

THE MONTHLY MAGAZINE OF THE CANADIAN SOCIETY OF PETROLEUM GEOLOGISTS

RESERVOIR

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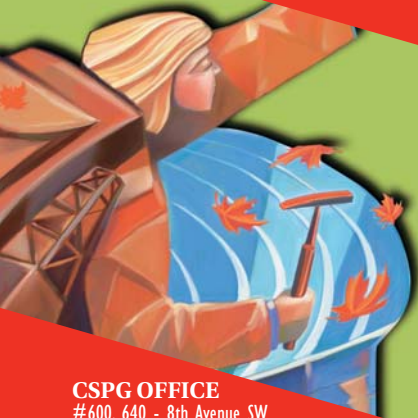
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RESERVOIR

THE MONTHLY MAGAZINE OF THE CANADIAN SOCIETY OF PETROLEUM GEOLOGISTS

DECEMBER 2007 - VOLUME 34, ISSUE 11

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To publish an article, the CSPG requires digital copies of the document. Text should be in Microsoft Word format and illustrations should be in TIFF format at 300 dpi., at final size. For additional information on manuscript preparation, refer to the Guidelines for Authors published in the CSPG Bulletin or contact the editor.

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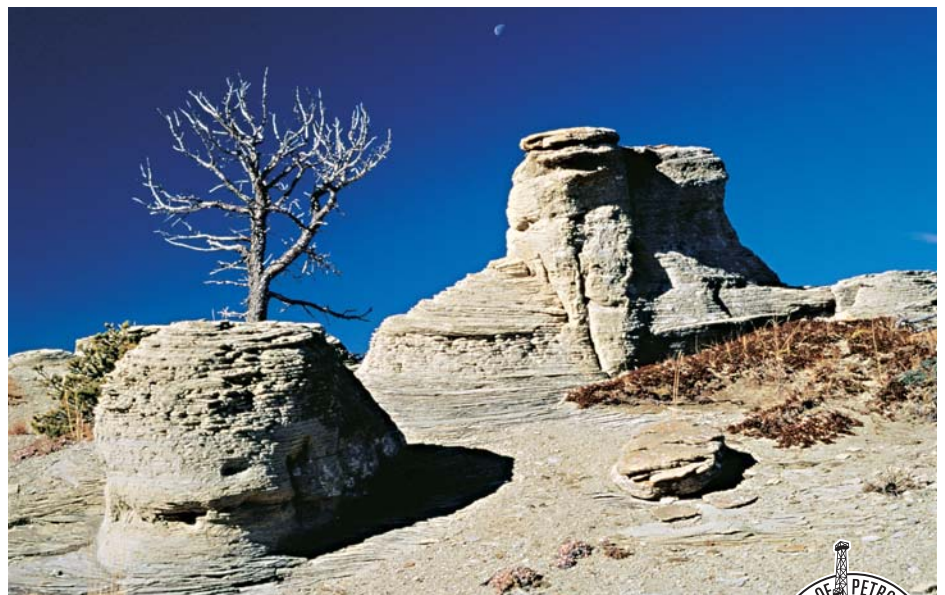
Additional copies of the RESERVOIR are available at the CSPG office for \$3.00.

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FRONT COVER

Antelope Butte, Alberta. Looking west to sandstone hoodoos on top of Antelope Butte, Alberta. The hoodoos are composed of cross-bedded grey sandstones located at the base of the Upper Cretaceous Belly River Formation. Photo by Gord Hurlburt.



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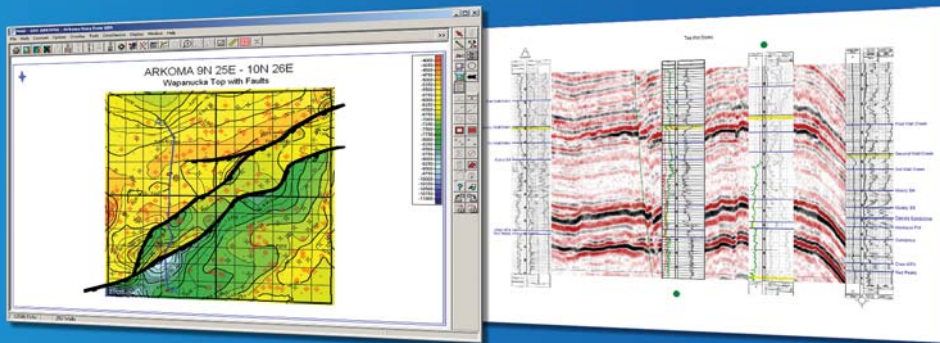
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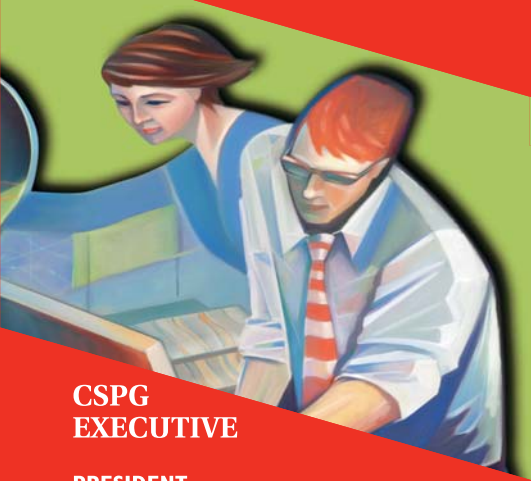
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CSPG President Colin Yeo, P.Geol, and an APEGGA Member for 30 years, wrote about compliance with APEGGA's licensure requirements in a recent column in *The Reservoir*.

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The Holiday Social will be held Tuesday, December 11 at 10:45 am in the Telus Convention Centre, prior to the Technical Luncheon. Last year over 900 tickets were sold, and this year we are limiting ticket numbers to 1,200. Get your tickets soon because you will not want to miss this event.

To download a ticket order form, go to <http://www.cspg.org/events/CSPG-Luncheon-Tickets.pdf>.

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Understanding the nature of Upper Mannville Coals in Central Alberta

SPEAKERS

Ian McIlreath and Thanos Natras
EnCana Corporation

11:30 am
Tuesday, December 11, 2007
Telus Convention Centre
Calgary, Alberta

Please note:

The cut-off date for ticket sales is 1:00 pm, Thursday, December 6, 2007.
Ticket price is \$34.00 + GST.

Due to the recent popularity of talks, we strongly suggest purchasing tickets early, as we cannot guarantee seats will be available on the cut-off date.

The petroleum industry is challenged relative to understanding the resource potential of CBM, particularly in Lower Cretaceous Upper Mannville coals. This is due in part to our lack of understanding of the geology of these coal deposits and their nature as reservoir rocks. In general, industry's understanding of coals is probably at best comparable to a similar understanding we had of clastics and carbonates in the mid-1900s.

Since coals differ in many ways from conventional reservoirs, it is inappropriate to apply petroleum system analysis to evaluate CBM from these coals. For the Medicine River and equivalent seams in Central Alberta, we have defined a coal system approach which incorporates data and information on most factors key to understanding the accumulation phase, burial/preservation stage, diagenesis/coalification, and development of gas resources.

Various previous studies have attributed significant original-gas-in-place numbers for Mannville CBM. The fundamental question is how much of this is recoverable? A key control is the permeability of what essentially is a fractured reservoir rock.

Some effort has been spent by industry to understand the nature of the coal fractures (cleats) and the basic structural framework. Much more effort has been directed to relating present day stress regimes to predict open endogenous cleat systems. Exogenous cleating is more poorly understood. There is little documentation on what influence the lateral and vertical variations in both coal quality and character have on cleating and methane generation.

There have been a number of earlier attempts to establish bed thickness and lateral extent of Medicine River equivalent coal seams in Central Alberta. These stratigraphic studies evolved from pure lithostratigraphic correlations to more recent attempts at relatively high resolution sequence stratigraphy in what are non-marine sediments. Coal stratigraphy is very much controlled by accommodation space, which is related to foreland subsidence, and locally to re-activation of faults during deposition. The latter leads to the development of exogenous cleating. A tecto-stratigraphic approach to correlation establishes a more realistic generic framework from which to interpret the continuity of individual seams and ultimately put depositional information in to a proper context.

To date, there are no depositional models for the Medicine River equivalents in Central Alberta; nor are there any suitable modern analogs. We do, however, have some idea about their depositional environment and their tremendous vertical and lateral variations in composition. We also know that these coals are wet in the up dip east side of the basin and that dry, or dryer, coals exist down dip of the wet coals. With the current data available there are several possible explanations as to the origin of the drier coal fairway.

BIOGRAPHIES

Ian A. McIlreath (Ph.D., P.Geol., DFGAC)

Ian McIlreath is a Technical Advisor for EnCana Corporation Ltd. Prior to the merger of Alberta Energy Company and PanCanadian Energy to form EnCana, he was Chief Geologist of PanCanadian. Over the last 33 years he has worked in most of the petroleum basins in Canada. He has also worked internationally, primarily in Asia. He has done extensive helicopter-supported fieldwork in mountainous and remote areas of western and northern Canada, mainly on Devonian and Triassic Rocks. More recently he has focused on exploration

and evaluation of Mannville CBM in Central Alberta. Dr. McIlreath's recent publications have focused on aspects of drilling horizontal wells in coal and on coal quality.

Dr. McIlreath received his Ph.D. from the University of Calgary. He has been President of the Canadian Society of Petroleum Geologists, Geological Association of Canada, and the Canadian Geological Foundation. He has been a Councilor of APEGGA and is APEGGA's representative to, and a Director of, the Canadian Council of Professional Geoscientists. He is currently Chairman of the newly formed CSPG-CSEG-CWLS Joint Annual Convention Committee. He is a member of SEPM and TSOP. Dr. McIlreath was General Chairman of GeoCanada 2000 and is the acting General Chair of GeoCanada 2010.

Thanos A. Natras (P.Geol.)

Thanos Natras is employed with EnCana Corporation Ltd. where he currently holds the title of Geologist, working mainly the Mannville coals of Central Alberta. He has previously held the role of Operations Geologist with the company since early 2004, where he played an integral part in drilling many successful horizontal wells into Mannville coal seams. Prior to his years at EnCana, Mr. Natras worked as a Wellsite Geologist for eight years on more than 150 wells ranging from 1,000 metres to 4,000 metres, from southeast Saskatchewan to northeast British Columbia. Mr. Natras has co-authored several publications on horizontal drilling in coal, and earlier this year he was awarded Best Geological Poster at the 2007 CSPG/CSEG Annual Convention for his poster entitled, "Successful Wellbore Placement Within a Mannville Coal Seam".

Mr. Natras received his B.Sc. in Geology from the University of Alberta in 1996. He has been a professional member of APEGGA since 2004 and is a member of the CSPG.

Quin Kola: Tom Payne's Search for Gold

SPEAKER

**Dr. Alice V. Payne, C.M., M.Sc.,
LL.D., P.Geol.**

11:30 am

Tuesday, January 8, 2008

Telus Convention Centre

Calgary, Alberta

Please note:

The cut-off date for ticket sales is

1:00 pm, Thursday, January 3, 2008.

Ticket Price: \$34.00 + GST.

Due to the recent popularity of talks, we strongly suggest purchasing tickets early, as we cannot guarantee seats will be available on the cut-off date.

The story of Tom Payne is an adventure book, amazing, heroic, and true. Born to a prominent British physician, the young Tom's restlessness led him to western Canada in 1912, where he first tackled the farming industry.

After a stint in northern Manitoba, freighting supplies for the developing base metal mines near Flin Flon, he drove a Linn tractor for the ill-fated MacAlpine expedition. This was one of the first attempts at aerial prospecting in the far north, but Tom ended up seal hunting on the ice of Hudson Bay with an Inuit friend. By the early 1930s, he moved to the portage at Fort Smith in northern Alberta where he succumbed to the lure of prospecting, inspired by Labine's pitchblende discoveries at Great Bear Lake. Grubstaked by his employers, his first efforts at getting rich quickly met with disappointment and near starvation, but he would not give up.

Tom finally discovered a rich gold mine among the quartz veins in the shear zones

at Yellowknife; he formed Quin Kola Gold Mines Limited and made an historic mining deal with Cominco. Tom's four claims became part of the 'Con' mine, which was one of Canada's largest operating gold mines. Instead of retiring later in life, he found new partners and drilled an oil well in Alberta. His story illustrates the heady excitement of frontier exploration, with the persistence and luck required for success.

BIOGRAPHY

Alice Payne, P. Geol., obtained her Bachelor of Science and Master of Science degrees from the University of Alberta in the early sixties. She spent fifteen years as a consultant in the mining industry and academia, and managed Ryan Gold Mines until it was sold in 1990. She worked another fifteen years in the oil patch, with Gulf Canada Resources, until her retirement in 1995. She is now the president of Arctic Enterprises Limited, her own company. Payne is a member of the Canadian Institute of Mining, Metallurgy and Petroleum; the Geological Association of Canada; the Association of Professional Engineers, Geologists and Geophysicists of Alberta; the American Association of Petroleum Geologists; and was the first woman to be president of the Canadian Society of Petroleum Geologists, in 1992. Payne has served on many boards and volunteer committees, and has been the recipient of several honours and awards, including the Paul Harris Fellowship, the YWCA Women of Distinction Award, a University of Calgary honorary doctorate, and the Order of Canada.

NOTE

Copies of Quin Kola: Tom Payne's Search for Gold will be available for sale at the January 8, 2008 Technical Luncheon for \$25.00 + GST. All proceeds of these sales will go to the CSPG Trust.



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Anisotropic seismic depth imaging tutorial and applications in fold and thrust belt exploration

SPEAKER

Don Lawton

Department of Geology and Geophysics, University of Calgary

11:30 am

Thursday, January 24, 2008

Telus Convention Centre

Calgary, Alberta

Please note:

The cut-off date for ticket sales is

1:00 pm, Monday, January 21, 2008.

Ticket Price: \$34.00 + GST.

Due to the recent popularity of talks, we strongly suggest purchasing tickets early, as we cannot guarantee seats will be available on the cut-off date.

Exploration for hydrocarbons in fold and thrust belts can be challenging. Seismic imaging is often hampered by severe topography, outcropping carbonates, acquisition conditions and parameters, near-surface velocity variations, structural complexity, and sparse geological control from outcrops or wells. Thus it may be difficult for explorers to produce interpretations of subsurface structures in which they have confidence.

Correct seismic imaging of geological structures in thrust belts requires prestack depth migration due to significant lateral changes in seismic velocities that often occur. A further complexity arises in structural domains where sequences of dipping clastic strata overlie hydrocarbon targets. Structures beneath such sequences will be mispositioned if isotropic velocities are used during processing. Anisotropic prestack depth migration (APSDM) is necessary to position these targets correctly. The requirement for success in anisotropic depth imaging is constructing correct models of interval velocities, anisotropy parameters, and dip used in the migration.

A deterministic approach to model updating through minimizing residual move out in common-image gathers is used commonly, but discussions between data processors and interpreters are also critical for reducing ambiguity and yielding geologically realistic models that can be structurally balanced. All sources of geophysical and geological data must be integrated to optimize velocity model updating. Determination of anisotropy parameters from offset vertical seismic profiles and field refraction surveys will be demonstrated, and the use of other geophysical data, such as gravity, to provide constraints on the geological models and interpretations will be illustrated.

Interpreters need to understand the limitations of the seismic acquisition and processing methods while data processors must address the credibility of their velocity models in the geological context. Increased collaboration between geology and geophysics is the key to improving success in thrust-belt exploration.

BIOGRAPHY

Don Lawton is a Professor of Geophysics and

Chair in Exploration Geophysics in the Department of Geoscience at the University of Calgary. He previously served as Head of the Department from 1997 to 2002. He joined the department in 1979 after obtaining a Ph.D. in Applied Geophysics from the University of Auckland, New Zealand. His research interests include integrated geophysical and geological studies in fold and thrust belts, acquisition, processing and interpretation of multi-component seismic data, seismic anisotropy, and geological storage of CO₂. He is a Director of the Fold-Fault Research Project (FRP) and an Associate Director of the Consortium for Research in Elastic Wave Exploration Seismology (CREWES), both of which are successful research consortia sponsored by industry. He is currently an Associate Editor of the Bulletin of Canadian Petroleum Geology and is a past Editor of the Canadian Journal of Exploration Geophysics. He was a recipient of a Meritorious Service Award from the Canadian Society of Exploration Geophysicists (CSEG) in 1996 and in 2000 he received the CSEG Medal, the Society's highest honour. He is a member of CSEG, CSPG, SEG, AAPG, EAGE, ASEG, and APEGGA. He is serving as a 2007/2008 AAPG-SEG Intersociety International Distinguished Lecturer.

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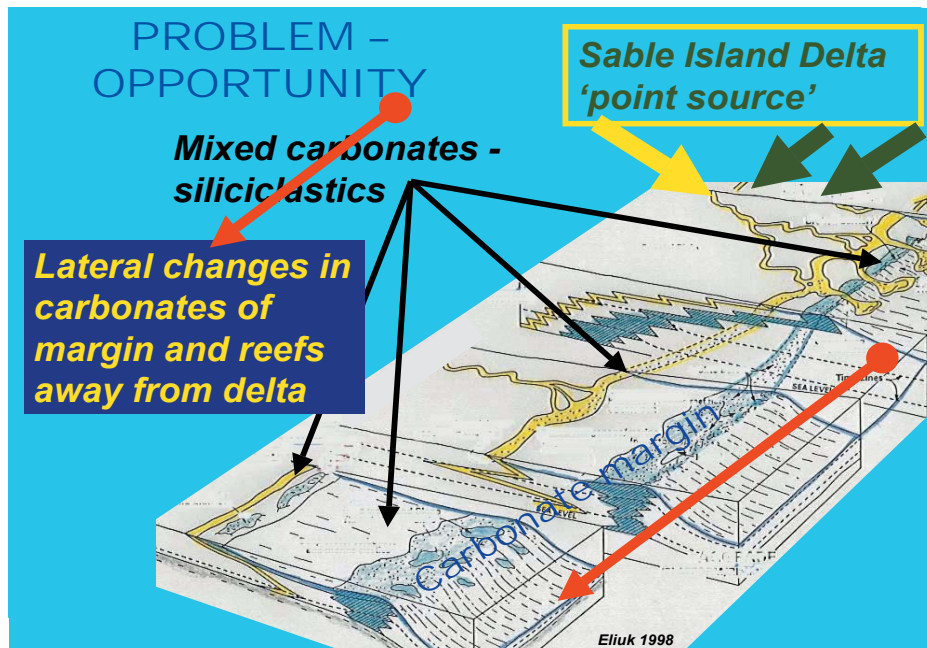
Leslie S. Eliuk, P.Geol.
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12:00 Noon

Friday, November 30th, 2007
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801-7th Avenue S.W.

The upper Abenaki has two expressions – prograding mixed siliciclastic-carbonate ramps associated with the Sable Island paleodelta and relatively stationary aggrading oolitic carbonate platforms to the southwest and arguably northeast. The unique Deep Panuke gas discovery in the platform margin has unusual, even paradoxical, features that may result from the, possibly unique, regional setting of a large delta dissecting a thick carbonate platform. As well and surprisingly, worldwide the Upper Jurassic has few reefal hydrocarbon fields despite its huge numbers of reefs and carbonate-hosted reserves. Therefore, no Panuke analogues exist.

Paradoxes of a shale plug in the carbonate margin drilled in Dominion J-14, platform drowning, argillaceous buildups, tight oolitic grainstones, sealing ‘reservoir rock’ for down-dip reef stratigraphic traps likely result from the influence of the nearby delta acting on a carbonate margin of complex topography and varied reef types. Prodeltaic fines and nutrients likely are inimical to shallow reef carbonates but favour slower-growing siliceous sponges. Rapid and deep burial destroys limestone porosity forming lateral seals, and gives top seals plus gas-prone source rocks.



Schematic of transition from Sable Island paleodelta southwest to Abenaki carbonate platform. This and some other talk slides can be seen at <http://www.offshoreenergyresearch.ca/OETR/NovaScotiaOffshoreBasinForum2007/tabid/57/Default.aspx>

Speculatively, the sediment loading may promote faulting and fracturing pathways for hydrothermal dolomitizing-leaching fluids that are critical to burial reservoir porosity. While Deep Panuke analogues are lacking, the recent discovery of siliceous sponge reefs in the prodelta of the Fraser River, British Columbia comes closest to a rare modern analogue for the Abenaki sponge reef mounds. But those buildups are mainly shale, not carbonate, and also lack effective porosity potential. Fortunately other reefal buildup types can be porous and hydrocarbon-bearing.

This talk reflects the initial attempt at integrating concepts and data. Concepts include the various Jurassic reef end-member types such as given by Reinhold Leinfelder, the three carbonate factories of Wolfgang Schlager, and the various influences of a nearby large delta on carbonates and their organisms. Data include the Nova Scotia offshore example based on previous old and new publications and ongoing well data – especially from cuttings and core – from industry activity, and comparative sedimentology to Baltimore Canyon Trough off the USA. While the study is not completed, I believe it confirms that carbonates and siliciclastics are not a world apart and that paleobiological and paleontological considerations do have economic and not just academic implications.

BIOGRAPHY

Les Eliuk is Alberta born. His birth date is January 1, 1946, and he claims to be the first baby boomer. He received his B.Sc. (Hon. Geology-Zoology 1968), M.Sc. (Geology-palynology 1969) both at the University of Alberta. He started his 35+ year career in petroleum geology with Shell Canada. From 1969 to 1999, he mostly worried about carbonate reservoirs and sour gas. The first six years were spent exploring in Eastern Canada (Quebec Cambro-Ordovician to Gulf of St. Lawrence Carboniferous to offshore Jurassic-Cretaceous carbonate margin). Several publications and even a little gas came from this effort but more of both resulted during subsequent years in the Western Canada Sedimentary Basin and Foothills.

As far back as 1970 Eliuk and Nova Scotia were linked, when he spent a seasick summer on a gas-sniffer boat. Later he helped drill the first reefs on the buried carbonate margin in 1974 and published 90 pages on the Abenaki in 1978. His fascination continued so, when pensioned off in 1999, he has been happy to help some smart younger PanCanadian/EnCana geologists with their Deep Panuke discovery as GeoTours Consulting.

He continues his Mesozoic reef interest and carbonate research with a move in mid-2005 to Lunenburg and the start of a Ph.D. programme at Dalhousie University in 2006. If you want to talk reefs, he can be contacted at geotours@eastlink.ca.

Thermal maturity in the Sverdrup Basin, Canadian Arctic Islands

SPEAKER

Keith Dewing

Geological Survey of Canada
kdewing@NRCan.gc.ca

12:00 Noon

Tuesday, December 4, 2007

EnCana Amphitheatre, 2nd Floor

East end of the Calgary Tower Complex

1st Street and 9th Avenue SE, Calgary, AB

The Sverdrup Basin in the Canadian Arctic formed during orogenic collapse of the Ellesmerian Orogen in the Early Carboniferous. A rift succession, with half grabens and evaporites, was succeeded by Carboniferous to Cretaceous carbonate and clastic sediments. The maximum thickness of strata is in excess of 10 kilometres. Rifting in the western Arctic started in the Jurassic and the Canada Basin opened in the Early Cretaceous. Starting in the Early Cretaceous and lasting about 60 Ma, flood basalts and gabbro sills and dykes were emplaced in the eastern part of the Sverdrup Basin. Sedimentation in the Sverdrup Basin largely ceased by the end of the Cretaceous. Salt diapirs and salt-cored anticlines are scattered through the central part of the Sverdrup Basin. These had major Early Cretaceous movement, but some structures had long and complex histories dating to the Triassic or earlier.

The Sverdrup Basin experienced compression in the Eocene as Greenland moved north and west relative to North America (Eurekan Orogeny). Deformation generated long-wavelength folds and reactivated salt diapirs. These folds were the target of oil and gas exploration during the 1960-1987 exploration boom, and 15 significant gas (+/-oil) discoveries were made.

A large number of thermal maturity measurements have been assembled to determine the burial and thermal history of the Sverdrup Basin. Maturity-depth profiles based on cuttings samples from wells contain an element of subjectivity since a decision has to be made as to which analyses are from caved material and which samples contain reworked organic matter from older successions. The difficulty is compounded by different labs frequently returning inconsistent reflectance values from

splits of the same sample, and the frequent lack of correspondence between converted RockEval Tmax and vitrinite reflectance.

The thermal maturity dataset has been verified by comparing the vitrinite reflectance with the sonic interval transit times from widespread shale units in the Sverdrup Basin. Burial of shale results in increased temperature (increasing the vitrinite reflectance) as well as in compaction (decreasing the transit time). A graph of these two parameters from wells with unimodal reflectance values results in a well-defined curve. The sonic transit time of samples with bimodal reflectance peaks was used to help decide which reflectance value was closer to the established curve, thereby improving the consistency of the dataset.

The thermal maturity map of the Upper Triassic Gore Point Member of the Schei Point Group illustrates the location of the hydrocarbon kitchens east of Lougheed Island and on Ellef Rignes Island and further to the northeast. Paradoxically, most of the Schei Point source rocks in the Sverdrup Basin lie within the oil window but most discoveries were dominated by natural gas. The lack of oil may be partially explained by the timing of trap formation.

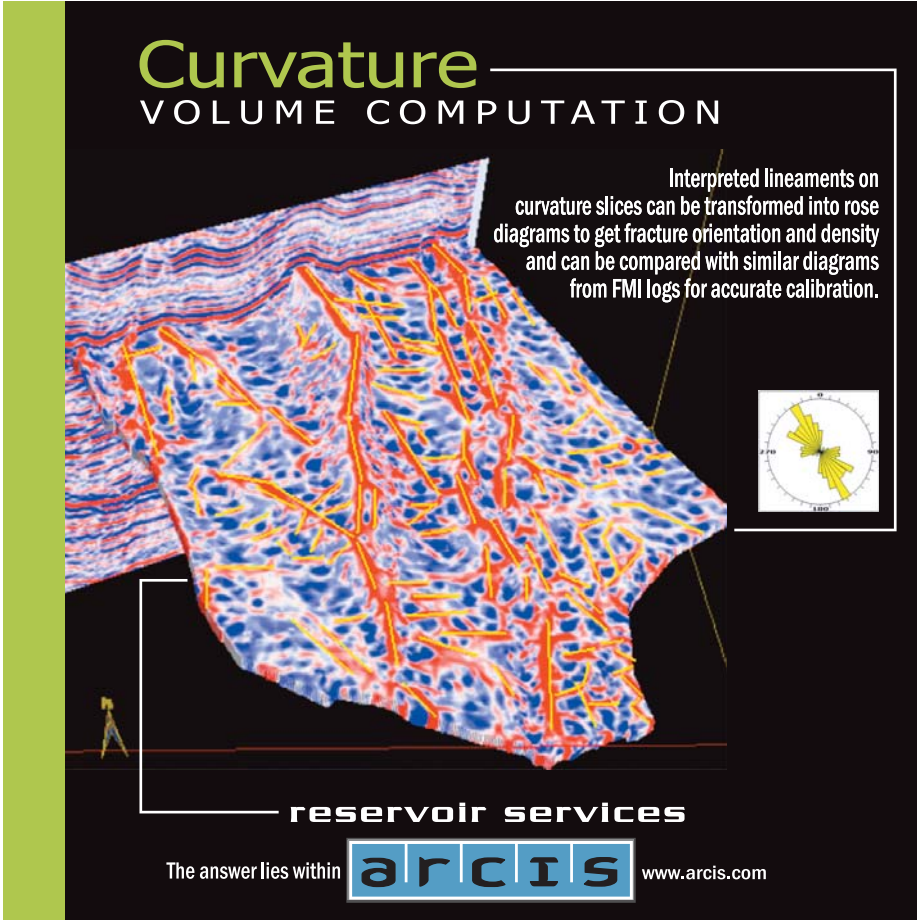
Most of the large anticlines that were drilled have a thermal maturity similar to that of the adjacent synclines, indicating that the structures post-date maximum burial. Notable exceptions are the Drake, Hecla, Hazen, and Sutherland structures. These structures appear to have had longer and more complex histories.

BIOGRAPHY

Keith Dewing is a research scientist at the Geological Survey of Canada in Calgary where he mainly works on lower Paleozoic strata in the Arctic Islands. Prior to joining the GSC in 1999, Dewing worked at MRDI building oil sand resource models and for Cominco Ltd. at Polaris Mine in Nunavut. Dewing has a B.Sc. from Queen's University, an M.Sc. from Laurentian University, and a Ph.D. from the University of Western Ontario.

INFORMATION

BASS Division talks are free. Please bring your lunch. For further information about the division, joining our mailing list, a list of upcoming talks, or if you wish to present a talk or lead a field trip, please contact either Steve Donaldson at 403-645-5534, email: Steve.Donaldson@encana.com or Mark Caplan at 403-532-7701, email: mcaplan@aosc.com or visit our web page at www.cspg.org/events/divisions/basin-analysis-sequence-strat.cfm.



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Railroad Valley and adjacent related structures, Nevada: analogues and clues from the Flathead Valley, southeastern British Columbia, Canada

SPEAKER

Peter Jones

Wedge Energy Inc., Calgary
 peter.jones@thementors.com

12:00 Noon
Thursday, December 6, 2007
Petro-Canada
West Tower, room 17B/C (17th floor)
150 6 Ave SW
Calgary, Alberta

For more than twenty years, Railroad Valley, Nevada was the site of some of the most prolific onshore oil wells in the U. S. A. Two neighbouring wells in Railroad Valley produced over 21 million barrels of oil, but ongoing exploration is severely restricted by lack and complexity of subsurface and surface data and uncertain structural relationships.

Comparable structural relationships occur in a simpler setting in the Flathead Valley, British Columbia, a half-graben in the Rocky Mountains, formed by the post-Laramide Flathead extensional fault. Paralleling the fault for more than 150 kilometres south-eastward into northwest Montana, the Tertiary Kishenehn Basin occupies the half graben, containing up to 3,300 metres of

Paleogene fine-grained lacustrine deposits and valley fill, overlying an irregular surface of Paleozoic carbonates and younger rocks. Fill includes reservoir-scale slide blocks of Proterozoic, Paleozoic, and Mesozoic carbonates and clastics, and oil seeps.

In the Flathead region, the Jurassic Fernie shale is a major detachment horizon separating overlying structures above from those below it, a function similar to that of the Mississippian Chainman shale of Nevada. Both units involve huge and anomalous thickness variations. The Flathead Valley has the potential for discoveries comparable to those in Nevada, without the structural complexity that has hampered Railroad Valley exploration. The comparison can benefit exploration in both areas.

BIOGRAPHY

Dr. Peter Jones obtained his D.Sc. in Geology from Colorado School of Mines and has focused on oil and gas exploration of structurally complex zones around the world. In 1982 he showed that the "triangle zone" at the east margin of the Canadian Cordillera was no local anomaly, but a common and logical element of fold and thrust belts that would be recognized worldwide. More significantly, the resultant revision of structural interpretations that followed resulted in new oil discoveries in an unknown number of countries, but acknowledged in the USSR, where in 1998 he was made a member of the Russian Academy of Natural Sciences in recognition of his contribution to their understanding of structural geology and the resultant oil and gas discoveries. Also, in 1998 he was awarded the Douglas medal of the Canadian Society of Petroleum Geologists, for "having contributed enormously to our understanding and evolution of deformed belts in general and the Canadian Rocky Mountain fold and thrust belt in particular." In 2003 he was made an Honorary Professor of Geology at The China University of Geosciences in Beijing.

INFORMATION

Talks are free and do not require pre-registration. Please bring your lunch. Refreshments are provided by HEF Petrophysical Consulting, and the room is provided by Petro-Canada. If you would like to be on the Structural Division e-mail list, or if you'd like to give a talk, please contact Jamie Jamison at (403) 269-3158 or jamie@hef.com.



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Christmas Social and Palaeontology Division Photo Contest

7:30-9:30 PM

Friday, December 14, 2007

Mount Royal College, Room B108

Calling all members with an interest in palaeontology: our December 14 session will consist of a potluck dinner at 7:30 pm sharp, which will be followed by a palaeontology slide show contest with prizes for the winners.

The contest categories are:

- Prepared specimens
- Fossils in the field
- Scenic shots
- Paleo-humour

SUBMISSION RULES:

- Deadline December 10, 2007 (last day for receipt of pictures)
- Entries will be limited to 10 per member, so be selective.
- Submitted files should be in jpeg, gif, or tiff format, and can be emailed to Philip.Benham@shell.com
- If you don't have prints in digital format, I can scan them for projection onto the screen. Please mail prints to:
Philip Benham
Shell Canada Ltd
PO Box 100, Stn M
400-4 Ave SW, Calgary, AB, T1Y 3P7
- Each photo should be documented with:
 - Your name (Photographer must be an APS or CSPG member or attend Mount Royal College)
 - Contest category
 - Slide title
 - Photo location (if relevant)
 - Geological information (if possible)

As each slide comes up the contributor may stand and give a brief comment on their photo with the understanding that the paleo-

humour may take slightly longer to set the stage. Attendance is not required to enter pictures or to win.

The APS requests the privilege of using the winning entries to generate a fund-raising product (such as a calendar). We are also looking for volunteers for a panel of "celebrity judges." Please contact Philip Benham if you are interested.

Pop and juice will be provided during the potluck portion of the event. Please bring finger food of your choice. Any questions regarding the contest can be directed to Philip Benham by phone or email (see below).

INFORMATION

This event is jointly presented by the Alberta Palaeontological Society, Mount Royal College and the CSPG Palaeontology Division. For details or to present a talk in the future please contact CSPG Palaeontology Division Chair Philip Benham at 403-691-3343 or programs@albertapaleo.org. Visit the APS website for confirmation of event times and upcoming speakers: <http://www.albertapaleo.org/>



NEW DIVISION!

DIVISION PROFILE

The Heavy Oil / Oil Sands Division was created in November 2007 to provide a forum for CSPG members who are interested in learning more about both the technology and geological reservoirs associated with the Western Canada Basin. In addition, this forum will provide the

opportunity for you and your peers to network, and share thoughts and ideas on this particular discipline.

Our meetings will be on the last Thursday of every month at 8:00 am, and there will be a complimentary continental breakfast supplied. The breakfast session will start at 8:00 am and finish by 9:00 am. Initially, depending on size, the event will be hosted by RPS Energy at 1400 - 800 5 Avenue SW,

Calgary. There will be no cost associated with this event, and anyone may attend. Each month a different service company will sponsor the continental breakfast. The first Division Talk will be Thursday, January 31, 2008.

For more information on this Division, please contact the Division Chair, Nicole Keilly, RPS Energy at keillyn@rpsgroup.com or call (403) 263-0449.

GAS COMMITTEE ORGANIZATIONAL CHANGES

Robert A. Meneley (P. Eng., P. Geol.) has been appointed Chairman of the Business Committee, responsible for the planning, execution, quality control and delivery of the next report scheduled for release in 2010. Mr. Meneley brings more than 50 years of domestic and international exploration experience and was the Committee's Chief Analyst for the previous assessments reports by the CGPC in 1997 and 2001, and was the Technical Advisor for the 2005 Report. Although the Committee is dominantly a volunteer group of geoscientists, to provide direct assistance to Mr. Meneley in the preparation and production of the 2010 Report, Peter M. Milburn has been contracted as Report Coordinator. Mr. Milburn brings his extensive computer hardware and software experience, graphics and report design skills to the CGPC. Gerry DeSorcy (P.Eng.), former Chairman of the Business Committee, continues as Chairman of the Board of Directors and heads the Committee's Finance Sub-Committee. Prior to joining the CGPC in 2003 Mr. DeSorcy was the Chairman of the Alberta Energy and Utilities Board.

For information on the Committee, its activities or to volunteer to assist in the next report contact the office at (403) 297-7222, e-mail cdngaspotential@shaw.ca or visit our website www.canadiangaspotential.com. Opportunities are available in the assessment teams for the WCSB, frontier basins, and unconventional gas sources in Canada.

A limited number of the Committee's 2001 Report is now available at no charge. This report, which originally sold for \$500 CDN, is in a seven ring binder, contains over 500 pages and provides gas resource assessments and maps for exploration plays in the WCSB and Canadian frontier basins, and discussions on potential in-situ CBM resources. To arrange pickup of this valuable report at the Committee's office in the EUB's Energy Resources Building contact the Committee's office by phone or e-mail as shown above.



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- Onshore Cretaceous Reservoir Equivalents

Morocco (Post-Meeting)

- Triassic Synrift Reservoir Facies & Architecture

Portugal (Post-Meeting)

- Jurassic Carbonates & Fluvio-deltaic Successions

ABSTRACT SUBMISSION DEADLINE

March 1, 2008

All abstracts must be submitted through the conference website

EXTENDED ABSTRACT DEADLINE

May 1, 2008

Extended abstracts for accepted papers must be submitted by this date

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CSPG VOLUNTEER PROFILE

Talking to Tony Cadrin

by Heather Tyminski



“Get involved and help create a better geoscience industry for your children, for your province, and for your country.”

ANTHONY AJ CADRIN, CO-CHAIR OF THE JOINT ANNUAL CONVENTION COMMITTEE

Employer: Sword Energy Inc.

Position: Vice-President Geosciences

Number of Years as a CSPG Volunteer: 15 years

What are your responsibilities as Co-Chair of the Joint Annual Convention Committee?

The goal of the committee is to create a three-year plan of the joint annual conventions with our partner societies (CSEG and CWLS). Along with my fellow committee members, I am responsible for organizing and arranging the Co-Chair and Technical Chair candidates to run the CSPG CSEG CWLS annual conventions. This involves the identification of the theme and the building of the management teams. It's like being the movie director and picking your actors.

What other volunteer positions have you held in the past at the CSPG?

I've volunteered on the Student Industry Field Trip (SIFT) Committee (1992-1996) and the CSPG Executive (Service Director in 1998-1999 and Programs Director in 2001). I've been the Technical Advisor and Special Session Chair for the Annual Convention (1998), the CSPG representative to the Geoscience Professional Development Centre (2000), Chair of the Technical Luncheon Committee (2002-2007), Link Award Committee (2002-2007), and Co-Chair for the Joint Annual Convention Committee (2005-Present).

Being on the executive takes a lot of time – a minimum of 300 hours a year, and to do a good job, it's 500 hours. If you can commit to this, you'll be pleased with your results and will be able to accomplish your personal directive goals. Each CSPG committee member sets their personal directive goals for them to achieve in the two years they are on committee.

As the Technical Luncheon Chair, I designed, developed, and implemented the Webcasting program, which has been one of the CSPG programs that most fulfills the technical content and outreach goals. We get thousands of people viewing these Technical Luncheon Webcasts (see the CSPG website to view the Technical Luncheon Webcasts).

Why did you initially decide to volunteer?

I wanted to give back to the geological community in which I was gainfully employed. When I was in university, one of my professors (Dr. Hugh Hendry, now deceased) talked about the CSPG and how it was the geological society you would want to be a member of as a student and in your subsequent working career. When I was finally in Calgary I read in the Reservoir an ad to volunteer for SIFT. I thought what an opportunity – I can assist in educating and provide students with an opportunity to join the industry and, in doing so, find the best people to join the industry. The more people I could get to join, the more great people I would have to work with.

After all these years, why do you continue to volunteer for the CSPG?

First of all, I got to work with some of my industry co-workers in the CSPG outside

of work. I got to know them better, which improved our work relationships. Secondly, it got me exposed to people I may not have met through industry activities. It enabled me to learn more about the people in my vocation. Thirdly, the accomplishments realized in volunteering with the CSPG, provided me with the benefit of good group dynamic skills, which encouraged me to seek the same sense of accomplishment and effective team building in my job. Lastly, in volunteering you can pick who you work with. Most people who volunteer have similar values and join because they want to work together with like-minded people, thus creating a very positive and productive environment.

What are some memorable moments you have had as a volunteer?

I've had many memorable moments: SIFT students and the field trips, working with the CSPG Executive and CSPG staff, the Past Presidents' Dinner, and Pearls of Wisdom Dinner (many valuable lessons imparted to me by very experienced industry people), sold-out Technical Luncheons, the success of the Webcast Program, being involved in the creative process for the Gussow Conferences and Joint Annual Conventions. I was also honoured to receive the Tracks Award in 2004. To me it meant that everything I was doing was appreciated, and that my peers enjoyed working with me.

Could you offer some words of wisdom to our CSPG members?

Through volunteering, I have met and made lifelong colleagues and friends. Get involved and help create a better geoscience industry for your children (if they follow in your footsteps), for your province, and for your country. The people I have met have been the biggest reward and together we accomplished lasting legacies for CSPG membership.

What is your opinion of current volunteerism in the CSPG?

The CSPG members who I have met through the volunteer program have made a significant impact to my professional and personal life, and it has been my privilege to share time and efforts with them. I strongly recommend to CSPG members to get involved with the CSPG as a volunteer and experience the rewards and accomplishments with us.

RESERVOIR ENGINEERING FOR GEOLOGISTS

Part 3 – Volumetric Estimation

by Lisa Dean, Fekete Associates Inc.

You have been asked to:

- Evaluate the properties that are for sale in a data room.
- Determine whether to participate in a prospect.
- Calculate the potential reserves encountered by a discovery well.
- Identify the upside potential in a mature field.

In all these situations, the bottom line is “how much oil or gas exists and can be produced, and what will be the return on investment?” This article addresses this question.

Volumetric estimation is the only means available to assess hydrocarbons in place prior to acquiring sufficient pressure and production information to apply material balance techniques. Recoverable hydrocarbons are estimated from the in-place estimates and a recovery factor that is estimated from analogue pool performance and/or simulation studies.

Therefore, volumetric methods are primarily used to evaluate the in-place hydrocarbons in new, non-producing wells and pools and new petroleum basins. But even after pressure and production data exists, volumetric estimates provide a valuable check on the estimates derived from material balance and decline analysis methods (to be discussed in upcoming *Reservoir* issues).

VOLUMETRIC ESTIMATION

Volumetric estimation is also known as the “geologist’s method” as it is based on cores, analysis of wireline logs, and geological maps. Knowledge of the depositional environment, the structural complexities, the trapping mechanism, and any fluid interaction is required to:

- Estimate the volume of subsurface rock that contains hydrocarbons. The volume is calculated from the thickness of the rock containing oil or gas and the areal extent of the accumulation (Figure 1).
- Determine a weighted average effective porosity (See Figure 2).
- Obtain a reasonable water resistivity value and calculate water saturation.

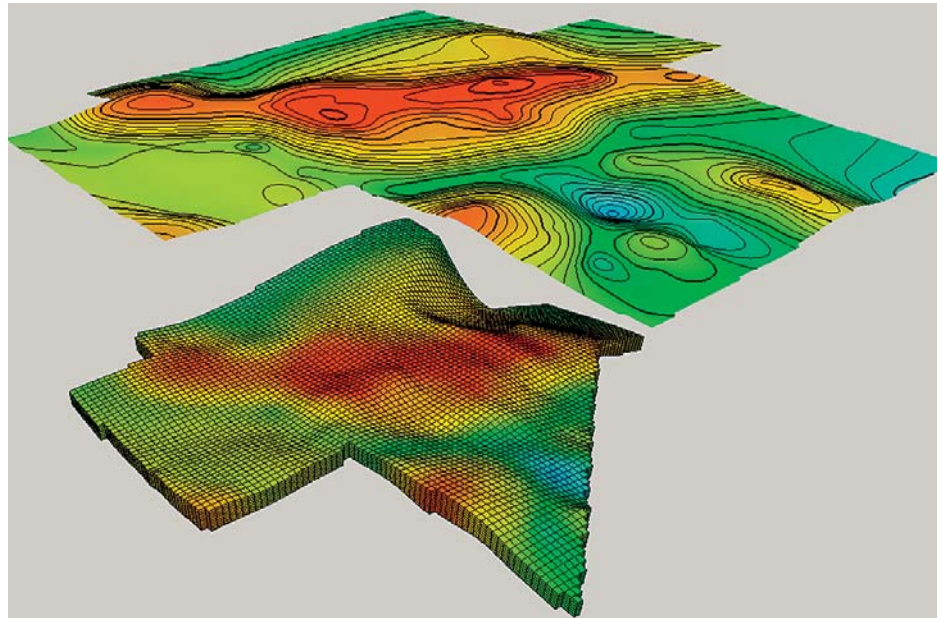


Figure 1. Areal Extent of Rock Volume Accumulation.

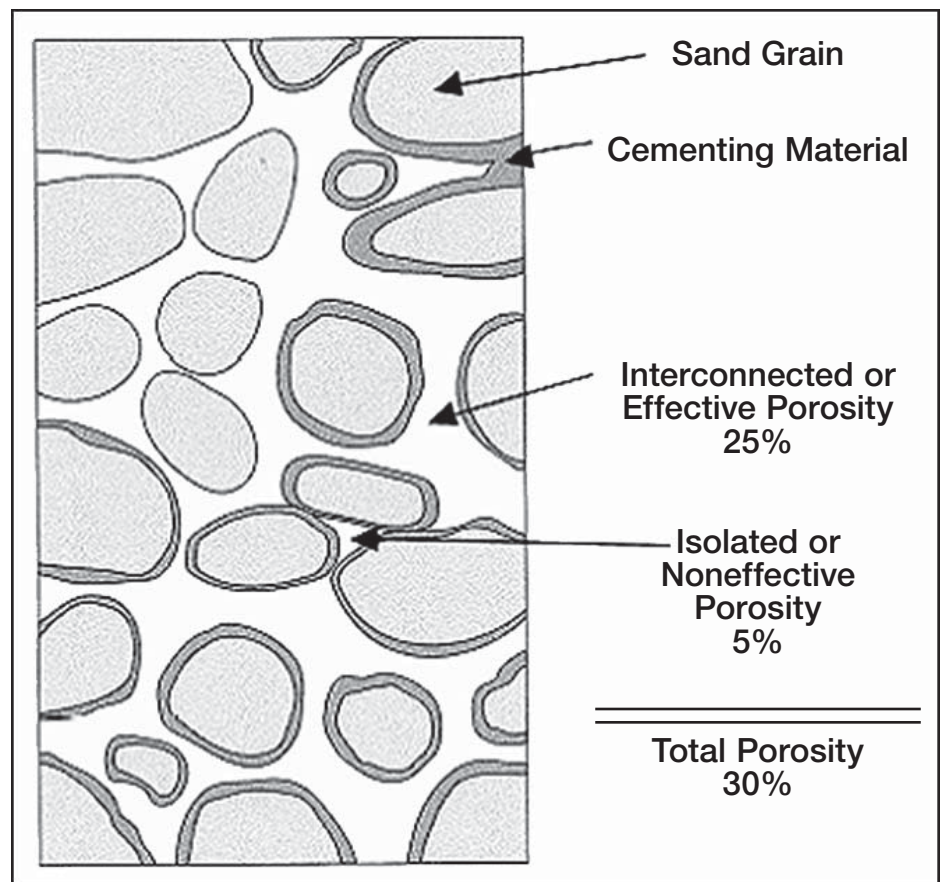


Figure 2. Weighted Average Effective Porosity.

With these reservoir rock properties and

original oil-in-place or original gas-in-place volumes can be calculated.

For **OIL RESERVOIRS** the original oil-in-place (OOIP) volumetric calculation is:

Metric:

OOIP (m³) =

Rock Volume * Φ * (1 - S_w) * I/B_o

Where: Rock Volume (m³) = 10⁴ * A * h

A = Drainage area, hectares
(1 ha = 10⁴m²)

h = Net pay thickness, metres

Φ = Porosity, fraction of rock volume available to store fluids

S_w = Volume fraction of porosity filled with interstitial water

B_o = Formation volume factor (m³/m³)
(dimensionless factor for the change in oil volume between reservoir conditions and standard conditions at surface)

I/B_o = Shrinkage (Stock Tank m³/reservoir m³)
= volume change that the oil undergoes when brought to the earth's surface due to solution gas evolving out of the oil.

Imperial:

OOIP (STB) =

Rock Volume * 7,758 * Φ * (1 - S_w) * I/B_o

Where: Rock Volume (acre feet) = A * h

A = Drainage area, acres

h = Net pay thickness, feet

7,758 = API Bbl per acre-feet (converts acre-feet to stock tank barrels)

Φ = Porosity, fraction of rock volume available to store fluids

S_w = Volume fraction of porosity filled with interstitial water

B_o = Formation volume factor
(Reservoir Bbl/STB)

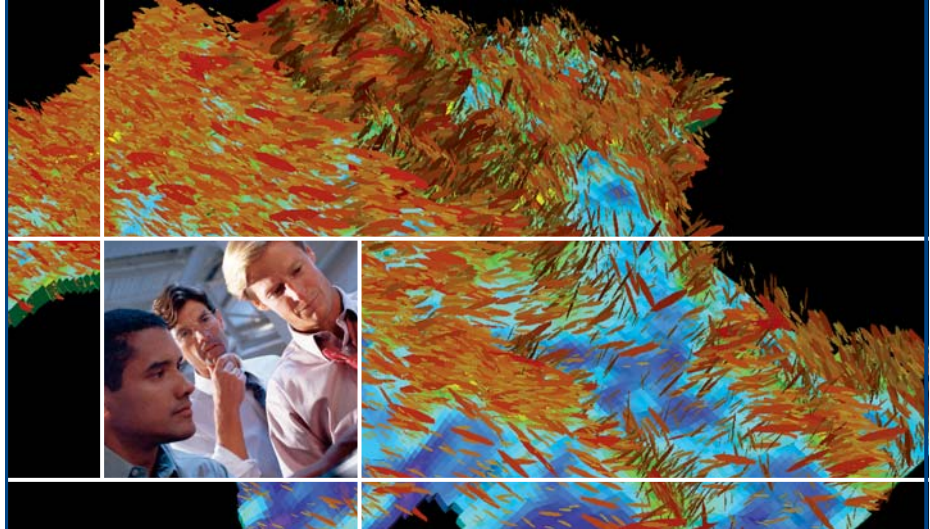
I/B_o = Shrinkage (STB/reservoir Bbl)

To calculate **recoverable oil volumes** the OOIP must be multiplied by the Recovery Factor (fraction). The recovery factor is one of the most important, yet the most difficult variable to estimate. Fluid properties such as formation volume factor, viscosity, density, and solution gas/oil ratio all influence the recovery factor. In addition, it is also a function of the reservoir drive mechanism and the interaction between reservoir rock and the fluids in the reservoir. Some industry standard oil recovery factor ranges for various natural drive mechanisms are listed below:

Solution gas drive	2 – 30%
Gas cap drive	30 – 60%
Water drive	2 – 50%
Gravity	Up to 60%

(Continued on page 22...)

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(...Continued from page 21)

For **GAS RESERVOIRS** the original gas-in-place (OGIP) volumetric calculation is:

Metric:

OGIP (10^3m^3) =

$$\text{Rock Volume} * \Phi * (1-S_w) * \frac{(T_s * P_i)}{(P_s * T_f * Z_i)}$$

Where: Rock Volume (m^3) = $10^4 * A * h$

A = Drainage area, hectares
(1 ha = 10^4m^2)

h = Net pay thickness, metres

Φ = Porosity, fraction of rock volume available to store fluids

S_w = Volume fraction of porosity filled with interstitial water

T_s = Base temperature, standard conditions, °Kelvin ($273^\circ + 15^\circ\text{C}$)

P_s = Base pressure, standard conditions, (101.35 kPaa)

T_f = Formation temperature, °Kelvin ($273^\circ + ^\circ\text{C}$ at formation depth)

P_i = Initial Reservoir pressure, kPaa

Z_i = Compressibility at P_i and T_f

Imperial:

OGIP (MMCF) =

$$\text{Rock Volume} * 43,560 * \Phi * (1-S_w) * \frac{(T_s * P_i)}{(P_s * T_f * Z_i)}$$

Where: Rock Volume (acre feet) = $A * h$

A = Drainage area, acres
(1 acre = 43,560 sq. ft)

h = Net pay thickness, feet

Φ = Porosity, fraction of rock volume available to store fluids

S_w = Volume fraction of porosity filled with interstitial water

T_s = Base temperature, standard conditions, °Rankine ($460^\circ + 60^\circ\text{F}$)

P_s = Base pressure, standard conditions, 14.65 psia

T_f = Formation temperature, °Rankine ($460^\circ + ^\circ\text{F}$ at formation depth)

P_i = Initial Reservoir pressure, psia

Z_i = Compressibility at P_i and T_f

To calculate **recoverable gas volumes**, the OGIP is multiplied by a recovery factor. Volumetric depletion of a gas reservoir with reasonable permeability at conventional depths in a conventional area will usually recover 70 to 90% of the gas-in-place. However, a reservoir's recovery factor can be significantly reduced by factors such as: low permeability, low production rate, overpressure, soft sediment compaction, fines migration, excessive formation depth, water influx, water coning and/or behind pipe cross flow, and the position and number of producing wells. As an example, a 60% recovery factor might be appropriate for a

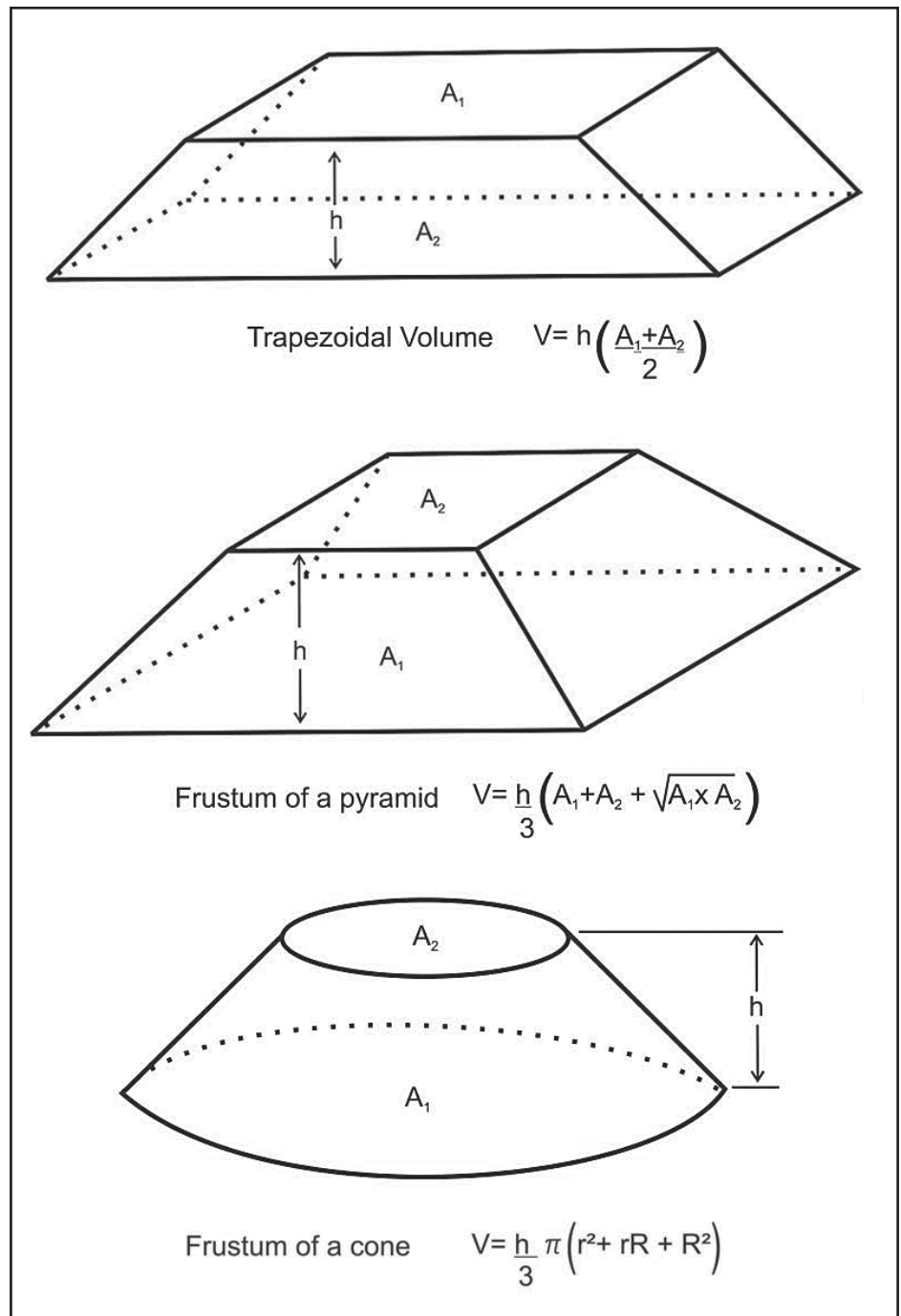


Figure 3. Volumetric Rules: Trapezoidal, Pyramidal, and Cone.

gas accumulation overlying a strong aquifer with near perfect pressure support.

Rock Volume Calculations (A * h)

Reservoir volumes can be calculated from net pay isopach maps by planimetry to obtain rock volume ($A * h$). To calculate volumes it is necessary to find the areas between isopach contours. Planimetry can be performed by hand or computer generated. Given the areas between contours, volumes can be computed using; Trapezoidal rule, Pyramidal rule, and/or the Peak rule for calculating volumes (see Figure 3).

Net pay

Net pay is the part of a reservoir from which hydrocarbons can be produced at economic rates, given a specific production method. The distinction between gross and net pay is made by applying cut-off values in the petrophysical analysis (Figure 4). Net pay cut-offs are used to identify values below which the reservoir is effectively non-productive.

In general, the cut-off values are determined based on the relationship between porosity, permeability, and water saturation from core data and capillary pressure data. If core

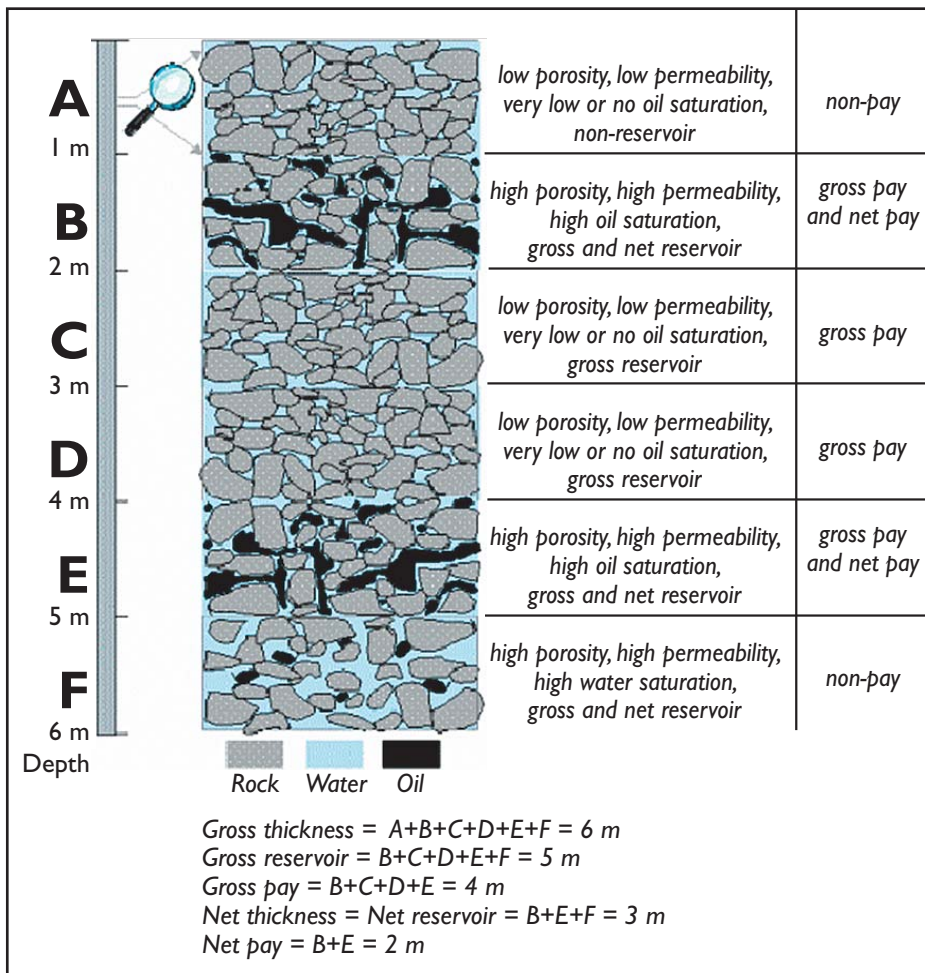


Figure 4. Gross and Net Pay Distinction.

is unavailable, estimation of a cut-off can be derived from offset well information and comparative log signatures.

Porosity and Water Saturation

Porosity values are assigned as an average over a zone (single well pool) or as a weighted average value over the entire pay interval using all wells in a pool. Similarly, the average thickness-weighted water saturation using all wells in the pool is commonly assumed as the pool average water saturation.

Drainage Area

Drainage area assignments to wells should be similar to offset analogous pools depending on the geological similarities and productivity of the wells within the analog. Pressure information is useful in estimating pool boundaries and if any potential barriers exist between wells. Seismic analysis usually improves the reservoir model and provides for more reliability in reserve or resource estimates.

Formation Volume Factor

The volumetric calculation uses the initial oil or gas formation volume factor at the initial

reservoir pressure and temperature. Both B_o and B_g are functions of fluid composition, reservoir pressure and temperature and consequently of reservoir depth. The B_o and B_g values from analogous offset pools are often used as an initial estimate for the prospect under consideration.

VOLUMETRIC UNCERTAINTY

A volumetric estimate provides a static measure of oil or gas in place. The accuracy of the estimate depends on the amount of data available, which is very limited in the early stages of exploration and increases as wells are drilled and the pool is developed. Article 8, entitled Monte Carlo Analysis, will present a methodology to quantify the uncertainty in the volumetric estimate based on assessing the uncertainty in input parameters such as:

- Gross rock volume – reservoir geometry and trapping
- Pore volume and permeability distribution
- Fluid contacts

The accuracy of the reserve or resource estimates also increases once production

data is obtained and performance type methods such as material balance and decline analysis can be utilized. Finally, integrating all the techniques provides more reliable answers than relying solely on any one method.

REFERENCES

Aprilia, A.W., Li, Z., McVay, D.A. & Lee, W.J., SPE Gas Tech Symposium May 15-17 2006, Calgary. SPE Paper 100575-MS

Canadian Institute of Mining, Metallurgy and Petroleum, Determination of Oil and Gas Reserves, Petroleum Society Monograph Number 1, 1994.

SPEE and CIM, Canadian Oil and Gas Evaluation Handbook, Vol 2. Detailed Guidelines for Estimation and Classification of Oil and Gas Resources and Reserves, November 2005.

Look for our next article on “Decline Analysis” in the January issue of the Reservoir.

This article was contributed by Fekete Associates, Inc. For more information, contact Lisa Dean at Fekete Associates, Inc.

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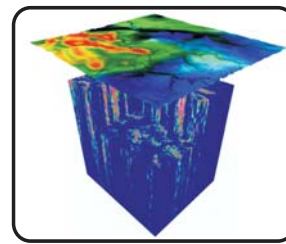
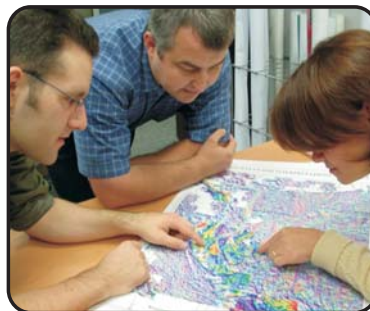
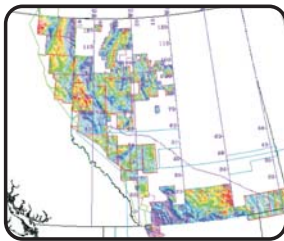
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CANADIAN SOCIETY OF PETROLEUM GEOLOGISTS

2008 Executive Committee

The Canadian Society of Petroleum Geologists takes great pleasure in announcing The Executive Committee for 2008. The new Executive will take office following the Annual General Meeting at the Calgary Telus Convention Centre on Tuesday, January 8, 2008.

PRESIDENT — LISA GRIFFITH



BIRTH: Bellefonte, Pennsylvania (1955).

EDUCATION: B.A., Rice University, Houston (1977); M.Sc. Geology, University of Calgary (1981).

EXPERIENCE: Geologist, Esso Resources Canada (1980-1985); Geologist, Lead Development Geologist, Regional Clastics Specialist, Amerada Hess Canada (1985-1992); Consulting Geologist, W.R. May and Assoc. (1992-1993); Sr. Geologist, Staff Geologist, Senior Clastics Specialist, PanCanadian/Encana (1993-2002); Chief Geologist, GEDCO (2003-2004); President, Griffith Geoconsulting Inc. (2004-Present).

PROFESSIONAL MEMBERSHIPS: CSPG, AAPG, SEPM, APEGGA.

CSPG ACTIVITIES: Thesis Committee (1980s, 1990s), Student-Industry Field Trip, Clastic Core Exercises (1990s), Asst & Finance Director (2002-2004), Visiting Lecturer (2003, 2004), Guest co-Editor Bulletin of Canadian Petroleum Geology (2002), Technical Session Co-Chair (2000, 2005), Convention Awards Committee (2005).

PUBLICATIONS: Numerous conference abstracts discussing Cretaceous clastic formations for oral presentations, posters (CSPG, AAPG), and core displays (CSPG) (Primary author 1980, 1986, 1995, 2002, 2003; co-author 1995, 1997, 1998, 2000, 2001, 2003, 2004.) CIM Preprint Paper No.88 39-50 (1988) (Cardium Fm); Cardium chapter co-author, Geology of the Calgary Area, CSPG Publication (1987).

AWARDS: CSPG-CWLS Best Oral Presentation (1995), CSPG Link Award (1996), SEPM Best Oral Presentation (1997, co-author), CSPG-CSEG Best Integrated Core Presentation (2003).

VICE-PRESIDENT — GRAEME BLOY



BIRTH: London, GBR (1953).

EDUCATION: B.Sc. Honours Geology, University of Alberta (1975); M.Sc. Geology, University of Alberta (1979).

EXPERIENCE: Exploration Geologist, HBOG (1977); Senior Geologist, Thomson Jensen Petroleum Ltd. (1982-1987); President, Quarter Point Resources; Senior Staff Geologist, Husky Oil (1988-1993); Senior Geologist, Chauvco (1993-1995); Senior Geologist, Startech Energy Ltd. (1995-1998); Senior Geological Advisor, Ulster Petroleum (1998-2000); Exploration Manager, Geotechnical Services, Anderson Exploration and Devon Canada (2000-2002); Exploration Manager, Peace River Arch & Unconventional Resources Devon Canada (2002-2007); VP Exploration, West Energy Ltd. (2007).

PROFESSIONAL MEMBERSHIPS: CSPG, AAPG, SEPM, CWLS, APEGGA.

CSPG ACTIVITIES: Manpower Committee (1981-1985), Short Courses (early 1990s), Technical Co-Chair Convention (1995), Chair, CSPG Trust (2001-2004).

PUBLICATIONS: Co-led a variety of CSPG field seminars to Grassi Lakes, Chester Lake, Sawtooth Range, Montana. Co-authored a variety of core workshop presentations, poster and oral presentations at CSPG conventions on reservoir attributes, stratigraphy, and exploration models. Co-organized several short courses on carbonate reservoirs and porosity development.

AWARDS: CSPG Volunteer Award (2004).

PAST-PRESIDENT — COLIN YEO, P.GEOL.



BIRTH: Dundas, Ontario (1951).

EDUCATION: B.Sc. Honours Geology and Geography, McMaster University (1974).

EXPERIENCE: Geologist, Petrophysicist and Team Leader Exploration, Exploitation and Production Business Units, Amoco Canada Petroleum Co. Ltd. (1974-1999); Evaluation Geologist, Acquisitions and Divestitures, Petroprep Resources Ltd. (1999-2000); Technical Advisor, Area Manager Shallow Gas Business Unit, Evaluation Geologist Acquisition and Divestitures, EnCana Corporation (2000-Present).

PROFESSIONAL MEMBERSHIPS: CSPG, APEGGA, CSEG, CWLS, AAPG.

CSPG ACTIVITIES: Media and Public Affairs (1977-1980), Art Event (1985-1987), History and Archive Committee (1988-1992), Annual Convention Core Conference Chairman (1995), Services Director (1999-2000), Volunteer Management Committee (2001-Present).

PUBLICATIONS: Co-authored papers on exploration activity in the WCSB; conducted many field trips within the Calgary-Banff corridor; gave several presentations to high school students in Alberta.

AWARDS: Service and Volunteer Awards (1992, 2002, 2004).

CORPORATE RELATIONS DIRECTOR — MONTY RAVLICH



BIRTH: Sault Ste. Marie, Ontario (1954).
EDUCATION: B.A. University of Ottawa (1977); E.MBA – Queens University (1999).
EXPERIENCE: Sales and Sales Management, Dresser Atlas (1980-88); Sales Management, Executive VP, President, President and COO, Great Guns Logging/Tucker Wireline (1988 – 2006); COO, Sanjel Corporation (2007 – present).
PROFESSIONAL MEMBERSHIPS: CSPG.
CSPG ACTIVITIES: Corporate Relations Chair (2006 – present), 1999 Convention Sponsorship Chair, Squash and Golf Committee Member.

FINANCE DIRECTOR — JAMES DONNELLY



BIRTH: Pembroke, Ont., 1955.
EDUCATION: B.Sc. University of Toronto (1979), B.Sc. Geology, University of Calgary (1982).
EXPERIENCE: Geologist, Anschutz Resources (1982-1987); Senior Geologist, Poco Petroleum Ltd. (1987-1999); Geoscience Advisor, Burlington Resources Canada Ltd. (1999-2006); ConocoPhillips Canada Ltd. (2006-Present).
PROFESSIONAL MEMBERSHIPS: CSPG.
CSPG ACTIVITIES: Session Chair CSPG and Petroleum Society Joint Convention (1999).

ASSISTANT FINANCE DIRECTOR — DAVID GARNER



BIRTH: Austin, Texas (1958).
EDUCATION: B.Sc. (cum laude) Geophysics, Washington & Lee University (1980); M.Sc. Geophysics, Cornell University (1983); Geostatistics Citation, University of Alberta (2006).
EXPERIENCE: Geophysicist, Chevron Petroleum Technology Company in the US and Canada (1982-1995); President, TerraMod Consulting (1996-2002); Reservoir Characterization Specialist, Surmont Oilsands, ConocoPhillips Canada Ltd. (2002-2006); Senior Advisor, Geological Modeling, Ells River Oilsands, Chevron Canada Resources Ltd. (2006-Present).
PROFESSIONAL MEMBERSHIPS: CSPG, AAPG, SPE, CHOA, EAGE, APEGGA.
CSPG ACTIVITIES: Treasurer/Chairman, Geomathematics and Computer Applications Division (1997-2005); Chairman, Geomodeling Division (2005-present); Technical Session Co-Chair (2007).
PUBLICATIONS: Numerous oral presentations, posters, and papers for the CSPG, CSEG, CHOA, AAPG, MEG, and SPE. Topics include studies using applied geostatistics, earth modeling, and mapping for resource assessment and development.

PROGRAM DIRECTOR — RANDY RICE



BIRTH: Moncton, New Brunswick (1952).
EDUCATION: B.Sc. Geology, Mount Allison University (1974); M.Sc. Geology (Glacial Sedimentology), University of Alberta (1979); Ph.D. Geology (Fluvial Sedimentology), McMaster University (1987).
EXPERIENCE: Stratigraphy and Grade Control, Mildred Lake Mine, Syncrude Canada Ltd. (1978-1979); Operations and Technical Group, Amoco Canada Petroleum Company Ltd. (1979-1981); Project Geologist, Precambrian Sedimentology, Ontario Geological Survey (1986-1989); Post-Doctoral Fellow/Adjunct Professor, Carleton University, Ottawa (1989-1993); Assistant Professor, American University of Beirut, Lebanon (1993); Regional Geologic Mapping, Capital Resources Ltd./ St. Francis Xavier University (1994-1995); Carlin-type gold exploration, Campbell Resources Ltd. (1996-2000); Project Lead, MVT Pb-Zn, Alberta Geological Survey (2001-2003); Team Lead, Regional Geological Study, Alberta Energy and Utilities Board (2003); Oil Sands Section, Geology and Reserves Group, Alberta Energy and Utilities Board (2005-2006); Firebag In-Situ Group, Suncor Energy Inc. (2006-Present).
PROFESSIONAL MEMBERSHIPS: CSPG, CHOA, APEGGA.
PUBLICATIONS: 50,000 scale map sheets, Nova Scotia; MVT Pb-Zn, Alberta; Precambrian sedimentology, Ontario; fluvial sedimentology, Arctic Islands.

SERVICES DIRECTOR — JEN VEZINA



- BIRTH:** Chappleau, Ontario (1968).
EDUCATION: B.Sc. Honours, Geology, Queen's University (1992); M.Sc., Geology, University of Alberta (1996).
EXPERIENCE: Geologist, Upton Resources Inc. (1997-1998); Contract Geologist, Coastal Oil and Gas Canada, Inc. (1999); Contract Geologist, Graham Davies Geological Consultants (1999); Contract Geologist, Apache Canada Limited (1999-2000); Geologist, NAL Resources (2000-2006).
PROFESSIONAL MEMBERSHIPS: CSPG.
CSPG ACTIVITIES: Field Trip Committee Co-Chair, CSPG and Petroleum Society Joint Convention Field Trip Committee (1999).
PUBLICATIONS: Quaternary sea-level highstands from Th/U dating of aragonitic corals, Journal of Sedimentary Research.

ASSISTANT SERVICES DIRECTOR — AYAZ GULAMHUSSEIN



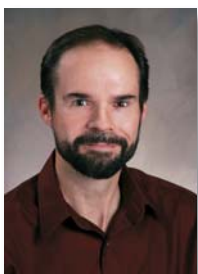
- BIRTH:** Calgary, Alberta (1980).
EDUCATION: B.Sc. Geology, University of Calgary (2003); B.A. Minor Applied Energy Economics, University of Calgary (2003).
EXPERIENCE: Staff Geologist, Coastal Resources Ltd. (2003-2005); Staff Geologist, Shiningbank Energy Trust (2005-2007); Exploration Geologist, NuVista Energy Ltd. (2007-Present).
PROFESSIONAL MEMBERSHIPS: CSPG, AAPG, APEGGA.
CSPG ACTIVITIES: Membership Chair (2005-2007). CSPG representative for AAPG Conference (2007).

OUTREACH DIRECTOR — GREG LYNCH



- BIRTH:** Deep River, Ontario (1960).
EDUCATION: B.Sc. Geology, University of Ottawa (1983); M.Sc. Geology, Washington State University (1985); Ph.D. Geology, University of Alberta (1989).
EXPERIENCE: Research Scientist, Geological Survey of Canada (1989-1998); Exploration Geologist, Shell Canada Limited (1998-Present).
PROFESSIONAL MEMBERSHIPS: CSPG, APEGGA.
CSPG ACTIVITIES: Student Industry Field Trip (SIFT) co-leader (1999-2005); Associate Editor, Bulletin of Canadian Petroleum Geology (2001-03, 2005-07).
PUBLICATIONS: Papers on Cordilleran and Appalachian geology; conference presentations on oil and gas geology.
AWARDS: CSPG Volunteer Appreciation Award; GSC Service Award.

ASSISTANT OUTREACH DIRECTOR — MIKE DESROCHES



- BIRTH:** Longueuil, Quebec (1958).
EDUCATION: Hons. B.Sc. Geology, University of Waterloo (1982).
EXPERIENCE: Exploration/Development Geologist, Gulf Canada Resources Ltd. (1982-1996); Geologist, Canadian Natural Resources Ltd. (1996-2006); Geologist, Crew Energy Inc. (2006-2007, 6 months); Contract Geologist, ProsPex Resources Ltd. (July 2007 – Present).
PROFESSIONAL MEMBERSHIPS: CSPG, APEGGA.
CSPG ACTIVITIES: SIFT Committee (1995-2006), Poster Chair (2001 Convention)
AWARDS: CSPG Volunteer Award, CSPG Service Award, CSPG Tracks Award (2006)

COMMUNICATIONS DIRECTOR — PEGGY HODGKINS



- BIRTH:** Pensacola, Florida (1966).
EDUCATION: B.Sc. Forestry and Geology, The University of the South, magna cum laude (1988); M.Sc. Geology, The University of North Carolina at Chapel Hill (1990).
EXPERIENCE: Exploration/Development Geologist and Petrophysicist, Amoco Petroleum Co. (1991-2000); Structural Geology/Petrophysics, BP Canada Petroleum Co. (2000-2002); Petrophysics and Rock Properties, BP America, Inc. (2002-2003); Development Geologist, Encana Corporation (2003-2006); Petrophysics and Rock Properties, Hampson-Russell (CGGVeritas) (2006-present).
PROFESSIONAL MEMBERSHIPS: CSPG, AAPG, SEG.
PUBLICATIONS: Application of NMR Logging to Reservoir Characterization of Low-Resistivity Sands in the Gulf of Mexico, AAPG Bulletin; Salt sill deformation and its implications for subsalt exploration, The Leading Edge; The use of fluid inclusions to constrain fault zone pressure, temperature, and kinematic history: an example from the Alpi Apuane, Italy, Journal of Structural Geology.

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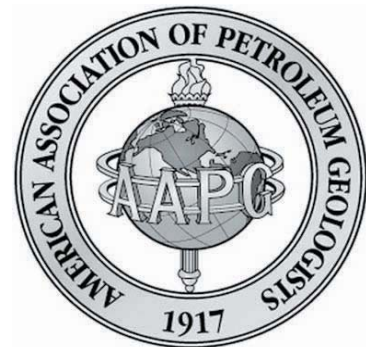
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WELCOME TO WIUGC *Edmonton 2008!*

The Western Inter-University Geoscience Conference (WIUGC) is a student-run conference that is held at a different western Canadian university every year. This year it is being hosted by the University of Alberta in Edmonton on January 3-6, 2008. It is a place where undergraduate and graduate students can present their research, learn about job opportunities in the industry, and meet other geology and geophysics students from across western Canada. The universities that are invited are the University of British Columbia, the University of Victoria, the University of Calgary, the University of Lethbridge, the University of Saskatchewan, the University of Regina, the University of Winnipeg, Brandon University, and Lakehead University.

This year, we are expecting 150-200 people for the conference. It will be held at the Shaw Conference Centre in Edmonton, in conjunction with the Courtyard by Marriott Hotel. There are a variety of fun activities throughout the three days of the conference.

On Thursday, January 3, everyone will arrive and settle into their hotel rooms. After dinner, there will be an informal welcome to WIUGC and networking events into the evening of the first night.

On Friday, the first full day of the conference, there will be talks given by undergraduate and graduate students from across western Canada, as well as posters, which will be judged by a combination of U of A faculty and industry people, with prizes given to the best posters and talks. A guest speaker will present at an informal lunch for those interested in attending. There will also be an industry fair to help students learn about career opportunities across Canada in the oil and gas industry, as well as the mining industry. This is a day for networking and getting to meet the delegates and industry people from around the country.

On Saturday, day trips are being organized around Edmonton that will enable the delegates and representatives from the industry to observe local geology and the industry in Alberta. A banquet on the final night will allow students, industry representatives, faculty and guests to listen to a keynote speaker, and a final opportunity to network and visit with students and industry representatives from across western Canada. All who attend



WIUGC 2007 Winnipeg.



Field trip to Sand Gold Corp. Mine at WIUGC 2007 Winnipeg.

will hopefully leave with an appreciation of the geology and industry of Alberta, a heightened awareness of what is happening in the geosciences of other western Canada provinces, and a great experience in learning and in meeting other students. Relationships built at WIUGC will last long after our university careers are over.

Anyone interested in attending or participating in WIUGC Edmonton 2008, or

simply would like more information about the conference can contact Becky Schmidt at wiugc2008@gmail.com or at our mailing address, which is:

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IN MEMORIAM:

James Drynan Aitken 1928 – 2002



Jim Aitken was a long-time member of our society who set high standards in his profession and achieved excellence in his many interests: the outdoors, skiing, climbing, hunting, construction, and especially field geology.

Born in Scarborough, Ontario, his first connection with the Geological Survey of Canada (GSC) was as a student assistant in geological field parties. Jim was especially inspired by working with John Wheeler, the eminent mapping geologist renowned for his work in rugged mountainous terrain. Following his bachelor's degree in geological engineering at the University of British Columbia (1950), Jim's doctoral studies were at the University of California, Los Angeles (1950-1953), where there began a long friendship with Tom Oliver, who later became the Dean of Science at the University of Calgary. The field component of his studies was the complex terrain of the Atlin area of northwestern British Columbia and was supported by the GSC (GSC Memoir 307, 1959). Following a stint in South America with International Petroleum, he arrived in Calgary in 1959, initially with J. C. Sproule and Associates, then, from 1960, with the GSC's Calgary office, where he was prominent in major mapping operations in northern Canada and in the Rocky Mountains of Alberta and British Columbia. His eminent scientific work at the Survey (with leadership roles as Head of the Paleozoic Stratigraphy Section, 1966-1969 and Head of the fieldwork components of Operation Norman, 1968 and 1969) included three years (1969-1972) as a Professor at the University

of Calgary where he taught stratigraphic concepts to undergraduate and graduate students with emphasis on the importance of careful scientific observations and where he inspired students with the fascination of his field experiences.

Jim's scientific work produced many elegant geological maps and comprehensive papers. Focussing on the Cambrian and Ordovician rocks of the southern Rocky Mountains, he revised and elucidated the stratigraphy and depositional environments of the Lower and Middle Ordovician (1967 with Brian Norford), of the Upper Cambrian (1967 with Bob Greggs) and especially the Middle Cambrian, for which GSC Bulletin 398 (1997) is an outstanding synthesis of the very complex depositional environments of the outboard regions of a tropical carbonate platform. Among his innovative concepts was the recognition and explanation of a series of Grand Cycles of transgressions and regressions reflecting changes in sea-level (1966, 1978). Also his recognition of the Kicking Horse Rim as a recurrent feature effecting the facies changes in Middle Cambrian time (1971). Another important contribution was his initiation of the now widely used term *cryptalgal* to describe stromatolite-like sediments that lack any apparent microstructure (1967). Jim described the stratigraphic framework for the Burgess Shale Project led by Harry Whittington of Cambridge University and, with Don Stott, compiled and edited the comprehensive GSC synthesis volume on the sedimentary cover of the Canadian craton (1993). Structurally, using his intimate knowledge of the Lower Paleozoic stratigraphy within the individual thrust plates, he outlined restoration of the depositional locations of the plates, contributing to the understanding of crustal shortening within the southern Rocky Mountains (1988). In the northern mainland and the adjacent Victoria Island, he described the stratigraphy and interpreted the depositional environments of the Proterozoic rocks, including recognition of Late Proterozoic glaciations.

A natural athlete, Jim Aitken enjoyed 25 years on the Lake Louise Ski Patrol. For the succession of his student field assistants, their first few days were spent learning demanding mountaineering techniques together with emergency procedures for anything that might happen in the mountains. A classic result was that once, during the

awesome quiet of an auto-rotating descent on the failure of a helicopter's engine, the field assistant sitting behind Jim tapped him on the shoulder and asked AJim, is this when we all put on our gloves? @. Hunting, primarily birds, was a speciality of Jim, often with colleagues Cecile, Cook, Hughes, McIlreath, Norford, or Thorsteinsson and his superbly trained Labrador Retrievers, preferably golden. An excellent shot, Jim's shout of AYours! @ meant that someone else had a single second to shoot before Jim downed the prime pheasant. Construction was another hobby, including the building of a large cottage near Sundre and both a home and a guest cottage on Denman Island. Watchdog and vigilante for the English Language was a continuing role, whether with regard to the scientific writing of his colleagues or the oral transgressions of CBC commentators.

An early tragedy saw Jim and Anne losing their young son in an accident while working in South America. Their other children Tenley, Scott, and Sally and the grandchildren were a constant pride for Jim. His second wife Roxanna shared the challenges of construction near Sundre and on Denman and their energetic and creative retirement as Island People.

Jim's scientific honours included our Society's Douglas Medal (1987) for outstanding contributions in sedimentary geology. He led many field trips for the Society and served as a Director on the Society's Executive in 1969. His contributions to the North American Commission on Stratigraphic Nomenclature from 1975 to 1978 (Chairman 1978), led to the publication of the extensively revised North American Stratigraphic Code in 1983.

Jim Aitken enjoyed life to the full and valued his friends and colleagues. He found many friends in all of his disparate activities, each of whom recognized his strong personality and his dedication to excellence in whatever he was doing. One of the superb Canadian geologists of his generation, Jim Aitken's sophisticated geological maps and his elegant syntheses of Lower Paleozoic rocks have set high standards for earth scientists in Western Canada.

Brian Norford

Selected Items from Jim Aitken's extensive bibliography.

- 1959 Atlin Map-area, British Columbia (104N). GSC Memoir 307, 87 pp.
- 1966 Middle Cambrian to Middle Ordovician cyclic sedimentation, southern Rocky Mountains of Alberta. Bulletin of Canadian Petroleum Geology, 14, p. 405-441.
- 1967 Classification and environmental significance of cryptalgal limestones and dolomites, with illustrations from the Cambrian and Ordovician of southwestern Alberta. Journal of Sedimentary Petrology v. 37, p. 1163-1178.
- 1967 Upper Cambrian formations, southern Rocky Mountains of Alberta, an interim report. GSC Paper 66-49 (with R. G. Greggs), 91 pp.
- 1967 Lower Ordovician Survey Peak and Outram formations, southern Rocky Mountains of Alberta. Bulletin of Canadian Petroleum Geology, v. 15, p. 150-207 (with B. S. Norford).
- 1971 Control of Lower Paleozoic sedimentary facies by the Kicking Horse Rim, southern Rocky Mountains, Canada. Bulletin of Canadian Petroleum Geology, v. 19, p 557-569.
- 1972 Cambrian and Ordovician biostratigraphy of the southern Rocky Mountains. Guidebook XXIV International Geological Congress Excursion A19 (with W. H. Fritz and B. S. Norford), 57 pp.
- 1978 Revised models for depositional Grand Cycles. Bulletin of Canadian Petroleum Geology, v. 26, p. 515-542.
- 1981 Stratigraphy and sedimentology of Upper Proterozoic Little Dal Group, Mackenzie Mountains. GSC Paper 81-10, p. 47-71
- 1988 Palinspastic map of southern Canadian Rocky Mountains. GSC Open File 1696.
- 1989 Uppermost Proterozoic formations, central Mackenzie Mountains, Northwest Territories. GSC Bulletin 368, 25 pp.
- 1991 Ice Brook Formation and late Proterozoic glaciation. GSC Bulletin 404, 43 pp.
- 1993 Sedimentary cover of the craton in Canada. GSC, Geology of Canada (7th Edition) , No. 5 (with D. F. Stott), 826 pp.
- 1997 Stratigraphy of the Middle Cambrian platformal succession, southern Rocky Mountains. GSC Bulletin 398, 322 pp.

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THE SEISMIC EXPRESSION OF FAULTS

by Bruce Hart, McGill University

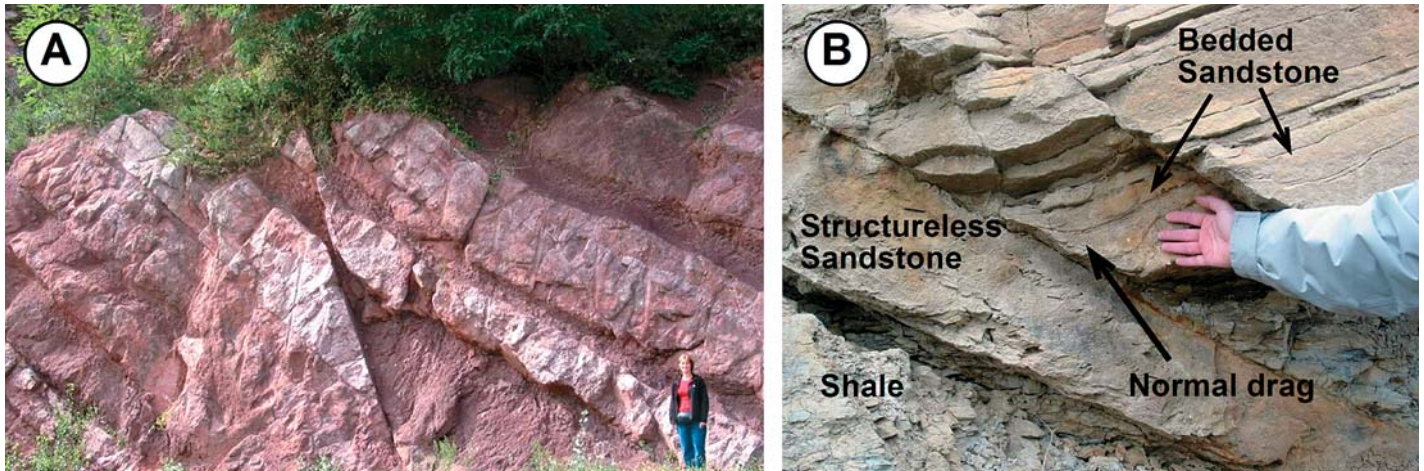


Figure 1. A) A fault exposed in an outcrop from the eastern Pyrennes. The fault is defined by bedding truncations. B) Faulted Tertiary strata from central Texas. Faults are defined by stratal offsets, terminations, and juxtaposition of different lithologies (sandstone against shale). Normal drag suggests a component of dip-slip displacement (down to the right).

Faults are important to the petroleum industry for a variety of reasons. Faults can set up a variety of structural traps, and they may be barriers to fluid flow (“sealing faults”) that compartmentalize reservoirs. In other cases, faults can act as conduits for fluid flow (e.g., migration pathways). In low-permeability reservoirs, highly fractured “damage zones” associated with faults may be drilling targets because they provide the permeability necessary for wells to produce at economic rates. Fault geometries can be used to reconstruct tectonic histories and those interpretations may play key roles in petroleum systems evaluations. For these and other reasons, we are interested in using seismic data to detect and map faults.

Faults are discontinuities in rocks across which there is evidence of movement. When looking at sedimentary rocks in outcrop, we recognize faults by stratal terminations that line up to define the trace of a fault plane (Figure 1a). Visually, we try to match the stratigraphy from one side of the fault to the other in order to assess the sense of movement. Is it a normal fault (implies extension), a reverse fault (implies compression) or a wrench fault (strike-slip displacement)? Is the outcrop parallel to the direction of the movement (i.e., does the outcrop truly represent a dip section through the fault), or is there is at least a component of movement in or out of the face of the outcrop? Perhaps we should examine the fault plane for slickenlines, or look for distortion of the strata that can be used to infer a sense of movement (Figure 1b).

Seismic data are commonly used to identify faults in the subsurface. As in outcrop analogues, we look for stratal terminations that line up to define the location of the fault on our seismic transect, and visually attempt to match up the stratigraphy from one side of the fault to the other in order to assess the sense of displacement (alas, slickenlines are not resolvable seismically). However, because of seismic resolution issues, faults with relatively small offsets might only be definable by subtle changes in reflection dip, changes in amplitude or changes in reflection character. Figure 2 shows at least two normal faults. One of the faults is identifiable by obvious reflection offsets, whereas the other (an antithetic to the first fault) is defined by more subtle fault indicators that line up to define the trace of the fault. In some cases we might see reflections from the fault plane

(Figure 3) but these situations are relatively rare, at least in part because the common midpoint method used to collect and process seismic data does not adequately image fault plane energy when dips are steep.

We need to keep in mind that the seismic images are not truly geological cross sections, that data acquisition and processing parameters (e.g., post-stack time migration versus pre-stack depth migration) have a significant impact on the images we see. Our seismic data can contain artifacts or noise that might either obscure our faults or may be confused as faults (e.g., Figures 2, 4). Furthermore, even how we display the data (choice of colour bar, amplitude scaling, vertical exaggeration, etc.; Figure 3) can have an impact on our ability to identify faults.

(Continued on page 34...)

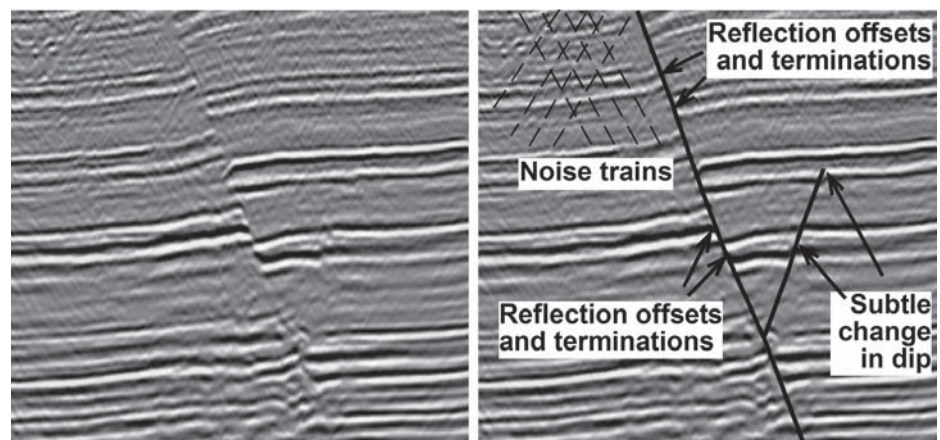


Figure 2. Uninterpreted and interpreted transect through some seismic data showing seismic expression of two faults. Steeply dipping noise trains (produced by acquisition and processing parameters) are most visible in the upper part of the figure, but affect the data throughout.

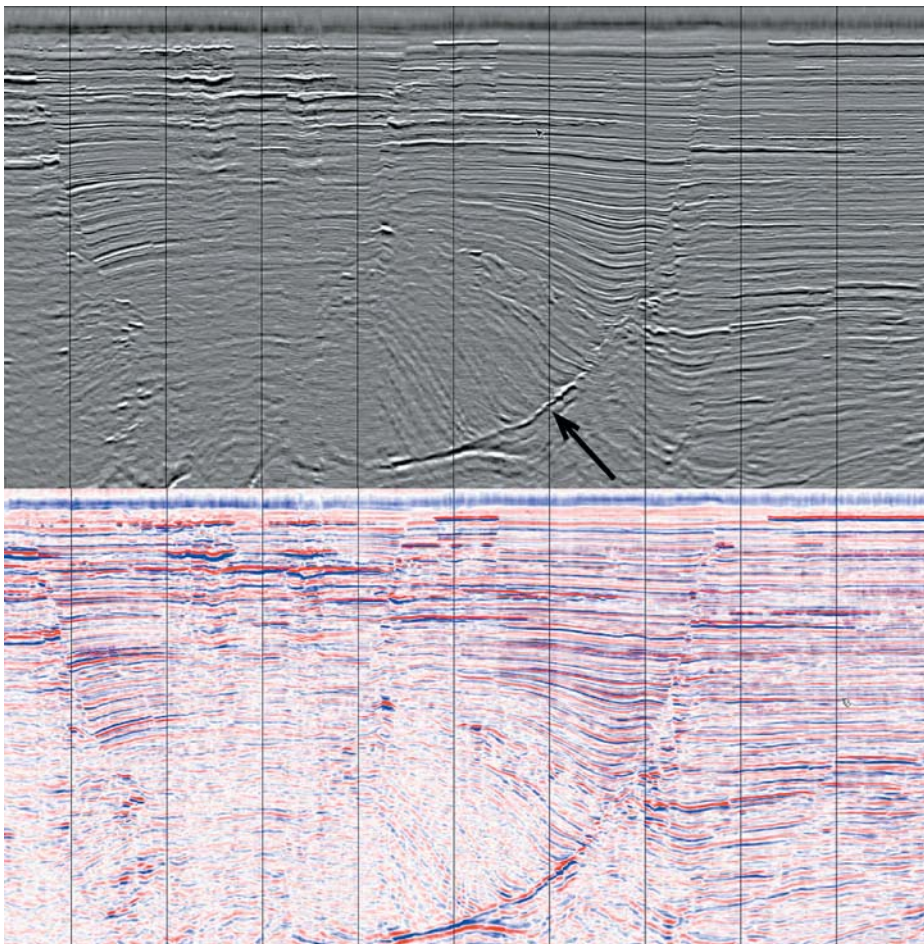


Figure 3. Seismic transect from the Gulf of Mexico showing faults using two different colour bars. Faults are defined by reflection terminations and offsets, changes in dip or amplitude, and (arrow) a fault-plane reflection. Note the differences in fault definition between the greyscale display and the blue-white-red display. A greyscale image is preferred for fault interpretations. Data courtesy of PGS.

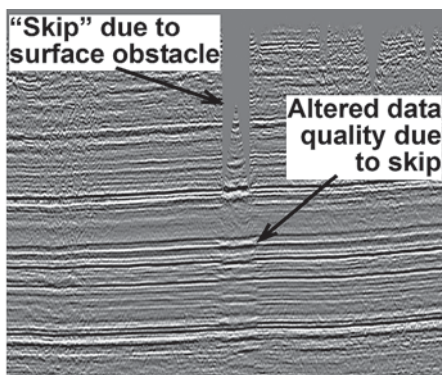


Figure 4. A data "skip", a result of a surface obstacle preventing shotpoints and receivers from being located in this area, in this image is responsible for changes in seismic character in a zone below the skip. The margins of this zone might be misinterpreted as faults, especially if the interpreter was not looking at the upper part of the data.

(...Continued from page 33)

It may be difficult to pick faults if the data are too noisy, or if the fault blocks lack continuous reflections that can be used to identify an offset. Both of these latter problems are common in shallow parts of seismic data from the Rocky Mountain

foothills, where Upper Cretaceous and Tertiary non-marine strata (which tend to lack lateral reflection continuity) are thrust and data quality is poor because of low stacking fold and steep structural dips.

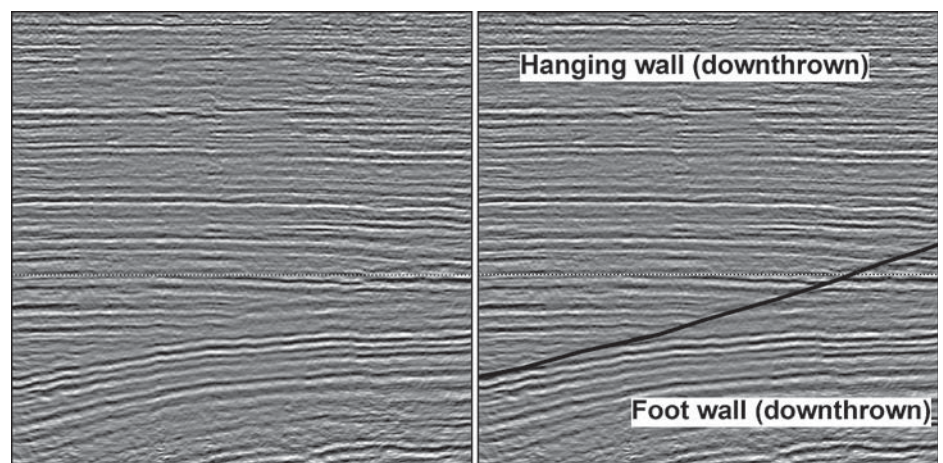


Figure 5. Uninterpreted and interpreted strike-oriented seismic transects through a listric normal fault. The transect has been selected from a 3-D seismic volume, and so its orientation with respect to the faulting is known. Displacement of the hanging wall is directly towards the viewer, but the sense of movement cannot be determined from this view. The angular discordance between reflections and reflection terminations associated with the fault is sometimes misinterpreted as an unconformity by participants in my seismic interpretation classes.

Like outcrop analogues, it is important to recognize that seismic data will not always show transects that are parallel to structural dip – the best orientation for observing the displacement. We typically try to collect 2D seismic lines that are parallel to structural dip. However, logistical or other problems (e.g., we may be forced to collect the data along existing roads) may prevent us from doing so. Furthermore, there may be faults, minor or major, that are at an angle to the dominant structural fabric. For any of these reasons, 2D seismic data may prevent us from seeing the true fault geometries.

Three-dimensional seismic data are a significant improvement over 2D data because they allow the interpreter to view the data from any angle. To best interpret faults, we need to view and pick them on dip-oriented transects through the seismic data cube. It is, however, instructive to take the time to view faults from different directions in the 3D seismic data. We quickly learn that the fault geometries we see in a seismic transect vary, depending on the orientation of that transect with respect to the orientation of the fault. For example, Figure 5 is a strike section through a listric normal fault. An unwary interpreter (perhaps working with 2D seismic data) might observe stratal terminations that appear to onlap a truncation surface, and conclude that an unconformity is present. However, views perpendicular to that shown in Figure 5 (i.e., dip lines) show that we are indeed looking at a listric normal fault. This exercise will help us to recognize different interpretation possibilities when working with 2D seismic data or even outcrop exposures.

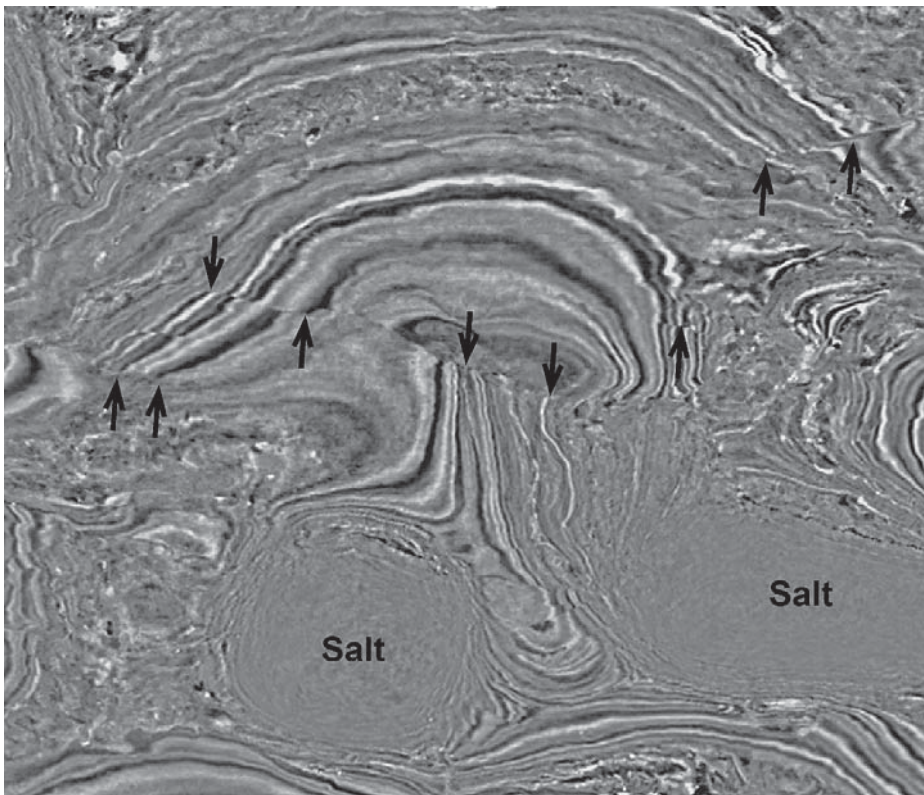


Figure 6. Timeslice through a 3-D seismic data volume from the Gulf of Mexico. Some reflection terminations are indicated by arrows, and can be used to define the traces of faults. The circular reflection-free zones are salt bodies. Data courtesy of PGS.

When working with 3D seismic data, it is important to be able to recognize the appearance of faults on timeslices (or depth slices, if the data have been depth converted) through the data cube. Figure 6 shows a timeslice through a 3D seismic volume from the Gulf of Mexico. Faults can be recognized by curvilinear features marked by reflection terminations, lateral offsets of reflections, or angular discordances between reflections on either side of the fault. Faults that are oriented parallel to the strike of the bedding will, however, be difficult to see in timeslices.

In the mid-1990s, geophysicists working at Amoco described a way to process 3D seismic cubes to produce a “coherency” attribute that would facilitate fault mapping. Since then, other processing and software companies have developed similar attributes that go by different names (e.g., “semblance”) but, simplistically, they are measures of the lateral variability in trace shape. Portions of the data where reflections are continuous have high coherency, whereas abrupt changes in reflection shape, such as reflection offsets associated with faults, have low coherency.

¹For simplicity, I will use the term “coherency” to refer to these processing products, even though there are differences in the way the attributes are derived mathematically.

The three images shown in Figure 7 should help to demonstrate the usefulness of these attributes. In the top image, we see a timeslice through a 3D seismic cube from the Western Desert of Egypt. After some inspection, it might be possible to recognize curvilinear trends (reflection truncations, changes in amplitude, etc.) running from upper left (NW) to lower right (SE). The middle image shows exactly the same timeslice, but this time through a version of the data that has been processed to show coherency. Discontinuities, i.e., areas of low coherency, are shown in black, and it is clear that this attribute is clearly delineating the location of the NW-SE striking faults. The reader should compare the number of faults visible in the coherency display with the number that might be interpreted in the amplitude timeslice of the amplitude version at top. It is clear that we will be able to better map the faults using a coherency timeslice than an amplitude version of the same data. Finally, some software packages allow two different versions of a seismic data cube to be viewed together, a technique known as co-rendering. The lowest image of Figure 7 shows the amplitude and coherency timeslices co-rendered. This type of display very clearly defines the faults by allowing us to view the coherency lineations and reflection offsets at the same time.

Some faults may be associated with only minor amounts of displacement. In these cases discrete reflection terminations or offsets may not be visible in the seismic data. Instead, the faults may be associated with minor displacements that are seen as slight “inflections” along a seismic reflection. The upper portion of the antithetic fault in Figure 3 shows displacements of this nature. In these cases, faults may be detected using “horizon attributes” that measure the dip, (Continued on page 36...)

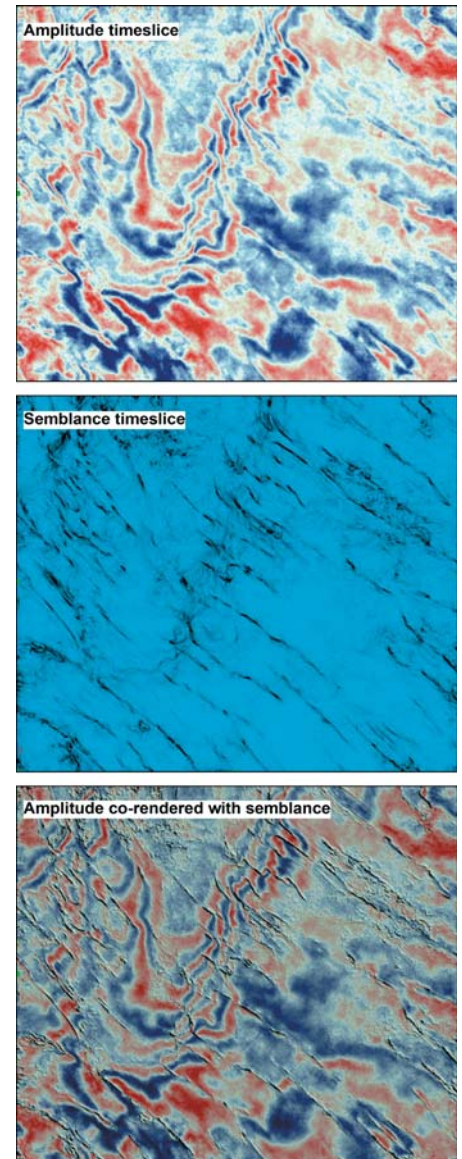


Figure 7. Timeslices through a 3-D seismic volume from the Western Desert of Egypt. Faults are visible in the amplitude timeslice (top) as reflection offsets and truncations that trend from upper left to lower right. The faults are much easier to identify in the semblance (“coherency”) timeslice (middle) from the same level. Blue areas represent continuous reflections and black areas indicate changes in reflection continuity (e.g., faults). The image at bottom shows semblance and amplitude displayed together (“co-rendered”). This display is most useful for interpreting/mapping faults. Data courtesy of Apache (Cairo).

(...Continued from page 35)

azimuth, curvature, or some other aspect of a surface that has been picked in a 3D seismic volume.

Figure 8 shows (top) a time-structure map of a Cretaceous sandstone at a Rocky Mountain uplift. Gaps in the surface are “fault-heave polygons” that show the locations and orientations of normal faults. The faults were identified and mapped using vertical transects and timeslices through amplitude and coherency versions of the seismic data. The middle map of Figure 8 shows the dip attribute, a measure of how steeply the surface is dipping at every trace location in the 3D survey, derived from the same surface (the surface had been interpolated across the fault polygons prior to the dip calculations). The steeply dipping areas indicate the locations of faults. Although the same fault patterns seen in the time-structure map are apparent at first glance, closer inspection reveals differences. For example, some structures originally mapped as a single fault are probably two separate but linked faults. Furthermore, some fault tips can be extended – the dip attribute identifies small offsets of the horizon that could not be identified visually. The lowest map shows the azimuth attribute, a measure of which way the surface is pointing, has been derived. A colour bar has been selected to highlight surfaces that are dipping in different directions. The main NW-SE striking faults are visible in the center of the dataset, but in this image some subtle NW-SE striking folds are apparent in the upper part of the survey area. These folds were not apparent in either the original time-structure map or the dip map. Clearly, the horizon attributes are helping us to detect small-scale features that are not readily apparent when undertaking a conventional interpretation of the data.

Horizon curvature is another approach for detecting small-scale structures. Furthermore, by tracking reflections in three dimensions, it is possible to derive curvature volumes from 3D seismic data. The curvature volumes can be viewed and analyzed like coherency volumes to detect faults. For brevity however, these methods will not be described in detail here.

Other types of displays can be useful for identifying and mapping small-offset faults. For example, Figure 9 shows amplitudes draped over a rendered surface (blue – high amplitude, red – low amplitude) that is illuminated from the northeast (upper right). The linear amplitude trends and shadows highlight some northwest-southeast striking faults.

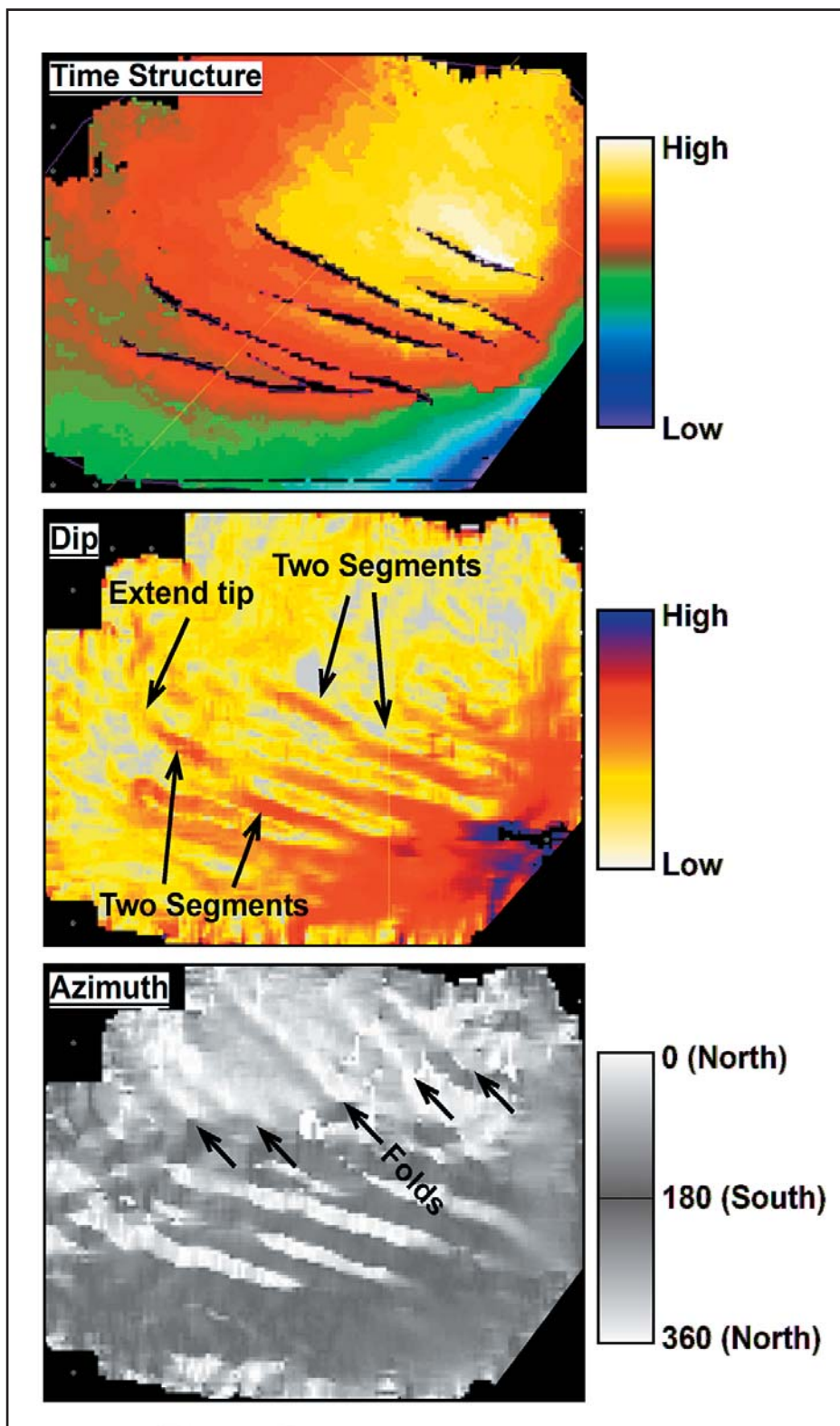


Figure 8. Time-structure map (top) of a Cretaceous horizon from a Rocky Mountain uplift mapped using amplitude and coherency vertical transects and timeslices through a 3-D seismic volume. The black areas are “fault-heave polygons” that show the locations and orientations of normal faults that offset the horizon. The dip map (middle) derived from the horizon shows the faults as relatively steeply dipping areas (red) that offset nearly horizontal bedding (yellow, white). Some of the changes to the fault interpretation (e.g., breaking apparently continuous faults into segments, extending fault tips) are highlighted. At bottom the azimuth map shows which way (compass orientation) the surface is pointing. The colour bar has been chosen to display north-facing areas in white and south-facing areas in grey, as if a flashlight is being shone on the surface. The NW-SE striking faults are visible, but harder to interpret than in the dip view. On the other hand, some NW-SE striking folds are visible in the upper part of this display but are not readily apparent in the dip or time-structure maps.

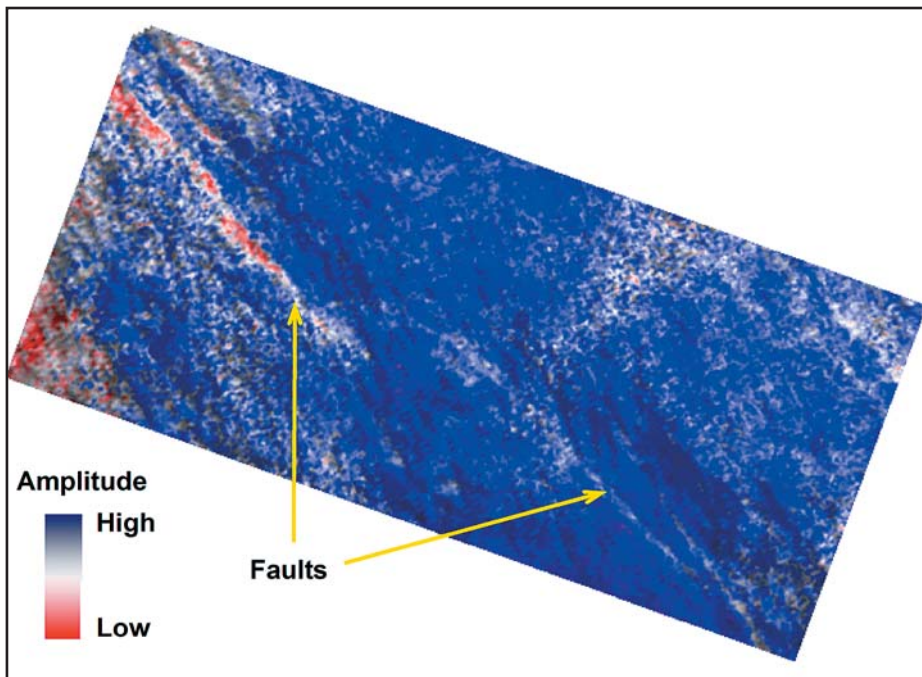


Figure 9. Amplitude map of an Upper Cretaceous horizon affected by shallow thrusts in the Deep Basin. The surface is being illuminated from the northeast (upper right), highlighting northwest-southeast striking structures. The combination of low amplitudes (red) and shadows indicates the location and orientation of faults. Data courtesy of Millenium Seismic.

SUMMARY

This article has examined several different techniques for identifying faults in seismic data. From the above discussion, it should be apparent that it will be easier to identify and map faults using 3D seismic data instead of 2D data. Three-dimensional seismic data allow the user to view the data from any angle, and identify the direction in which the faults are most apparent (usually a dip-oriented section). Coherence volumes may be derived from 3D seismic data, and these datasets can greatly facilitate the identification of faults. Finally, horizon attributes derived from surfaces mapped in 3D volumes can be useful for identifying small-offset faults that could not be identified using 2D seismic data. Not fully discussed or illustrated here, but of significant importance, is the impact of acquisition and processing parameters in defining the appearance of faults in the seismic data.





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ARCTIC ISSUES

Under microscope at Gussow

by Ruth Klinkhammer

Presenters at the 2007 Gussow Conference agreed that while there are significant oil and gas resources in the Arctic, there are also many challenges and obstacles slowing exploration and development.

The two-day conference at the Banff Centre in October 2007 saw over 25 experts present on a variety of issues ranging from northern pipeline development, to terrestrial and underwater reserves, to Arctic sovereignty, to the potential impacts of climate change on exploration and development. The wide range of topics, only a fraction of which are discussed below, reflected the changing state of the Arctic, and the challenges facing the north.

Conference Co-Chair Benoit Beauchamp, Executive Director of the Arctic Institute of North America at the University of Calgary, opened the meeting by pointing out the heightened media awareness of the north. "You cannot open a newspaper or turn on the television without seeing one or two or three stories on the Arctic," said Beauchamp. This increased interest is a reflection of the massive changes taking place in the north.

Other speakers focused on oil and gas deposits in the north and agreed that there are significant resources of conventional and unconventional gas and oil. Of particular note, Dennis Johnston, manager of Devon Canada's Frontier/New Exploration Group,



2007 Gussow Co-Chairs Gerry Reinson and Benoit Beauchamp.

announced Devon's successful application for a Significant Discovery License for the offshore discovery of 250 MMB of oil at the Paktoa well in the Beaufort Sea. Johnston encouraged other companies to become active in the north and said technological improvements are opening new frontiers

for exploration. "There's real potential up north," he said.

As well as the Beaufort Sea, speakers also concentrated on Alaska's north slope, the Yukon, the Sverdrup Basin, and the Mackenzie corridor region. Ashton Embry, from the Geological Survey of Canada, told the group that there are many areas in the Sverdrup Basin with rocks and structures that could capture and contain oil or gas. "The Sverdrup Basin has the potential to become a major petroleum-producing basin."

Embry's data show the basin contains eight kilometres of Mesozoic to Paleogene strata, and it is the Mesozoic succession which he believes holds the greatest potential for future discoveries. Already 18 oil and gas fields have been discovered in the Triassic and Jurassic strata with recoverable reserves estimated at 18 TCF of gas and 500 MM bbls of oil. "It will all come to be when the price of oil is right," predicted Embry.

The Mackenzie Valley and the proposed pipeline were addressed by a number of speakers. Conference Co-Chair Gerry

(Continued on page 40...)



Benoit Beauchamp opening the Gussow Conference with his talk "The Arctic is Hot."

(...Continued from page 39)

Reinson, of Reinson Consultants Ltd., said there are opportunities in the Mackenzie Valley, but development is being slowed by the lack of a pipeline. He described the area as a field of dreams and said “build the Mackenzie Valley Pipeline and they will come” – a sentiment repeated by energy consultant Doug Matthews in his presentation on northern pipeline development.

Paul Price, Chief Geologist with MGM Energy Corp., the only company which is actively exploring in the Mackenzie Delta, said recent discoveries in the Central Mackenzie Corridor show great potential for both oil and gas. However, numerous challenges make exploration and exploitation difficult. One of these is the lack of infrastructure. For instance, there are few all-weather roads, a limited number of barges, and a small local labor pool. This, coupled with the limited access afforded by the weather, means that sound planning is key to success. “If you don’t plan, you aren’t going to get it done,” said Price.

Nick Poushinsky, a principal with the environmental consulting firm Jacques Whitford AXYS, told the group that any companies involved in hydrocarbon exploration and extraction in the north face complex regulatory regimes. In some regions, regulatory regimes are new and untested. In other regions, great weight is given to local knowledge. And blanketing it all is a complex web of administration and multiple jurisdictions between and within regions. “If you don’t plan for complexity and timing you can lose a season in a heartbeat,” he said.

Poushinsky also stressed the importance of community consultation. “The watchword you need to bring is respect – you have to respect what goes on in the local area. That has to be the takeaway.”



Mark Nobie conversing with Poster Presenter Peter Emmet.

Two other speakers also focused heavily on the importance of community consultation – environmental consultant Bonnie Gray-Wallace and Tuktoyaktuk resident and big game guide Randal Boogie Pokiak.

Gray-Wallace said planning and application processes can be streamlined and accelerated with early and thorough consultation. Companies should also be aware of key issues northerners bring to the table including a lack of stakeholder confidence in industry and government, and differences in ambitions and expectations: “These are the things that are swirling around communities.”

She advises companies to consult very early in the planning process, when planning is at the stage where it is flexible enough to accommodate change. “Consult early, consult often, consult in an open manner. This kind of consultation can result in trust,” said Gray-Wallace.

Pokiak, who helped develop the Inuvialuit Final Agreement, echoed the message of cooperation presented by previous speakers. “We want to be equal. We want to be part of it. If you are willing to talk, we are willing to talk.” He also advised resource companies and governments to learn about the history and culture of the Inuvialuit people with whom they want to conduct business.

“We expect government and companies to do their homework,” said Pokiak.

Other speakers focused on unconventional forms of oils and gas. Kirk Osadetz, head of the Laboratory Services Subdivision at the Geological Survey of Canada, talked about the abundance of gas hydrates in both the permafrost and on the sea floor in the Mackenzie Beaufort and the Sverdrup Basins. “If Canada has a ten-year reserve of natural gas [...] there is the possibility that gas hydrates offer a millennium of natural

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Brian Keating of the Calgary Zoo delivering his Keynote Presentation on his own arctic exploration.

gas supply considering current rates of consumption.”

But while the hydrates are there, the technology needed to extract gas from them is not. Osadetz called on companies to fund and engage in research. “It’s time for this to move out of the sphere of publicly funded research.”

Other speakers focused on the challenges of northern oil and gas exploration. Climate change is making it harder to plan for construction because winters are shorter and milder. Steve Blasco, of the Geological Survey of Canada, spoke at length about geo-environmental constraints to underwater exploration such as mud volcanoes, shallow gas venting and oil seepage, and scours along the seabed floor caused by iceberg and sea ice pressure ridge keels.

University of Calgary political scientist Robert Huebert gave a riveting talk on Arctic sovereignty. “The Arctic is in a state of transformation the likes of which we have never seen before and the ramifications of which we may not fully understand,” said Hubert.

Arctic boundaries between the U.S., Canada, Russia, and Denmark have always been a conflict waiting to happen, but in the past northern countries ignored their differences because the harsh climate prevented exploration and shipping

opportunities. Differences are no longer easy to overlook. The catalysts for today’s tensions are increased interest in resource development and climate change which is opening northern seas to ocean traffic.

Huebert was critical of Canada’s policies which he defines as piecemeal and reactive.

“We have a tradition in Canada of being very concerned but not doing anything. We have to start thinking about it now. If we continue to pretend all is fine, we will have

a major diplomatic, maybe even more than a diplomatic, dispute,” he warned.

The conference concluded with a panel discussion on the future of Arctic development featuring Henry Sykes, President of MGM Energy, Michel Scott, Vice-President of Devon Canada Corporation, and Murray Todd, President and CEO of Canada Hibernia Holding Corp (see panellist synopsis entitled “Panelists agree complex regulations slowing development”).



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PANELISTS AGREE

Complex regulations slowing development

by Ruth Klinkhammer

A panel of oil executives whose companies have energy interests in the Arctic agree that the lack of a pipeline and the complex, multi-layered regulatory systems are impeding oil and gas development in Canada's north.

Murray Todd, Vice-President and CEO of Canada Hibernia Holding Corp, Henry Sykes, President of MGM Energy Ltd., and Michel Scott, Vice-President of Devon Canada Corporation, said there are substantial reserves of oil and gas in the north. But, said the panel which closed the 2007 Gussow Conference, the lack of a transparent regulatory framework is preventing development.

"The hurdles are not technical. They are political and regulatory," said Todd, adding it will take political will to get companies active in the north again. "The feds are the only ones who are going to solve this mess. Industry has a good track record of working together when proprietary interests don't conflict. It's not an industry problem, it's political."

Sykes agreed saying the problem is not the regulations per se or the right of land owners to have a say in how their land is developed. The problem rests in the layers of regulations and the multiple regulatory bodies with which companies have to deal.



Murray Todd of Canada Hibernia Holding Corp., Michel Scott of Devon Canada Corporation, and Henry Sykes of MGM Energy Ltd.

"We are not complaining about regulatory hurdles in terms of the burdens you need to meet – the issue is overlapping jurisdiction. It's hard to know which is the group that has authority," he said. In addition, it often appears as if regulations are being developed as applications move forward.

Scott recalled that the regulatory regime was much simpler when he began working in the north in 1973. Now it is complex and the delays are costly. "I'm not advocating that there be no local voices, but we need balance between local voices and national interests."

Another factor preventing the development of northern reserves is the lack of a north-south pipeline. The Mackenzie Valley pipeline is slowly working its way through a lengthy regulatory approval process in the midst of estimates that costs have jumped from early projections of \$7.5 billion to \$16.2 billion. In October, MGM issued a vote of confidence in the future of the pipeline when it signed a capacity request agreement for 200 million cubic feet of natural gas per day. At the Gussow Conference, Sykes spoke enthusiastically about the benefits he thought the pipeline would bring to the north.

"A pipeline is going to be like the railway was for the west. It will open the entire North West Territories to economic development," said Sykes.

Scott said he believe a pipeline is a necessary condition for attracting other resource companies to the north. "We hold that the basin has resources. That's not the issue. In my mind, it's the pipeline," said Scott. Both men were adamant that Canada has the technical expertise to construct the pipeline. Said Sykes, "We all believe the pipeline can be built in a way that's culturally and environmentally sound."

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25th ANNUAL CSPG SQUASH TOURNAMENT

February 7 – 9, 2008

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GET YOUR ENTRY FORM IN EARLY TO AVOID DISAPPOINTMENT!**

Register online at www.cspg.org/events/events-social-squash-register.cfm

EVENTS: Men's & Women's A, B, C, D, and Novice.

ENTRY FEE: \$60.00 Members (Members of the CSPG and CSEG, Spouse/Partner)
\$90.00 Non-Members

- Two guaranteed matches (Saturday teams tourney), T-Shirt, refreshments and food during the tournament, Saturday night dinner and draw prizes.
- Pre-tournament drop-in squash at Bow Valley Racquet Club (2nd Street and 5th Avenue S.W.) on Wednesday, January 23 and Tuesday, January 29 from 6:00 pm to 8:00 pm. **Generously sponsored by Tucker Wireline Services.**
- Pre-tournament Registration Social will be at the Bow Valley Racquet Club on Monday, February 4 at 5:00 pm. Pick up your tournament kit and first draw time. Enjoy a free pint of ale with munchies. **Generously sponsored by Tucker Wireline Services.**
- All door prize draws Saturday evening – must be present to win.

ENTRY DEADLINE: Early Bird Deadline **January 4, 2008.** Qualify for Early Bird Draw Prize.

Registration Deadline **January 18, 2008.** No refunds after this date.

REGISTRATION DETAILS:

CSPG CSEG Member# _____ Non Member

Name: _____ Email: _____

Company: _____

Phone: Daytime: _____ Evening: _____

Male Female Shirt size: S M L XL XXL

Level/Frequency of Play: A B C D Novice

Interested in Doubles Squash: Yes No

Will you be attending dinner: Yes No Meal Preference: Meat Veggie

Guest Name: _____

Male Female Shirt size: S M L XL XXL

Level/Frequency of Play: A B C D Novice

Interested in Doubles Squash: Yes No

Will you be attending the dinner: Yes No Meal Preference: Meat Veggie

PAYMENT DETAILS (GST Included. GST# I18836295):

_____ \$60.00 Member/Spouse

_____ \$90.00 Non-Member

_____ \$35.00 Extra Meal Ticket (Non-playing guests. Maximum 15 spots; first-come, first served).

_____ **TOTAL**

VISA MC Cheque (Payable to **Canadian Society of Petroleum Geologists**)

Card Number: _____ Expiry: _____

Name of Card holder (Please Print): _____ Signature: _____

REGISTRATIONS TO BE SENT TO:

Canadian Society of Petroleum Geologists

Attn: Squash Tournament

600, 640 8 AVE SW, Calgary, AB T2P 1G7

Phone: (403) 264-5610 Fax: (403) 264-5898

MEET THE CANADIAN FEDERATION of Earth Scientists

by Ian Young

My name is Ian Young and I am the current President of the Canadian Federation of Earth Scientists (Fédération canadienne des sciences de la Terre), a new name for the now 35-year-old Canadian Geoscience Council. The CGC was founded to provide a united voice for earth sciences in Canada at a time when there was galvanizing concern over the lack of influence of earth science on the national stage, a lack of awareness of the impact and benefit of earth science among the general population, and concern over the recruiting of bright young students with little high school exposure to earth science into earth science programs at Canadian Universities.

Thirty-five years later, not only does the original mandate still ring true, but in fact with earth science-related topics such as climate change, geohazards and energy supply ever more in the news, it is even more relevant today than it was in the 1970s. Unfortunately, while there were

many excellent initiatives that came out of CGC and some tireless and energetic earth scientists contributing countless hours to the cause, CGC never developed into the influential national voice that was envisaged.

Recognizing this, two individuals in different parts of the country and different parts of the earth science community, initiated a path of renewal that included the presidents of Canada's major earth science organizations. A remarkable consensus of opinion across all segments of earth science developed over the next two years, culminating in a meeting in November 2006 in Quebec City.

At the Quebec meeting, 20 unanimous motions were passed, including the name change to CFES-FCST, and a presidency that will rotate through the various sectors of earth science, starting with Oil and Gas. This is how I found myself in the possession

of a compelling request from a group of oil and gas organizations late last summer to head up a rejuvenated organization.

As a manager and leader in the oil and gas business, my own petroleum geology had slipped into the background, and I had come to think of myself more as an oil and gas businessman than a geologist. In the months since, after countless phone calls, visits to Whitehorse, Yellowknife, Vancouver, Ottawa, Toronto, and Quebec City, and meeting a fascinating cross-section of committed and passionate earth scientists, not only have I rediscovered these original roots, but I have become more familiar with the whole earth science community that stretches across every part of this country, a community with profound reach and accomplishment.

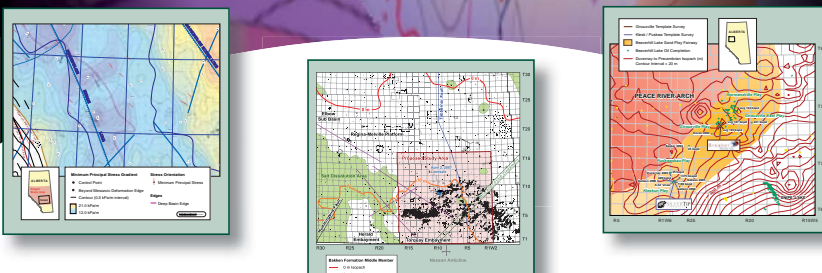
I have become aware, for example, that in 2006 more money was raised in Toronto for the global mining business than New York, London, or any other world market; I have learned the annual PDAC conference is the largest mining-related conference in the world; and I have learned about an NRCan initiative whereby Canadian earth scientists work with local geoscientists in Peru, Bolivia, Ecuador and Colombia to help local residents protect themselves from the risks associated with volcanoes, earthquakes, and landslides.

With Canada's vast geological landscape and abundance of natural resources it will come as no surprise that Canadian earth science is held in high regard. Indeed, in a study conducted by the Council of Canadian Academies (CCA) of the quality and reputation of science in Canada, earth science was ranked highly in every category. It is the only science that covers the spectrum from extraction of resources through to the understanding of groundwater and the impact of surficial processes on the physical environment.

As earth scientists, we are privileged to understand both the benefits of the earth's riches and the physical, monetary, and environmental costs of their extraction while in addition, dealing with remote and often inconclusive data gives us a balanced understanding of risk and uncertainty. With this broad perspective we are in a unique


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position to provide meaningful input on many concerns that trouble modern day policy makers and public opinion. It is this milieu in which earth sciences and CFES finds itself today, and the milieu in which we must build our vision.

VISION FOR CFES

The CFES vision involves defragmenting the earth science community in Canada, effectively recruiting bright young minds and improving the visibility, awareness, and influence of earth science nationally. This is a tall task facing CFES, but I am optimistic. Any organization that can combine the expertise of physical geographers, hydrogeologists, natural hazard specialists, and mining, oil and gas geoscientists, has incredible potential energy to harness.

What gives me additional optimism is the strength of the organizations that form the make-up of CFES and their obvious willingness, even eagerness, to collaborate. Colin Yeo, the current President of the CSPG, one of the largest earth science organizations in Canada, listed collaboration with and involvement in CFES as one of his four priorities in the coming year.

With this kind of support in mind, my vision for CFES is more along the lines of LINUX, the open source program. Where other software companies compete aggressively for talent and market share, LINUX provides a service that is made powerful by collaboration across the broad community of experts who contribute time and energy to provide a world-class system.

Similarly I see CFES as an entity made immeasurably stronger by the diversity and brain power of a broad population, in this case earth scientists. Continuing on the analogy, CFES will be successful through the success of its member organizations and, with an emphasis on collaboration, leveraging the work and volunteer effort that is already in place, rather than creating a large organization that competes for funding and volunteer effort with those organizations.

SHORT TERM PRIORITIES

A number of initiatives designed to provide useful service to member societies are currently underway. They are the following:

- Maintain a comprehensive website with links to all member organizations and relevant Earth science related societies. (www.geoscience.ca or www.cfes-fcst.ca);

- Develop a comprehensive earth sciences conference calendar (already posted on the website);
- Create a "Careers in Earth Science" website targeting junior high school children through CGEN (the Canadian Geoscience Education Network);
- Continue work to investigate shared service potential for member societies, including insurance, registration, student chapters, and communications;
- Complete a new "highly qualified personnel" survey to provide a snapshot of employment opportunities in the

spectrum of earth science sectors, as well as highlight the expected demographic-related shortfall;

- And partner with the Canadian National Committee for the International Year of Planet Earth, coming up in 2008. As part of that initiative, CFES is the organizational partner for the exciting new book project: *Four Billion Years and Counting, Canada's Geological Heritage* planned for publication during 2008.

(Continued on page 46...)



McGill

Sedimentary Geology

The Department of Earth and Planetary Sciences at McGill University invites applications for a tenure-track position in Sedimentary Geology at the level of Assistant Professor. Applicants with interdisciplinary research interests, including but not limited to paleoenvironments, basin analysis, and sedimentology, are particularly encouraged to apply. The appointee will establish an externally funded research program, mentor graduate students, and teach undergraduate and graduate courses in their field.

A Ph.D. is required at the time of appointment and post-doctoral experience is desirable. Salary will be commensurate with experience and standing in the community. Applicants should submit a letter of application, curriculum vitae, statement of research interests and teaching philosophy, and three confidential letters of recommendation sent under separate cover by the candidate's referees upon the request of the candidate. Applications should be sent to: Professor John Stix, Chair, Department of Earth and Planetary Sciences, McGill University, 3450 University Street, Montreal, Quebec H3A 2A7, Canada. The anticipated start date for the position is July 1st, 2008.

Review of the applications will begin on December 15th, 2007 and continue until the position is filled. Information about the department can be found at <http://www.eps.mcgill.ca>.

McGill University is committed to equity in employment and diversity. It welcomes applications from indigenous peoples, visible minorities, ethnic minorities, persons with disabilities, women, persons of minority sexual orientations and gender identities and others who may contribute to further diversification. All qualified applicants are encouraged to apply; however, in accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents of Canada.

ALBERTA'S HISTORIC OIL AND GAS INDUSTRY *captured in unique calendar*

by Randal Kabatoff

With energy matters on the minds of most Albertans today, it's timely that a new unique calendar has been launched that provides a pictorial and editorial history of Alberta's energy sector. The 2008 Alberta Petroleum Discovery Calendar is a collaboration between Soul of Alberta Creations Inc. and the Canadian Petroleum Discovery Centre located at Devon, Alberta.

"Although most Albertans are well aware of the role oil and gas plays in our economy today, we found there was a real void in knowledge about the many interesting individuals and events that shaped Alberta's early oil and gas industry," says Soul of Alberta Publisher Randal Kabatoff. "The Discovery Calendar's design and content creatively captures the industry's early days through the publication of over 100 rare black and white photographs and interesting articles."

Being over 44 pages in length, the large-format calendar highlights Alberta's exciting

oil and gas heritage through numerous stories of the men and women who played pivotal roles in building the province's prosperity. In addition, the calendar features numerous timelines, maps and some of the famous geologists and pioneering geological surveys.

"With the calendar's many stories of the adventures and heroism associated with developing Alberta's oil and gas industry, readers are bound to learn new facts about our province's colourful and historic energy sector," adds Kabatoff.

"As one of the early wildcatters that worked in the Leduc field, I find the Discovery Calendar not only captures this industry milestone with great pictures and accompanying stories but also the industry's evolution since that landmark event," says Dan Claypool, a longtime resident of Devon and a volunteer at the Canadian Petroleum Discovery Centre. He continues "it is an excellent reference summary for the history of the oil patch."

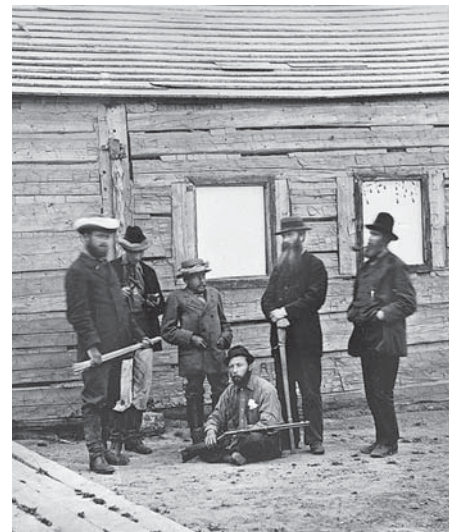


Photo Credit: Provincial Archives of Alberta A-7053

Early surveyors collect samples of bitumen along the banks of the Clearwater River.

For more information, contact Randal Kabatoff, Publisher at Soul of Alberta at (780) 414-0866.

www.SoulOfAlberta.com

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(...Continued from page 45)

LONGER TERM PRIORITIES

In the longer term, CFES must develop a national advocacy and advisory panel made up of distinguished earth scientists from all the sectors, an essential step towards improving the image, influence, and impact of earth scientists in Canada. The panelists will be selected for both the respect they command among their sector peers, as well as for their ability to impress upon provincial and federal decision-makers the importance of earth science on Canada's present and future. I see this august group as part of a two-pronged CFES approach to outreach and advocacy, with the grass-roots, volunteer-driven CGEN as the second part.

CONCLUSION

I started this article by quoting the original goals of the CGC when it was founded in 1972, and I noted how its goals are still relevant today. If we as earth scientists want to make progress towards those goals, we need to fully participate in our local and sectoral societies with an awareness of how that organization is a part of a broader community. To quote the environmental movement, we need to think globally and act locally.

By itself, CFES will not magically create cooperation, a sense of community, and a greater awareness of earth science in Canada. That requires a spectrum of strong earth science organizations full of individuals who recognize the common issues that impact all organizations and have the willingness to collaborate across boundaries. My introduction into the broader earth science community has made for remarkable discovery. I invite you to actively support your affiliated professional organization and perhaps begin your own journey of discovery.

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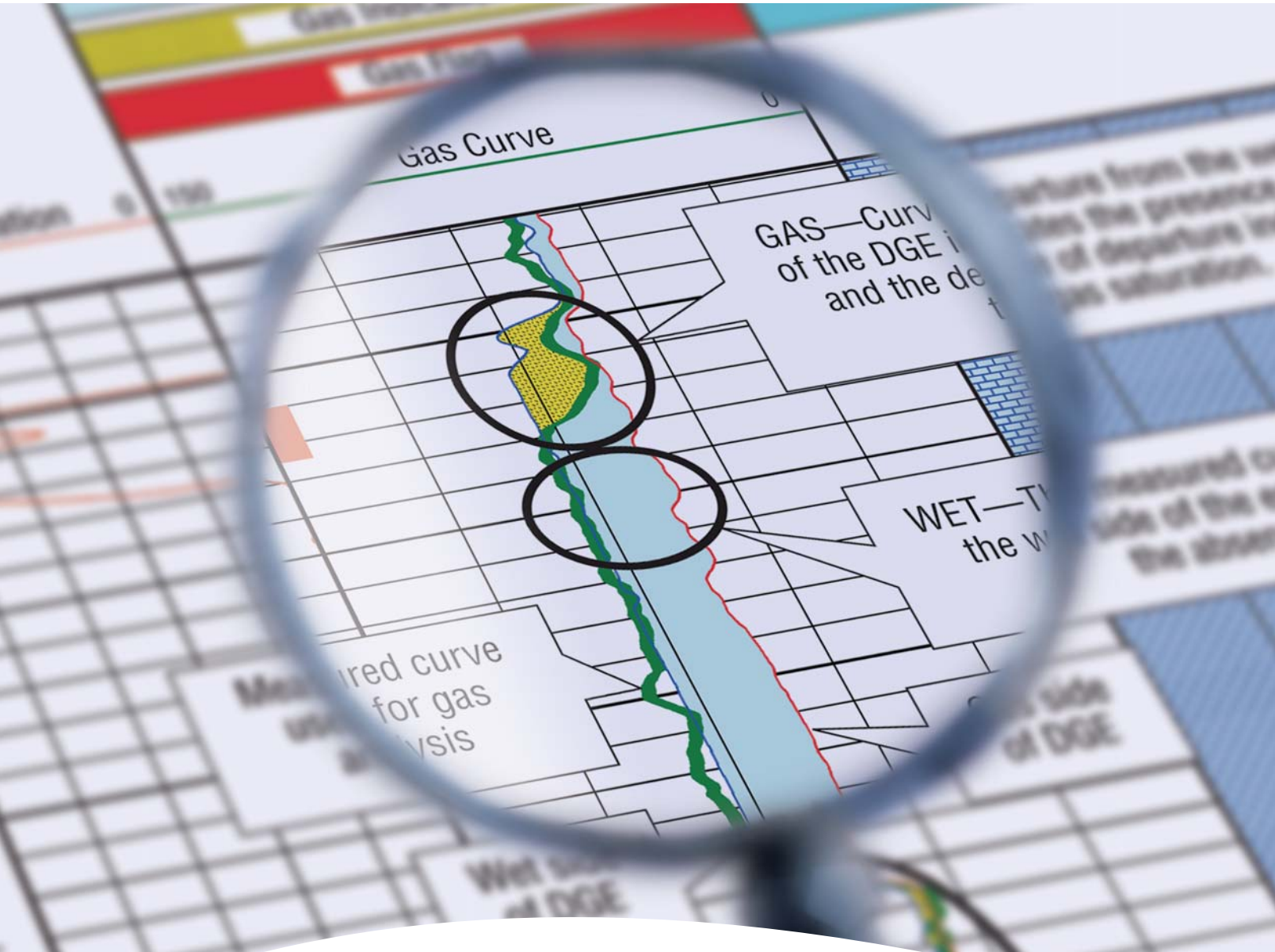
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