

## MIDDLE EAST REGION PRESIDENT'S COLUMN

Robert Kuchinski



*The coming of spring in the Middle East always gives us much to look forward to: the warming temperatures, the longer days and of course GEO2016!*

*Although the New Year arrived on a rather somber note as oil prices took another step downward, the oil industry and AAPG members remain resilient and determined to press forward during this difficult time. GEO2016, the largest geoscience conference in the Middle East, will serve as a chance for geoscientists in the Middle East to take a collective deep breath and gather to discuss what is next for our profession.*

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In concert with our sister societies, the Society of Exploration Geophysicists and the European Association of Geoscientists and Engineers, we have assembled a rich technical program which will foster discussion on many important current technical topics in our industry today. There will also be a strong program for students and young professionals. In addition to networking events, technical courses, poster sessions, a soft skills short course, and core workshops, there will also be a panel session discussing factors for success in the industry.

The AAPG's Imperial Barrel Award Competition, scheduled for March 6, will include a record eight teams. This will be the most competitive IBA we have ever had in the Middle East Region.

The theme of this year's conference "Today's Geosciences, Tomorrow's Energy" is very representative of our where we are today. Thanks to the recent and ongoing revolutions in technology, it is becoming quite apparent that the energy we consume in the future will be discovered and produced using ideas and technologies that are new and/or haven't been thought of or invented yet. This is truly exciting. It is also a reminder of how much change happens in our profession, and the need for all of us to stay current with emerging trends.

All in all GEO2016, will be a wonderful opportunity to get a glimpse of the direction geoscience is taking in the region in the coming years. It will also be a great place to meet old friends and make new friends. I hope you all can attend this conference and I look forward to seeing everyone there.

In addition to GEO2016, the AAPG endeavors to bring high quality learning and networking experiences to our members. Despite the difficult current economic climate, the AAPG regional council remains busy reaching out to our members through a variety of channels such as geoscience technical workshops (GTW's), Visiting Geoscientists and conferences. In 2016, we will host or co-host with our sister societies a number of events that are topical and relevant to geoscientists in the Middle East. Topics will include Hydrocarbon Seals of the Middle East,

Source Rocks of the Middle East, The Knowledge Management Challenge, Exploring Mature Basins, Stratigraphic Traps of the Middle East and Shale Gas. If there is a topic that you would like us to explore, please send me an email to (Robert.kuchinski@me.weatherford.com) with your idea. Your ideas on what you think is important to our profession in this region is of great interest to all of us on the council.

In closing, I would thank all AAPG members, our council, our staff in the Dubai office, and our corporate sponsors for their support over the past year. During this time, the AAPG, like many organizations in the oil industry, has made a few changes to adapt to the current economic climate. As we move through 2016, these changes will ensure we can continue to serve our members.

Regardless of how long our industry will suffer, or how long it takes for the oil market to rebalance, geoscience will remain at the core of our industry. This fact will continue to drive the AAPG in ensuring our members have access to the most topical and relevant geoscience knowledge.

I am sure the remainder of 2016 will be eventful for our profession. Our individual success or lack of success may be affected by factors outside of our control. There are, however, many factors within our control and those are the factors, which will see us all through this difficult time.

I wish everyone all the best in the coming months.

### MIDDLE EAST REGION COUNCIL MEMBERS



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## HISTORICAL OIL PRICES: WHAT CAN WE LEARN FROM THEM?

Salim Al-Mahrouqi

AAPG ME Council – President-Elect

In the last 35 years the global crude oil market has seen four dramatic periods of fluctuating oil prices.

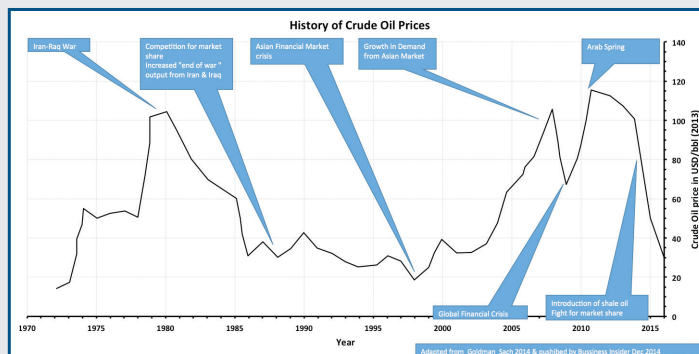
- The period between 1980-86 is characterized by a free fall in the crude price from US \$100 (at today's prices) to just around US \$35. This drop was instigated by competition among key oil producers to increase their production to regain market shares and increased output associated with the end of the Iran-Iraq war.
- During the period between 1986-2002 the oil price oscillated between US \$40 and just below US \$20. This time the drop is believed to have been caused by the Asian financial crisis in 1997.
- The period between 2002-05 saw sharp increase in oil prices to over US \$100 largely driven by strong demand for oil to fuel the growth of the Asian economy. This rather brief increase was disrupted in 2007-08 by the global financial crisis, which sent oil price down to below US \$70.
- The period between 2008 to the end of 2014 was characterized by recovery in global economy with strong demand from China and India. Again the geopolitical situation in the Middle East and North Africa (Arab spring) and the associated disruption in oil supply drove the oil prices to over US \$120 in 2011 before it started to fall at the end of 2014 and continued till today.

The current plunge in oil prices is widely believed to have been largely initiated by the boom in production from shale oil in the United States. Horizontal drilling and fracturing techniques made shale oil accessible at affordable prices. As a result U.S. output increased from 5 mln bpd in 2005 to above 9.5 mln bpd in 2015. This fall in oil prices (Brent crude is 29 USD at the time this article is written) is exacerbated by:

1. The competition among OPEC and non-OPEC producers to maintain market share
2. Weaker demand from key consumers such as China who suffered lower than expected growth in 2015.
3. The increasing trend toward a low-carbon-economy. Consequently it is estimated that current supply exceeds demand by 2.2 mln bbl per day which is incidentally equal to OPEC surplus output.

Some key observations can be drawn from the historical fluctuation in oil prices:

- Supply disruption due to wars and civil unrest in the source areas/countries tend to drive oil prices up very rapidly. However, this increase is only temporary as other producers tend to immediately compensate for this short fall in supply.
- After a sharp fall, the oil prices at some stage will always rebound. This is because capital investment in the development of new oil fields shrinks, production goes down and due to the business cycle it takes time to bring new oil on stream and to go back to the same levels of production.



- There seems to have been a shift in OPEC strategy from fight for prices to fight for market share. It is not clear if this is driven by politics or the fear that continuous increase in oil prices will drive the consumer to explore alternative, perhaps cleaner, source of energy. Recent advances in electric vehicles, bio fuel and concerns over climate change are all pushing towards a decarbonized economy.
- Growth in Asian market, especially China, becoming a dominant force for growth in oil demands and hence for determining oil prices. Diversifying the customers and seeking alternative or additional markets is crucial for oil price stability.
- To reduce the breakeven price, most oil companies' responses to low oil prices have been cutting cost and improving efficiency, while trying hard to sustain production. One very common element of this cost cutting is curbing employment and laying off technical staff, which may include specialists in niche areas of geosciences and petroleum engineering. This may not be the smartest strategy to control cost because such highly skilled specialists can be leveraged in conducting high-end subsurface studies and field development plans, which then give the company competitive advantages when the oil price rebounds.

Low oil prices certainly impose serious economic challenge to all oil dependent countries with varying degrees of severities such as Oman, Bahrain and Iran. It forces countries to draw from their national reserve funds (if they have them), borrow money to make up for the deficit in their budgets and scrap social and development programs. However, low oil prices also offer an opportunity for economic reforms, driving efficiencies, and diversifying economy. The Gulf Cooperation Council (GCC) countries have been attempting to diversify their economies over the last 40 years but with limited success. However, with the current oil crisis, the GCC countries have started to take more serious measures such cutting subsidies on petrol, water and electricity, introducing taxes and privatizing some of their key assets to reform their economies and ease the economic hardship on their national budgets.

*(The views expressed in this write up is that of the author and is not that of the organization in which he works or that of AAPG)*



## MIDDLE EAST ACTIVITY REPORT

*Abeer Al Zubaidi, AAPG Middle East Director*

**2015** was an exciting year for AAPG Middle East during which we continued to offer the geoscience community various GTW's and programs. The Council was very keen on ensuring a number of visits were made to various universities as part of our regional outreach program to students and upcoming young professionals. The Visiting Geoscientist Program was especially active and covered countries such as Jordan, Beirut and Saudi Arabia. In 2015 the AAPG Middle East also offered its very first Young Professionals and Students Summit, which also hosted the 2015 IBA Regional Competition. This region yet again saw one of its very own teams, King Fahd University of Petroleum and Minerals, take third place at the Global IBA Competition during AAPG's Annual Convention and Exhibition (ACE) which took place in Denver. The summit welcomed students from all over the region and the program was inclusive of a Meet n' Greet, short courses, a field trip and a social outing.

Throughout the year, a number of GTW's focusing on hot topics were successfully delivered in Kuwait, Abu Dhabi, Muscat and Dubai providing attendees with more knowledge, networking opportunities, and new ways of thinking and approaching their daily tasks. However, one of the year's most important achievements was the increased collaboration between AAPG, EAGE, SEG and SPE, which has proven to be extremely timely during the current market conditions.

Looking ahead at 2016, we are confident that the AAPG Middle East will continue to thrive and deliver an exciting and rewarding line up of GTW's, conferences and programs aligned with its mission statement.



*Courtesy of Loic Bazalgette*

*"Beehive tombs" (third millennium BC) sitting on a series of Hawasina rocks in front of Jebel Misht (Al Ain village, Wilayat of Ibri). Hawasina Series are deepwater marine sedimentary rocks of Permo-Triassic age, transported, deformed and over-thrusted by the Samail ophiolite over the north of Oman during the Late Cretaceous oceanic obduction phase. The Hawasina units locally include masses of transported and recrystallized Triassic carbonate mounds known as "Exotics." Jebel Misht is one of the most spectacular examples of such Exotics, which exposes a 1,000m vertical cliff on its western face.*

## 2015 AAPG – MER STUDENTS AND YOUNG PROFESSIONALS' ACTIVITIES

Aisha Al Bulushi, YPSS Chair

The 2015 started with a huge economical challenge for all associated with the oil and gas industry. However, it couldn't affect our enthusiasm to serve the geosciences committee of the AAPG Middle East Region, and more specifically representing the students and the young professionals. AAPG Middle East Young Professionals and Students Support Team (YPSS) is chaired by Miss Aisha Al-Bulushi. It organized the sixth Middle East Region Imperial Barrel Award (IBA) competition and the first Young Professionals and Students' Summit from 16-18 March 2015 in Muscat, Oman. Thanks to the sponsors: Saudi Aramco, Saudi Geophysical, Petroleum Development Oman and Stoner Engineering for their continuous support to the Students and YP's in the region.

Three universities from the region have participated in the sixth MER IBA competition: King Fahad University of Petroleum and Minerals from Saudi Arabia (KFUPM), Sultan Qaboos University (SQU) from Oman and United Arab Emirates University (UAUE) from UAE. The competition took place in the morning of 16 March, and in the evening prominent industry leaders from the region were invited to the awards ceremony to recognize the winner of the competition, as well as to recognize our sponsors and the judges. The winner of the sixth MER IBA competition was the KFUPM team. SQU and UAUE teams received the second place awards. The ceremony was closed by remarks on success factors defined by Mahmood Abdulbaqi, who has been a great support for the young professionals' movement in the region.

On March 17-18 the IBA participating universities, in addition to six more universities and eight YPs, participated in the first AAPG-MER YP's and Students Summit in Muscat, Oman. The additional six universities were: American University of Beirut, Jordan University, Hashemite University, King Saud University, Kuwait University, Petroleum Institute and German University of Technology.

The YP's were sponsored by their companies: Saudi Aramco, Kuwait Oil Company, Petroleum Development Oman and Schlumberger Oman. The program included a fantastic geological field trip in Muscat, organized by the Geological Society of Oman, followed by a visit to the traditional Souq in Mutrah. A Meet and Greet session, in the evening of 17 March, started with a talk on "The 10 Factors for a happy and successful Career" given by AAPG-MER president Said al-Hajri. In addition to that, industry leaders from the region shared their learning and success definitions with the participants and had a face-to-face chat with all the students and YP's. On 18 March we organized a tour in the Oil & Gas Museum and a tour in Muscat for all the participants. The program was closed by thanking the participants and faculty advisers, and we heard great feedbacks from them. Below are some feedbacks from the participants of IBA and the Young Professional and Student Summit:

Sadieh Mirza Khosravi, an IBA participant from UAUE, said about her experience during both events: "IBA competition and YPs Summit program made an incredible memory for me,



AAPG 2015, last year's field trip in Muscat, Oman.

which will greatly benefit both my academic and professional career in the future," Khosravi said. "The most irreplaceable and unforgettable part of this event was being able to make new friends from different groups and gain new experience through their stories."

Mohammed Al Awadhi from Kuwait University said, "It was a really nice experience to share with other students and young professionals. I have created many friendships with students, which is pretty good to keep in touch. He added, "First, about the field trip, it was great to know about the geology of Oman and specially the ophiolite. I was impressed to see the whole oceanic crust and the part of the mantle by my eyes and walked over it! Second, about the meet and greet, it's nice to discuss and talk with professionals about their careers and how to improve myself to reach my goals. I love you AAPG."



## HYDROCARBON SEALS OF THE MIDDLE EAST

*Rachel Jamieson, Heriot-Watt University*

The 2016 AAPG and EAGE Hydrocarbon Seals of the Middle East workshop was held 18-20 January. The first of its kind, it was developed in response to increasing recognition of the importance of hydrocarbon seals in the Middle East and how rarely they are given prominence. The purpose of the workshop was two-fold:

1. To highlight our current understanding of the composition, properties and behavior of hydrocarbon seals, both regional and local.
2. To identify any knowledge gaps and consider how we might go about improving and de-risking future exploration in the region.

The format of the workshop was a mixture of presentations, posters, breakout sessions and field excursions designed to maximize knowledge sharing and increase our understanding of seals.

Over 55 participants representing 26 companies and institutions from 11 different countries attended and heard a series of talks given by leading geoscientists in the industry and distinguished academics working in the Middle East.

Initial presentations provided an introduction to the seal types found in the region and their characteristics, and it became clear that the Middle East is unique in containing multiple hydrocarbon systems separated by a variety of regional and local seals. Another takeaway from this session was the variability of these seals in terms of age, depositional environment, lithology, rheology, continuity and pressure. This complexity perhaps provides one reason for the conclusions of the following breakout session in which the delegates were split into four groups and given a discussion topic relating to our current understanding of seals and how we, as an industry, go about dealing with them. Reporting back to the wider group, it was agreed that there is a general lack of focus on seals in the Middle East, resulting in and from a lack of data collection and high-resolution analysis. Lack of consistency, both between and within companies, when assessing seals and integrating them into workflows was also highlighted.

A mid-conference fieldtrip provided the delegates with the opportunity to see some of the seals discussed. This was enthusiastically taken up by almost all of the participants and a thoroughly enjoyable afternoon was spent visiting outcrops around Muscat, Oman. Interaction and discussion between delegates and with the trip leaders was encouraged, leading to knowledge sharing and development of ideas and concepts.

After regrouping, armed with a better understanding of the seal types in question, the next technical sessions focused on different methodologies for seal prediction, classification and analysis and how we assess seal integrity. Among those discussed were, geochemical tracing of hydrocarbons, integrated 3-D basin modeling and different workflows for fault seal prediction. Key to these sessions were the numerous examples of these techniques and workflows being used to aid interpretation and understanding of fields in the Middle East.

Following on from this, were several presentations on underexplored and unconventional seal concepts such as



*Group photo taken during the geological field trip at Muscat.*

hydrodynamic trapping, which led seamlessly into a breakout session in which participants were encouraged to brainstorm conceptual trap types. This proved very popular and led to some truly interesting and innovative ideas. The workshop wrapped up with a session on risking and a panel discussion in which some interesting differences between companies came to light in terms of their techniques and classification of risk vs. uncertainty.

The attendees left the workshop with a significantly improved understanding of hydrocarbon seals. Over the course of the three days, it was demonstrated that we have the geological expertise, techniques and methodologies in place to better understand seals but that more research, facilitated by data collection and a focus on multi-disciplinary teamwork, is needed in order to improve and streamline our approach to seal prediction, analysis and risking. Those who attended the workshop can now seek to adjust their approach within their individual companies to the benefit of the future of hydrocarbon exploration in the Middle East.

### Acknowledgements

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## A JOURNEY WITH AAPG – FROM A STUDENT TO A PROFESSIONAL GEOLOGIST

Joyanta Dutta, Development Geologist, Chevron Bangladesh

I took admission in the Department of Geological Sciences of Jahangirnagar University, Bangladesh back in 2005, without knowing much about Geology and its applications. In a developing country like Bangladesh, where much of the affiliated sciences are not that recognized and popular among student, I also did not have any clue on the Petroleum industry and its link with Geology.

In 2006 one of my Professors introduced us with the AAPG association and then I became a member of AAPG Student Chapter. Under the umbrella of AAPG, I started attending different seminars and conferences held in the country where I came to know about Petroleum Industry in detail. I was always fascinated to participate and interact with some of the heavily experienced persons in this Oil and Gas industry through these meetings. The free coupon bulletins and magazines I got from AAPG as a student member were also helping me to keep myself updated on the global Petroleum industries and the latest technologies. I started dreaming about to become an oil and gas professional in my future career.

Meanwhile I became the president of AAPG student chapter of my university in 2009. I had a unique chance to arrange a seminar in my university where the speaker was Dr. Joseph Lambiasi, who was the then president of AAPG Asia Pacific Region. I also came to know some officials from different IOCs working for Bangladesh. Specially Dr. A.H.M Shamsuddin (Shams), chief exploration geologist of Chevron Bangladesh and Sponsor-Bangladesh AAPG Student Chapters.

Through the contact of Dr. Lambiasi I came to know about a scholarship of petroleum geosciences in Thailand. After completing my master's degree in geophysics and securing the highest CGPA

in both bachelor's and master's from my department, I applied for that scholarship program. I got the scholarship in Chulalongkorn University and started my class there from August 2011. Later when I was planning to do my thesis work, I was contacted by Dr. Shams and got a proposal to do my research work patronized by Chevron Bangladesh.

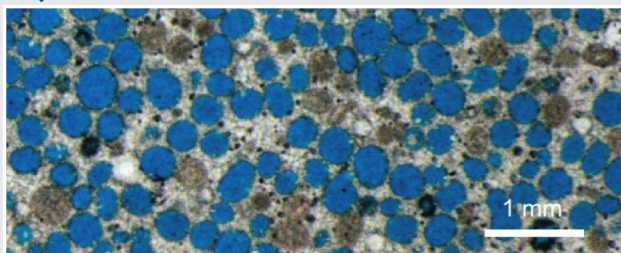
After successfully completing the research work, I got a job offer from Chevron and joined there as an earth scientist In October 2012. I have already successfully completed three job assignments in Chevron Bangladesh: planning development wells, operation geology job where we drilled overpressure zone and the latest was generating 3-D Earth Model, which was the first in the country. Absorbed on the job, still I have a good communication with the AAPG society. In 2014 I became the country representative for the Young Professional group of AAPG.

Looking back on my education and professional career, I found having a close relationship with a big association like AAPG was very helpful. It helped me to drive myself into the right direction to become a professional in the petroleum industry and now helping me to build a professional network, which will certainly help to grow my future career, too.



## GEO QUITZ

**Q1:** What rock type and pore system is shown on the micrograph? How did it form?



**Q3:** Which one among the following systems tracts, of the general sequence stratigraphic model, has the following paleontological signature of an offshore facies within a depositional sequence: a gradual upward reduction in open-ocean planktonic fossils, while benthic fossils indicate shallowing-upwards conditions?

- A) Lowstand system tract – lowstand fan
- B) Lowstand system tract – lowstand wedge
- C) Transgressive system tract
- D) Highstand system tract

**Q2:** What of the following is the typical order of salt deposition during the evaporation of lake or marine waters?

- |              |              |              |              |
|--------------|--------------|--------------|--------------|
| A) Calcite   | B) Calcite   | C) Calcite   | D) Calcite   |
| Dolomite     | Dolomite     | Dolomite     | Dolomite     |
| Halite       | Anhydrite    | Sylvite      | Anhydrite    |
| Anhydrite    | Halite       | Halite       | Halite       |
| Carnalite    | Sylvite      | Anhydrite    | Sylvite      |
| Sylvite      | Carnalite    | Tachyhydrite | Tachyhydrite |
| Tachyhydrite | Tachyhydrite | Carnalite    | Carnalite    |

**Q4:** Which of the following stratigraphic sequences would provide a good conventional reservoir candidate?

- A) Brittle mudstone – sandstone – brittle mudstone
- B) Brittle mudstone – sandstone – ductile mudstone
- C) Ductile mudstone – sandstone – brittle mudstone
- D) Ductile mudstone – sandstone – ductile mudstone

Answers on page 8



Continued from page 7

**Answer to Q1: The correct answers: Oomouldic limestone.**

This rock was formed by diagenesis whereby secondary leaching dissolved the  $\text{CaCO}_3$  that was in the originally deposited ooids after the pore space had already been cemented. The leaching fluid did not disturb the initial pore space (now completely cemented); so it essentially reversed the initial roles of grains and pores; resulting in round pores and a cemented matrix. There are some grains that were not leached; though; and these may retain their primary porosity unless they were cemented in the earlier cementation period.

**Answer to Q2: The correct answer is B.**

For dissolved salts to precipitate, the water body must enter a restricted environment where water input into this environment remains below the net rate of evaporation. This is usually an arid environment with a small basin fed by a limited input of water. When evaporation occurs, the remaining water is enriched in salts, and they precipitate when the water becomes supersaturated. The most common minerals that are generally considered to be the most representative of marine evaporates are calcite, gypsum and anhydrite, halite, sylvite, carnallite, langbeinite, polyhalite and kainite. Kieserite ( $\text{MgSO}_4$ ) may also be included, which often will make up less than four percent of the overall content. [2] However, there are approximately 80 different minerals that have been reported found in evaporite deposits (Stewart, 1963; Warren, 1999), though only about a dozen are common enough to be considered important rock formers.

The minerals precipitate out of solution in the reverse order of their solubility's, such that the order of precipitation from sea water is :

1. Calcite ( $\text{CaCO}_3$ ) and dolomite ( $\text{CaMg}(\text{CO}_3)_2$ )
2. Gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) and anhydrite ( $\text{CaSO}_4$ ).
3. Halite (i.e. common salt,  $\text{NaCl}$ )
4. Potassium and magnesium salts.

**Answer to Q3: Correct answer is D.**

Highstand system tract is characterized by a gradual upward reduction in open-ocean planktonic fossils, while benthic fossils indicate shallowing-upwards conditions. Alternation and transition from shallow marine to brackish and terrestrial settings. Biofacies boundaries will be diachronous.

**Answer to Q4: Correct answer is B)**

**Brittle mudstone – sandstone – ductile mudstone**

This type of sequence should be a good conventional reservoir candidate thanks to the presence of the right components in the right order, provided every component takes place in the system at the right timing: source, migration/expulsion, reservoir and seal.

- A) This sequence will most likely be associated with no seal and no hydrocarbons as hydrocarbons would have migrated out of the system. There are two types of mudstone: brittle and ductile. Ductile mudstone shall act as a good seal but usually without permeability; whereas brittle mud would allow the migration of hydrocarbons.
- C) This sequence will most likely be associated with no migration pathways unless faulted/fractured.
- D) This sequence will most likely be associated with no migration pathways unless faulted/fractured.

## AAPG Middle East 2016 EVENTS CALENDAR

**AAPG/EAGE/SEG/SPE THE KNOWLEDGE  
MANAGEMENT CHALLENGE**

23–24 March 2016 • Abu Dhabi, UAE

**AAPG/SEG INTERNATIONAL CONFERENCE  
AND EXHIBITION (ICE)**

3–6 April 2016 • Barcelona, Spain

**EXPLORING MATURE BASINS**

11–13 April 2016 • Manama, Bahrain

**AAPG/SEG ADVANCES IN SUBSURFACE  
IMAGING & MAPPING**

16–18 May 2016 • Muscat, Oman

**AAPG ANNUAL CONVENTION & EXHIBITION**

19–22 June 2016 • Calgary, Alberta,  
Canada

**AAPG/SEG INTERNATIONAL CONFERENCE  
AND EXHIBITION (ICE)**

6–9 September 2016 • Cancun, Mexico

**SPE/AAPG/EAGE SHALE PLAYS WORKSHOP**

21–23 November 2016 • Dubai, UAE



**AAPG**

Middle East Region



AAPG MIDDLE EAST

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