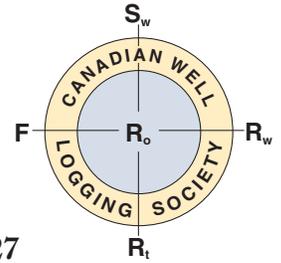


InSite

CWLS Magazine

March 2008 Issue 1 Volume 27



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33 SAMPLES/ METER

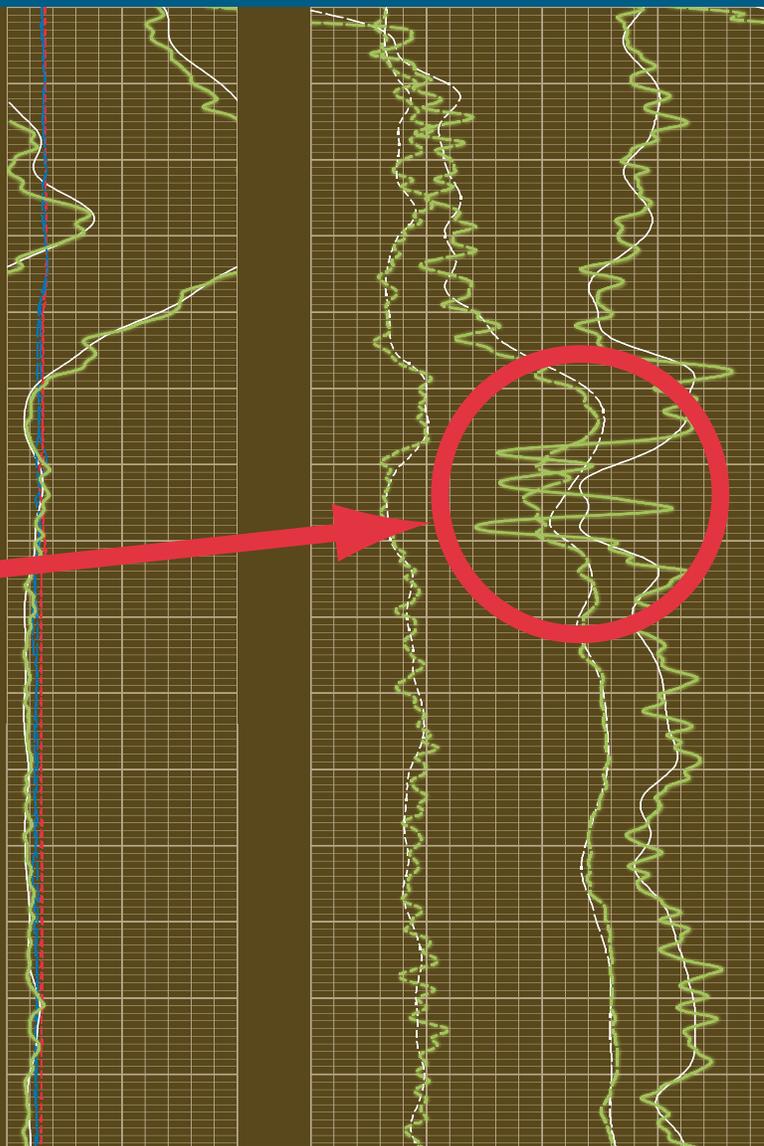
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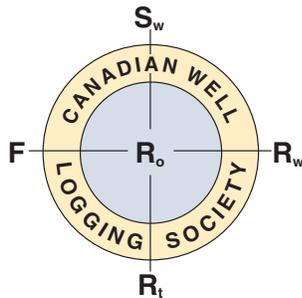
InSite

CWLS Magazine

March 2008

Issue 1

Volume 27



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The InSite is an informal magazine with technical content. The material is not subject to peer review. The opinions expressed are those of the individual authors.

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Cover Photos: *Tattakaw Falls near Field, BC. Photo courtesy of Vern Mathison*

*Trilobite from Burgess Shale Trail near Field, BC
Photo courtesy of Kelly Skuce*

If you have a photo that the CWLS can use on its next InSite cover please send a high resolution jpeg format version to Howard.Pitts@can.apachecorp.com or Kelly.S.Skuce@conocophillips.com. Include a short description of the photo with your submission.



The 2008 - 2009 CWLS Executive:

Front row (l - r): Kelly Skuce, Douglas Hardman, Jeff Taylor, Greg Schlachter.

Back row (l - r): Howard Pitts, Vern Mathison, Dave Ypma, Gary Drebit, Roy Benteau.



President's Message

I am going to dedicate my inaugural column to “Change”. Change occurs every year at this time as we transition from the previous year’s Executive to a new executive. The 2008 members of the CWLS executive are:

Jeff Taylor – Past President

Doug Hardman – Vice President

Dave Ypma – Secretary

Vern Mathison – Treasurer

Kelly Skuce – Publications Co-Chair – Position 1

Howard Pitts – Publications Co-Chair – Position 1

Greg Schlachter – Chair of Committees

Gary Drebit – Membership Chair

Thank you to the outgoing 2007 executives that are not returning for the great job last year:

Perer Kubica – outgoing Past President

Cindy Guan – outgoing Secretary

Gordon Uswak – outgoing Membership Chair

Tyler Maksymchuk – outgoing Publications Co-Chair

The 2007 Executive made some excellent progress by continuing the quality of the technical programs, increasing membership, attracting and rewarding student participation, securing the financial future of the CWLS by agreeing to participate in the CSPG/CSEG/CWLS convention every year and upgrading our website hardware and software. Although the 2008 Executive has only met once, informally, I can feel the energy and believe the society is in for an exciting year. Doug Hardman has already assumed his role as Vice President and secured a number of excellent luncheon speakers. Brian Glover the CWLS Co-Chair for the 2008 GeoConvention with the other Co-Chairs have put together a great technical program for the May convention. The new Executive will build on the strong foundation constructed by previous executives but create a story that is unique. The additional goal that the new executive has for 2008 is to add to our publications and augment our website generating a technical resource for new and senior members.

A lot has changed in our industry since the first well drilled in Canada about 150 years ago. The first electrical log was

recorded in 1927 in a well in the small oil field of Pechelbronn, in Alsace, a province of northeastern France. In 1946, working in large part off technology developed during World War II, the logging industry produced the first sonic log, the casing collar log. I believe the first well logged in the WCSB was in 1948 in the Lloydminster area. Ed Burge, who later participated in the first CWLS executive and became an Honorary Member, logged the well. The CWLS was founded in 1955, back when engineers used slide rules and if lucky used card-punch machines and card readers to submit programs to computers that had fewer capabilities than current advanced programmable calculators. Studies of world history show that technological change is exponential and this acceleration is as evident in our industry as any other. The first density log was not commercialized until 1962. In 1976 we were still recording logs on film and making prints on ammonia-based printers. By the late 1970’s, computerized logging trucks started to show up and computing centers used large DEC-10 and Perkin-Elmer computers. In the mid 1980’s the first portable satellite systems for log data became available. In the early 1980’s Hewlett Packard produced one of the first desktop computers and programmers quickly produced usable log analysis programs but the PC using 286 and 386 Intel chips and running DOS operating systems were not far behind. In the 1990’s everyone had a workstation integrating well log, core, geologic and seismic data calibrated with production characteristics into 3 dimensional block models. Today we carry laptop computers that rival high-end workstations, we use cell phones that can function as portable computer/GPS/music and video player, and we have unlimited access to knowledge and services through the Internet.

Technological changes have redefined the way we live and work. We are inundated with data measured in megabytes, gigabytes and terabytes. E-mail has become an essential but time-eating monster that follows us everywhere via wireless networks and piles up in directories. The ability to generate multiple analytical iterations and hone presentations to near art has prompted management to a better understanding and an insistence on better graphics. These changes have provided



more data but perhaps less time to analyze and understand it so commonly better software tools are expected to provide the answer. To effectively use these tools our members need a better understanding of petrophysics and the society needs to provide more technical support to members, particularly as the most experienced are retiring and the most effective are enthusiastic but young.

The CWLS with its website provides Western Canadian formation water resistivity data, special core data, and technical references in addition to events information, however, more is needed. I found it interesting that most CWLS members join to access our database as less than half of CWLS members attend any function. The CWLS needs to on our website, connect through the use Q&A sessions or blogs less experienced members to industry experts and stimulate recorded debate on contentious issues. In addition, to help less experienced members we need an updated Canadian Glossary, basic log interpretation guide and special core help section. For the experienced member, the CWLS could augment the special core database and provide digital as well as raster data. For a technical society publishing is job one. Let us know if you have any ideas for publications or feedback on the website.

From time to time I love to look through a book I bought called: "Cavalcade of Canadian Oils" written by A. Garfield Heyes and published in April 1948. It is a treatise on the history and development of the Canadian Oil Industry of the time so I thought you might appreciate the map showing the Principal Oilfields of Western Canada in 1948. He writes: "Oil is the Blood of the earth flowing through Fortunes' Field to enrich Mankind..... Its most generous rewards generally go to those who combine some degree of thought and action." I can assure you that the new executive will combine thought and action to add value to the CWLS membership and Formation Evaluation community, however, to maximize these efforts we will be need many volunteers. My personal thanks to all those that work so hard to make our society what it is today and I encourage all members to help build our future.

*Roy Benteau, P.Geol.
CWLS President*

Calgary Well Log Seminars 2008

by Professional Log Evaluation
and W.D.M. (Bill) Smith P.Geol.

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or at 403 265-3544

UNDERSTANDING WELL LOGS

May 26

Calgary Petroleum Club, lunch included. This one day seminar is designed for Land, IT and non technical support staff who wish to have a qualitative understanding of well logs. Math content is minimal and no prior well log experience is needed. Candidates will learn to recognize obvious zones of interest and understand the importance of the basic log curves.

Fee is \$450 + GST

BASIC WELL LOG SEMINAR

Jan 9-11, May 28-30, June 4-6, Oct 1-3

Calgary Petroleum Club. This popular seminar is intended as a refresher course and is also suitable for recently graduated geologists, engineers and technicians with some knowledge of well logs. A complete discussion of the qualitative and quantitative applications and the newest logs.

Fee \$1,250 + GST

INTERMEDIATE WELL LOG SEMINAR

Jan 16-18, June 11-13, Oct 8-10

Calgary Petroleum Club. This seminar provides an in depth look at the relationships for well log analysis and includes a reconnaissance method for finding by passed zones, a module on shaly sand analysis, responses from the newest logs, through casing gas detection, and a section on Coal Bed Methane logging. CD provided with reservoir log plots for 80+ reservoirs. Designed for candidates who have used logs qualitatively and wish a refresher and update on quantitative applications.

Fee \$1,450 + GST



Past President's Message

The CWLS has had a very active and successful 2007. Over the past year, the CWLS held 9 technical luncheons of which 2 were sold out, awarded 2 student scholarships, published 4 InSite magazines, increased student membership by 64 and overall membership by 118. Our membership now stands at over 700 – the highest in our 53 year history. With the increased membership, we have also agreed that the CWLS should participate every year in the CSPG/CSEG/CWLS joint conventions rather than every other year. Last year, we totally revamped the CWLS.org website which will lead to improved functionality for our increased numbers.

These successes have been made possible by the many volunteers who contribute their time, effort and expertise to make the CWLS work, and my thanks go to the members of the past executive for their contributions.

I would like to take this opportunity to thank Roy Benteau (our past VP) for organizing a very successful AGM on February 19th at the Palliser. We had 155 attendees come out to meet colleagues, socialize and listen to our speaker, Jeff MacInnes. Additional thanks to Cindy Guan (past secretary) for organizing the printing of programs, reports and sponsor recognition forms.

The AGM business meeting proceeded smoothly. It was my pleasure to present Distinguished Service Awards to Mike Eddy and Robert Bercha. Both are long time members who made major contributions to our society. The awards for the best technical luncheon presentations of the past year were awarded to Bob Everett for his talk on An Alternative Approach to Find Vshale – Handling the Influence of Clay Minerals on Estimates of Porosity and Permeability and Mike Sullivan for his talk on Calibrating Permeability in Reservoir Models of Complex Carbonate Systems using PLT Logs. These awards came with \$1000 and \$500 cheques – congratulations! My thanks also go to the past President Peter Kubica for organizing the election ballot.

Congratulations to our new executive, and also thanks to all those society members who were in the running but did not get elected. Please, run again next year, as I will be looking for candidates!

After the AGM business was concluded, we all had a really good dinner, and a very interesting and entertaining presentation by Jeff MacInnes. His talk and his visual clips from his worldwide challenging adventures were outstanding.

Our new President, Roy Benteau, needs little introducing. He was the CWLS VP for the last year, responsible for organizing our monthly lunch meetings. He is a long time society member and presently a Petrophysical Specialist at EOG. I congratulate Roy and his newly elected executive and wish them all the best in 2008.

2007 has been a successful and rewarding year. In 2008, as “Past President”, I will be supporting the incoming President, Roy Benteau, as well as soliciting CWLS executive candidates for next years’ election. Please contact me if you are interested in volunteering your time to keep this organization active. Once again, it was a pleasure working with the current executive and volunteers and I would like to thank the membership for allowing me to serve you as President this last year!

*Jeff Taylor, P.Eng.
CWLS Past President*



CWLS 2008 to 2009 Executive

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EOG Resources

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Email: roy_benteau@eogresources.com

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Petro-Canada Oil and Gas

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Email: dhardman@petro-canada.com

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Nexen Inc.

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ConocoPhillips Canada

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Editors Message

Welcome to the new issue of the InSite Magazine. Yes, we are still here in print, however more and more of our content is being posted on the website at www.cwls.org. Check out the new webcast section with last month's technical luncheon speaker, Dave Amendt speaking about "Identifying Critically Stressed Fractures Using Borehole Geomechanics: A Case Study in the Nikanassin.

The CWLS is once again participating in the annual C3GEO Convention (but now on an annual basis) coming up on May 12-15, 2008 so please come to our booth and show your support.

On to some bad news. As one of the editors of a non peer-reviewed magazine, and volunteer as well, we at the CWLS have encountered one of the risks of not reviewing every article submitted to us for publication, plagiarism. Our magazine published an article by Bandar Al-Anazi titled "Fundamentals of the Pickett Plot" in our Tech Corner section. It was very well written and sound however, the problem was it was taken wholly from a manual by Dr. John Doveton and others of the Kansas Geological Society in their PFEFFER logging software

manual. I have spoken with Bandar Al-Anazi who has expressed his apologies to the CWLS and John Doveton and others. Bandar has said he received the article from someone else and confirmed with him it was okay to publish as his own.

Once again, the CWLS InSite Magazine apologizes for any inconvenience the article publication has caused Dr. Doveton and the Kansas Geological Society.

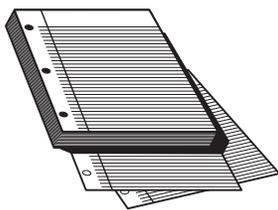
Please enjoy some select petrophysical abstracts from the C3GEO Convention and check out the pictures at the end of the magazine of the CWLS Annual General Meeting. Thanks to Tyler Maksymchuk for the pictures and a great speech by Jeff MacInnis.

As always, please keep the papers, questions and pictures coming in to the CWLS for publication.

Thanks.

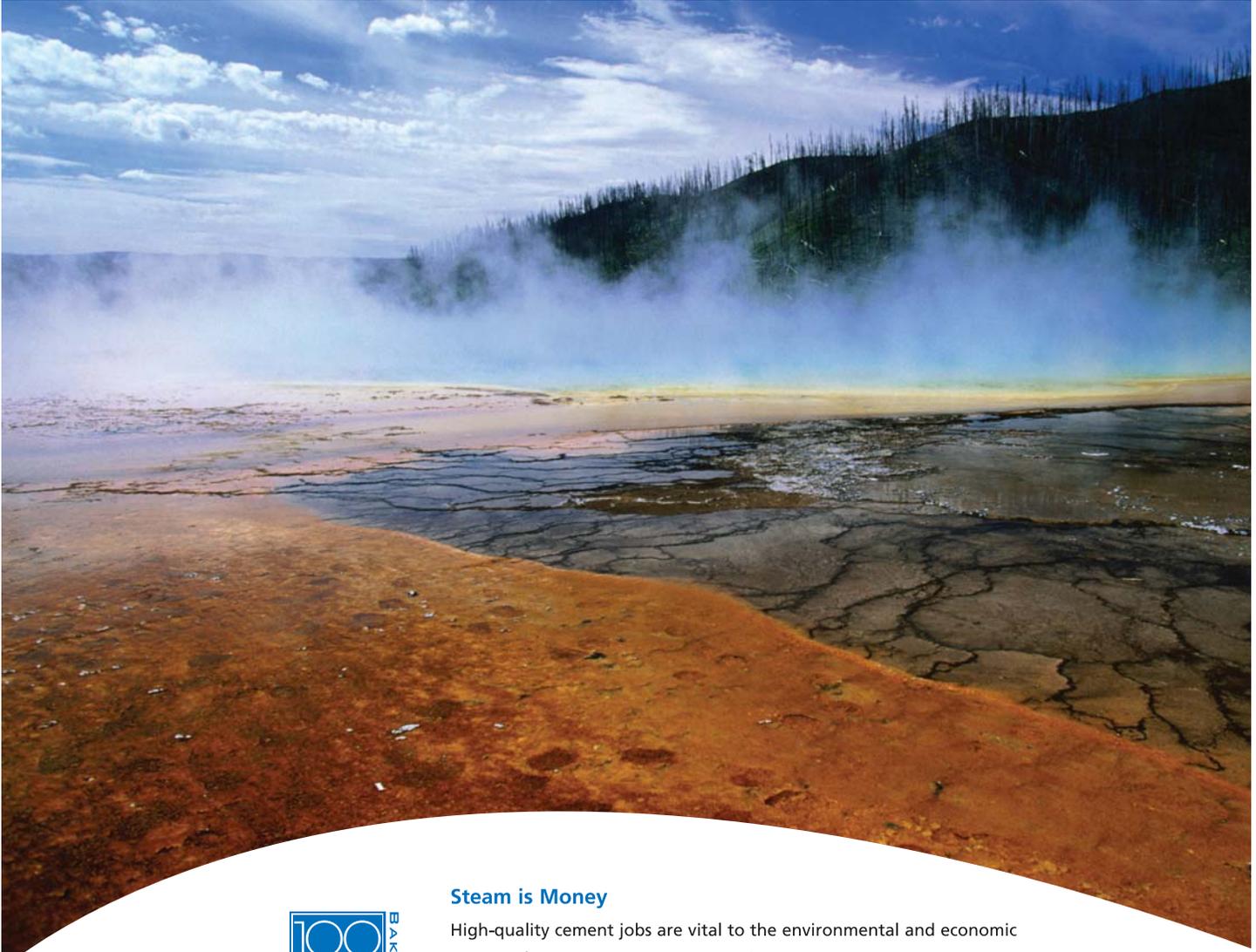
*Kelly Skuce
Howard Pitts
CWLS Publication Co-Chairs*

Call for Papers



The CWLS is always seeking materials for publication. We are seeking both full papers and short articles for the InSite Magazine. Please share your knowledge and observations with the rest of the membership/petrophysical community. Contact publications co-chairs Howard Pitts (Howard.Pitts@can.apachecorp.com) at (403) 260-6248 or Kelly Skuce (Kelly.S.Skuce@conocophillips.com) at (403) 260-1931

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As the Winch Turns

My first winter working as a wireline Field Engineer was one that I will never forget. It was my first shift alone as I was given the go ahead to no longer travel with a training engineer. I was “it”. My truck and crew were going to be sent up to Rainbow Lake, Alberta on December 30, 1998 and were told to meet a hotshot of a formation imaging tool on location. We had been logging for about a week without ever making it back to home base and things had been going relatively well considering it was my first hitch without help. We had no failures, a couple of silly mistakes on my part, and my operators were looking after me.

My task on this day was going to be to log a section of a deep well for a thief zone and the only thing I needed to do was to correlate to the existing open hole run and to give the client a field copy of the image. 120 metres with 50 metres of overlap above and below the zone and that was it. I was told, do not try to interpret the log, do not try to make more of it than what it was, and do not by any stretch do things that would compromise the validity of the log. I had never seen this tool before, let alone log it and charge a whole lot of money for it. My best approach was to read the help files, all the reference materials I had, and to try to ensure that I did not mess anything up.

My training engineer had been a very good mentor and taught me a lot, however he was, how should I say; blunt. He was the one sending me the image tool from our shop and his exact words before getting off the phone were; “Do not screw this up”. As we drove from wherever we were, I remember getting the sweaty hands, knotty nervous stomach pains, and I hoped and prayed that I could do a good job on this one.

My operators as I briefly mentioned, were already looking after me this shift and this was going to be no exception. I got on the radio to Brian and said, “Guys, we are heading to Rainbow Lake and they

want us to run an image log. They are ready for us on location but the tool will not arrive till tomorrow morning.” The reply I received was to instead of stop and rest, both wanted to get to location, and then rest. I found that it was always better to be early and prepare for the job ahead of time, so I agreed. If you had all things ready to go when the rig or in this case the tool arrived, things would be much smoother than rushing to get the job going.

The next morning the tool arrived as scheduled, the rig was ready as scheduled, and the tool came of the hotshot truck and was hanging in the derrick ready to run in before I even could get my glasses on and wake up. I was ready and so were they. Let us do this. For those of you who never sat behind the desk of logging truck cabin before it was pretty exhilarating and even though I did not quite know what exactly I was doing at the time I did have one of the Senior operators say something I will have to paraphrase for the sake of this story. He basically told me in not so many words that I better not do anything to compromise the job, he wanted to go back to High Level for New Year’s eve as there are things he wanted to do back at the hotel to celebrate the new year. I did not ask, but one could well imagine, a whole bunch of oil field workers in the middle of nowhere, at the Stardust on New Year’s eve. Hmmmm.

Well we settled in to our spots and so the job began. To skip ahead in the story just a bit we ended up bridging the first time we tried to log the tool, and were successful on the second attempt after a very long wiper trip. It was now about 8 PM on the 31st of December, we were at the starting point of where I was going to log this image tool. The tool was running, all the lights on my computer screen gave every indication that it was making measurements, so I politely told the operator at the winch to start coming up. It was at that moment as I started to open the calipers, the lights in the cabin fell off, and that all too



familiar sound of an electrically charged hum died off. Oh man, what did I do? Before I could turn around and see what had happened the same operator that gave me stern orders to not mess anything up, went bounding out of the cabin to see what happened. It turned out that the other operator who had been sleeping in the sleeper berth of the truck had knocked out the hydraulic power take off switch by accident. Within moments the grinding of gears could be heard and all the lights gave roaring back on. I want to say it was likely a matter of a few minutes before my operator had everything working again, but it felt like a few seconds. Everything happened so fast, I was amazed at how quickly these guys worked when things were going to hit the fan.

That night, after much excitement we got the well logged as requested, I still had no idea if I had done everything correctly, and but we were going to make it to High Level for the midnight entertainment on this day. As we drove our trucks back, I was glad that I had some experience in the truck today, because I probably would have been stuck there for hours not really knowing how to troubleshoot that particular problem.

I watched the digital clock in the truck turn 12:01 AM as we drove maybe 10 minutes from our destination, and got on the radio and said, "Happy new Year boys." The reply was nothing more than a "Ya, whatever".

Buckey Iams

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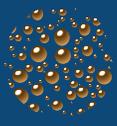
New Members

- | | |
|---|---|
| Gary Calderwood
Enseco Energy Services | Brian Homer
Weatherford Canada Partnership |
| Brenda Barkley, Core Laboratories | Laurie Butkovic
Total E&P Canada Ltd. |
| Patrick Brennan | Bryce Breunig, Baker Atlas |
| Paxton Livingston
Datalog Technology Inc. | Brian Evans |
| Rabindra (Rabin) Thanju
Energy Resources Conservation Board (ERCB) | Brian Bartley
Schlumberger Wireline |
| Josh Caswell, Action Energy | Melanie Pedersen
Marble Point Energy Ltd |
| Launie Schiewe, Terralliance | Jesse Peterson
MEG ENERGY Corp. |
| Elizabeth (Buzzy) Blair Mitchell
Apache Canada Ltd | Tim Watters |
| Gregg Vernon
Petro Andina Resources Inc. | Colin Heckenberg
RG Geologging Australia Pty Ltd |
| Malcolm Rider | Kirk Stewart, RECON |
| Caley Cobbe, Shell | Simon Corti |
| Constantin Pacurar, Fugro-Jason | |

Student Members

- Jason Motkoski, University of Calgary
- Ashish Rangami, University of Calgary
- Marie van Egteren, University of Calgary
- David Edward Kupp, University of Calgary
- Elizabeth van Egteren, University of Calgary
- Nand Lal Khatri, University of Calgary
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BACK TO EXPLORATION

2008 C3Geo Convention
 May 12 – 15, 2008
 Calgary, Alberta, Canada



The 2008 CSPG CSEG CWLS Convention is just a few months away and there are some exciting changes to the program this year – two fascinating luncheon speakers, a great complimentary buffet luncheon on the Exhibit Floor and a revitalized Student/Industry night join traditional favourites such as the Core Meltdown and Icebreaker. Watch your mail for the Final Circular, which will tell you everything you need to know about the Core Conference, Continuing Education offerings from all three partnering societies, the Convention schedule and registration!

REGISTRATION OPENS MONDAY MARCH 17, 2008

Registration fees for this year's convention are as follows. **Please note prices do not include GST:**

	Early Bird Registration Deadline: April 11, 2008 (cutoff time is 6:00pm MST)	Regular Registration Deadline: April 25, 2008 (cutoff time is 6:00pm MST)	On-Site Registration May 12 – 15, 2008
Member (CSPG/CSEG/CWLS)	\$325	\$425	\$525
Non-Member	\$425	\$525	\$625
Retired Members (CSPG/CSEG/CWLS)	\$165	\$165	\$165
Student*	\$75	\$75	\$75
Presenter	\$150	\$150	\$150
Student Presenter	\$0	\$0	\$0
Day Pass – Exhibit Floor Only Monday or Tuesday	\$50/day		
Luncheon Tickets Monday or Tuesday	\$50 each		
Icebreaker Tickets (additional tickets may be purchased for guests of convention delegates)	\$35 each		
Core Meltdown Tickets	\$15 each		

Avoid the Monday morning on-site registration rush...REGISTER EARLY!

On-line registration will be available through www.GEOconvention.org using VISA or MC.
 Please make cheques payable to 2008 CSPG CSEG CWLS Convention.

Registration forms with payments may be mailed or dropped off to:

BACK TO EXPLORATION: 2008 CSPG CSEG CWLS Convention

c/o CSPG Office
 #600, 640 8th Avenue SW, Calgary, Alberta T2P 1G7
 Fax: (403) 264-5898

Registrations received after **6:00pm (MST)** Friday, April 25th 2008 will be held and processed on-site. On-site registration fees will be applied.

BACK TO EXPLORATION

Luncheon Speakers



Monday Luncheon Speaker

Sponsored by:



Rick Mercer

Think *This Hour Has 22 Minutes* ... Think *Made In Canada* ... Think *Talking To Americans*... Think *The Rick Mercer Report*. Now you understand why Rick Mercer has become “Canada’s

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Rick Mercer is without a doubt one of this country’s most highly respected writer/actors, having garnered many awards and accolades since he burst on to the stage at the National Arts Centre in 1990. He has won numerous Gemini awards for his writing and performances, the Sir Peter Ustinov Award at the prestigious Banff Television Festival, and was the 2004 recipient of The National Arts Centre Award at the Governor General’s Awards for the Performing Arts. He is also the only civilian to be awarded the

Canadian Arms Forces Commander Land Force, Command Commendation—this in recognition of his ongoing support of Canada’s armed forces, which has included several visits to Canadian troops in Afghanistan. But the awards only tell a small part of the story. Mercer has become Canada’s most celebrated entertainer because of his ability to connect with ordinary Canadians. Nowhere is that better illustrated than in his historic one-hour CBC special, *Rick Mercer’s Talking to Americans*, which attracted 2.7 million viewers across Canada, making it the highest rated comedy special in the history of Canadian television. The special drew rave reviews and media attention across North America and the world.

Hailing from St. John’s Newfoundland, Mercer premiered his one-man show at Ottawa’s National Arts Centre (NAC) in 1990. *Show Me the Button, I’ll Push It* became a national hit and was performed from St. John’s to Vancouver. His second one-man show, the critically acclaimed *I’ve Killed Before; I’ll Kill Again* opened at the NAC in 1992. It played to sold-out houses across Canada. A third one-man show, *A Good Place to Hide*, premiered at the NAC in May 1995, and was met with critical praise and full houses. He has hosted the *East Coast Music Awards*, *The Gemini Awards*, *The Juno Awards*, the history series *It Seems Like Yesterday*, the annual Canada Day show from Parliament Hill, and the CBC Television special *The Next Great Prime Minister*. *Time* and *Maclean’s* have published his work, and in June 1998, his first book, *Streeters*, was published by Doubleday and quickly rose to #1 on the *Globe and Mail’s* National Best Seller List. Mercer currently hosts *The Rick Mercer Report*, one of the CBC’s most popular and acclaimed shows. A book based on the show will be released in September 2007.



Tuesday Luncheon Speaker

Sponsored by:



Peter Tertzakian

Best selling author of *A Thousand Barrels a Second*, published by McGraw-Hill,

Peter Tertzakian is the Chief Energy Economist of ARC Financial Corporation, one of the world’s leading energy investment firms.

Peter’s background in geophysics, economics and finance, combined with his entrepreneurial spirit, helped him rise from the trenches of hands-on oil exploration fieldwork to become an internationally recognized, top-ranked expert in energy matters.

Often seen and heard through media outlets around the world, Peter’s been a featured guest on many high-profile radio and television shows including *The Daily Show with Jon Stewart*. In print, Peter has been featured in *US News and World Report* and has contributed editorials to widely read publications like *The Globe and Mail* and *Forbes.com*. He also writes a weekly column, *ARC Energy Charts*, and is a sought after public speaker.

Peter has an undergraduate degree in Geophysics from the University of Alberta, and a graduate degree in Econometrics from the University of Southampton, U.K. He also holds a Master of Science in Management of Technology from the Sloan School of Management at MIT

He lives in Calgary, Alberta, one of the world’s leading oil and gas centers, with his wife and two children.

BACK TO EXPLORATION

Field Trips & Short Courses

PRE CONVENTION - FIELD TRIPS

FTP01

Virgelle Member at Writing-on Stone Provincial Park, Southern Alberta: Analogue for a Subsurface Exploration Target

Leader: Rudi Meyer
Date: May 7 - 8, 2008
Maximum Attendance: 14 participants

The primary aim of this field trip is to provide an overview of high-resolution stratigraphic relationships and depositional facies within Virgelle Member sandstones of the upper Cretaceous Milk River Formation, southern Alberta. Continuous outcrops offer three-dimensional exposures to illustrate relevant sedimentologic and stratigraphic linkages across a range of scales, from metre-scale bedforms to successions 5-30 km apart.

FTP02

Geological Walking Tour - The Building Rocks of Calgary

Leader: Bill Ayrton
Date: May 7, 2008
Maximum Attendance: 30 participants

This interesting half-day tour examines the rocks, sedimentary features and fossils beautifully displayed on the buildings of Calgary. We will also see the building rocks used by our landscapers and sculptors. The rocks range in age from PreCambrian to Tertiary, and come from as far away as Scandinavia and India; some were even quarried locally.

FTP03

Triassic Sedimentary Framework and Sequence Stratigraphy, Williston Lake, British Columbia

Leader: John-Paul Zonneveld, Ph.D.
Date: May 6 - 9, 2008
Maximum Attendance: 14 participants
(Trip begins and ends in Fort St. John)

The Williston Lake, British Columbia, field course centers around the sedimentologic and stratigraphic development of the Triassic succession in Western Canada. Excellent outcrop equivalents of all major producing subsurface units (Montney, Doig, Halfway, Charlie Lake, Baldonnel and Pardonet) are observed and discussed. For more information, please visit www.GEOconvention.org.

POST CONVENTION - FIELD TRIPS

FTPST01

Fluvial Architecture of the Lower Tertiary Porcupine Hills Fm, Southwest Alberta

Leaders: Derald Smith & Peter Putnam
Date: May 16, 2008
Maximum Attendance: 15 participants

Fluvial architecture in the Porcupine Hills Fm. (Paskapoo equivalent) of southwestern Alberta is best exposed where Willow Creek cuts through the north end of the Porcupine Hills. These early Tertiary rocks consist of channel-fill and crevasse-splay sandstones and overbank-shallow lacustrine poorly cemented siltstones. On the basis of stratigraphy, architecture and lithologies, we interpret these fluvial facies as being most analogous to modern anastomosing fluvial deposits. Hydrocarbon-bearing upper Cretaceous Willow Creek, St. Mary and Belly River Formations have similar fluvial architecture to that of the Porcupine Hills. For more information, please visit www.GEOconvention.org.

FTPST02

Upper Cretaceous Shelf and Shoreface Sandstones: Montana Outcrops and Alberta Basin Cores

Leaders: Peter Putnam & Derald Smith
Date: May 20 - 22, 2008
Maximum Attendance: 15 participants

Upper Cretaceous wave-impacted sandstones form important (historical and current) petroleum reservoirs in western Canada and Montana. Although sheet-like in gross geometry, sufficient heterogeneity exists in these deposits to influence exploration strategy, well operations, completions and production practices. Excellent exposures of these units in north-central Montana provide useful analogues for those geoscientists exploring or exploiting these types of reservoirs anywhere in western Canada.

FTPST03

Jurassic and Lower Cretaceous Deposits of Northeast British Columbia: Exploring the Surface and Subsurface

Leaders: Godfried Wasser
Date: May 20 - 23, 2008
Maximum Attendance: 11 participants
(Trip begins and ends in Fort St. John)

This is a 4-day course, comprising a fieldtrip at Williston Lake, a core workshop and lectures on the N.E. British Columbia gas reservoirs covering the Bluesky to Nordegg interval. Areas discussed include Buick, Beg, Blueberry, Peejay, Bernadette, Siphon, Silver, Cutbank and Grizzly. The course addresses petrography, log analysis, core and cuttings examinations as well as production and pressure history.

FTPST04

Major Dolomite Reservoir Types, Outcrops and Subsurface Analogues Western Canada: Distinct Types or Continuum?

Leaders: Graham Davies & Jack Wendte
Date: May 21 - 22, 2008
Maximum Attendance: 20 participants

This field seminar will compare the origin of dolomite and evolution of pore systems of two lithologically distinct types of dolostones in the Canadian Rocky Mountains. The first day of the seminar is in Calgary and consists of a half-day of lectures on these dolostones and their subsurface analogues, and a half-day core seminar focused on Devonian 'Cairn'-style dolostones and origin of porosity in dolostones. The second day will be a field trip to view hydrothermal dolostones hosted in Cambrian exposures in southwestern Alberta and southeastern British Columbia.

FTPST05

Geology of the Athabasca Oil Sands

Leaders: Mike Ranger & Murray Gingras
Date: May 26 - 29, 2008
Maximum Attendance: 20 participants
(Trip begins and ends in Ft. McMurray)

This three-day field excursion to the Fort McMurray area provides an excellent opportunity to observe the geology of the Athabasca Oil Sands, as well as the engineering and mining technology related to recovery of the bitumen. Numerous outcrops along the Athabasca, Christina and Steepbank Rivers will be visited by high speed jet boat and helicopter.

PRE CONVENTION - SHORT COURSES

SCPRE01

Sequence Stratigraphy: A Practical Understanding of Basinal Controls for Mapping and Exploration

Instructor: Andrew Miall
Date: May 5 - 6, 2008

A practical course designed to assist the petroleum geologist in the identification of different types of sequence, based on the generating mechanisms. The sequence architecture in a given basin (thickness, extent, isopach pattern, composition) may reflect the action of several simultaneous processes interacting locally to globally over a wide range of time scales.

BACK TO EXPLORATION

Field Trips & Short Courses

SCPRED02

Shale Gas Critical Fundamentals, Techniques and Tools for Exploration Analysis

Instructor: Basim Faraj
Date: May 5, 2008

This one day course will introduce the fundamental differences between conventional, hybrid and shale gas plays. Source and reservoir rock attributes of shale gas plays will be discussed as well as GIP calculations, water, oil and gas saturations, essential laboratory, and optimum geochemical and mineralogical parameters. Slickwater completion (vertical and horizontal) lessons learned from the US will be detailed. Canadian plays will be highlighted and discussed.

SCPRED03

Basic Petroleum Economics

Instructor: Dave Volek
Date: May 6, 2008

Learn the principles of cash flow discounting and present value—and how these principles apply in making capital investment decisions in a world of risk. Bring your laptop with a spreadsheet program for lots of “learn-by-doing”. Visit the Finance section of www.oilfinancier.com to inspect this seminar's topics.

SCPRED04

Canada Rocks: The Geological History of Canada's Sedimentary Basin

Instructors: Nick Eyles and Andrew Miall *
Date: May 7 - 8, 2008

“Canada Rocks: The Geologic Journey” is a new book, illustrated with a wealth of new photographs, maps and diagrams, that describes the four-billion-year geologic history of Canada for a non-technical audience. This course describes and explains the Phanerozoic history of Canada's sedimentary basins by situating the development of the North American continent within the context of global plate-tectonic evolution.

* Instructor

SCPRED05

Sequence Stratigraphy: Principles and Applications

Instructor: Octavian Catuneanu
Date: May 7 - 9, 2008

This course presents the concepts and practical applications of sequence stratigraphy for petroleum exploration and production. All concepts are illustrated with field examples of seismic, well-log, core, and outcrop data. In-class exercises emphasize the recognition of sequence stratigraphic surfaces and systems tracts on well-log cross-sections, seismic lines, and outcrop profiles.

SCPRED06

Practical Sequence Stratigraphy: Concepts and Applications

Instructor: Ashton Embry
Date: May 5 - 6, 2008

This two-day course presents the concepts and practical applications of sequence stratigraphy for petroleum exploration. Workshop exercises will emphasize the recognition and correlation of sequence stratigraphic surfaces on well log cross-sections.

Following the course, participants will have a clear understanding of the use of sequence stratigraphy for predicting facies types and geometries away from control points.

SCPRED07

3-D Seismic Interpretation

Instructor: Bruce Hart
Date: May 7 - 8, 2008

An introduction to 3-D seismic technology, emphasizing fundamental principles of the interpretation process. Course touches on physical basis of seismic method, acquisition and processing effects on data interpretability, 3-D survey design, 3-D visualization, and 3-D interpretation workflow. Short exercises, case studies and live demonstrations emphasize course material.

SCPRED08

Concepts, Models, and Case Studies of Dolomitization – with Applications to Hydrocarbon Exploration and Development

Instructors: Hans Machel and Jay Gregg
Date: May 8 - 9, 2008

This course summarizes the major advances and current controversies in dolomite research. A major part of this course deals with the various dolomitization models, from early to late and from shallow to deep, from hypersaline reflux to hydrothermal dolomitization and MVT mineralization. These concepts will be applied to hydrocarbon exploration and development, with specific reference to the Devonian of Western Canada.

SCPRED09

An Introduction to Petroleum Geostatistics

Instructor: Clayton Deutsch
Date: May 8 - 9, 2008

The fundamentals of geostatistical tools for constructing models of geological heterogeneity and quantifying uncertainty are presented. The practical application of tools and procedures for constructing high resolution models of surfaces, facies and petrophysical properties will be covered with examples. Emphasis will be placed on reproducing all available data and quantifying uncertainty for improved decision making.

SCPRED10

Exploration 101: Basic Geological and Seismic Principles in the Upstream Petroleum Industry

Instructor: Easton Wren
Date: May 9, 2008 (Half day)

This is a brief, yet illuminating, introduction to exploration and will take the participant through the normal progression from the origins of oil and gas to geological concept to prospect definition to drilling the exploratory well using a combination of geological and seismic tools. This course is open to all interested parties, but preference will be given to exhibitors and students.

SCPRED11

Risk and Analysis of Exploration Plays

Instructor: Gary Citron
Date: May 9, 2008

This course serves as a companion with R&A's successful course “Exploration Economics, Risk Analysis and Prospect Evaluation.” While The Prospect is the economic unit of exploration, The Play is the operational unit. Accordingly, this course addresses what many authorities believe to be the most difficult and critical task in Petroleum Exploration: the selection of plays and concessions in which to explore.

SCPRED12

The Stratigraphic Setting of Lower and Middle Triassic Strata, Western Canada Sedimentary Basin

Instructor: Jim Dixon
Date: May 9, 2008

The objective of this course is to help explorationists understand the regional stratigraphic setting of Triassic rocks and how this can be used in a more local exploration program. The course is four hours long and consists of two lectures, some correlation exercises and an examination of several cores that illustrate various facies types and/or significant stratigraphic surfaces.

SCPRED13

Exploration: From Geology to the Seismic Section

Instructor: Bob Parker
Date: May 7 - 9, 2008

This 3-day course takes the participants through the complete cycle of exploration geophysics. It starts with a review of geological principles – the target of the seismic tool. It then looks at seismic acquisition and processing – how the subsurface is imaged. A section on the seismic response to geology examines how these images appear on the seismic section, and looks at pattern recognition as a tool in interpreting both structural and stratigraphic features. The course ends with hands-on interpretation exercises (including some interpretation pitfalls).

BACK TO EXPLORATION

Field Trips & Short Courses

SCPRES14

Production Logging

Instructor: Munir Sharar
Date: May 5, 2008

Wireline Production Logging is an invaluable means in assisting Reservoir and Completion Engineers in understanding the effects of completions and stimulations on a well. Production logging can also be used as a diagnostic tool in checking Cross Flow between zones, packers or sliding sleeves integrity and channels behind casing. This one day course will cover all PL tools available in the industry and specific applications of each tool. More information on this course may be found in the Final Circular or online at www.GEOconvention.org.

SCPRES15

Formation Damage Evaluation, Reduction and Removal

Instructor: Brant Bennion
Date: May 6, 2008

Course will consist of a combination of interactive lectures and question-answer sessions. Course Content includes, but is not limited to:

- Definitions of formation damage
- Major mechanisms of formation damage
- Mechanical Damage Mechanism
- Chemical damage mechanisms
- Biological formation damage issues

For more information, please visit www.GEOconvention.org.

SCPRES16

Acoustic Logging

Instructors: Denis Schmitt, Doug Patterson, John Walsh
Date: May 7, 2008

The objective of this course is to provide both an overview and understanding of the theory, physics, and measurements of borehole acoustic devices. The course will discuss the basic system configurations of the older generation monopole devices, still being utilized, as well as the new generation multipole and cross-dipole systems more commonly used. The critical issues of log quality control and the borehole environmental effects will also be covered. The course focus will be the application and limitations of the measurements from these devices in petrophysical, geophysical, and reservoir engineering disciplines using real-world examples.

SCPRES17

Log-Core Integration

Instructors: John Nieto, Ross McLean, David Kelly
Date: May 8, 2008

This course provides an in-depth look at the integration of wireline log response and rock lithofacies as seen in core. The course instructors will take several carbonate and clastic formations at the Core Research Centre and demonstrate that these can be subdivided based upon log response. This classification leads to a reservoir 'facies' curve which can be used directly in shared Earth Modeling, petrophysical evaluation and reservoir engineering. For more information, please visit www.GEOconvention.org.

SCPRES18

Borehole Imaging

Instructors: Paul Elliott, Tahereh Mirzadeh
Date: May 9, 2008

The one-day course will introduce attendees to the following aspects of Borehole Imaging:

- Tool theory and data acquisition
- Data processing workflows
- Identifying bed boundaries
- Fractures
- Faults
- Micro-faults
- Rose diagrams
- Schmidt plots
- Azimuth Frequency plots
- Dip Domain analysis
- In situ stress
- Identifying sedimentary features
- Artifacts

POST CONVENTION - SHORT COURSES

SCPST01

Structural Styles and Interpretation Techniques in Fold-Thrust Belts

Instructor: Shankar Mitra
Date: May 20 - 23, 2008

Fold-thrust belts contain complex trap-forming structures, which are not well imaged on seismic data. The objective of the course is to discuss the use of 2-D and 3-D structural models and techniques for constructing maps, balanced cross sections and 3-D interpretations. Models of trap-forming structures for fold-thrust belts will be presented. Problem sets will provide hands on experience in interpreting subsurface structures using seismic and well data.

SCPST02

Applied Structural Geology

Instructors: Mark Cooper & Marian Warren
Date: May 20-22, 2008

How can an understanding of the way in which rocks deform impact exploration, development, drilling and production of hydrocarbons? The aim of the course is to provide a basic overview of how structural geology techniques can improve the finding and production of hydrocarbons. The course will involve both lectures and practical exercises. For more information, please visit www.GEOconvention.org.

SCPST03

Clay Minerals and Their Effect on the Electrical Behavior of Shaly Sands

Instructor: E.C. Thomas
Date: June 17, 2008

More information on this course may be found at www.GEOconvention.org but it will cover, among other things:

This one day course will cover the fundamentals of the following topics:

- The structure of clay minerals
- The origin of cation exchange capacity in clay minerals
- Bound water and how it is measured, including comparison to NMR
- Advantages of having horizontal and vertical resistivity measurements for the analysis of shaly sands

More information on these Short Courses and Field Trips may be found at www.GEOconvention.org



Do the Right Thing

A recent survey suggests that only 65 per cent of practicing geologists and 53 per cent of practicing geophysicists in Alberta are licensed with APEGGA. While there are a variety of reasons given for non-compliance, the bottom line is this: if you are independently practicing geology, geophysics or engineering in Alberta you need to be licensed.

Geologists, geophysicists and engineers who intend to practice geology, geophysics or engineering in Alberta are required by law to be registered with APEGGA. The Province of Alberta has long decreed that only Members of APEGGA can apply the practice of geology, geophysics or engineering within the province. Alberta requires that APEGGA ensure that only its Members are able to practice. In the province's view, APEGGA does not exist to serve its Members, but rather exists to protect the public interest.

So, if you are a practicing geologist, geophysicist or engineer in Alberta, you should become a Member of APEGGA.

Do the right thing. Visit www.apegga.org for more information or call Mark Tokarik, P.Eng., Director, Registration, Bill Santo, P.Eng., Assistant Director, Registration or Park Powell, P.Eng., Assistant Director, Registration at 426-3990 or 1-800-661-7020.

This ad is the first in a series





Identifying Critically Stressed Fractures

Using Borehole GeoMechanics: A Case Study in the Nikanassin

*Dave Amendt, Foothills Petrophysicist
ConocoPhillips Canada*

Summary

The Nikanassin is a thick sandstone reservoir exhibiting 3-9% porosity with multiple large successions. The optimum production mechanism is believed to be a combination of primary porosity and natural fractures.

An application of Borehole Geomechanics was undertaken in an attempt to better understand the optimum production mechanism by identifying the critically stressed or hydraulically conductive fractures - those open to flow.

The primary components of the Geomechanical model are: the Rock Model - defining the mechanical rock properties of the formation and the Stress Tensor - defining the interplay between the Vertical Stress S_v and the Minimum and Maximum horizontal far field stresses. Once the Rock Model and Stress

Tensor have been defined, the natural fractures as picked from the borehole image logs can be analyzed and the Critically Stressed fractures identified using the Mohr-Coulomb failure criteria.

This presentation will focus on the process used to build the rock model, define the stress tensor and identify the critically stressed fractures. The image log is used to constrain the minimum and maximum stress values by analyzing the borehole breakout and its relationship to pore pressure, mud pressure, rock properties and wellbore trajectory.

After the process of identifying the Critically Stressed fractures is defined, a detailed look at a Cadomin-Nikanassin well in NE BC is presented to validate the process. The example will focus on the geological and petrophysical analysis of the formation with production logs confirming the productive intervals and their relationship to the critically stressed fractures.

Integrated Petrological, Petrophysical and Geological Study

of the Reservoir Quality of the Cadomin Formation in the Deep Alberta Basin

*John B. Gordon**
Petro-Canada Oil and Gas

Brian Glover
Petro-Canada Oil and Gas

Richard W. Evoy
Petro-Canada Oil and Gas

An integrated petrological, petrophysical and geological study was conducted on the Cadomin Formation in the Deep Alberta basin. This study utilized data collected from core, drill cuttings and well logs to determine the reservoir quality and hydrocarbon potential of the Cadomin Formation sandstones and conglomerates.

A detailed petrographic study showed the presence of six distinctive petrographic facies based on the abundance of

monocrystalline quartz, ductile lithic clasts and chert. Natural fracturing is also a key component adding to the overall reservoir quality in these otherwise tight petrographic facies.

Core to well log calibration techniques were employed to define porosity and permeability heterogeneity in the highly variable Cadomin facies. The petrographic data was then compared to the petrophysical characteristics of the Cadomin sandstones and conglomerates to more accurately define productive reservoir units within the Cadomin. In general, these data sets were found to be in good agreement.

This talk will focus on the methodology used and results to establish a rock-log calibration model based on petrographic facies analysis, petrophysical characteristics and how the data set compares to geological interpretation.



The Fish Scales, a Hybrid Shale Gas Play – Characterization, Regional Extent and Controls on Productivity

Roy Benteau P.Geol *

EOG Resources Canada Inc., Calgary, Alberta, Canada

Basim Faraj Ph.D.

Talisman Energy Inc., Calgary, Alberta, Canada

Summary

The Geological Atlas of the Western Canada Sedimentary Basin describes the Fish Scales Zone as a basin-wide marker that demonstrates the Albian/Cenomanian boundary (Lower/Upper Cretaceous) and which contains abundant fish remains within finely laminated, generally non-bioturbated, very fine sandstone and siltstone. Most geologists are familiar with its characteristic high gamma ray and resistivity deflection but only in the last few years has the zone been recognized as a commercial gas reservoir. The Fish Scales Zone has a complex and variable mineralogy, complicating log interpretations. However, detailed geological, mineralogical and geochemical as well as modern log data have allowed elucidation of the main controls on its productivity. The variable nature of these unconventional play types should be considered as a characteristic.

Introduction

The Upper Cretaceous rocks in the Plains and Foothills of the Western Canada Sedimentary Basin record essentially uninterrupted deposition through the epoch. They grade from marine shale at the base to continental sandstone at the top, the rocks deposited in a broad, slowly-subsiding epeiric seaway, flanked on the west by the ancestral cordillera and on the east by a low Precambrian shield area. The Fish Scale sandstone marker horizon is taken at the base of the Fish Scales zone where the sandstone is better developed and contains abundant, easily recognized fish scales.

The Fish Scales Formation is less than 20 meters thick and consists of mudstone to claystone with associated sandstone and conglomerate beds. Bioturbation is sparse to absent and TOC abundances are variable up to 8 weight percent and comprises a mixture of Types II and III. The log responses in the Fish Scales Formation are variable reflecting a heterogeneous lithology that includes numerous bentonites, variable organic matter content, the presence of well-developed Barons

Sandstone lenses in southwestern Alberta and bioclastic debris beds composed largely of phosphatic skeletal remains in south and central Alberta. In south and central Alberta the conventional net pay ranges from 0.5 to 8 meters with core porosity up to 21% and permeability up to 150 milliDarcies. The sandstones have been described as the proximal facies of an upward coarsening/shoaling parasequence. They are finely bedded quartz siltstone to medium grained sandstone, wave-rippled, finely interbedded with shales and normally non-calcareous.

Oil and Gas production from the Barons sandstone in southwestern Alberta has been well known and exploited trend, but more recently gas has been found in the radioactive sandstones of the Fish Scales zone in southern and central Alberta.

Method

Initially, sonic and density data was averaged in shales over the basin to identify a corridor where the zone was in the correct facies and where porosity was preserved. Thin section, x-ray diffraction and scanning electron microscope data was used to calibrate log data and derive mineral composition. The geologic work identified positive areas which were pattern drilled with cost and economics in mind.

EOG Resources Canada has completed hundreds of wells in the Base Fish zone as an independent production zone or commingled with other producing zones. Cross-sections, petrophysical evaluation plots and production histograms will be used to characterize the reservoir properties of the Fish Scales zone in the Wintering Hills, Bindloss and Chinook areas of Alberta.

Conclusions

- The Base Fish Scales is widespread in the Western Canada Sedimentary Basin but its reservoir potential is confined to specific areas.
- An integrated approach and multidisciplinary analysis is necessary to high grade producing areas.
- Production from the BFS zone varies widely between 2 and 244 Mcf/d and this variation should be viewed as a characteristic of unconventional play types.



- Innovative drilling and completion techniques, taking costs into account are necessary to unlock potential in the BFS economically.
- The BFS is best exploited as an add on production zone.

Acknowledgements

Thank you to EOG Resources Canada and Talisman Energy management for permission to give this presentation.

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The Unexpected Should Not be Unexplained – Multi-disciplinary Integration Including Anomalous Data

Jean-Yves Chatellier*
Talisman Energy Inc., Calgary

Giancarlo Giampaoli
Consultant, Punta de Mata, Venezuela

Judith de Narvaez
ENI Resources Internacional, Milan Italy

Bob Menard
Petrometrics Ltd, Calgary

Summary

Subsurface data in tectonically complex areas is commonly a challenge to interpret. That is particularly true in large fields where depletion and secondary pressure maintenance mechanisms are in place. Making use of all of the data available is often attempted but frequently some data is discarded for various reasons. A series of examples from the eastern Venezuela thrust belt will focus on how to deal with anomalous, rejected data of various kinds: rock data (porosity), fluid data (API gravity) and pressure data (RFT).

In the Santa Barbara field there was no porosity-depth trend when using averages per sand unit for all 150 wells (log derived porosity calibrated with numerous cores). The display on a map of porosity depth trend per well shows domains of similar patterns (Figure 1) that are related to large scale folding and bed parallel slip post hydrocarbon emplacement. Similarly, patterns of abnormally low RFT pressures helped identify inverted series later confirmed by stratigraphy and log analysis (Figure 2).

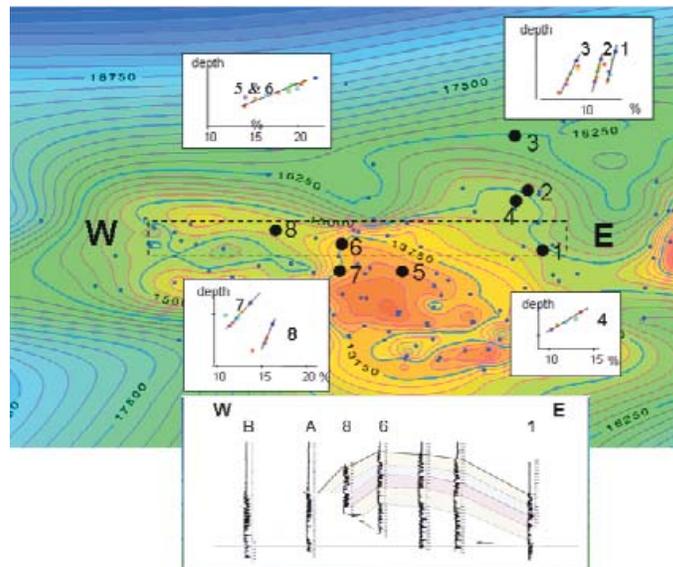


Figure 1: Various domains of porosity-depth trend in the Santa Barbara field

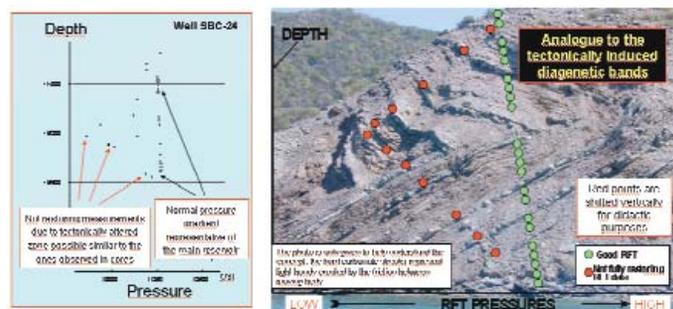


Figure 2: Abnormal RFT data indicating inverted series with outcrop analogue

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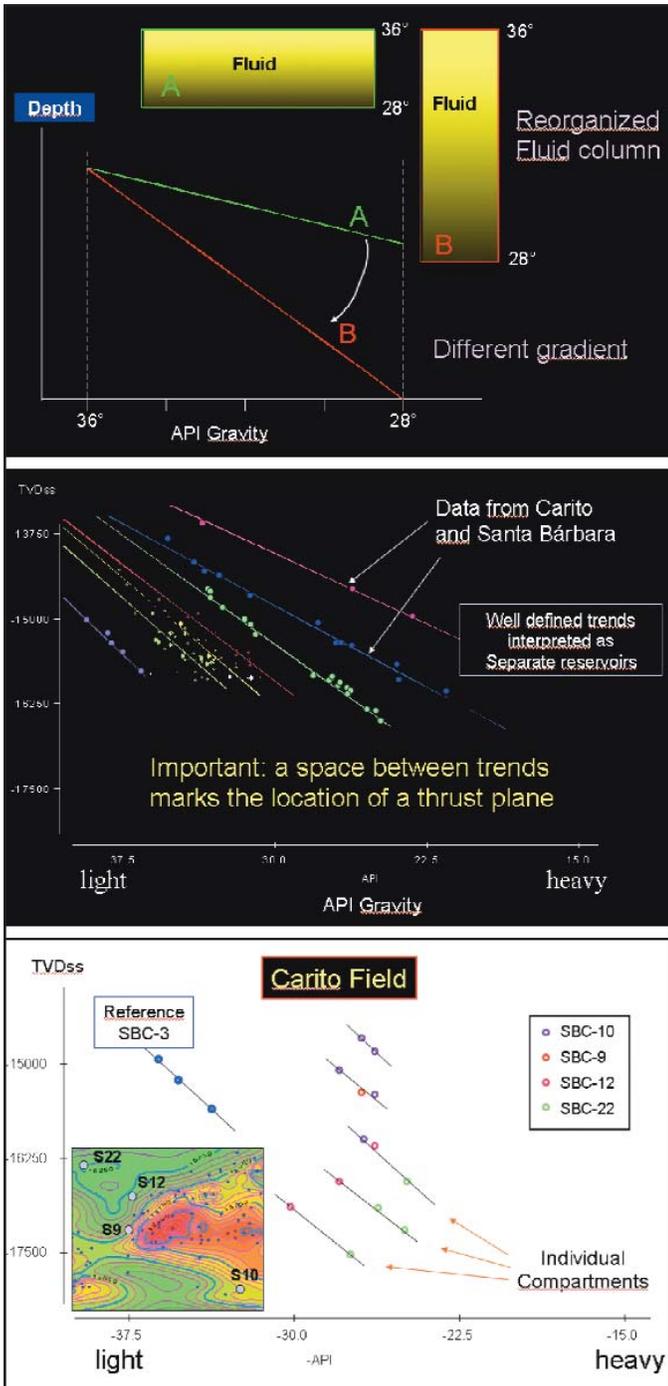


Figure 3: Identification of thrust sheets using a multi-well approach and API gravity

Combining many wells with anomalous fluid characteristics led to a better understanding of the compartmentalization in Santa Barbara; it also led to the recognition of large thrusts (post hydrocarbon emplacement) in the Carito field (Figure 3). Block tilting making T_{VT} > T_{ST} is responsible for the change in gradient (API versus depth).

A major horizontal detachment was identified using previously discarded pressure data from many wells. Subsequent work led to the discovery of a large hydrocarbon-filled klippe that glided above the detachment outlined by reservoir engineering data (Figure 4).

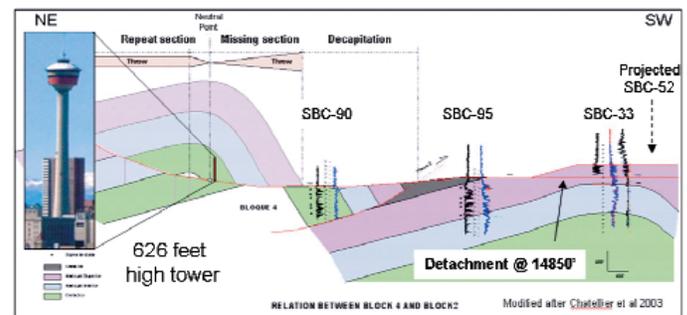
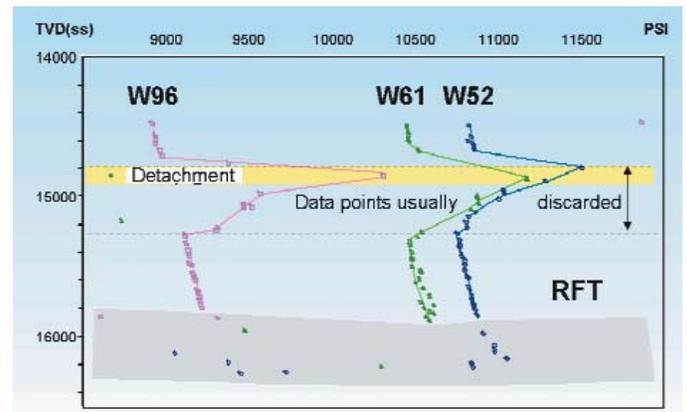


Figure 4: Detachment plane outlined by abnormally high RFT pressures and associated large structure displaced along that plane



Application of Pulsed Neutron Elemental Spectroscopy Measurements in Heavy Oil and Shale Gas Reservoir Evaluation

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Introduction

A new generation elemental spectroscopy tool (Formation Lithology Explorersm) which utilizes a pulsed neutron source permits the measure of gamma rays emitted by the interactions with the neutrons in both the inelastic and capture energy spectra. Additional elements are able to be quantified by measurement of both spectrums including Mg, Al and C. The RockViewsm service utilizes the results from the FLE^x device and Spectralog II to determine formation lithology and mineralogy. In certain types of reservoirs the amount of elemental carbon measured exceeds the amount necessary for the mineralogy of the rock itself and is presented as 'Excess Carbon'. The measurement of carbon and excess carbon along with mineralogy determination have applications for Heavy Oil and shale gas reservoir evaluation.

Theory and/or Methodology

Pulsed neutron tools have been ran in the cased hole environment for estimating hydrocarbon content in the formation since Dresser Atlas a predecessor company of Baker Atlas introduced the technology to the industry in 1963. The theory of the measurement is well known and in common use in the Industry so only a brief discussion of the theory of the measurement will be given.

The application of this technology in a wireline tool designed for use in open hole permits the use of a much larger detector to improve the count rates of the gamma rays emitted from the elements present in the formation as a result of their interaction with the neutrons with which the tool's source bombards the formation. The energy levels of the gamma rays are characteristic of the element from whose nucleus it is emitted. In the open hole environment where the sonde is placed immediately opposite the formation and shielding is applied to the tool minimizing borehole effects. Detailed information on the tool theory, design and processing can be found in the Pemper et al paper "A New Pulsed Neutron Sonde for Derivation of Formation Lithology and Mineralogy", SPE 102770, presented

in San Antonio in 2006.

From the inelastic spectrum the new Formation Lithology Explorer (FLE^x)sm is able to uniquely provide a formation weight percentage of elemental carbon (C) in the formation as well as much more robust measures of Magnesium (Mg) and Aluminium (Al) then were previously available to the industry. These measures when combined with the elements that are quantifiable through the use of the capture spectra permit for a more robust estimation of the lithology and mineralogy of the formation.

The RockViewsm interpretation system differs from previous methods in that uses a sequential approach which systematically builds upon initial conclusions. Using the elemental weight fractions as input the interpretation system first defines a general lithology for each record then follows by a more detailed classification of a specific lithology. Mineralogy is then systematically determined for each record by sequentially using the measured elemental weight fractions that are available. The process obeys the principles of mineral stoichiometry. The RockViewsm interpretation is based solely on the measured geochemistry and does not require input from other wireline logging devices. The RockViewsm expert system can be easily modified to account for unique basin or formation lithologies or mineralogy. The resulting mineralogy from RockView can then be further incorporated with additional logging measurements for further petrophysical evaluation and reservoir characterization.

The elemental weight fraction of carbon is one output of the FLE^x sm tool. Carbon may occur as part of the dry rock matrix or in the pores. The RockView processing determines the amount of the measured carbon that is required as a component of the dry rock mineral components of each record. Any remaining carbon fraction is classified as "excess" carbon. This ability to quantify the amount of carbon and excess carbon can be used in numerous ways depending upon the operator's particular production and formation issues. To date applications that have been discussed and / or utilized are for a prediction of hydrocarbon in place in heavy oil reservoirs, an indicator of total organic carbon content (TOC) in shale gas plays and identification of bitumen plugged zones in gas plays.



Examples

Shale Gas - US Examples

Athabasca Tar Sand - Canada Examples

Bitumen Plugging - Canada Examples

Conclusions

The introduction of a pulsed neutron spectroscopy measurement designed for the open hole environment allows for a more comprehensive measurement of common formation elements. This additional information can be input into a new expert system interpretation software that provides a better definition of the lithology and mineralogy than has been previously available to the industry from wireline measurements.

The measure of carbon and excess carbon weight fractions gathered through the inelastic spectra coupled with the mineralogy has numerous potential formation evaluation applications.

Acknowledgements

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The Identification of Natural Fractures in Inclined Highly Fractured Formations

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Summary

Most features, like fractures and faults can be identified on borehole images with reasonable confidence at the borehole wall. Based on the fracture appearance, the natural fractures might be distinguished from any other drill-induced fractures and qualified as productive features. However, this is all based on observed features on the borehole images at the borehole wall with no confirmation on the extent of these features into the formation.

By combining acoustic shear dispersion, shear anisotropy and Stoneley mobility analyses with high resolution borehole images, the fractures can be investigated beyond borehole wall.

This is an integrated process to investigate the probability of observed geological features on the borehole images extending into the formation.

Introduction

Geologists have been trying to understand the fracture production mechanisms in both carbonate and clastic reservoirs. Unfortunately, the traditional logging approach has been of little value. For example, the orientation of many observed fractures appears similar to the drilling induced fractures that are created as a result of tensile failure near the borehole and parallel to the in-situ principle stress. When the current stress has a similar orientation to the ancient stress, the differentiation between the natural fractures and drilling induced fractures remain unresolved in some cases.

The introduction of high resolution borehole images allowed the identification of features at the borehole wall. Acoustic technologies enabled the analysis of the probability these features extend into the formation.

Traditional acoustic shear anisotropy is not limited to imbalanced existence of far field stresses. Anisotropy is also influenced by the measurement inclination with respect to the beds, planar fractures, and microstructural layers. With dispersion analysis, the anisotropy source can be identified and compared with borehole images observations. If both confirm the ob-

served feature, the probability of its existence in the formation increases.

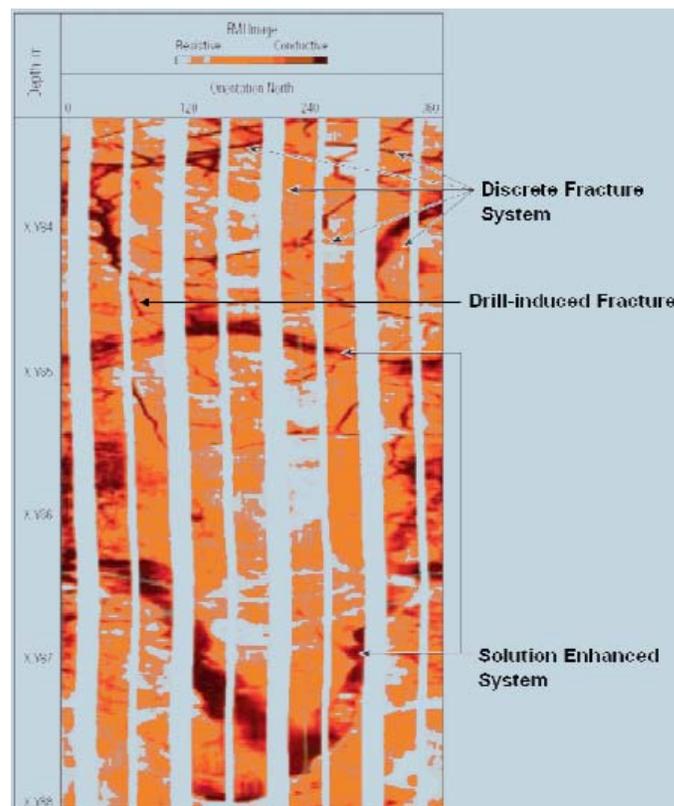
However, in case of non-planar features, like microfractures, which do not create any plane of symmetry in the formation, the acoustic anisotropy will not be affected by microfractures. In addition, if the aperture of microfractures is smaller than borehole image resolution, then the borehole image will not be able to resolve them.

In this case, Stoneley wave is analyzed to detect borehole fluid mobility into the formation. Then, by comparing with porosity profile, Stoneley will help to indicate microfractures presence.

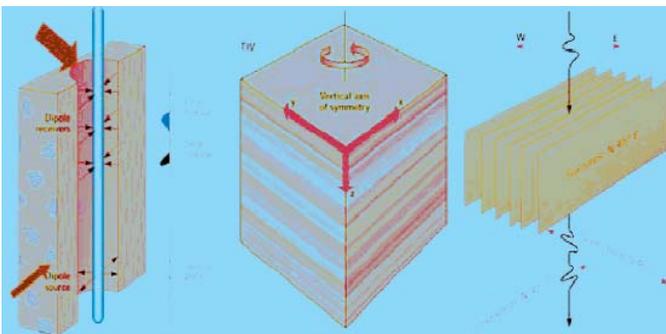
Theory and/or Method

The process of integration is composed of four main steps:

1. Borehole images are processed for structural and textural features. The analysis is performed with detailed feature classification, orientation and dip. It is essential to extract as much information as possible with high confidence from the images.



2. Shear wave splitting analysis is performed to analyze plane of symmetry orientation and degree of anisotropy. This is performed using Alford rotation on cross shear measurements. The evaluated cross-energy difference of the split waves may indicate degree of anisotropy as well.
3. Shear dispersion analysis (Schlumberger Sonic Scanner Analysis) is used to identify the acoustic anisotropy source. This is essential as not all observed wave splitting is due to stress alone.



4. The features detected on borehole images are integrated with the acoustic anisotropy parameters in a 3D model using FracAniso technique (Schlumberger Software). If observed bore hole images features are planar in the formation, the shear anisotropy will match the direction confirming that borehole images observed features extending into the formation.
5. Stoneley wave is analyzed using special technique for mobility detection in tight fractured zones. The evaluated Stoneley Index (StI) is compared with measured porosity profile to analyze secondary porosity. StI will help in highlighting productive microfractures or chicken-wire type fractures which are non-planar features.

Based on these analyses, the probability of natural fracture existence can be evaluated.

Conclusions

The integration of borehole images, shear anisotropy, shear dispersion and Stoneley waves allows us to evaluate the probability and productivity of natural fractures. This approach gives confidence in establishing successful completion strategy and it is essential in the construction of a representative simulation model for reservoir performance evaluation.

Acknowledgements

Thanks to Ken Faurschou on his contributions into this presentation.



CWLS Annual Meeting



*Guest Speaker Jeff MacInnis at the CWLS AGM.
Photo courtesy of Tyler Maksymchuk*



*Mike Eddy and Robert Bercha receiving Distinguished Service Awards from outgoing President Jeff Taylor.
Photo Courtesy of Tyler Maksymchuk*



*Mike Sullivan received the Vice President Award for Best Canadian Presentation from Jeff Taylor.
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*Bob Everett received the President's Award for Best Paper from Jeff Taylor.
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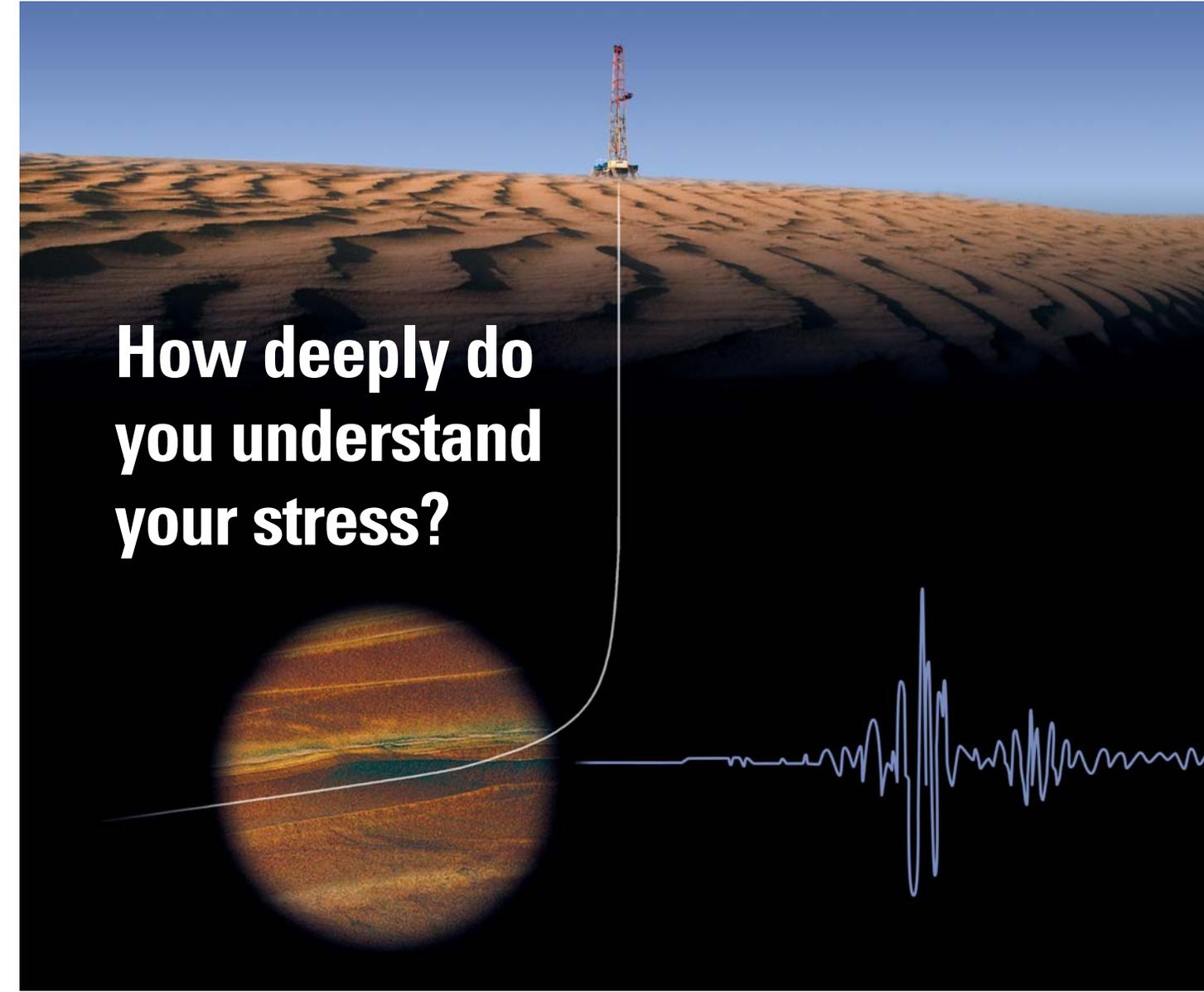
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