managers. We have had also current and past SPWLA international board members and well recognized names in the oil industry!



SPWLA members socializing during the most recent happy hour.

Everybody is welcome!

When: *Thursday March 21, 2019,
5-8 PM*

Where: *Yard House at Citycentre,
800 Sorella Ct Space 116,
Houston, TX 77024*



What is your favorite science or math joke?

Please, send us some nice jokes, memes or comic strips at spwlaysp@spwla.org or through SPWLA social media, and we'll choose some responses to publish in the next issue!

Thanks for your participation.

Contact us: SPWLAYP@SPWLA.ORG

We encourage you to contact us with any suggestions for improving our group and/or if interested in participating in our activities.

**GO AHEAD,
SEND US
A MESSAGE!**



Send us your articles, stories, fun moments, photos, etc. to be published in The Bridge.



Welcome New Members — November 24, 2018 – December 12, 2018

Aldajani, Omar, Massachusetts Institute of Technology, Cambridge, MA, United States

Alhamad, Abdullah, IFP School, France

Angulo Yznaga, Reinaldo Jose, Halliburton, Abu Dhabi, UAE

Barrere, Gregory, IFP School, Rueil-Malmaison, France

Beick-Baffour, Michael, Texas A & M University, Kingsville, TX, United States

Bily, Christopher, Baker Hughes, Houston, TX, United States

Bourgeois, Charles, Baker Hughes, Humble, TX, United States

Brackeen, Steve, Primexx Energy Partners, Frisco, TX, United States

Chen, Yuntian, Peking University, Beijing, China

Connolly, Paul, University of Western Australia, Fremantle, WA, Australia

Firth, William, Colorado School of Mines, Thornton, CO, United States

Gassy, Oliver, Imperial College London, Tamworth, Staffordshire, United Kingdom

Ghadban, Marie Al, Richardson, TX, United States

Gomez, Juan, Noble Energy, Houston, TX, United States

Oziel, Gonzalez-Verdejo, Imperial College London, London, United Kingdom

Harris, Paul William, Reservoir Group, Edinburg, TX, United States

Iqbal, Muhammad Atif, Curtin University, Perth, WA, Australia

Kurmaniak, Marcin, University of Leeds, Wakefield, West Yorkshire, United Kingdom

Lemus, Jesus G., Texas A&M University – Kingsville, Kingsville, TX, United States

Li, Wei, MIT, Watertown, MA, United States

Liu, Wei, China University of Petroleum-Beijing, Beijing, China

Mason, James, Imperial College London, London, United Kingdom

Mohamed, Mohamed Awad, University of North Dakota & Rice University, Houston, TX, United States

Murad, Ehsan, Cornell University, Katy, TX, United States

Onwumelu, Chioma, University of North Dakota, Grand Forks, ND, United States

Osman, Walid Mohamed Abouelnour, Occidental Petroleum of Qatar, Doha, Qatar

Otobo, Solomon, Abody, IFP School, Rueil Malmaison, Ile-de-France, France

Pant, Animesh, Indian Institute of Technology, Kanpur, Kanpur, Uttar Pradesh, India

Piri, Mohammad, University of Wyoming, Laramie, WY, United States

Saini, Gurtej Singh, University of Texas at Austin, Austin, TX, United States

Sharma, Shivam, Schlumberger, Mumbai, India

Silva, Pablo Lacerda, University of British Columbia, Richmond, BC, Canada

Urrego, Juan Pablo, Shell, Houston, TX, United States

Wang, Heng, University of Wyoming, Laramie, WY, United States

Xia, Muming, China University of Petroleum Beijing, Beijing, China

Yang, Zhuo, Harvard University Cambridge, MA, United States

Zhao, Xi, Xian City, BeiLin District, China

Zwali, Ali, Halliburton, Houston, TX, United States

Mark Skalinski 1944–2018



It is with a heavy heart that we acknowledge the passing of our friend and colleague Mark Skalinski. We mourn our loss, but also celebrate the guidance, and impact that Mark had on so many people. Mark had an incredible zest for life, and he has served as an inspiration to all that have met him. His scientific and artistic contributions have literally been felt across the world. Mark has enriched us all through his generosity, scientific and technical contributions, his photographic artistry, and his inspiration of dance.

Mark was born in Poland. In high school Mark was an athlete and was a pole vaulter. He was also an elegant and talented skier. He spent a week each year for the past decade on the slopes of the Italian Dolomites and skiing his home in Canada.

Mark received his MSc and PhD in Geophysics from the University of Mining and Metallurgy in Krakow, Poland. He met his wife Margaret during his University days. Mark has had a lifetime interest in politics; he was a member of Solidarity resistance to Soviet domination of Poland. He left Poland for Morocco one month before the declaration of Martial Law. If he had stayed on more month, he would likely have been arrested.

Mark left Poland for an assignment in Morocco working as a petrophysicist for ONAREP in Rabat Morocco (1981–1985). Later he emigrated to Canada with his family and worked with Husky Oil Canada (1985–1991) in Calgary. In 1991 he joined Chevron, where he spent the rest of his career. Along the way, he made many friends and made huge contributions to recover hydrocarbons in projects across the world. Mark held several positions in Chevron, including Research and Development (2009–2018) in Houston Texas, Kazakhstan (2002–2008),

Canada Calgary (2000–2002), Angola (1996–2000), Kuwait (1995), and Canada Calgary (1991–1995)

Mark made outstanding professional contributions to the petroleum industry. Not only was Mark regarded as a top petrophysicist in Chevron, he was considered an industry-leading expert in his field of permeability characterization of difficult geology. He made many contributions to furthering this science. He authored at least 11 technical papers and coauthored an additional 18+. He gave a large number of technical presentations throughout his career and loved to help others and share his knowledge. In 2012, Mark was an invited contributor to the prestigious Hedberg conference in France. In 2017–2018, Mark was given the honor of being a Distinguished Lecturer for the Society of Petroleum Engineers (SPE) and gave approximately 20 lectures all over the world on his lecture tour. Following that, he was appointed Distinguished Speaker for the SPWLA for the 2018–2019 season.

During University, Mark participated in Polish traditional dance, in addition to his studies in geophysics. After his first degree, Mark spent two years in France (starting in 1968), originally to pick grapes. The Polish government at the time allowed students to spend two months working in the fields to get some much-needed cash. Mark managed to connect with a Russian Dance Ensemble in Paris and was able to extend his stay from two months to two years by participating in the Russian Dance team. After two years in France, he resumed his academic studies leading to his PhD.

Following his emigration to Canada, Mark was a director of a Polish dance ensemble “Polanie.” Mark was an outstanding choreographer and increased the standards of the ensemble, leading to a performance at opening ceremony of the 1988 Winter Olympics in Calgary. Mark’s choreography was brilliant, and Polanie won numerous awards for its artistic achievements. Mark invested thousands of volunteer hours with Polanie to work on the choreography of dance. Mark was recognized for his contribution to Polish culture with an award from the Polish ambassador to Canada.

It was in Mark’s nature to live life to the fullest, and there are dozens of stories of him demonstrating his lack of fear at taking on new challenges.

Photography was one of Mark’s passions. Mark was always behind the camera. His photos were published in books about Kazakhstan (Atyrau) and Bhutan, and his photos were published in calendars. He has an extensive collection of his photographs on Photo.net (please search on Skalinski to sample this artwork). He traveled the world from Bhutan, Cambodia, Galapagos, to Norway with his camera and insights as an artist.

Mark has touched the hearts of many. He graced many of us with his presence and talents, and his “footprints” are truly global. He is sorely missed.

Mark is survived by his wife Margaret, his daughter Maya and his sister Marta Michowska. He is preceded in death by his son Michael.

Dan McCay Arnold 1938–2018



Dr. Dan McCay Arnold of Katy, Texas, died on January 30, 2018. “Mac,” as he was affectionately known by so many, was born in Athens, Georgia, to the late Dan and Ruth Arnold.

He received his BS, MS and PhD, in nuclear physics, all from the University of Georgia. In 1961, Dan married Mary Bo Strozier, Oxford, Georgia, and together they moved to Texas, so he could apply his nuclear physics background in the oil industry.

He joined Welex (Halliburton Logging Services) in 1978 as Director of Research after 14 years of research in nuclear logging and nuclear process controls at the Texaco Bellaire Research Laboratory. A leading pioneer in his industry, Dan authored numerous papers published in SPE, SPWLA, and other technical society journals, and was issued over 60 US patents, and received several Meritorious Engineering Awards from several expert organizations.

Dan was a first-rate scientist, a thoughtful and considerate man, and was a friend to everyone with whom he came in contact. He also had a keen sense of humor: He recruited me to join him at Texaco Research in the Houston area, in part by driving me down Memorial Drive and through Memorial Park, and convincing me that all of Houston was like that (we both grew up in the wooded hills of east Georgia). While at Texaco Research, our team conceived, developed, and patented the first successful carbon/oxygen logging tool technology. Dan also made significant improvements in pulsed-neutron-capture (PNC), compensated-neutron, natural gamma-ray spectroscopy, and oxygen-activation logging as well.

At Welex/Halliburton, he recruited and directed the team (including Ward Schultz, Harold Peelman, and myself, among others) that developed Welex’s first PNC logging tool/system. That tool, the TMD, revolutionized the course of PNC logging by identifying and resolving the formation and borehole thermal-neutron-decay components for the first time (which is common practice today). After retiring from Halliburton Logging Services as Vice President of Technology Dan worked/consulted in the field of patent law as a patent agent, using his considerable experience gained at Texaco and Halliburton in the process of obtaining his impressive number of issued US Patents. Additionally, he held professional memberships in SPWLA (a member since 1971), the American Physical Society, and the Society of Petroleum Engineers.

Those of us who knew and/or worked with Dan will sorely miss his encouraging words, his kind heart, his mentoring, and his overall brilliance in the field of nuclear well logging. He is survived by his beloved wife, Mary (Strozier) Arnold of Houston, Texas; and daughter and son-in-law, Kimberly and Scott Parker, of Lubbock, Texas.

Donations in his memory may be made to the E. Walton Strozier Scholarship, c/o Oxford College of Emory University – Financial Aid Office, 801 Emory Street, Oxford, Georgia, USA, 30054.

Harry Smith

Petrophysical Data-Driven Analytics (PDDA) SIG Announcement



Chicheng Xu
Chairman, PDDA SIG
Petrophysics Associate Editor for
Data-Driven Analytics

Dear SPWLA members,

Happy New Year! The past year of 2018 marked the epoch of petrophysical data-driven analytics (PDDA) with a series successful themed events: The Spring Topical Conference in April, formation of the PDDA SIG in June, and the special issue of *Petrophysics* in December. I hope you all enjoyed and benefited from those events and feel motivated to participate more SPWLA events.

Recent publications indicate that PDDA has been emerging as an active subdiscipline of petrophysics. Numerous field examples from the petrophysics literature showcased the potential applications of machine learning in the following technical areas:

- Geological facies classification or petrophysical rock typing
- Seismic rock properties or rock physics modeling
- Petrophysical/geochemical/geomechanical properties prediction
- Fast physical modeling of logging tools
- Well and reservoir surveillance
- Automated data quality control
- Pseudodata generation
- Logging, fluid sampling, or coring operation guidance.

The December 2018 issue of *Petrophysics* highlighted PDDA and featured 11 papers covering theories and applications of emerging data analytics and machine-learning methods as applicable to petrophysical data analysis. Table 1 lists recent PDDA applications by summarizing the input data, algorithms, and tasks of each reference in all different technical areas.

Table 1—Summary of Input Data, Algorithms, and Tasks for Each Reference in *Petrophysics* PDDA Issue

Reference	Data Input	Algorithms	Achieved Tasks
Jobe et al., 2018	Thin-section images	CNN – deep learning	Dunham texture classification
Zhu et al., 2018	Well logs	Wavelet decomposition and CNN – deep learning	Lithology classification
Gupta et al., 2018	Well logs	K-means, hierarchical clustering, and SVM	Hydraulic fracturing location
He et al., 2018	Well logs	OLS, PLS, LASSO, MARS, ANN	Pseudolog generation
Tariq et al., 2018	Well logs	Functional Network	Static Poisson’s ratio prediction
Xu et al., 2018	LWD logs	Neural network, Gradient-Boost Regression Tree, Gaussian Process Regression	LWD resistivity modeling
Shen et al., 2018	LWD logs	Transdimensional Bayesian method	Ultradeep azimuthal resistivity interpretation and uncertainty quantification
Venna et al., 2018	Acoustic signal	PCA & SVM	Flowing phase classification
Chen et al., 2018	Fluid optical data	Forward and inverse neural network	Missing fluid-data reconstruction
Frost and Quinn, 2018	Logs in general	Automation workflows	Data quality control
Zimmermann et al., 2018	Logs in general	Fully connected neural network	Automatic depth matching

So far, the PDDA special issue has received wide attention across the petroleum industry. To continue this momentum, we need more paper submissions to *Petrophysics* on this emerging topic and we are planning to launch another special issue in 2019. Meanwhile, we will start a PDDA column in the SPWLA Newsletter. If you would like to contribute as an editor, an author, or a writer, please indicate your interest to Dr. Bin Dai, PDDA SIG Secretary of Publications, at Bin.Dai2@halliburton.com.

Wishing everyone a prosperous year in 2019!

Chicheng Xu
On Behalf of the PDDA SIG Board