

March / April
2020

SPE Review London

The official e-magazine of the Society of Petroleum Engineers' London branch

The Role of Microbial DNA Analysis in the Oil & Gas Industry

- * **When Ted and Christine meet Robby Robot**
- * **C-Level Talk: Accommodating a carbon-neutral future with intelligence and enthusiasm**
- * **Diversity and inclusion: SPE and International Women's Day**
- * **NEW! Book Review**



BEHIND THE SCENES

MEET THE BOARD

ONLINE EVENTS

SPE Review London

The official e-magazine of the Society of Petroleum Engineers' London branch

ABOUT US

The Society of Petroleum Engineers (SPE) is a not-for-profit professional association whose members are engaged in energy resources, development and production. SPE is a non-profit professional society with more than 156,000 members in 154 countries, who participate in 203 sections and 383 student chapters. SPE's membership includes 72,000 student members. SPE is a key resource for technical knowledge related to the oil and gas exploration and production industry and provides services through its global events, publications, events, training courses and online resources at www.spe.org. SPE London section publishes SPE Review London, an online newsletter, 10 times a year, which is digitally sent to its 3000+ members. If you have read this issue and would like to join the SPE and receive your own copy of SPE Review London, as well as many other benefits – or you know a friend or colleague who would like to join – please visit www.spe.org for an application form.

The views expressed herein are not necessarily those of the SPE. Extracts may be reproduced subject to a clear acknowledgement of the source.

CONTACTS

Communications: spelondon@spemail.org

CHANGE OF ADDRESS?

Go to: <https://www.spe.org/member/access/MyAccount>

SPE encourages open and objective discussion of technical and professional subjects pertinent to the interests of the Society in its publications. Society publications shall contain no judgmental remarks or opinions as to the technical competence, personal character, or motivations of any individual, company, or group. Any material which, in the publisher's opinion, does not meet the standards for objectivity, pertinence, and professional tone will be returned to the contributor with a request for revision before publication.

Cover photo by Enrico Nunziat

In this issue

- 03 Behind the Scenes
- 04 Letter from the Chair
- 05 Letter from the Editor
- 24 SPE London Board

FEATURES

- 08 ASEC 2020
- 10 PetroBowl 2020 - here we come!
- 12 When Ted and Christine meet Robby Robot
- 16 From London to Brazil: the SPE YP way
- 17 The role of microbial DNA analysis in the oil & gas industry
- 20 Diversity and inclusion: SPE and International Women's Day
- 21 C-Level Talks.
In this issue, Clara Altobelli, Vice President at ESG, talks about accommodating a carbon-neutral future with intelligence and enthusiasm
- 23 NEW: BOOK REVIEW
Future Fossils: The legacy of oil and gas, one million years from now

WHAT'S HAPPENING?

- 06 News Digest
- 25 ONLINE Global events

Share your experiences and stories online

<http://london.spe.org/home>



Behind the Scenes: SPE Review Editorial Board



Elizaveta Poliakova, Editor in Chief

Elizaveta is a Reservoir Engineer at Trident Energy Management Limited. She has a Master's of Science in Petroleum Engineering from Imperial College London and a Bachelor's in Petroleum Engineering from the University of Leeds.

Elizaveta has been with SPE for more than five years. She was the President of SPE Imperial College Chapter and the President of SPE Leeds Chapter. Previously, she was also on the committee of SPE YP.



Josh Beinke

Graduated from University of Adelaide in 2008 with a Petroleum Engineering degree. Moved to Europe in 2016, and working as a Production/Exploitation Engineer with Vermilion Energy.



Mark Beleski

Experienced engineer, with deep understanding of industry practices, trends and challenges. Energy Loss Adjuster with MatthewsDaniel, in London.



Ffion Llwyd-Jones

B2B writer and editor. Finding, explaining and sharing stories that people can understand and relate to. International experience in technology, environment, animal therapy and not-for-profits.



Justin Reynolds

Content/features writer, and web designer. Digital and print publications including The New European, openDemocracy, The Calvert Journal, CityMetric, Creative Bloq and Social Europe.

A big Thank You! to all the organisations that support the SPE London section



Letter from the SPE London Chair



Dear SPE London members and colleagues,

Welcome to the March/April issue of SPE Review London! This is also a first edition when we start to cooperate with The First, SPE Norway magazine; we look forward to a mutually successful collaboration.

Since our last communication we have delivered the February Evening lecture programme, along with a networking social event afterwards, both attended by many of our colleagues. Then the situation changed and quite a lot of events have been cancelled or postponed.

At this difficult time, SPE International is quite active. Examples include the many SPE Distinguished Lecturer webinars available online, free for SPE members ([link from spe.org](#)).

For students and Young Professionals, a special Virtual Career Pathways Fair is organised for the end of April. This is an opportunity for quick-fire mentoring - specific to job roles you are pursuing - at a time and place that suits you. As a virtual conference, this advice will be available in the most convenient and accessible way, and it will also provide direct links to established resources. This event will also feature live webinars, SPE Resources and links to industry. Volunteer opportunities are available for that event.

On our London section level we, individual supporters and society as a whole, face huge challenges. Members are, however, technically and professionally skilled, highly educated and located throughout the UK. Most will be secure financially relative to others, though some face a career-changing moment (again!). Some remain working flat out in critical roles, others suddenly less so. How could members of our industry contribute our particular skills and experience to assist in the fight against Covid-19 in addition to volunteering through local support groups and via the NHS initiative? Could we somehow leverage through the Chapter to add weight? For more information, please contact John Martin on jhmartin@jhma-reservoir.com.

If you have other ideas to share, please, contact the SPE London Board individually, via social media channels or SPELondon@spemail.org.

We will continue monitoring the situation and potential impacts on future activities! Thank you for your continued efforts!

Stay safe!

Maxim Kotenev



Letter from the Editor



Dear SPE members and readers of SPE Review London

Happy Easter and welcome to our second SPE Review London issue of 2020!

With this publication, we would like to introduce our new feature: 'Book Reviews'. Within the rubric, our ambition is to maintain an independent and a non-biased view on industry-related literature. Feel free to let us know your thoughts or send us your short reviews that you would like to see published.

Also, we are happy to announce a beginning of our collaboration with SPE Norway and its local magazine, 'The First'. On [page 12](#), read our first article exchange, written by the CEO of Pro Well Plan, Magnus Tvedt!

The two months since our last edition of SPE Review London have proved to be a challenging time for our industry and our world. We were urged to work from home and spend the vast majority of our days and nights indoors. While this has undoubtedly made us reflect about the way we live, work and interact with each other, it has been a period where we could start doing things which we always wanted to do, but never found the opportunity to pursuit. To help our readers on the search for new and exciting habits, we have put together some ideas on things to do during quarantine. Hopefully you might find some of these interesting and useful ([page 25](#)). We would love to hear our reader's stories about what you have accomplished during these unprecedented times. Please send them to us via: spelondon@spemail.org

Finally, I would like to express my gratitude to the Editorial Team of SPE Review London for their energy, efforts and endless flow of ideas to support this publication!

Sincerely Yours,
Elizaveta Poliakova



NEWS DIGEST... NEWS DIGEST... NEWS DIGEST

The Texas Railroad Commission returns

As governments explore their policy toolbox to support economies through the Coronavirus lockdown, some dormant institutions may be making a return.

One of these is the Texas Railroad Commission, which as the state's oil and gas regulator has the authority to ration production – powers it hasn't used since the 1973 oil crisis.



Opec has often been criticised for seeking to engineer the oil market by turning the

taps on and off, but in these exceptional times the US may follow suit.

In a Bloomberg Opinion piece, Commission member Ryan Sitton argues if Texas, Saudi Arabia and Russia each cut production by 10%, then pressures on the market would help put a floor under oil prices.

[Link here for full story](#)
[And here](#)

Oil and gas included on Covid-19 response list

The UK government has included oil and gas in the list of sectors considered essential to coping with Covid-19.

Children of workers performing critical roles in the oil industry are expected to be prioritised for school places amid the coronavirus outbreak.

The Scottish Government has also included 'energy suppliers' in its first category of 'key workers' who would have continued access to learning or childcare.

OGUK has appealed to the British government for assistance, pointing out the region's role in providing secure energy.

[Link here for full story](#)
[And here](#)
[And here](#)

Energy transition turbulence

The oil and gas industry isn't the only sector of the energy market in turbulence.

As the world economy suffers a sharp downturn, demand for all energy, including renewables, is falling rapidly.

When the Covid-19 outbreak surfaced, the sector's biggest concern was a breakdown in the capacity of the industry's workshop (China), to supply solar panels, wind turbines and batteries. But the dawning reality of a serious global economic slowdown is hitting the sector hard, particularly the electric vehicles market. Falling oil prices may make traditional cars more compelling for cash-strapped consumers, a looming possibility reflected in the collapse of Tesla's share price from the heights reached just a few weeks ago.

[Link here for full story](#)
[And here](#)
[And here](#)

Overflowing tanks

The oil supply glut caused by Opec price wars and plummeting demand due to Coronavirus is threatening to overwhelm storage capacity.

Around 3.3 billion barrels of oil is stored globally onshore, close to the peak of 3.4 billion barrels reached in early 2017. Another 91 million barrels is in floating storage - vessels at sea, close to peaks reached in 2009.

Measures to support the US and Indian industries include state purchase to bulk strategic stockpiles. Estimates suggest that total spare inventory capacity is around 900 million barrels.

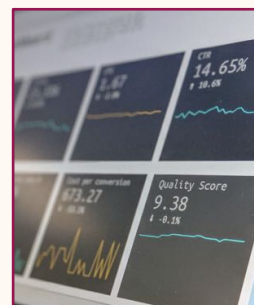
[Link here for full story](#)
[And here](#)

Wood Mackenzie says North Sea can survive at low oil prices, but long-term investment critical

Wood Mackenzie predicts that, in the short term, the North Sea can survive; 95% of onstream production is 'in the money' at US \$30/bbl.

But companies must find resources for long-term investment to increase production and reduce unit costs. If the industry goes into harvest mode, a premature end is inevitable.

Where will the money for investment come from? The traditional North Sea players



may not be willing investors. The Majors will defer capital elsewhere and the sector's independents will struggle financially, particularly if banks look to decarbonise their portfolios.

At a time when there is public pressure to move towards more a 'greener' energy mix, it's hard to see governments easing the fiscal terms.

Perhaps private equity will come to the rescue again, as after the 2014 downturn.

[Link here for full story](#)

NEWS DIGEST... NEWS DIGEST... NEWS DIGEST

Biden vs Sanders: 'no fracking' or 'no new fracking'?

Joe Biden's emergence as the Democratic Presidential nominee may have profound significance for the future of the US fracking industry.

Bernie Sanders, who for many months led Biden in the polls, had committed to an all-out ban on fracking. Biden's energy policy does not commit to a ban and allows for use of fossil fuels in the near term while pledging that the US will reach net-zero emissions by 2050.

Biden has indicated he would toughen his position to allow 'no new fracking'.

The Trump administration supports the industry.

[Link here for full story](#)

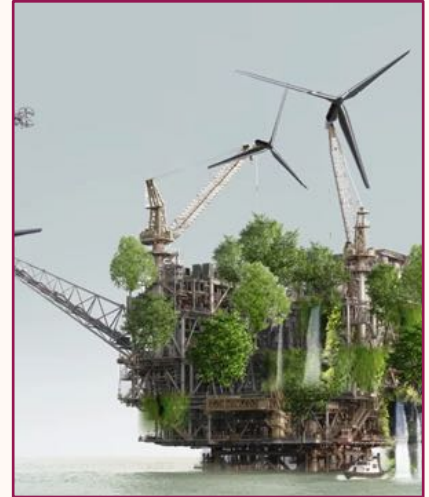
The gentrification of offshore platforms

An ingenious set of speculative designs submitted to the web magazine Design Boom imagines how old offshore oil platforms might transformed into the bohemian housing of the future. XTU Architects suggest rigs could



become 'poetic, habitable and exotic' frameworks for apartments. The designs picture platforms suffused with greenery, their power supplied by wind turbines. The ideal solution, perhaps, to the decommissioning challenge?

[Link here for full story](#)



Call for volunteers – make an impact on someone's future!



Action Tutoring is an education charity looking for volunteers and partners to support students in increasing their academic knowledge, becoming more confident and reaching their full potential.

Help support disadvantaged pupils in reaching their academic and career dreams!

For more information:

<https://actiontutoring.org.uk/>

Or contact the organisation via:

hello@actiontutoring.org.uk



Annual Student Energy Congress 2020

The Annual Student Energy Congress - ASEC was in the beautiful capital of Croatia, Zagreb. Boris Vidoš, University of Zagreb SPE Student Chapter President, provides an overview of the seventh Congress, held during 2-5 March 2020.



It was a privilege to gather more than 200 students, young professionals and E&P experts from Croatia and Europe. With more than 80 foreign students from Europe's most prestigious Oil & Gas-related universities, it was a great opportunity for our students to share knowledge, collaborate and make new friends and connections.

ASEC 2020 was under the high patronage of the Ministry of Environment and Energy, and the Croatian Chamber of Economy. During our opening ceremony, all our distinguished guests made it clear that networking and knowledge sharing these type of events is of crucial importance for our Industry's future.

Panels and Discussion

On the first day of the congress, a panel discussion entitled 'Flexibility of Oil & Gas Industry in Energy Transition' was a great hit. SPE 2020 President, Shauna Noonan, was our distinguished guest, and experts from Croatia gave us their opinion of the current situation in the Oil & Gas Industry, as well as their thoughts about the future.

After the panel discussion, Shauna held an outstanding presentation entitled 'Transformation of the Petroleum

Engineer: Impact of the Digital Revolution and Social Responsibility'. She encouraged us to be persistent in what we do and to adopt new technologies and knowledge throughout our education and work.

2020 Petrobowl Europe Regional Qualifiers

The second day of the congress was reserved for 2020 Petrobowl Europe Regional Qualifiers. There were 13 teams and all of them showed an envious level of knowledge. They went head to head in several rounds on a previously scheduled draw, in front keen eyes of our judges and Jean-Marc Dumas, SPE Regional Director for Europe. It was amazing to see so much knowledge, passion and fair play from students from all over Europe.

I want to use this opportunity to say congratulations to the winner's University of Aberdeen SPE Student Chapter, followed by the Heriot-Watt University SPE Student Chapter in second place, and IFP School SPE Student Chapter in third place.

After the PetroBowl Qualifiers, Jean-Marc Dumas held a Question & Answer session with all the participants. It was a great opportunity for the students to talk with Jean-Marc and ask questions about SPE and our Industry. At the end of the second day, all the participants had the opportunity to go sightseeing and take the Zagreb City Tour.

2020 SPE Student Paper Contest and ASEC 2020 Poster Competition

On the third day of the congress, the 2020 SPE Student Paper Contest and ASEC 2020 Poster Competition took place. For the Student Paper Contest, there were three categories: Undergraduate, Master, and Ph.D. All the



Annual Student Energy Congress 2020 continued

students that presented their papers and posters were highly prepared and truly outstanding. The best three papers from every category were awarded with SPE certificate and opportunity to present their paper during the Annual Technical Conference and Exhibition - ATCE in October, in Denver, USA.

Field trip - Croatian Geothermal Power Plant

On the last day of the congress, participants had the opportunity to go for a field trip. We went for a guided tour of the first Croatian Geothermal Power Plant - Velika I near Bjelovar, Croatia. After the field trip participants had the chance to enjoy the amazing Croatian countryside of Bilogora, try Croatian cuisine and take a winery tour.

I want to thank the University of Zagreb - Faculty of Mining, Geology and Petroleum Engineering for supporting the University of Zagreb SPE Student Chapter and making ASEC 2020 possible. Also, great thanks go to Mr. Jean-Marc Dumas, SPE Regional Director for Europe, Professor Daria Karasalihović Sedlar, our SC Faculty Adviser and Professor Vladislav Brkić, SPE Croatian Section president. They were always there for us and never stopped pushing us forward. The most important thank you goes to ASEC 2020 Event Board without whose help organising this event would be impossible.



PetroBowl 2020 - here we come!

The University of Aberdeen SPE Student Chapter has made it to the world finals of the PetroBowl competition at SPE Annual Technical Conference and Exhibition (ATCE) 2020. The team of four students, who are members of the University's SPE Student Chapter, recently scooped the first place in the European qualifiers in Zagreb, Croatia in March.



Our final game against Heriot-Watt University (leading 133-71). The timer in front of us shows seconds before the finish, yet Bauyrzhan (far right) picks up the last question and must answer. Understanding nothing will change the score, the rest of the team celebrate the victory in front of a cameraman.

The PetroBowl competition matches SPE Student Chapter teams against one another in a fast-paced quiz competition covering technical and non-technical aspects of the oil and gas industry.

The Aberdeen team faced fierce competition from other universities represented in the qualifying round, including Stavanger, Heriot-Watt, Portsmouth and Bergen.

Nonetheless, the team won all four knock-out stages to finish in the top spot, meaning team members will go to the global PetroBowl competition, which is being held during ATCE 2020 in Denver, USA on 5-7 October.

The global six-regional qualifiers including Europe were first introduced back in 2015; our then Aberdeen team participated the first time and boarded the top-5 qualifying to the grand finals in Houston. Afterwards, four years in a row in different mixes, we faced the strongest opponents, until 2020. This is the first time we have achieved such a high-calibre result and we are very proud of being recognised as the best team in Europe.

It took us some time to get to this point. Every year, we tried to learn from our mistakes and understand what gaps we need to fill to come in the best shape. It was not an easy task, but we had that goal in the back of our heads constantly reminding us that we need to get there. This year, it turned out that all the team members who qualified through the university on-site selection process were the final-year students, so this was basically our last chance. Nevertheless, we managed to achieve a fantastic synergy that carried us throughout the entire qualifier journey; it started from spending evenings together at the library going over the preparations and up to having some meals together. Looking back now we can say – it was definitely fun! And there is still lots of time for us until the next stage in October.

We're looking forward to representing the University of Aberdeen on the global stage at the PetroBowl in Denver, where we will be one of 32 teams vying for the top prize. Moreover, attending ATCE 2020 will also be a fantastic opportunity to network with the industry leaders, hear brilliant discussions on various topics, as well as meet like-minded peers. It is amazing for students like us to have such opportunities."

Team captain Filip Wejzerowski adds: "The global PetroBowl is the most important and biggest event in the



Petrobowl 2020 - here we come! continued

SPE's calendar and we're really looking forward to taking part. For now, we are planning a short break and then we will resume our preparations for Denver while searching for sponsorship opportunities to help fund our trip." **For sponsorship inquiries, please reach out to Viktors: viktorsstepovoj11@gmail.com**



Officially celebrating the championship after Bauyrzhan completes the answer.



Award ceremony with top-3 teams. White - Aberdeen; Red - Heriot-Watt; Blue – IFP School.



Award ceremony with Jean-Marc Dumas, SPE Director for Europe.
Left to right: Theodor Tufa, Viktors Stepovoj, Jean-Marc Dumas, Filip Wejzerowski, Bauyrzhan Batayev.

When Ted and Christine meet Robby Robot



The SPE Oslo (Norway) section was established in 1993. Today the section has grown to 350+ members and includes both Young Professionals and the student Chapter at the University of Oslo.

First magazine was created by the joint efforts of all SPE sections in Norway as an information channel for the oil & gas industry and academia. The Technical Section's white papers are written by oil & gas professionals, and include descriptions of new technologies, case studies and summaries of ongoing academic research. The First contributes to spreading technical information among SPE members in Norway, and is an information channel for all the Norwegian SPE sections.

This article by Magnus Tvedt (CEO, Pro Well Plan) was first published in 2019.

I know tons of drilling stories. They all start with 'One time, we were ...' and continue placing me in the center of solving a Rubik's cube of mud, torque, and steel: 'I had to wake up the supervisor', 'We had three boats pumping day and night', 'Then we realized we had drilled into another well'. These stories make me a good story-teller, but I wonder if the single-person endeavors fit better on a movie screen than in a portfolio of risk management and cost control.

As a founder and CEO of a service company, I head up a team developing a well-planning platform with modern work processes. I get to meet with engineers and managers around the world and learn how they work. I've always been a developer; best practices, governing documents, and improvement projects appeal to me as I get to dig deep and learn the why's and why not's of how we work.

Developing a well-planning platform where the engineers find all their data, and can do all their work, invites to rethinking what drives quality and decisions in well planning. Fitting traditional work processes to modern data opportunities, ensuring technical integrity while motivating and inspiring the users, while at the same time delivering just-in-time on projects, can take the breath from most people. Luckily, we had no idea how challenging this would be before Pro Well Plan kicked off.

Our mission is to halve well costs, and the secret sauce is to give brilliant engineers the tools they need to do a better job. Read on to learn how modern management principles and data science open the door to collaboration, experience transfer, and campfire talks like 'We didn't have a single surprise', 'I wasn't woken up a single time'. Yeah I know, we need to work on those stories. And read all the way through to the end, and I'll share with you how spreadsheets fit into a modern work process.

Travelling back in time

In our industry, we get to pick from the top shelf of human brains. The smartest girls from the best universities are offered safe and well-paid jobs. Then we give them heaps of data, emails, sometimes-working video rooms, enormous budgets, and unpredictable timelines. In fact, most of the work is just like fifteen years ago, when their manager was fresh fruit.

When our current work processes were established, data analytics was reading reports and making spreadsheets, and your value as an employee was determined by your personal experience. After-action reviews were in a meeting room with a spreadsheet on the big screen, and planning sessions were in hotels with walls covered in bullet points. When I joined the industry, I remember falling asleep in both meetings. The information was just too overwhelming and led my brain to let the drill bits form clouds, with packers riding around on laminar and turbulent flows. The cowboys thrived, the juniors hoped for time to pass quickly.

We had then realised the value of gathering information; only now, fifteen years later, can we make use of all the information; data science and cloud solutions open for collaboration across silos and datasets.



When Ted and Christine meet Robby Robot ... continued

Let me introduce you to a couple of stars in our story here, they will make a good point.

Christine the Machine

I'll introduce Christine the Machine with a story she told me about how she sees the value of planning. She was late for a party and hit the road. It was getting dark when she took the wrong exit and ended up in a dodgy place. Christine wished she had made a better plan before leaving the comfort of her living room. In the sofa safeness, she could have planned alternate routes, looked up road conditions. Had she planned even better, Christine would be riding shotgun with her friend, outcompeting the stereo to a Roxette tune.

"She wants to be the one who busts open the doors of modern business."

Christine has fought excel sheets and powerpoints to management level, but now she talks and walks for change. She tells her colleagues she is watching old episodes of Friends, but in the evening she goes undercover with her laptop, finding patterns in well data. She knows there are more learnings and

experiences in the data, and she wants to be the one who busts open the doors of modern business, so her company doesn't again end up in a dodgy wrong exit.

Tedious Ted

Tedious Ted likes to hoard information on his local drive, spends weeks on calculations only he can verify and holds hour-long meetings just to get hold of data. Ted writes reports to describe decisions but distrusts other people's reports because they never get some detail right. Ted has a full suite of spreadsheets to cover any aspect of his job and can serve up a persuasive answer for any quality control meeting.

Ted shares his experience with his closest team members, generously offering the full history of equipment selections and well designs, and he has drawings and spec sheets ready for you if you should need a second opinion. He's a master of the art and can tell you exactly how many times we have built inclination in any formation, based on statistics he keeps in a spreadsheet on his local drive.

But when someone outside Ted's closest team is looking for experiences, they don't know what experiences he has in his local drive and fail to learn his knowledge.

What did you discover, Christine the Machine?

Every day, Christine's job takes her searching for some dataset which she needs to complete a task. She needs a geologic description of wells in the proximity of where she is planning a well. Without access to the dataset, she has to call for a meeting with a colleague who has access, to describe her need. Three emails, some meeting room frustration and a week later, she can start waiting for an answer. Fast forward another week, and she is back in the meeting room to get the results. Unfortunately, the data wasn't formatted for her purpose, a larger manual effort is necessary to combine multiple datasets, with different experts.

"They lose another week of progress."

Christine is also a developer like me, but not a patient one, so she makes fun of her colleagues, giving them the names of api-calls. Hey, get-geo-markers-in-area, wouldn't it be more fun for you to create company-wide data models together with get-logs-from-area than running around creating local datasets?

Both are offended, Christine says she's sorry, but they lose another week of progress.

Christine and Ted

I met with Christine the other day and she told me her story. She thinks the reason why her api-call-colleagues don't like the thought of working on datasets is that there are other people supposed to be working on that. And they are afraid to seem unimportant. I asked Christine who their manager is and how they are motivated for change? Christine introduces me to a guy named Ted. He fully agrees, even throws in some advanced lingo, but is a bit busy right now, he's making a presentation for a management meeting.

When Ted and Christine meet Robby Robot ... continued

'So many jobs here seem to be extracting information from one source and forwarding it to another', Christine the Machine tells me. It's like working and reporting is disconnected. Us engineers put in hours and hours to simulations and analysis, learning about scenarios, cases, opportunities, and pitfalls. But in the end, only a line or two is going into a report. She wants it to be so that when she is learning something on duty for her company, her experience should be available for the entire company.

She is trained by society to be a quick learner and adopter of knowledge. Sharing comes first and second because she always gets more back than what she gives. In meetings with Ted, she admires his knowledge, but is frustrated because the knowledge he possesses is kept from her.

Oh, the drilling schedule has changed, so Christine the Machine has to read up on the reports from another well and create a plan in a couple of weeks. 'We'll just copy the last one, it's pretty similar anyway'. I guess we have to continue our article without Christine.

Treating humans as robots is a bad thing

Let's go back to our desk with the Rubik's cube of well planning. We need to give Christine the Machine and Tedious Ted some new tools for more modern work processes.

I said initially that data science and modern management principles open doors to collaboration. Ted and Christine differ in how they handle data. One hoards to increase his value, the other shares to empower her team. Everyone who has tried would rather work in a sharing team, because hoarding places you in a social vacuum where only robots thrive. And you don't want to compete with robots on data hoarding.

So to prevent treating humans as robots, you need to build a sharing culture. Building a sharing culture not only keeps you out of the robot's realm, but it also increases the value of your organisation in many ways. You get to work on improving a common dataset, you avoid slow and unrewarding reporting, and you get to spend more time on interesting discussions.

Let the team be a team

When a drilling problem is imminent, drilling engineers and their managers federate around white electric desks with excitement and emotion to play the puzzle. Day and night, nothing can get in their way. The common enemy (the stuck pipe), the team effort, the clear goal, and the value of your contribution (greased with lukewarm overtime pizza) bring the energy through the roof. When you have been through this once, you want more.

"...federate around white electric desks with excitement and emotion to play the puzzle."

What does it take to get the same brain receptors go bing-bing in well planning? In planning, you can create exciting and complex events, and have your colleagues pour their brain soup into your bowl. There is no reason why planning is less thrilling than operations, except for the attention you get in the moment. That is where modern social technology helps.

With social technology, you can share experiences quickly and personally - just like you are doing in meetings and discussions. And when the platform is built for sharing well designs and well studies, you don't have to create a report or presentation - just click share.

With technical visualisation and social sharing, you don't have to worry about onboarding newcomers. In fact, you can learn what all the Teds and Christines in the company are working on, to learn that they are facing the exact same formation and pressure as you, and that, together, you can find a better solution.

Psychology and machine learning

Developing software is a game of psychology, technology and physics, where psychology can never be

When Ted and Christine meet Robby Robot ... continued

underestimated. Why don't you do this, why do you do it that way? So many of our professional choices are dominated by what our brain wants to chew on. If you ignore the psychology of behaviour you are treating colleagues like robots, and they deserve better.

This leads us to machine learning, a fantastic tool for sorting experiences, our industry's biggest problem. When I started working on the rigs, I was told I needed a course on experience, because my shelves weren't fully stacked, straight out of school.

Machine learning can analyse enormous datasets, and find similarities. In Pro Well Plan, we found we had to develop data cleaning processes and machine learning models that would answer the question: Has this been done before? Engineers have always been brilliant data analysts, and they love finding experiences so quickly, and now, their enormous datasets become useful in everyday tasks.

"Robots can't share and collaborate. I suggest we do."

We all know stories of repeated negative events, running into losses in this or that formation, collapsing holes, too high ECD's, blowouts and more. Even if we had the theory to predict the events, they happened again and again. Machine learning, in combination with a modern work-process, allows you to plan your way out of costly events, without having to learn them the hard way.

Spreadsheets are great, you can do everything

I promised you a reward if you read through the entire article, and that is how spreadsheets are a great tool for your work process. They are not. Not because you can't write formulas for everything engineerish under the sun (I've seen you do that), nor because you can't create impressive datasets, because that's what you do every day.

But because they are not made for sharing, quality control is impossible, without you they are useless, and they limit you to focus on simpler data analysis tasks. Read that sentence again.

And I believe very strongly that if you want a modern organisation, you want everyone to work for improving the company database, you want to have experts working on QC and improvements, you don't want to push the responsibility for safety on individual engineers, and you want to expand your experience with more and more analysis. That's how I would run a drilling organisation.

Reinventing campfire talk

With more advanced tools in the engineering belt, we can raise the bar on planning. New KPI's such as plan coverage, reference well coverage, and a division between plan failures and operational failures will create new stories about wells, moving from pioneering to factory thinking. I discuss these KPI's with operators around the world every week, and I think we all will have more fun jobs in the near future with more value-adding work on the management boards.

Rubik's cube has one solution, drilling has multiple problems and multiple solutions. People can solve a Rubik's cube, but not as fast as robots.

Robots can't share and collaborate. I suggest we do.



Magnus Tvedt is the Founder and CEO of Pro Well Plan.

Pro Well Plan improves the efficiency and quality in well planning and operations, so you can focus on operational performance and advanced well technology. We help you make the best plans for drilling and completions operations, with a minimum of input and modern work surfaces. Our world-leading Pro Well Kernel holds algorithms for modern drilling and completion operations, so you can use talent on improvement, not repeated operations.

From London to Brazil: the SPE YP way

In light of cancelled events over the next two months, here is London SPE YP's most recent contribution for the SPE Review London. A member of both the SPE YP committee and SPE London gave a presentation at his hometown in Brazil.



Energy4me at schools

Recently, Brent was +50\$/bbl, Russians and Saudis were together, Covid19 wasn't a pandemic yet – and I was on leave in my hometown, Progresso-BR.



Since 2019, I have been a YP member of two sections: SPE Brazil and SPE London. As I have done previously, I took the opportunity to come back to São Francisco School, where I studied from 2006 to 2011, to give two lectures titled: Oil and Gas: From well to petrol station.

The presentations gathered more than 50 eager students with questions such as:

- How do we find oil?
- Why is gasoline expensive in BR?
- Will O&G end or will we be replacing O&G to renewables?

As always, I emphasised the importance of O&G today and in the future; as IEA reported last year, and I clarified, we are living during a transition to a low-carbon energy where the gas will be fundamental.

More than any impact of the current O&G crisis, we are still important to the world and we will continue to be so. Our role as O&G professionals is, as SPE mission says, to collect, disseminate, and exchange technical knowledge concerning the exploration, development, and production of oil and gas resources, and related technologies for the public benefit.

Proud to be SPE, proud to work in the O&G industry.



The role of microbial DNA analysis in the oil & gas industry



Willem van Strien, Principal Consultant - Integrated Services at SGS

Based in the Netherlands, Willem van Strien is a principal consultant for SGS' Microbial Risk Assessment Services (MiRAS) coordinating sampling, analysis and study programs for the prevention and mitigation of souring, biofouling and corrosion issues.

Corrosion facilitated or influenced by microbial communities is estimated to account for over 30% of all corrosion-related costs in the oil and gas industry. Their presence may also lead to plugging of systems (biofouling) or the production of toxic gases (localised souring). Costs associated with remediation or repair, replacement and associated production deferral cause significant financial impact. In addition, environmental, health and safety issues induced by unmitigated localised failure events lead to reputational damage and potential legal implications.

Archean Period
4.0 to 2.4 billion years ago

Oxygen was not present in the atmosphere yet, and plants evolved the land ~0.5 billion years ago.

Large supercontinents spread CO₂ and sulfur rich compounds.

SIMPLE ORGANIC COMPOUNDS

Simple organic compounds, like methane, were produced in the first molecules. These compounds became a substrate for other species.

A dense CO₂ atmosphere resulted in surface pressures being 100 times what we see today.

HIGH PRESSURES

Hot springs and hydrothermal vents were plentiful.

Iron containing meteorites bombarded our early Earth. Most rocks at surface were just metal rich.

METAL RICH

Oilfield Infrastructure

NO OXYGEN

Corrosion and production systems are typically anaerobic.

SULFUR RICH

Many cracks and production or injection waters contain sulfur.

Hydrocarbons are the main organic compounds.

Oil and gas is produced at high pressures and temperatures.

HIGH TEMPERATURES

SGS

Archaea & Bacteria first evolved four billion years ago. Conditions back then were actually very much like they are in our oilfields and their infrastructure today.

The issues microbes cause are well known and often can be mitigated, but to do this effectively one needs to accurately understand the microbial community dynamics first and then monitor microbial trends as a standard routine. DNA analysis provides us new powerful tools to achieve this key requirement.

A billion years of Microbial Evolution

Microbes have been active on our planet for a very long time. They are very resilient, have outlived many mass extinctions and have changed our planet significantly. In the earliest times of their existence they evolved in conditions that are very different from our world today. The Archean period spanning from 4 to 2.4 billion years ago was a world without oxygen. There was a dense, CO₂ laden, atmosphere resulting in high temperatures and pressures at surface. Volcanic activity produced sulfur-rich compounds and the newly formed land masses were still rich in metals, which have since subducted to the core of the planet. The earliest microbes produced and consumed simple organic compounds like methane.

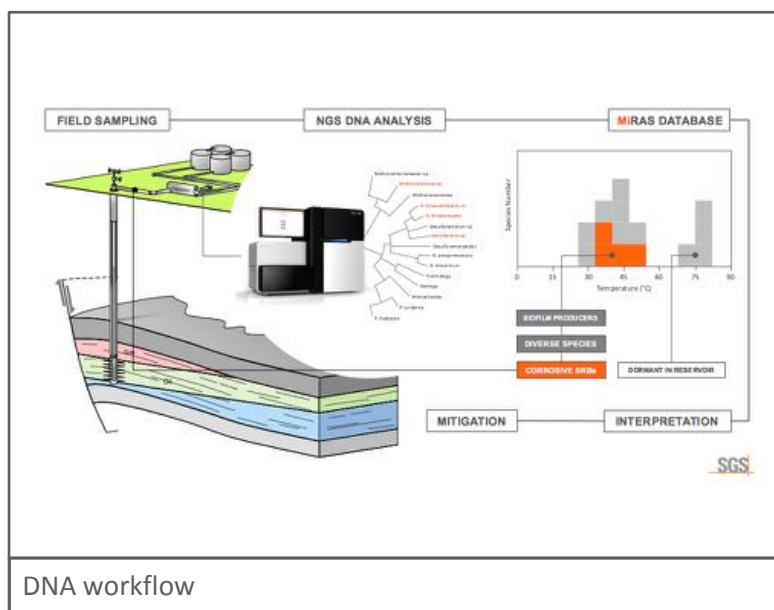
This all changed drastically 2.4 billion years ago when photosynthesis evolved, and the first plants

started producing oxygen. This gas was toxic for these first microbes and many disappeared from the surface of the planet. They didn't go extinct though. We now know many still survive buried deep in the earth.

As humans drilled wells to produce oil and gas and built infrastructure to transport it, we (unknowingly) created the ideal conditions for microbes to thrive. In many oil and gas fields temperatures and pressures are high. There are also anoxic conditions in subsurface reservoir and in our facilities we stringently remove oxygen to prevent corrosion. On top of this we feed the microbes with organic compounds and sulfur-rich crudes or the sulphates present in our production and injection waters. We encapsulate all this in pipes, tanks



The role of microbial DNA analysis continued



and vessels of which the metal still partly holds the 'chemical energy' used to melt, cast and weld it all together. In those situations, microbes do what they have evolved to do for almost two billion years: grow, multiply and extract energy from the metals around them. By doing so they cause rapid, severe and often very localised corrosion.

Microbial Ecosystems

Although there are microbial species that can attack steel alloys in solitude, the most aggressive corrosion is often observed when a diverse set of species are present. In these 'ecosystems', microbe species survive and thrive synergistically with each other which consequently can enhance

corrosion. For instance, while one species actively 'consumes' steel, other species breaks down complex hydrocarbons to provide the 'bite-size' metabolites that others require. Other species may excrete extracellular substances that protect the community from environmental changes and harmful chemicals (like biocides).

While historically the industry has largely focused on a single species or a particular functional group of microbes when monitoring their facilities, SGS now looks at the entire ecosystem. Using this 'ecosystem approach' is key to the successful assessment of the 'microbial risk' for oil and gas fields and their facilities. At SGS we use advanced and innovative DNA technology to accurately identify and validate all species present in a sample to facilitate this approach.

DNA Technology

In recent years DNA sequencing technology has become commercially viable. Today we can sequence the human genome in hours and for approximately 1000 USD, while in 1990 this took 13 years and cost roughly five billion USD.

The DNA technology SGS uses to screen and monitor microbial communities in oilfield samples is Next Generation Sequencing (NGS). With NGS technology we can detect all microbial species or taxonomic groups in virtually any sample type. After NGS analysis has identified all species in a sample, SGS utilizes a proprietary Microbial Risk Assessment (MiRAS) Database to link species traits and assemblages to corrosion, biofouling or souring risk. This database is populated with information on metabolic pathways, corrosion tendency and environmental parameters (e.g. temperature, pH, salinity, oxygen tolerance, etc.) for all microbial species. On the basis of system temperature and fluid chemistry, we can then identify which species could not survive at the corrosion site. This helps us to filter out 'contaminations' originating further upstream or species introduced during sampling. The result is a robust corrosion or souring risk assessment for specific areas of a subsurface reservoir or facility.

In addition, the use of NGS alleviates issues with shipping live samples and there is no longer a need to wait for results of culture tests. Culture tests rely on growing microbes in specific media to enumerate certain species or microbial groups and can take up to 28 days. Culture tests are very useful in certain situations, but often lack accuracy and have the tendency to overlook a large number of microbes present.

When possible, we combine NGS with other microbial monitoring techniques based on SGS' MiRAS service



The role of microbial DNA analysis continued

programme. We use ATP technology to enumerate all active microbes onsite and we apply targeted DNA analysis to enumerate specific microbial groups (via qPCR). This combination, when integrated with other data like system design, operating procedures, water chemistry and system conditions, provides the best method of successfully monitoring microbial risk to assets.

What's Next?

The industry's focus is commonly on the negative impact microbes have on oil and gas fields and production systems. However, there are many applications that are being developed that use microbes to de-risk exploration activity, enhance oil production and to aid reservoir management.

For instance, the evaluation of microbial diversity in soils can lead to the detection of microseep systems. On the principle that each hydrocarbon accumulation leaks minute volumes of gas, and the microbes that live of this gas can be detected at surface, certain exploration wells can be de-risked or sweetspots in shaleplays can be mapped.

Microbial Enhanced Oil Recovery (meOR) has been a concept for many decades. The idea that microbes could break down heavy hydrocarbons, produce surfactants or gasses to change miscibility or divert flow to enhance hydrocarbon sweep has been tried and tested several times. Until recently the complexity and diversity of microbial species indigenous to our oil reservoirs was poorly understood. With the advent of DNA technology we now know so much more and there is a better understanding on the ways we can utilize the natural microbial community to increase production and enhance recovery whilst equally mitigating the negative consequences such as microbial influenced corrosion, reservoir souring or system plugging.

Other applications of DNA for oilfield operations focus on synthetic DNA tracers to monitor injection systems and inter-well connectivity. Also, the use of DNA to identify productive zones or to provide a method for production allocation is already being implemented.

The world is only just embracing the power of DNA sequencing and our understanding of genetics and microbial life is experiencing tremendous growth. Within SGS, the use of DNA is already successfully being used for microbial monitoring and risk mitigation. It is likely that there will be many more applications in the near future.

*** For more information, please follow this link: <https://www.sgs.com/en/oil-gas/upstream/microbial-risk-assessment-services-miras>



Willem van Strien is a principal consultant for SGS' Microbial Risk Assessment Services (MiRAS) coordinating sampling, analysis and study programs for the prevention and mitigation of souring, biofouling and corrosion issues.

In 2010 he graduated from Utrecht University after studying geology. He started his career working for Staatsolie in Suriname and primarily focused on exploration in both onshore and nearshore blocks, while he also received exposure to operational activities. In 2011 Willem joined PDS and was contracted into Shell as a Geoscience Workflow Advisor. Through PDS he worked on plug-in developments for Petrel and worked with many of Shells expert geoscientists to bring technology and applied R&D to the geologists working in the project and asset teams. Furthermore, he has delivered numerous Petrel

workflow courses on topics ranging from depth conversion, geostatistics and integrated reservoir modeling. In 2013 Willem joined SGS Subsurface Consultancy as a senior geologist and has been involved in many multidisciplinary studies for oil and gas fields in the North Sea, West Africa, the Middle East and South East Asia. He has also worked on more specialized studies like coalbed methane, production optimization and reserve audits. Since 2016 Willem has focused on reservoir souring, microbiology and geochemistry and he now leverages SGS' vast lab and sampling capability to deliver integrated studies.

Diversity and inclusion: SPE and International Women's Day

SPE Imperial College London chapter celebrated International Women's Day this year by organising a forum towards encouraging females to undertake leadership roles as students and in their careers.



On 4 March, with 58 attendees, The SPE ICL Women Leadership Symposium commenced with a keynote address delivered by Professor Ann Muggeridge, the Chair in Petroleum Engineering at Imperial College. She was then joined for a panel session by Axelle Brière (Head of Human Resources, Tax & Contracts) and Elizaveta Poliakova, a Reservoir Engineer at Trident Energy Management Limited.

The panel session sparked questions to which insights were shared by the panellists: about their individual career journeys, making smart, albeit difficult choices about one's career future; and being bold in nominating oneself for leadership positions. The role of men towards achieving "EachforEqual" (the theme for IWD 2020) was not left out - by maintaining professionalism and respect in the work place, men contribute to an enabling environment for everyone without patronising their female counterparts.

On the whole, positive feedback was received from the audience, who participated ardently in the panel session, won freebies during a fun trivia game and received goody bags, thanks to the event sponsor Trident Energy Management Limited.



Accommodating a carbon-neutral future with intelligence and enthusiasm



Mark Beleski, SPE Review London Editorial Board, chats with Clara Altobelli, Vice President ESG and Business Innovation at Serica Energy.

Clara is currently responsible for the environmental, social and governance aspects of Serica's business as well as innovation.

Prior to her current role, Clara was Technical VP 2015 - 2020, International Asset Manager from 2012 – 2015, and Staff Petroleum Engineer from 2008 to 2012.

Who is Clara Altobelli? Tell us about yourself.

I'm a former petroleum engineer who now works for an independent oil and gas company called Serica Energy. I live in London and enjoy that I have a short commute and make the most of what London has to offer, although there's less clubbing and more theatre these days. I enjoy city life, but usually escape to the countryside at weekends either mountain-biking or going to the beach; it's very rarely too cold to go in the sea! I like organising things and my holiday itineraries are legendary. I also like to organise a good night out or a party. I tend to keep in touch with people, whether they like it or not, and enjoy networking and socialise. I love travel and getting to know people from different countries and cultures. I'm a bit of a skinflint and love a bargain, but will splash out if nagged enough.

Walk us through your career. How did you become Technical VP at Serica Energy?

I've actually just taken on the role of VP ESG and Business Innovation. This is a big step for me, moving away from the technical side of the business.

I started out studying mining engineering at Newcastle University, I was attracted to the variety of the course, compared to a pure science. I then converted to Petroleum Engineering, doing the MSc at Imperial College. I liked the global nature of the business and the ability to travel with the job. I also again liked the practical side to it.

After graduation, the job market wasn't great and I was in no rush to settle into a real job so I taught English in a university in Slovakia for a couple of years and then back in London to mixed nationality groups. This really developed my ability to communicate and to work with people from different cultures and backgrounds. It was also great for learning to present concepts in ways that were entertaining and easy to understand. Finally, when

the cost of living in London overtook my earnings, I managed to secure a job in the oil and gas industry. I worked in Burlington Resources for twelve years, starting out as a production technical assistant and working up through well-testing operations, development and production. I spent a lot of time in Algeria and really enjoyed the people I met and the working environment, as well as the privilege of working in the Sahara Desert. I moved to Serica Energy in 2008, excited by the prospect of working for a small independent company with a new development in Indonesia. I've stayed with the company ever since, working my way up to VP Technical and now VP ESG and Business Innovation. This is reflection of how the company and the business environment has changed over the years.

Tell us about how you underwent a transition from a Petroleum Engineer to the International Asset Manager.

Working for a small company gave me the opportunity of taking on a variety of roles, not just pure engineering. In order to look after assets in the UK, Ireland, Morocco and Namibia it was necessary to have skills in managing all aspects of the assets. I really enjoyed this and thrive in having a mixture of commercial, technical and diplomatic challenges.

You were President of the Mining Society during your Bachelor's of Engineering at Newcastle University. Would you say you benefited from this experience and has it played a big role in your personal development alongside pursuing a technical degree?

I'm a serial volunteer, from sixth-form onwards, I can't stop myself raising my hand for committee positions. I've been sixth-form chairperson, where I organised the best Christmas and summer parties, I



Accommodating to a carbon neutral future... continued

was President of the Mining Society in 1991 and am still organising the Newcastle Mining Annual Dinner, almost twenty years later. Following that, there's been residents' committees, SPE London Section chair and Continuing Education Chair, SPE Europe board-member etc. When in the thick of organising conferences and events, for no financial reward, you ask yourself why you bother, but in the end there is always an immense feeling of satisfaction and the people I've met along the way and information I've shared has made it more than worthwhile. I try hard not to let people take things too seriously and try to inject some fun into the organising, while still putting on constant pressure to beat the deadlines. This has been invaluable experience throughout my career.

You have worked in various companies of different sizes. Do you think there is a right time for the right place? Do you think that people at different career stages benefit more at companies of a certain sizes?

I enjoy the spirit of working for a small company where I can make a real difference, although I appreciate the advances that the bigger companies have made to technology and working practices with their larger research and development budgets. I think you should just take the opportunities where you can, but even if you work for a very large company, you should still question working practices and put your viewpoint forward as much as you can. I have never followed a mapped out career path, but have just done whatever felt right at the time. For example my first industry job was incredibly frustrating, punching in numbers into reports and not using much brain-power, but I persevered and kept pushing for the opportunity to work on an operated asset in Algeria, which eventually came. Having the MSc from Imperial provided me with the justification that management needed to give me the chance to progress relatively quickly.

We are currently undergoing another industrial (and economic) downturn. From your experience, and in your opinion what effect might we see on the industry in the next one to five years?

I think working practices will change, we will use more technology to do to routine tasks, people will

work remotely and costs will have to come down. I don't know if exploration will reduce as oil and gas prices stay low and governments move towards greener energy. Riskier exploration will definitely be more difficult to fund as will marginal developments. The transition from coal to gas will continue and so there will be gas demand, but oil demand is less certain with the move to electric cars and the current COVID19 crisis and its impact on the longer term. The M&A market will have to come up with some novel solutions to battle debt that cannot be repaid at current commodity prices, developments that cannot jump hurdles and how to demonstrate sustainable cash-flow to potential buyers. If prices stay low, decommissioning of some assets will come too early unless there is a paradigm shift in the way of working.

What current developments in the industry thrill you the most?

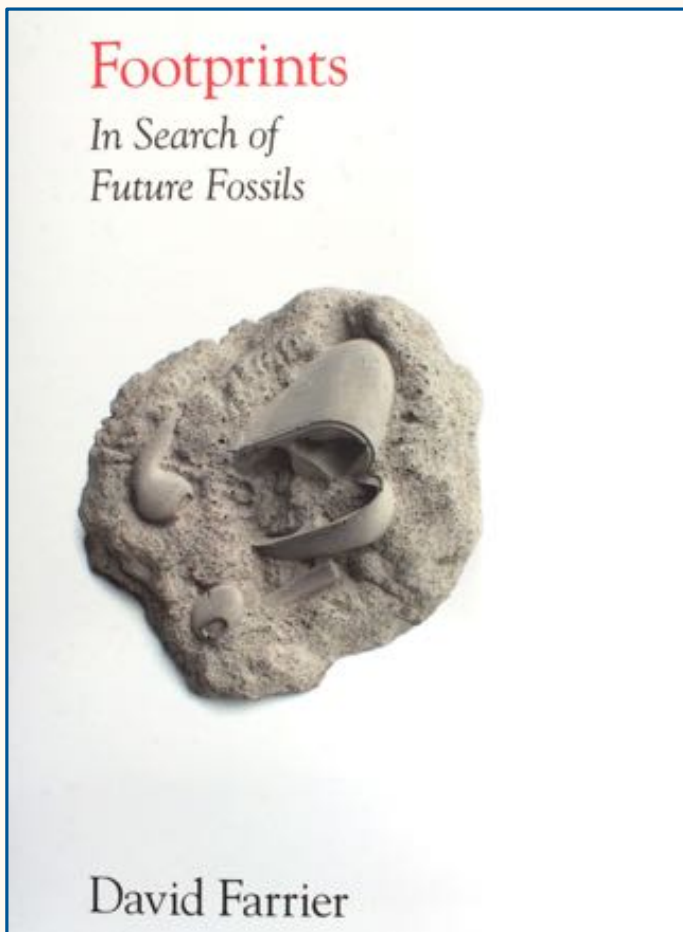
The energy mix, working to survive in a world that needs to reverse climate change, while still providing heat, transport and light. There are a lot of initiatives, digitalisation, carbon capture and storage, hydrogen that can help address the problem – I'm looking forward to tapping in to the skills and ideas that are out there and bringing Serica up to speed on what we can do as a company to make a real difference.

What would be your main advice to the future generation of leaders in the Oil & Gas industry?

Join the industry, learn your trade and make a difference. The industry gets a lot of bad press and with the climate emergency, it's not surprising. So much is reliant on oil and gas right now, the industry needs to exist, but it also needs to adapt to accommodate a carbon neutral future. I think solving these problems requires intelligence and enthusiasm and with an aging, but highly-skilled workforce, we need to attract people from all ages and backgrounds to succeed and, more importantly, adapt.

Future Fossils: The legacy of oil and gas, one million years from now

Editorial Board member Justin Reynolds reviews 'Footprints: In Search of Future Fossils', written by David Farrier and published by 4th Estate.



'The hills are shadows, and they flow/From form to form' wrote the Victorian poet Alfred Tennyson in his elegy *In Memoriam*, one of the first works of literature to try to make sense of the world from the vertiginous perspective of deep time opened by the then new science of geology.

'Footprints: In Search of Future Fossils' by David Farrier, an English lecturer at Edinburgh University, is a fresh effort to use myth, narrative and image to situate the human story in the context of an ancient planet. Where Tennyson looked for the deep past in his day, Farrier sifts today's world for signs of the far future, seeking to discern the traces we will leave millions of years from now.

The imprint of the oil and gas industry, for good and ill, is at the heart of his essay. As the writer Ryszard Kapuscinski observed, 'Oil is a fairy tale', like all fairy tales promising new freedoms, but at a cost. Farrier considers the industry's most notorious by-product, atmospheric carbon buildup. But his primary focus is its physical legacy: the infrastructure necessary to get oil out of the ground and transport it, and the electrified urban civilisation it has made possible.

He surveys the oil graveyards of Azerbaijan through the photography of Edward Burtynsky, whose wide-angle shots of skeletal derricks, rig carcasses, ghost refineries and blackened landscapes are the negative image of the shining cities and buzzing road networks constructed and powered by the energy they produce.

But long after those surface structures have weathered and worn away it is the boreholes sunk into the Earth that will remain. Laid end to end, they would make a borehole some 50 million kilometres deep, equivalent to the planet's entire paved road system. They go far deeper than holes dug by any other life form: the Kola Superdeep Borehole drilled by the Soviets pokes more than 12 kilometres underground, far below the silent depths inhabited by the most hardy microbial communities. Some will still be there more than a million years from now, when the great motorways and cities will survive only as asphalt and concrete stratum a few metres high. Curiously it is the low-lying megacities most vulnerable to rising seas, like Mumbai, Guangzhou and Kolkata, that will leave the deepest trace, their foundations, metro lines, pipes and cables caulked by thick layers of mud, shielded from corrosive wind, rain and sun.

Farrier finds a vivid example of the Earth's embalming power close to home, in the new Queensferry Crossing over the Firth of Forth, 'a miracle of light and air' seemingly held fast by brilliant white threads strung from three spindling towers. In fact this ethereal structure is secured by a massive bolus at its southern end created by the longest ever continuous underwater pour of concrete, 17,000 cubic metres tipped night and day for weeks into the rock below the river. A million years from now, when the bridge's elegant towers and 37,000



Future Fossils... continued

kilometres of cables are long gone the bolus is all that will survive, as Farrier puts it, 'written into the earth like speech marks around a lost quotation, bearing witness that here, once upon a time, a road crossed a river that will itself long since have vanished.'

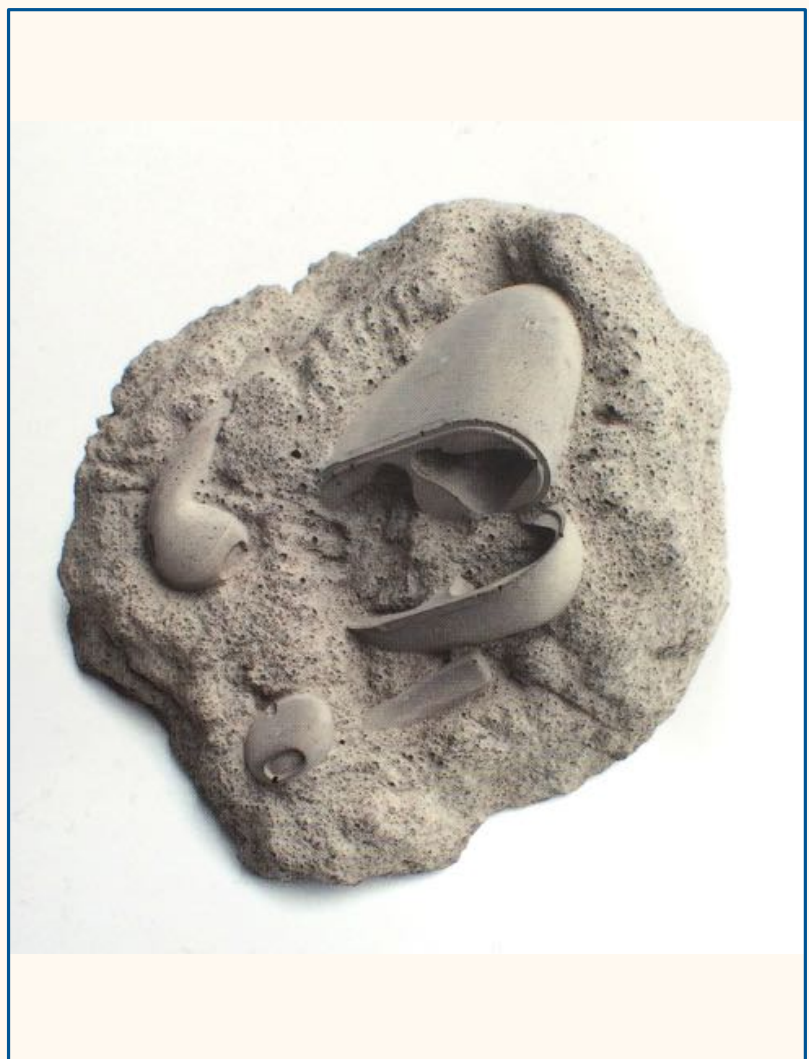
Elsewhere he charts the Homeric journey of one of oil's most ubiquitous products, the plastic bottle. His bottle begins life as algal bloom, and after a glacial 150 million years transmutation into oil, its slumber is suddenly disturbed when the borehole finds out its layer. Within a matter of weeks it becomes plastic, is shaped as a bottle, and lives a brief life in the light before being casually discarded into a river and swept out to sea. It is pulled across the oceans by currents and anticyclonic winds to the 20 million square kilometre expanse of the North Pacific gyre, where more than five trillion individual pieces of plastic accumulate into trash islands. After more than 350 years, tossed by passing ships, pecked by gulls, and nibbled by fish, the bottle finally breaks apart. Its fragments sink to the sea bed and, encased in anoxic sediment layers, slowly return to oil.

Another fascinating vignette contemplates the long, long afterlife of an alternative energy source, uranium. Older than Earth itself, forged in ancient supernovae more than six billion years ago, the element presents challenges of safe disposal that strain the imagination, as demonstrated by the elaborate 'nuclear semiotics' designed to protect the Waste Isolation Pilot Plant (WIPP) in New Mexico against disturbance by future generations.

Addressing the concern that words themselves have a half-life - linguists believe languages last for around 750 to 10,000 years - the system draws on semiotics, anthropology and mythology to design a warning system to resonate across millenia. WIPP will be wreathed with iconography intended to communicate a sense of dread, and even fear of supernatural retribution, comprising jagged rocks, claustrophobic tunnel architecture, and images of revulsion modelled on Edvard Munch's *The Scream*.

It's all quite different from the approach taken at Finland's Olkiluoto repository, where the waste is simply buried in copper canisters deep in the ancient bedrock and allowed to slumber under forests of black alder, forever.

Farrier's essay ends with a question asked by Italo Calvino in his novel *Invisible Cities*: 'If a New World were discovered now, would we be able to see it?' *Footprints* helps us make out that distant world at the edge of vision, 'by the eerie light cast by the onrushing future.'



What's happening in 2020?

In these challenging times, here are some ideas on how to continue to be culturally curious, do some virtual in-house travelling, broaden your mind, and stay active.



Satisfy cultural curiosity

National Theatre, London, UK
[Enter here](#)

Royal Opera House, London, UK
[Check it out](#)

Sydney Opera House, Australia
[What's on](#)

Musée d'Orsay, Paris
[Paris, where else!](#)



Travel the world - virtually

Empire State Building, New York
[Go there](#)

Taj Mahal, India
[Explore!](#)

The Hermitage Museum, Russia
[Visit virtually](#)

The Basilica of Saint Peter, Rome
[Step this way](#)



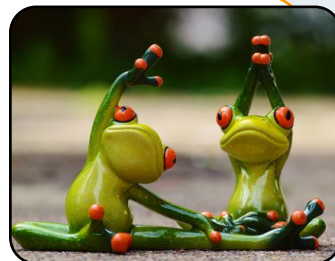
Learn new stuff

EDX
[Find courses](#)

Khan Academy
[Daily schedules](#)

Coursera
[Join for free](#)

Open University
[Study now](#)



Keep fit and active

Yoga with Adriene
[Keep flexible](#)

Fitness Blender
[Work it!](#)

Golds Gym
[Build strength](#)

305 Fitness
[Dance it out](#)

Meet the SPE London Board

SPE is a non-profit professional society with more than 156,000 members in 154 countries, who participate in 203 sections and 383 student chapters. SPE's membership includes 72,000 student members. The SPE London Section, with an average 2,000 members and seven associated student chapters, is an active section with an aim to connect, engage and promote the exchange of knowledge within the London energy community of technical and commercial professionals. The SPE London board is the governing body for the SPE London section. The different committees oversee the chapters various activities including the evening programme, various SPE events, Young Professionals, Women in Energy and associated student chapters.



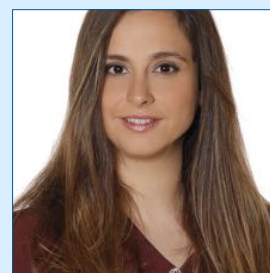
Chair
Maxim Kotenev



Past Chair
Olga Bradulina



Programme Chair
Tim Lines



WiE Chair
Isabel Asenjo



Continuing Education Chair
Adam Borushek



Continuing Education Co-Chair
Patrick Davies



Sponsorship Chair
Adrian Southworth



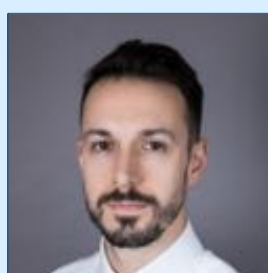
Student Chapters
Maria Astrid Centeno



Director
Miles Cudmore



Director
Alain Gringarten



Communications Chair
Mark Beleski



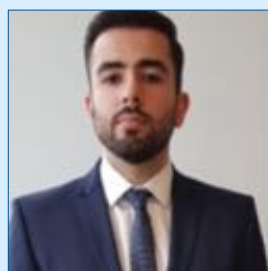
Big Data
Kanad Kulkarni



Secretary
Adam Zalewski



Treasurer
Vincent Penasse



Young Professional Chair
Shwan Dizayee



Membership Chair
Richard Prior

Challenging, fun, career-boosting, educational - why not explore the great opportunities with the SPE London team?



LOVE TO ORGANISE?

Volunteer with the events section of SPE London – you'll learn lots, be valued for your ideas, and have fun!



GOT GREAT IDEAS?

How about sharing and contributing as an SPE London Board member?

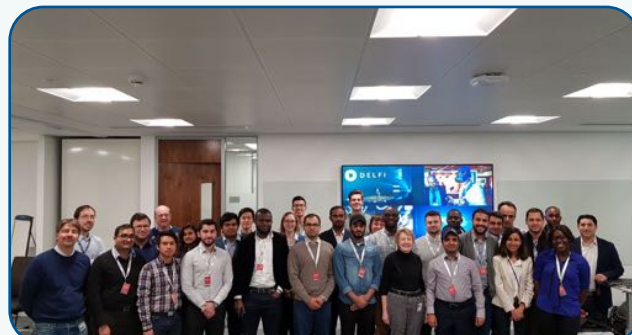


YOUNG PROFESSIONAL?

Learn, explore and meet your fellow YPs at SPE London

FIND OUT MORE!

Get in touch with our Editor, Elizaveta Poliakova via LinkedIn



**Skills. Increase knowledge.
Sharpen thinking. Boost expertise.
Solve problems. Gain confidence.
Stay competitive. Improve prospects.
Move ahead. Enhancement.**

Keep up with the rapidly evolving field of E&P through SPE training courses and webinars from seasoned industry experts.

Join the Society of Petroleum Engineers, a not-for-profit professional association that serves a growing worldwide membership in the E&P industry. SPE is a key resource for technical knowledge providing publications, events, training courses, and online resources.

To learn more and become a member, visit www.spe.org/join.

SPE—Setting the standard for technical excellence

Society of Petroleum Engineers

