

THE RECORD

Denver Geophysical Society



August 2009 Features

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Articles to be considered for publication should be submitted at least one month before desired publication date. Notices for DGS events should be received by the 15th of the the month preceding the publication date.

Commentary



For The Record

By Scott Harman
DGS Editor

On our cover page this month we have a picture of participants from the BLM awards presentation at the 2009 Rocky Mountain Energy Epicenter Conference recently held in Denver. These six individuals are from left to right: Bonnie Carson, Smiling Lake Consulting; Nancy House, Encana Oil & Gas; DeWitt Morris, Green River Energy Resources (GRER); Mike Simons, GRER; Tom Hare, DJ Environmental, and Dave Filler, GRER.

These six individuals were all involved with the Encana La Sal 3D geophysical survey project near Moab, UT. Unlike most geophysical surveys, this project was conceived and completed in the same calendar year. That is amazing

when you think about all the approvals, permits and time tables that needed to be met to keep everything on track.

The BLM presents these awards to the Oil, Gas, Geophysical and Geothermal contractors and their partners who demonstrate leadership and creativity in reducing the impacts of developing natural gas, oil, and geothermal resources on public land. GRER was the geophysical contractor that was awarded the plaque from the BLM for their Best Management Practices (BMP) on this geophysical survey.

DeWitt Morris, President of GRER says that it was an honor for Green River Energy Resources to receive the award but the important thing is that those BMPs are now legitimized by the Bureau of Land Management so that any operator can walk into their office in Price, Vernal, Richfield and even into Colorado and say look these are the practices that you want us to use and shouldn't have to fight about an archeology inventory on the receivers and that is the greater value to the industry.

The DGS would like to congratulate all those involved on a job well done and the positive recognition it brings to the geophysical industry. We should all want to be environmentally sound so that our kids and their kids can enjoy the same natural wonders and nature that we have. And if takes going the extra step as Encana and GRER have demonstrated on the La Sal 3D project then I tip my hat to them!

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For The Record

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On a further note this month's Executive Corner article was written by Jim Applegate, President of Applegate Consulting. Jim's unique personality and humor comes out in his article referring to the demise of "Geological Thinking". Is it possible to have too much data and not have the time to interpret all that data accurately?

One final note: Have you been enjoying the rain and cooler weather? The outdoor enthusiasts may not like the

rain but I for one most certainly do enjoy the cooler weather. It just makes being outside so much more enjoyable. The one problem I foresee is that due to the significant amount of rain we have received this summer, what is going to happen to our water rates? Do you think the Denver Water Board will have to raise our rates since we are buying less water for our lawns and they won't have enough revenue to cover their costs???

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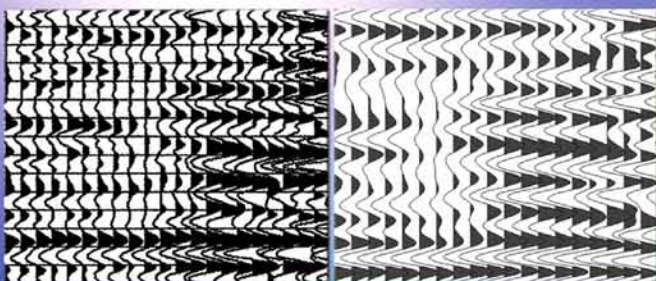
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Executive Corner

By Jim Applegate
DGS President-Elect

Should We Return to the Old Days of Geological and Geophysical Interpretation?

I would like to address the decline of geological thinking due to the advent of the workstation. In recent issues of the AAPG DPA *Correlator*, R. C. Shoup has written a series of articles, some with Michael Halbouty listed as co-author. All are thought provoking, but the one I specifically want to address is entitled, *The Decline and Fall of the Geologic Empire: The Fall*, with R. C. Shoup as the author. It appears

in the Spring 2009 issue of the *Correlator*.

I found the article to be very thought provoking. I would like to add a few thoughts of a similar bent, but perhaps more from a geophysical perspective.

Over 30 years ago, I helped plan, acquire, process and interpret my first 3D survey. It was a postage stamp-size 3D to map uranium roll-front deposits in Wyoming. Since it was a postage stamp survey I interpreted it from paper copies for not only each line and cross line, but also each time slice. No 3D workstations for this one. The interpretation required one to look at each line, cross line, and time slice to make a complete interpretation. There was no auto-picker, no computer map generation.

Am I advocating a return to this interpretation process? Not exactly. The geoscience workstation has made all of our lives easier even though we all spend some of our time cursing the way they function. Perhaps the workstation has made our lives too easy. The workstation should free us to investigate our data in greater detail, and allow us more time to ponder the implications of each subtle nuance of the data with all of its acquisition, processing, and/or geological subtleties. Unfortunately, this is often not the case. Rather we rush through more and larger volumes of seismic data, generating map after map of structures, attributes and so on. We often focus more on the 'volume' of interpretation rather than the quality of interpretation. The more 'work' we do, the more our management or clients appreciate us. Everyone is extolling the

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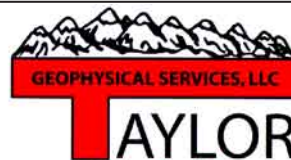


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Executive Corner

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virtues of the workstation, i.e., how fast can we work.

The perceived importance of the workstation in our lives is illustrated by employment ads for geophysicists – ‘must be proficient with XYZ workstation’. This phrase should always draw a laugh. The ad devalues the true geophysicist. Perhaps the ad should more accurately read – ‘must be able to pick 10,000 traces per hour, generate 30 maps of structure and attributes per day’. Perhaps we should all

go the ‘piece work’ approach where we are paid for the volume of interpretation – so much per trace and map generated. Either ad implies that the speed of interpretation is far more important than the thinking process the geophysicist brings to the interpretation. The workstation is a tool, albeit a sophisticated tool, but still only a tool. When a building contractor is hiring framers does he run ads – ‘must be proficient with Lowe’s hammer’? Or maybe he prefers his framers use Home Depot hammers. I have always maintained that one can teach a monkey to generate a map with a workstation. The map might not mean much, but it still would be a map. Geophysicists are certainly smarter than this – we can adjust to using different tools with ease. Anyone with a modicum of knowledge and experience can adjust to a different workstation in a short time. Keen insight, and geophysical and geological knowledge trumps the brand of workstation every time.

If we drill a successful well, we all want to claim the success, citing our outstanding interpretation skills. However, when the well is dry or disappointing, we often try to throw the blame on the algorithms in the workstation that produced misleading results.

The goal is to avoid taking the blame for this failure – clearly as expert workstation jockeys we did everything correctly. In considering the cause of the failure we often fail to think about basics. The basics of acquisition, processing, and interpretation and their impact on the data are glossed over. Surely, what we didn’t worry about couldn’t have hurt us. Was the survey planned and executed to obtain the best data possible to answer the geological questions? Did we provide input to the processor and monitor the workflow so that the processor could produce the best product?

Did we interpret the data completely? Or did we turn that marvelous auto-picker loose after seeding it with a very limited num-

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Executive Corner

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ber of picks? Or did we take the time to look at every line and every cross line looking for the subtle features in the data? After identifying these features did we analyze each as to its validity? Did we consider whether each feature was an artifact of the acquisition, or processing? Did we interact with the geologist, discussing various geologi-

cal scenarios that might have produced the anomaly? Did we consider a variety of geological hypotheses in our interpretation, integrating the data not only with the geology, but also with other geophysical, and geoscience data. Did we check the validity of our final interpretation? Is it geologically reasonable?

Taking the care to fully evaluate our data, integrating other geophysics and all of the geology is a return to the 'old days of interpretation'. This

approach is more work. In these days of specialization, many people have never laid out a 2D line or planned a 3D survey. They have never surveyed a line, planted a geophone (pointed end down), looked at a noise record, designed an array, looked at a field record, or checked a source signature. In the same manner, most have never processed a 2D line, let alone a 3D survey. The uninformed interpreter assumes that every seismic trace from a 2D line or 3D survey is created equal. They are not. If one feels uncomfortable with all of the tasks involved in the seismic process, one needs to find a mentor, do some home study, or find a consultant to help them to better understand the limitations of their data. We all owe a 'full service' professional effort to our employer or client. Particularly, in today's tight economy, anything less is a disservice.

The workstation has diminished the application of creative geological thinking. We have an obligation to restore that value with creative interpretation of our geophysical data.

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Visit www.denvergeo.org for abstracts, registration and information on sponsorship. Please contact Ashley Tompkins for further questions at ashleytompkins5@gmail.com or (720) 289-7519



DGS Annual Golf Tournament



Tuesday, September 22nd

2009

Private Course - The Ranch Country Club

Shotgun Starts 7:30am & 1:00pm

The DGS 2009 Golf Committee would like to cordially invite you to our Annual Golf Tournament. This years tournament will be held at private course, The Ranch Country Club on Tuesday, September 22nd. A portion of proceeds from registration and sponsorship will be donated to the DGS Scholarship Fund – helping local geoscience college students.

Due to an overwhelming number of registrants in past years, the DGS and RMAG have decided to split tournaments – giving you more opportunities to network!

To Register or Review Sponsorship Opportunities, Visit
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Contact Ashley Tompkins (720) 289-7519 or ashleytompkins5@gmail.com
with additional questions



**Denver
Geophysical
Society/
RMAG
Joint
Luncheon
Notice**

No reservations will be taken by DGS
for the August luncheon.

August 7, 2009

**Devonian Carbonate Platform
of Eastern Nevada: Facies,
Surfaces, Cycles, Sequences,
Reefs, and Cataclysmic Alamo
Impact Breccia**

John Warme

**At Marriott City Center
California Street
Between 17th and 18th Street
(Check the Event List in
Lobby for the Room)**

**11:30 am Doors Open
12:00 pm Lunch Served
12:20 pm Talk Begins**

Reservation Deadline is
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**Lunch Cost - \$30.00
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Luncheon cost is \$30.00. Cash or Checks payable to
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ahead of time with a credit card by calling the office
(MC or Visa only). All Credit Cards Accepted Online.

No reservations are required for the talk only. Walk-
ins cost is \$5.00.

Note: Cancellations are taken by calling (303) 573-
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the Wednesday before the luncheon. If you make a
reservation and you do not attend the luncheon you
will be billed for the luncheon. You may send someone
in your place. If you do not claim your reservation by
12:00 we will attempt to sell your reservation



DGS Luncheon Speaker Abstract

John E. Warme
Professor Emeritus
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Devonian Carbonate Platform of Nevada: Facies, Surfaces, Cycles, Sequences, Reefs, and Cataclysmic Alamo Impact Breccia

Abstract

The Devonian shallow-water carbonate platform of southeastern Nevada exhibits a gallery of features that can be studied for their significance related to programs of global mineral exploration and development both for hydrocarbons

and for important metallic and other commodities. Examples include dolomitized porous platform beds, platform margin and mid-platform organic reefs, regional lowstand karst systems, and transgressive or highstand seals. In addition, this specific platform contains the partial crater and thick impact breccias from the major Late Devonian extraterrestrial Alamo Impact Event; impact craters also produce such commodities.

The carbonate platform is comprised of the familiar Lower Devonian Sevy and Middle Devonian Simonson dolostone formations and the Upper Devonian Guilmette mainly limestone formation; recent work on these units has broken out some new formations and members. These rocks are superbly exposed in numerous mountain ranges, centered about 150 km (100 mi) north of Las Vegas, where they total as much as ~1500 m (5000 ft) in thickness. They exhibit continuous exposures of a classic, long-lived, shallow-water carbonate platform, comprised of a hierarchy of hundreds of partial to complete shallowing-upward Milankovitch-scale cycles, each representing tens to hundreds of thousands of years. The cycles are grouped into sequences bounded by regionally significant exposure surfaces or flooded intervals. The cycles and sequences show up on surface gamma-ray profiles, which can also be interpreted as sea-level cycles.

Dolomitization in the Sevy and Simonson is likely linked to long-term exposure and related deep underlying karstified intervals. The less-altered Guilmette exhibits characteristic shallowing-

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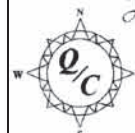
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DGS Luncheon Speaker Abstract

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upward limestone-to-dolostone cycles that contain typical carbonate-platform fossil assemblages, display stacked biostromes and bioherms of flourishing and diverse calcareous sponges (stromatoporoids) and sparse corals, and are punctuated by channeled quartz sandstones. The Guilmette also contains completely exposed reefs.

One is ~50-m (165 ft) in thickness, constructed mainly of diverse stromatoporoids, and later exposed and karstified across the crest. These build-ups exemplify such Devonian structures known from surface and hydrocarbon-bearing subsurface locations worldwide, notably in the Alberta basin of Canada and the Middle East.

Of special interest is the stratigraphically anomalous Alamo Breccia that now represents the formal middle member of the Guilmette Formation. This spectacular cataclysmic megabreccia, produced by the Alamo Impact Event, is as thick as 100 m and may be the best exposed, proven bolide impact breccia and impact debris field on earth. It contains widespread intervals generated by the seismic shock, ejecta curtain, tsunami surge, and runoff from a major marine impact. Different facies of the Alamo Breccia are placed into regional genetic Realms, labeled Crater Rim, Ring, Runup, Runoff, Seismic, and Runout/Resurge. Each Realm exhibits a specific combination of processes and products that help interpret the varied facies of the Alamo Breccia, as well as the depth of excavation and direction to the target zone.

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Schedule of Events: August 2009

Luncheons

Meetings

Courses

Events

Conventions

Conferences

Symposiums

Holiday

						Sat 1
Sun 2	Mon 3	Tue 4	Wed 5	Thu 6	Fri 7 RMAG/ DGS Joint Luncheon	Sat 8
Sun 9	Mon 10	Tue 11 DGS Executive Committee Meeting	Wed 12	Thu 13	Fri 14	Sat 15
Sun 16	Mon 17	Tue 18	Wed 19	Thu 20 NGOGP Joint Happy Hour	Fri 21 RMAG Luncheon	Sat 22
Sun 23	Mon 24	Tue 25 DGS C E Week	Wed 26 DGS C E Week	Thu 27 DGS C E Week	Fri 28 DGS C E Week	Sat 29
Sun 30	Mon 31					



Schedule of Events: September 2009

Luncheons

Meetings

Courses

Events

Conventions

Conferences

Symposiums

Holiday

		Tue 1	Wed 2	Thu 3	Fri 4	Sat 5
					RMAG Luncheon	
Sun 6	Mon 7	Tue 8	Wed 9	Thu 10	Fri 11	Sat 12
	Labor Day	DGS Executive Committee Meeting		DGS Luncheon		
Sun 13	Mon 14	Tue 15	Wed 16	Thu 17	Fri 18	Sat 19
					RMAG Luncheon	
Sun 20	Mon 21	Tue 22	Wed 23	Thu 24	Fri 25	Sat 26
		DGS Golf Tournament				
Sun 27	Mon 28	Tue 29	Wed 30			

Expanded Upcoming DGS Events Information



By Ashley Tompkins
DGS Events Coordinator

The Denver Geophysical Society will be hosting many interactive and educational events throughout the upcoming summer. These events are great for networking and drumming up new business – don't forget to mark your calendars!

Monthly Luncheon – Friday, August 7 @ 11:30am

Devonian Carbonate Platform of Eastern Nevada: Facies, Surfaces, Cycles, Sequences, Reefs, and Cataclysmic Alamo Impact Breccia by John Warne of Colorado School of Mines

Continuing Education Week – August 25th thru August 28th

This year we have proudly created a line up of 3 classes that will appeal industry wide – including seismic rock physics, GIS, GPS, seismic anisotropy and much more! To review full abstracts, visit www.denvergeo.org.

Annual Golf Tournament – Tuesday, September 22nd @ 7:30am & 1:00pm

The DGS 2009 Golf Committee would like to cordially invite you to our Annual Golf Tournament. This year's tournament will be held at private course, The Ranch Country Club on Tuesday, September 22nd. A portion of proceeds from registration and sponsorship will be donated to the DGS Scholarship Fund – helping local geoscience college students. *Due to an overwhelming number of registrants in past years, the DGS and RMAG have decided to split tournaments – giving you more opportunities to network!*

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Cover Photo for August 2009 Record



Photo by Mary Sue Purcell with Williams Energy.

From left to right: Bonnie Carson, Smiling Lake Consulting; Nancy House, Encana Oil & Gas; DeWitt Morris, Green River Energy Resources (GRER); Mike Simons, GRER; Tom Hare, DJ Environmental and Dave Filler, GRER

2009 Continuing Education Week

**Register
Now!**

Republic Plaza – Denver, CO
August 25 – August 28, 2009

Tuesday, August 25 - Rock and Fluid Properties: Seismic Rock Physics by Mike Batzle

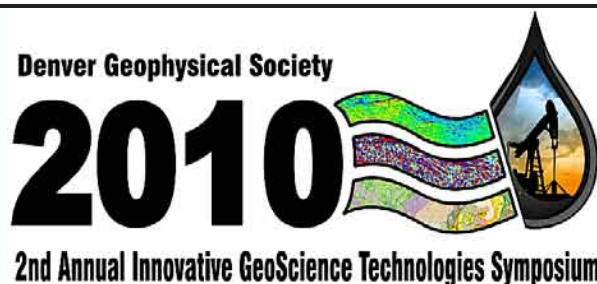
Wednesday, August 26 - Where in The World is My Well, My Land...And For That Matter Me? by John Sharry

Thursday & Friday, August 27 & 28 - Seismic Anisotropy: Basic Theory and Applications in Exploration and Reservoir Characterization by Ilya Tsvankin and Vladimir Grechka

Visit www.denvergeo.org for abstracts, registration and information on sponsorship. Please contact Ashley Tompkins for further questions at ashleytompkins5@gmail.com or (720) 289-7519

On behalf of the attendees of the DGS/ RMAG Rockies game, we would like to thank the following sponsors.

Your generosity provided a great night of networking & fun!



Denver, May 2010 - Authors are invited to submit papers for presentation at The 2nd Annual Innovative GeoScience Technologies Symposium. Preference will be given to papers which present new and innovative technologies or approaches to the GeoScience Industry.

Requirements to submit papers are as follows:

- * Must have permission to share information among industry professionals
- * Short abstract - 200 words or less
- * Must directly relate to current and future GeoScience technologies and approaches for the exploration of oil & natural gas

Papers are to be submitted to Jim Applegate jimapple@comcast.net or Bill Pearson bpearson@pearsontechnologies.com.

Papers must be submitted to Jim Applegate or Bill Pearson no later then October 15, 2009

Please contact Ashley Tompkins ashleytompkins5@gmail.com or (720) 289-7519 for further information.



Denver
Geophysical Society
www.denvergeo.org

DGS Continuing Education Week

August 25 – 28, 2009

DGS will offer three courses this year. One two day course and two one day courses and will be held at the Republic Plaza, 370 17th Street – 40th Floor. Presentations will begin at 8:00 am and end at 5:00 pm with a one-hour lunch break at noon. If your schedule permits, you may take all courses. The deadline for a discounted early registration is July 10th and the **final deadline is July 31st**.

To Register On-Line Go To: www.DenverGeo.org

Name: _____ Name Tag: _____
Company: _____ E-mail: _____
Address: _____ Fax: _____
City: _____ State: ____ Zip: _____ Phone: _____

Tuesday, August 25

Rock and Fluid Properties: Seismic Rock Physics By **Mike Batzle**

DGS/RMAG members THROUGH July 10: **\$175.00**
DGS/RMAG members AFTER July 10: **\$200.00**
Non-DGS/RMAG members as of May 27, 2009: **\$225.00 ***
Full-time Students or Unemployed DGS members: **\$35.00** \$ _____

Wednesday, August 26

Where in The World is My Well, My Land... And For That Matter Me? By **John Sharry**

DGS/RMAG members THROUGH July 10: **\$175.00**
DGS/RMAG members AFTER July 10: **\$200.00**
Non-DGS/RMAG members as of May 27, 2009: **\$225.00 ***
Full-time Students or Unemployed DGS members: **\$35.00** \$ _____

Thursday, August 27 and Friday, August 28

Seismic Anisotropy: Basic Theory and Applications in Exploration and Reservoir Characterization

By **Ilya Tsvankin and Vladimir Grechka**

DGS/RMAG members THROUGH July 10: **\$350.00**
DGS/RMAG members AFTER July 10: **\$400.00**
Non-DGS/RMAG members as of May 27, 2009: **\$450.00 ***
Full-time Students or Unemployed DGS members: **\$35.00** \$ _____

* You may apply the non-member registration fee to your 2009 DGS membership dues. Member registration fees are only available to those who were DGS/RMAG members as of May 27. A DGS membership forms will be available for completion.

Please make check payable to: **Denver Geophysical Society**

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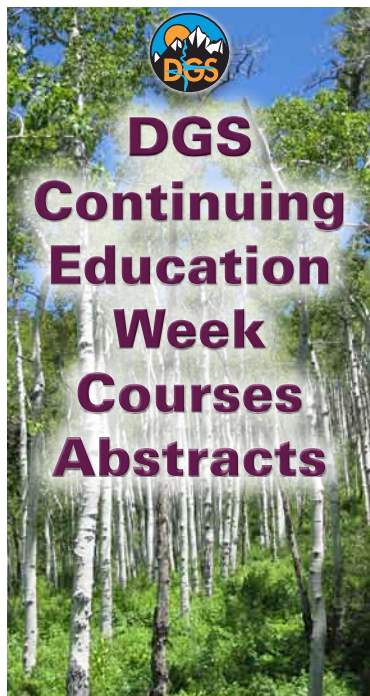
Email: office@denvergeo.org

Attn: Ashley Tompkins

7144 E. Warren Drive

Denver, CO 80224

For More Information Visit: www.denvergeo.org



Rock and Fluid Properties: Seismic Rock Physics

Mike Batzle and
De-hau Han

GENERAL DESCRIPTION:

Locating and identifying pore fluids, assessing reservoir quality, and monitoring production procedures are usually the ultimate goal of any

geophysical activity. As we strive to make geophysical methods, particularly seismic results, more quantitative, we must have a thorough understanding of the pertinent rock properties, in situ pressures, pore fluids, and how these interact to influence the seismic signature.

This course is valuable for geophysicists, petrophysicists, and geologists involved in quantitative evaluation of seismic data for exploration, reservoir characterization, and reservoir monitoring.

COURSE OUTLINE:

I. INTRODUCTION

Goal of geophysics: rocks, pores, fluids
Seismic data contains fluid and rock information

II. GENERAL PORE FLUID PROPERTIES

Liquid versus Gas versus Fluid
Hydrocarbons
Brines
Drilling muds

III. HEAVY OILS

Biodegraded oils
Viscoelasticity

IV. FLUID CALCULATIONS

General relations
'FLAG' calculator

V. GASSMANN'S EQUATION & FLUID SUBSTITUTION

Gassman's eqn.: derivation, definitions, assumptions
Simplifications
Mineral moduli
Fluid moduli
Log-based substitution
Fluid mobility

VI. SEISMIC ROCK PHYSICS

DHI (Direct hydrocarbon Indicators)
Time-lapse (4-D) seismology
Fluid versus Pressure effects
CO2 Monitoring
Attenuation

VII. SUMMARY & CONCLUSIONS

Biographies

Mike Batzle

Baker Hughes Professor of Petrophysics and Borehole Geophysics- Colorado School of Mines

Professor Batzle has served on the research faculty of Colorado School of Mines since his arrival in 1994. He co-founded and co-directs the Fluid Property Research Consortium, which is a collaborative research project between the Colorado School of Mines and the University of Houston. For several years, Professor Batzle has taught geophysical field methods, coordinated the geophysical engineering senior design projects, and directed the Geophysics Field Camp, and last year he also co-taught borehole geophysics. From 1979 to 1994, Dr. Batzle worked in geophysical research at ARCO Oil and Gas Co., where he designed, fabricated, and operated a complete rock physics laboratory, and where he was awarded patents for a torsional wave logging tool and a hand-held acoustic velocity meter. In 2002, Professor Batzle was awarded the Virgil Kaufmann Gold Medal by the Society of Exploration Geophysicists for his outstanding contributions to the advancement of geophysical exploration. Awarded best poster presentation at the 2005 SEG annual technical convention.

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DGS Continuing Education Week Courses Abstracts

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De-hua Han

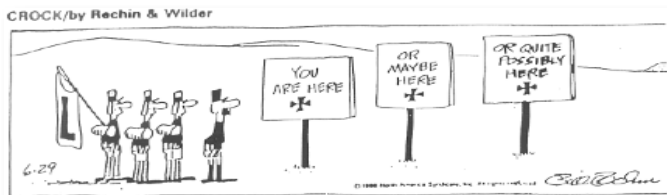
*Director of Rock Physics Lab –
University of Houston*

Professor Han has served on the research faculty of University of Houston since his arrival in 2003. He co-founded and co-directs the Fluid/DHI Consortium, which is a collaborative research project between the University of Houston and the Colorado School of Mines since 1994.

From 1986 to 1994, Dr. Han worked in geophysical research at Unocal Oil Co., where he is director of rock physics laboratory. Then, He has worked for HARC as senior scientist and co-founder the Fluid/DHI consortium in 1994. Professor Han had his BS in Physics, 1967 from China, and obtained his MS degree in Rock Mechanics from Graduate School of Chinese academy of Science and Ph.D in Geophysics from Stanford University in 1987.

Where in The World Are: My Wells, My Land, My Seismic, My No-Permit Areas, My Pipelines, My Roads, My Windmills, And For That Matter Me? An Introductory Course in GIS, GPS, Surveying and How to Use Them Properly

John Sharry and Jacki Portsmouth



As we use more and more technology to increase our chance of success it is critical that we are sure of our location and elevation data both on the surface and in the subsurface for wells, seismic and land data. Wells

have been drilled on the wrong lease or targets missed because of a poor understanding among geoscientists and geotechs of how location is derived and stored in our databases. Problems arise from many sources including: footage call locations versus GPS locations, map projection and datum conversions, crossing state plane boundaries, poor documentation of coordinate systems in paper records and digital databases. Directional wells have been misplaced due to incorrect north reference, planned versus actual surveys, and using the wrong sidetrack to name a few.

This course will present case histories of these problems and their consequences. The most common map projections and datums will be reviewed. We will look at the different types of GIS data available and what needs to be done to get it into our workstations. We will look at techniques to spot errors and work flows to ensure the data we use is located properly. Lastly we will discuss things to consider when giving location data to the landman, permit person, driller, or other geoscientists.

Biographies

John Sharry

Dr. John Sharry has over 28 years experience in geological and geophysical interpretation for domestic and international exploration and production. He was responsible for developing the mapping portion of Sun Explorations and Production's first workstation and written directional survey software for all 3 major providers of directional survey databases. John is currently chief geologist for Amigos Energy Advisors.

Jacki Portsmouth

Jackie Portsmouth has over 25 years of experience in the domestic and international oil & gas industry specializing in the field of Geomatics. Jackie's work experience includes 17 years with Canadian Superior Oil Co. and Mobil Oil Corporation in Canada, the U.S., and various countries around the world. Jackie attended the Northern Institute of Technology (NAIT) in Edmonton Alberta specializing in petro-

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DGS Continuing Education Week Courses Abstracts

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leum land surveying and is an active member of the SEG and CSEG. Currently he is the majority owner and President of SANTOS Inc. a forensic Geomatics company with offices in Calgary and Dallas.

Seismic Anisotropy: Basic Theory and Applications in Exploration and Reservoir Characterization

Ilya Tsvankin and Vladimir Grechka

Elastic anisotropy, widely recognized as a typical feature of sedimentary formations, has a strong influence on seismic velocities and amplitudes. For example, the difference between stacking and vertical velocity in anisotropic media most commonly is the reason for misties in time-to-depth conversion. This course provides the necessary background information regarding anisotropic wave propagation and discusses modeling, inversion, and processing of seismic reflection data in the presence of anisotropy.

The most critical step in extending seismic processing to anisotropic media is to identify and obtain from the data the medium parameters responsible for measured reflection signatures. Therefore, the course emphasizes parameter estimation for transversely isotropic and orthorhombic subsurface models using both conventional narrow-azimuth data and wide-azimuth surveys. A description of P-wave time and depth processing for VTI (transversely isotropic with a vertical symmetry axis) media is followed by analysis of the joint inversion of P-waves and converted PS-modes which can yield the true vertical velocity needed for depth imaging. Field-data examples illustrate the improvements achieved by anisotropic migration algorithms and the possibilities of applying anisotropy parameters in lithology discrimination. The part devoted to anisotropic AVO analysis

includes simple analytic approximations for reflection coefficients as well as for amplitude distortions (geometrical spreading) in the overburden. The course also introduces fracture-detection methods based on the azimuthal variation of reflection moveout and prestack amplitudes of P- and PS-waves.

The course should be useful for both graduate students and geophysicists working in exploration or reservoir monitoring. Mathematical details are kept to a minimum, but familiarity with the basics of elastic wave propagation and seismic data processing would be helpful.

COURSE OUTLINE:

- Basic description of anisotropic wave propagation
- Anisotropic ray tracing
- Notation and seismic signatures for vertical transverse isotropy
- Normal-moveout velocity for 2D anisotropic models
- 3D description of NMO velocity and NMO ellipse
- Nonhyperbolic reflection moveout
- P-wave time-domain signatures in VTI media
- Inversion of dip and nonhyperbolic moveout
- Time and depth processing of P-wave data for VTI models
- P-wave stacking-velocity tomography
- Moveout of PS-waves and the PP+PS=SS method
- Joint inversion of PP and PS data and multicomponent tomography for TI media
- Case studies of multicomponent (PP+PS) processing
- Thomsen-style parameters for orthorhombic and HTI media
- Anisotropic AVO analysis
- Effective medium theory and fracture characterization
- Anisotropic inversion of VSP data

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DGS Continuing Education Week Courses Abstracts

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previous page —

Biographies

Ilya Tsvankin

Ilya Tsvankin received his MS (1978) and a PhD (1982) in geophysics from Moscow State University in Russia. From 1978 to 1989 he worked at the Institute of Physics of the Earth in Moscow and was deputy chief of the laboratory "Geophysics of Anisotropic Media." In

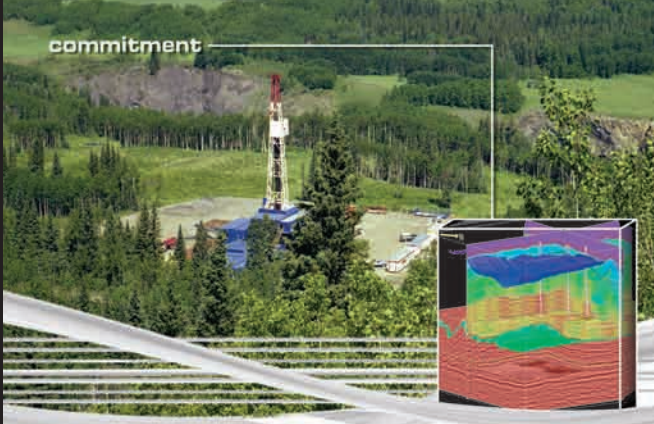
1990, he moved to the U.S. and became a consultant to the Amoco Production Research Center in Tulsa, Oklahoma, USA and in 1992 he joined the faculty of Colorado School of Mines, where currently he is professor of geophysics and co-leader of the Center for Wave Phenomena. His research has been focused on seismic modeling, processing and inversion for anisotropic media, fracture characterization, and time-lapse seismic. For his work in seismic anisotropy he received the Virgil Kauffman Gold Medal Award from SEG (1996). The monograph "Seismic signatures and analysis of reflec-

tion data in anisotropic media," which he published in 2001, is regarded as a major text in the field. He is a member of SEG, EAGE, AGU and Sigma Xi.

Vladimir Grechka

Vladimir Grechka received his MS degree (1984) in geophysical exploration from Novosibirsk State University, Russia, and a PhD (1990) in geophysics from the Institute of Geophysics, Novosibirsk, Russia. He worked in the same institute from 1984 to 1994 as a research scientist. He was a graduate student at the University of Texas at Dallas from 1994 to 1995. Then Vladimir joined the Department of Geophysics, Colorado School of Mines, where he was an associate research professor and a co-leader of the Center for Wave Phenomena. Since 2001, he is a senior geophysicist at Shell Exploration & Production Company.

Vladimir's research is focused on theory of seismic wave propagation in anisotropic media, velocity analysis, fracture characterization, and microseismic. Vladimir received J. Clarence Karcher Award from the SEG (1997) and the East European Award from the European Geophysical Society (1992). He is a member of the SEG and EAGE.



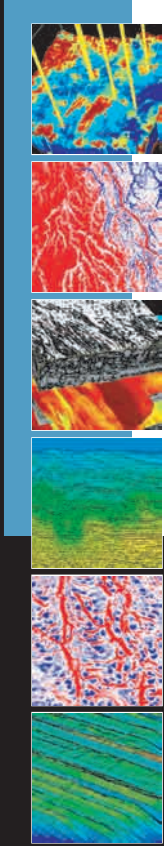
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Rob Howey Sr. VP Seismic Processing rhowey@arcis.com	Satinder Chopra Reservoir Services Manager schopra@arcis.com

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Minutes of the DGS Executive Board Meeting
Tuesday, June 2, 2009
Fairfield Industries Conference Room
1776 Lincoln Street #1200
Denver, Colorado 80202

Present: John Browder (JB), Jim Applegate (JA), Larry Irons (LI), Julie Shemeta (JS); Ashley Tompkins (AT) Mary Sue Purcell (MP).
 Absent: Bill Pearson (BP), Nancy House (NH), Scott Harman (SH)

Board meeting called to order at 4:45 PM by President Larry Irons

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Office Report – John Browder (JB)

Membership is at 609 for the end of May; 2008 at this same time period was 570. Currently there are 46 business card ads, 8 display ads for The Record. Registration for CE Week is available on the DGS website.

Event Coordinator Report – Ashley Tompkins (AT)

AT discussed her spreadsheet on advertising options for CE Week. She is looking for additional ideas. SEG has the information on their website. The Outcrop will advertise the CE Week. Currently, there is low registration for the YP Putt-Putt Tournament. It will unfortunately be cancelled. AT is working on the yearly sponsorship package and will have general outline available for July Board meeting.

Secretary Report – Mary Sue Purcell (MP)

No changes were made to the May minutes, and the minutes were accepted.

Treasury Report – Julie Shemeta (JS)

JS discussed the investment account options and will review with the investment banker. This will be discuss further at July Board meeting. DGS had a negative activity of \$1000 on the DISC, which was less of a loss than originally anticipated. Finances for Student Challenge Bowl not available yet, still awaiting last of the expenses.

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DGS Executive Board Meeting Minutes

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previous page —

Editor and Webmaster Report – Scott Harman (SH)

Report on monthly services provided by webmaster for upgrades to website.

Vice President Report – Jim Applegate (JA)

This month's luncheon speaker is Dave Bird; Dave was gracious enough to agree to this presentation even though he is no longer employed by Geomage. July luncheon will be a joint meeting with RMAG, speaker will be PGS's Bill Pramik. SIPES

Workshop for Consultants and Independents will be held June 16th at the Wynkoop. SIPES would appreciate an announcement about the workshop to all members of DGS.

President's Report – Larry Irons (LI)

DGS received a letter from SEG thanking us for scholarship contributions. DGS is sponsoring a total of 8 students, with an emphasis on students at CSM and CU. LI will be meeting with RMAG about advertising exchanges between the two organizations.

Past President's Report – Nancy House (NH)

NH has been named the General Chairman of the 2010 SEG Annual Meeting, to be held here in Denver in October of that year. Stewart Levin will be the Technical Chairman. NH will be appointing numerous Committee Chairpersons in the coming weeks, is actively looking for volunteers, and welcomes all ideas or suggestions. NH also reviewed additional preparations made for CE Week, including issues related to EnCana's gracious offer to be the site for CE's courses.

Prior Past President's Report – Bill Pearson (BP)

Nothing to report for this month

The meeting was adjourned at 5:42 PM by President Larry Irons.

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Geophysicist



Randy Luckiw
Vice President
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DGS New Members



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Moore, Randy

GeoSource Energy Services

Nelson, Vard

Consultant

Ryan, Kris

Green River Energy Resources, Inc.

Stockstill, Jason

Dawson Geophysical

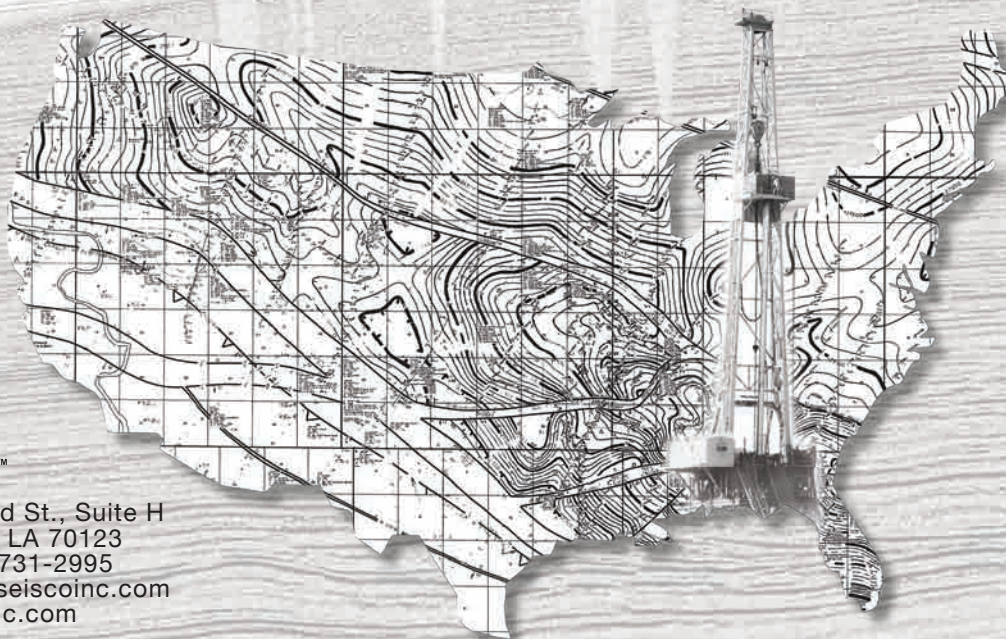
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Advertising in *The Record*

1) Select Ad Type and Size from this table:

Ad Type	Ad Size (inches)	1 Month	3 Months	6 Months	12 Months
Full Page	7.25" wide by 9.75" tall	\$330	\$924	\$1710	\$3240
Two-thirds Page Horizontal	7.25 wide by 6.4" tall	\$225	\$630	\$1170	\$2208
Half Page Horizontal	7.25" wide by 4.75" tall	\$188	\$519	\$972	\$1848
Half Page Vertical	3.5" wide by 9.75" tall	\$188	\$519	\$972	\$1848
Third Page Horizontal	7.25" wide by 3.1" tall	\$128	\$348	\$630	\$1176
Quarter Page Vertical	3.5" wide by 4.75" tall	\$98	\$270	\$498	\$948
Sixth Page Horizontal	3.5" wide by 3.1" tall	\$68	\$180	\$336	\$636
Eighth Page Horizontal	3.5" wide by 2.25" tall	\$56	\$147	\$228	\$408
Business Cards	2.625" wide by 1.5" tall	—	—	—	\$180

- 2) Ads should be set up as digital files at a minimum of 200 dpi (dots per inch), preferably near 300 dpi resolution, at the final sizing as displayed in the *The Record*.
- 3) Ads need to be set up exactly to the size dimensions of your ad type selected above.
- 4) Any ads setup as native Microsoft Word, Quark XPress or Adobe InDesign (or any other Word Processing or Publishing programs) documents should first be converted to a 300 dpi **.pdf** (Portable Document Format) file before being sent in for inclusion in *The Record*.
- 5) The preferable final graphic format for any ad is **.pdf (with all fonts set to be embedded)** which is the same format as the final production of each *Record*. Other acceptable file formats include **.psd, .jpg, .ai, .eps, or .tif**.
- 6) Ad files can be sent as an attachment via email to *Denver Geophysical Society* at **office@denvergeo.org** and will then be forwarded to Vaughn Hamby at **vaughnhamby@mac.com** for inclusion in *The Record* upon Editor approval.
- 7) For further information please contact:

Denver Geophysical Society
7144 E. Warren Dr
Denver, CO 80224

303-757-2942 voice
303-753-8791 fax
office@denvergeo.org

EIGHTH PAGE HORIZONTAL AD

3.5" wide
by
2.25" tall

BUSINESS CARD AD

3.5" wide
by
2.0" tall

Ad samples are displayed proportionately at 28% of actual size

FULL PAGE AD

7.25" wide
by
9.75" tall

HALF PAGE VERTICAL AD

3.5" wide
by
9.75" tall

THIRD PAGE HORIZONTAL AD

7.25" wide
by
3.1" tall

HALF PAGE HORIZONTAL AD

7.25" wide
by
4.75" tall

TWO-THIRDS PAGE HORIZONTAL AD

7.25" wide
by
6.4" tall

QUARTER PAGE VERTICAL AD

3.5" wide
by
4.75" tall

SIXTH PAGE HORIZONTAL AD

3.5" wide
by
3.1" tall