



Geophysical Society of Pittsburgh



*Proudly Presents Tuesday, September 14, 2021
At Cefalo's Restaurant, Carnegie, PA
2018 Honorary Lecturer to North America*

Importance of Recognizing Preexisting Fractures to Completion and Production Efficiencies in the Marcellus Shale.

Presented by:

Dr. Tim Carr

West Virginia University

Authors: Timothy R Carr, Ebrahim Fathi, Brian Panetta, Natalie Odergaarden, West Virginia University
BJ Carney, Northeast Natural Energy LLC
Rob Bohn, Silixa LLC

The Marcellus Shale Energy and Environmental Lab (MSEEL) provides a publicly available dataset and a hypothesis-driven field test of the significance of preexisting natural fractures at multiple scales on the effectiveness of the stimulation of an unconventional reservoir. Sonic and micro resistivity imaging show the presence of numerous preexisting cemented fracture swarms is evaluated.

Natural fracture intensity in the Boggess 5H and MIP 3H were interpreted based on wireline and LWD image logs showing that 1000's of calcite and bitumen cemented, but weak, fractures are present along the laterals as swarms that are at an angle to the present-day stress regime. Fractures with complex bitumen and calcite filling were recognized in core at the micro and macroscales (micron to millimeter). The importance of pre-existing fractures geometric stimulations was evaluated and compared to cluster that avoid intense pre-existing fractures using fiber-optic DAS/DTS data and supported by production and simulation.

Fiber-optic DTS and DAS measurements coupled with wireline and LWD image logs from the lateral to recognize preexisting and cemented fractures. This data is supplemented with core analysis including (CT and thin sections) from vertical pilot wells show that clusters in parts of a stage dominated by preexisting fractures have significantly more hydraulic fracture activity to the point that other clusters appear largely inactive. In addition, processed fiber-optic data indicates that preexisting fractures can form near-well bore leak-off pathways to previous stimulated stages. Both can lead to stimulation and subsequent production inefficiencies. Two wells (Boggess 1H and 3H) that attempted to avoid preexisting fractures showed a significant increase in fracture stimulated volume based on decline curve analysis and micro seismic. Production history and simulated future production, support the conclusion that avoiding preexisting fractures in the Marcellus Shale can increase estimate ultimate production.

We present conclusions about stage and cluster spacing and the significance of preexisting natural fracture on stage isolation and fracture efficiency. The publicly available data and workflow allow others to use, verify, and evaluate our findings using the same initial data.

*Please RSVP using the PayPal link on the Geophysical Society of Pittsburgh website at: www.thegsp.org
Cost: \$35 Members, \$40 Non-members (\$20 for Students). Meeting Location: 428 Washington Ave, Carnegie, PA 15106
(412) 276-6600.*



- Biography: **Dr. Timothy R. Carr** came to West Virginia University in 2007 as the first Marshal Miller Energy Professor in the Department of Geology and Geography. Dr. Carr is also a visiting professor at the China University of Geosciences in Wuhan and consultant to the private sector and the US State Department. He is a past President of the Council Energy Research and Education Leaders (CEREL) and the Eastern Section of the American association of Petroleum Geologists (AAPG). Current research projects are in the areas of unconventional resources, subsurface petroleum geology and geophysics, energy systems, and carbon capture and storage. Prior to coming to West Virginia, Carr worked as chief of the Energy Research Section and as senior scientist for the Kansas Geological Survey at the University of Kansas. He was also co-director of the Energy Research Center and adjunct professor in the University of Kansas, Department of Geology. His experience also includes 13 years with Atlantic Richfield (ARCO), where he worked in a number of research, operations and management positions. At ARCO, Carr was involved in both exploration and development projects in locations including Alaska, the North Sea, East Greenland, California and Kansas. He was a founder of a company focused on carbon storage and associated enhanced oil recovery. Carr has a bachelor's degree in economics from the University of Wisconsin, a master's in geology from Texas Tech University and a doctorate in geology from the University of Wisconsin.

Tuesday September 14, 2021

Agenda:

11:30 Door Open

11:45 pm Lunch Buffet

12:00 pm Lecture

To receive a CEU certificate from this lecture please contact *Bill Harbert*

This months lecture will be held at :

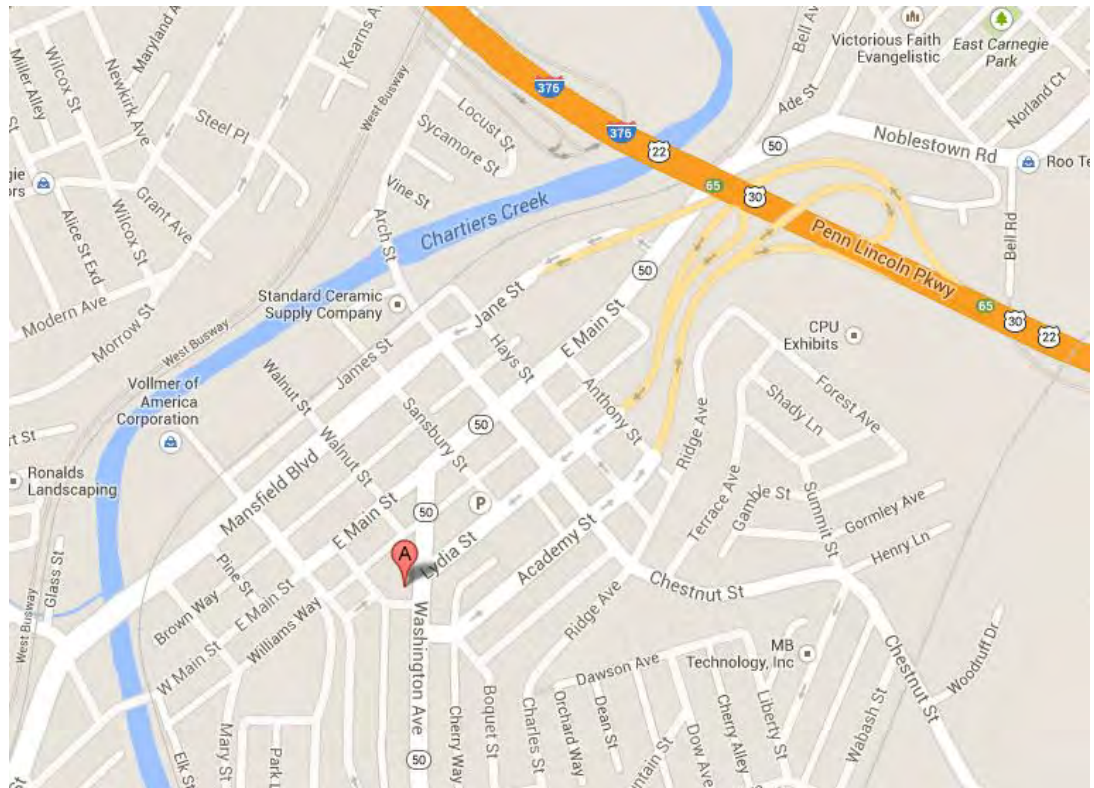
Cefalo's

Banquet & Event Center

428 Washington Ave.

Carnegie, PA 15106

412.276.6600



We would like to thank our 2021-2022 Corporate Sponsors. Please contact Joel Starr is you are interested in sponsoring the GSP

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Sponsorship Opportunities



The Geophysical Society of Pittsburgh offers sponsorship opportunities. Our monthly meetings occur each first Tuesday of every month beginning in September through May.

Since our inception in 2010, meetings have been very well attended by industry professionals, averaging well over 50 attendees per meeting, peaking at more than 100 for our most highly attended meeting. Not only do our meetings offer exceptional technical presentations in the field of geophysics, but they provide an outstanding networking opportunity for oil and gas industry professionals working in the Appalachian basin.

Your generous donations will help in the following ways: 1) helping to bring in distinguished lecturers; 2) offsetting part of the cost of the monthly meeting venue; and 3) enabling a Scholarship Program for future Geophysicists to be awarded each year to an outstanding student enrolled in a Geophysics program at one of our local universities.

Your company logo will be boldly displayed during the social hour of each meeting on the front screen, as well as on all meeting announcements and on our website. We are offering corporate sponsorship opportunities at several levels this year, as well as opportunities to sponsor our social hour during the meeting. Please note that a secure payment link is now available on our website for your added enrollment convenience.

Please click [HERE](#) to download more information, then return to this page to enroll as a sponsor.



Geophysical Society of Pittsburgh

The Geophysical Society of Pittsburgh successfully hosted the first and second Appalachian Basin Geophysical Symposia (ABGS). The events were huge successes with great speakers covering the latest innovations in geophysical research, technology and perspectives of the Appalachian Basin. We thank all our generous sponsors, speakers and organizers who made this event possible.

The positive feedback received from our community has prompted the GSP board to make the ABGS an annual event. With the addition of this yearly symposium, *it was determined that the monthly meetings should be reduced to a quarterly basis.*

The goals of this change are twofold:

1. Boost attendance numbers at our general meetings;
2. Focus Appalachian Basin centric talks for the ABGS.

Two of the quarterly meetings will occur in the fall and the other two during the spring. The ABGS will still be held around the beginning of June in tandem with the golf outing. This ensures that our members still have the opportunity to network on a semiregular basis.

We hope these changes help enhance the GSP's ability to promote the science of geophysics as well as promote the fellowship and cooperation among its membership. We look forward to seeing everyone at the first meeting this September.

Sincerely,

The GSP Board

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## 2021-2022 GSP OFFICERS

|                        |                |                           |
|------------------------|----------------|---------------------------|
| <i>President:</i>      | Jianli Yang    | Seneca Resources          |
| <i>Vice President:</i> | Brian Lipinski | DiGioia Fray              |
| <i>Treasurer:</i>      | Joel Starr     | Independent<br>Consultant |
| <i>Secretary:</i>      | Bill Harbert   | Univ. of Pittsburgh       |



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Your Dues and Sponsorship in Geophysical Society of Pittsburgh go toward:

- *Outstanding Monthly Lecture Series*
- *SEG Distinguished Lecturers*
- *Annual Scholarship Awards*
- *Annual Golf Outing*
- *Short Courses*

Please contact Jianli Yang, Joel Starr, Brian Lipinski or Bill Harbert for Sponsorship Opportunities.

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