



# *Geophysical Society of Pittsburgh*



*Proudly Presents Tuesday, September 9, 2014*

*At*

*Penn Brewery, Pittsburgh, Pennsylvania*

## **Modified Curvature Analysis to Quantify Strain within the Marcellus Shale**

**Mr. Joel Starr**

**Abstract:** Understanding and quantifying regions of localized deformation within a black shale interval is extremely important when planning a horizontal drilling program. One school of thought states that pre-existing fracture networks, created by deformation, are advantageous as it creates conduits for the hydrocarbons to migrate to the well bore. The counter argument is that it would be more ideal to drill in competent, unperturbed rock as the hydrocarbons are still in place within the matrix. Pre-existing fractures would reduce the effectiveness of completions by allowing the water, injected into the formation, to dissipate (Douds, 2011).

The amount of deformation within a given interval of strata can be quantified by determining the strain exhibited by its structure. This paper describes a method of determining strain by modifying traditional curvature analysis to provide a least squares estimate of the local structure. From the local structure, the strain ratio ( $\lambda$ ) between the current structure and the original horizontal orientation can be determined. Strain ratios between successive interpreted horizons can also be determined. Areas where  $\lambda$  diverges from a value of 1.0 indicate relative movement between the horizons and as such, it can be inferred that faults and fractures exist within the interval bounded by the horizons.



**Biography:** *Joel Starr is the Principal Geophysicist for EQT Production in Pittsburgh PA. He received a B.S. in Geology from Juniata College in 1985 and an M.S. in Geophysics from the University of New Orleans in 1990. He has worked in the Gulf of Mexico, South America, North Sea and Arabian Gulf. He spent too much time in West Africa and not enough time in Australia. Joel contributed to the development of the Ocean Bottom Seismic acquisition technique in the early 1990's as well as several methods for processing multi-component data. He holds five patents and multiple publications in the SEG and EAGE.*

*Please RSVP using the PayPal link on the Geophysical Society of Pittsburgh website at: [www.thegsp.org](http://www.thegsp.org)*

*Cost: \$35 Members, \$40 Non-members (\$20 for Students). Meeting Location: Penn Brewery, 800 Vinial St., Pittsburgh, PA 412.237.9400*

## Tuesday, September 9, 2014 Meeting Menu

### 5:00 pm Social Hour

This month's social hour is proudly sponsored by

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TESLA EXPLORATION INC.

### Beer on Tap:

*Penn Dark Lager Beer, European-Style Dark*

*Penn Gold Lager, Munichener Helles Style*

*Penn Pilsner, Vienna Style Pilsner*

*Also Available: Red & White wine*

### Hors D'oeuvres:

*Side of Smoked Salmon with Pumpernickel, Cream Cheese, Chopped Eggs and Red Onions, and Capers*

### 6:00 pm Dinner

#### Dinner Buffet

*Weiner Schnitzel*

*Sausages and Sauerkraut*

*Penne Alfredo,*

*Grilled Vegetables,*

*Potato Pancakes,*

*Green Beans with Red Peppers, and,*

*Tossed Green Salad with Ranch, Italian and Balsamic Dressing.*

**Dessert:** *Apple and Cherry Pie*

*Coffee & Cream*

### 7:00 pm Lecture

*We are pleased to announce that this month's lecture will be held at :*

#### Penn Brewery

800 Vinial Street

Pittsburgh, PA 15212 USA

412.237.9400

