

BULLETIN

Corpus Christi Geological Society



and

Coastal Bend Geophysical Society



**January
2021
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CORPUS CHRISTI GEOLOGICAL SOCIETY
P.O. BOX 1068* C.C.TX. 78403
2020-2021

www.ccgeo.org

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| | | | |
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AAPG DELEGATE

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MEMBERS PLEASE NOTE COMMITTEES CONTINUE TO FUNCTION WITHOUT A NAMED CHAIR, ALL ARE WELCOME TO ANY COMMITTEE THAT SUITES YOUR INTEREST

| | | | |
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| Type Logs | | | |



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2020-2021

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**Visit the geological
web site at
www.ccgeo.org**

CCGS/CBGS JOINT MEETING SCHEDULE 2020-2021

| September 2020 | | | | | | | October 2020 | | | | | | | November 2020 | | | | | | |
|-------------------|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|------------------|----|----|----|----|----|----|
| S | M | T | W | Th | F | S | S | M | T | W | Th | F | S | S | M | T | W | Th | F | S |
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| 6 | 7 | 8 | 9 | 10 | 11 | 12 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 27 | 28 | 29 | 30 | | | | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 29 | 30 | | | | | |

Virtual Meeting Sept 16, 2020
At 11:00 am
Honoring Ray Govett

Oct 21 Virtual Meeting at
11:00 am
Presenter Dr. Osareni
Ogiesoba from the BEG

Nov. 18 Virtual Meeting at Ilam
Presenter: Andrew Munoz
Geophysicist for Ensign Natural
Resources. "Unlocking Value
from Vintage Seismic
Processing-Pre-Stack
Conditioning & Inversion in the
Eagle Ford Shale"

| December 2020 | | | | | | | January 2021 | | | | | | | February 2021 | | | | | | |
|------------------|----|----|----|----|----|----|-----------------|----|----|----|----|----|----|------------------|----|----|----|----|----|----|
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| 6 | 7 | 8 | 9 | 10 | 11 | 12 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 27 | 28 | 29 | 30 | 31 | | | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 28 | | | | | | |
| | | | | | | | 31 | | | | | | | | | | | | | |

Dec 1 Virtual Meeting at 11am
Presenter: Dr. Lisa Tauxe
Distinguished Professor of
Geophysics, Scripps Inst. Of
Oceanography, Univ. of Calif.
San Diego. "Hunting The
Magnetic Field Through Ocean
Drilling"

Jan 20 Virtual Meeting at 11am
Presenter: David M. Abbott, Jr.
AIPG Ethics Columnist & Ethics
Chairman Emeritus.
"Selected topics in Geoethics"
Jan.6 Virtual Meeting
Integrating Seafloor & Outcrop
Data Uncovers Surprising
Results

Feb. 17 Virtual Meeting at noon
Dr. Shuoshuo Han, Research
Associate, University of Texas
Institute for Geophysics. "Links
Between Sediment Properties
& Megathrust Slip Behavior-the
Cascadia Example."

CCGS/CBGS Joint Meeting Schedule 2020-2021


| March 2020 | | | | | | | April 2020 | | | | | | | May 2020 | | | | | | |
|---------------|----|----|----|----|----|----|---------------|----|----|----|----|----|----|-------------|----|----|----|----|----|----|
| S | M | T | W | Th | F | S | S | M | T | W | Th | F | S | S | M | T | W | Th | F | S |
| | 1 | 2 | 3 | 4 | 5 | 6 | | | | | 1 | 2 | 3 | | | | | | | 1 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 28 | 29 | 30 | 31 | | | | 25 | 26 | 27 | 28 | 29 | 30 | | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| | | | | | | | | | | | | | | 30 | 31 | | | | | |

Calendar of Meetings and Events Meetings and Events

Calendar of Area Monthly Meetings

| | |
|-------------------------------------------------------------------|----------------------------------------------------------|
| Corpus Christi Geological/Geophysical Society..... | Third Wed.—11:30a.m. |
| SIPES Corpus Christi Luncheons..... | Last Tues.—11:30a.m. |
| South Texas Geological Society Luncheons..... | Second Wed—noon San Antonio |
| San Antonio Geophysical Society Meetings..... | Fourth Tuesday |
| Austin Geological Society..... | First Monday |
| Houston Geological Society Luncheons..... | Last Wednesday |
| Central Texas Section of Society of Mining, Metallurgy & Exp..... | 2 nd Tues every other month in San Antonio |

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From the President's Desk

Rick Paige

New Year... New Issues, Old Issues

Greetings to you in the new year of 2021. This new year carries more reason than usual to celebrate, if for no other reason than it is not 2020! I hope that your holidays were safe, peaceful, and provided comfort at the end of a difficult year.

Our Zoom talks are fast filling up the calendar. I hope you've had the chance to log into them. As a newcomer myself to the Zoom virtual world, I find the experience worthwhile. It isn't as satisfying as an in-person presentation over a good lunch with friends and colleagues, but it does have the advantage of convenience, being free of charge, and always getting the best seat in the house! Our upcoming talks include Dr. Stephen Hubbard on deep-water channel processes and resulting sedimentary structures, held on Wednesday, January 6, 11:00 AM; David Abbott, Jr. discussing selected topics in geoethics, held on Wednesday, January 20, 11:00 AM; and Dr. Shusoshuo Han speaking on full waveform inversion of Cascadia margin data, held on Wednesday, February 17, 11:00 AM. As a reminder, we're not putting out Bulletins every month, so as presentations are lined up you will be notified by email. Please make sure the CCGS has your current, correct email address. Of course, all presentations for which we have enough lead time will be advertised in the Bulletin, as always.

Perhaps an unexpected bonus of virtual presentations is it now allows you, dear member, the chance to line up a talk for your society. If you see a live or pre-recorded lecture that you feel our membership will benefit from, just contact one of the board members and ask! If the board concurs it is appropriate, we'll approve. You may be asked to approach the author, or organization, responsible for the presentation, to set up a live virtual meeting, but that's easy, since there are no travel, lodging, or meal arrangements to organize. If you prefer, our program chair can contact the author. And, many organizations now have pre-recorded video lectures available, making a presentation to our society, with permission, as easy as downloading a file.

Another unexpected benefit of virtual meetings recently materialized. The CCGS has allied with the South Texas Geological Society of San Antonio to share our Zoom meeting invitations. The STGS operates in the same manner as the CCGS, specifically by using the Zoom platform and making virtual presentations free to members. So, both societies have immediately enhanced their educational program offerings. Meeting invitations for STGS presentations will be forwarded by our Membership Chair, Randy Bissell, and so will appear in your inbox as sent from the CCGS. We have not exchanged member contact information between our two societies. This sharing agreement applies only to virtually-hosted meetings. Whenever in-person luncheon meetings/workshops return, established member/guest costs and RSVP criteria will apply.

Some sad pandemic-related news to report, the Energy Auxiliary has been forced to disband. Since 1952 this organization, made up of spouses of CCGS members, has put on the annual shrimp boil, an event loved by all. It also hosted a few internal social events each year. But, as we've seen all too frequently in 2020, in-person social organizations have been shut down cold. After making the hard decision to disband, the Auxiliary generously donated their operating budget money, in the amount of \$2,001, to

the CCGS College Scholarship fund. I know I speak for our entire membership in thanking the Auxiliary for their generosity and long, worthwhile service. They will be missed.

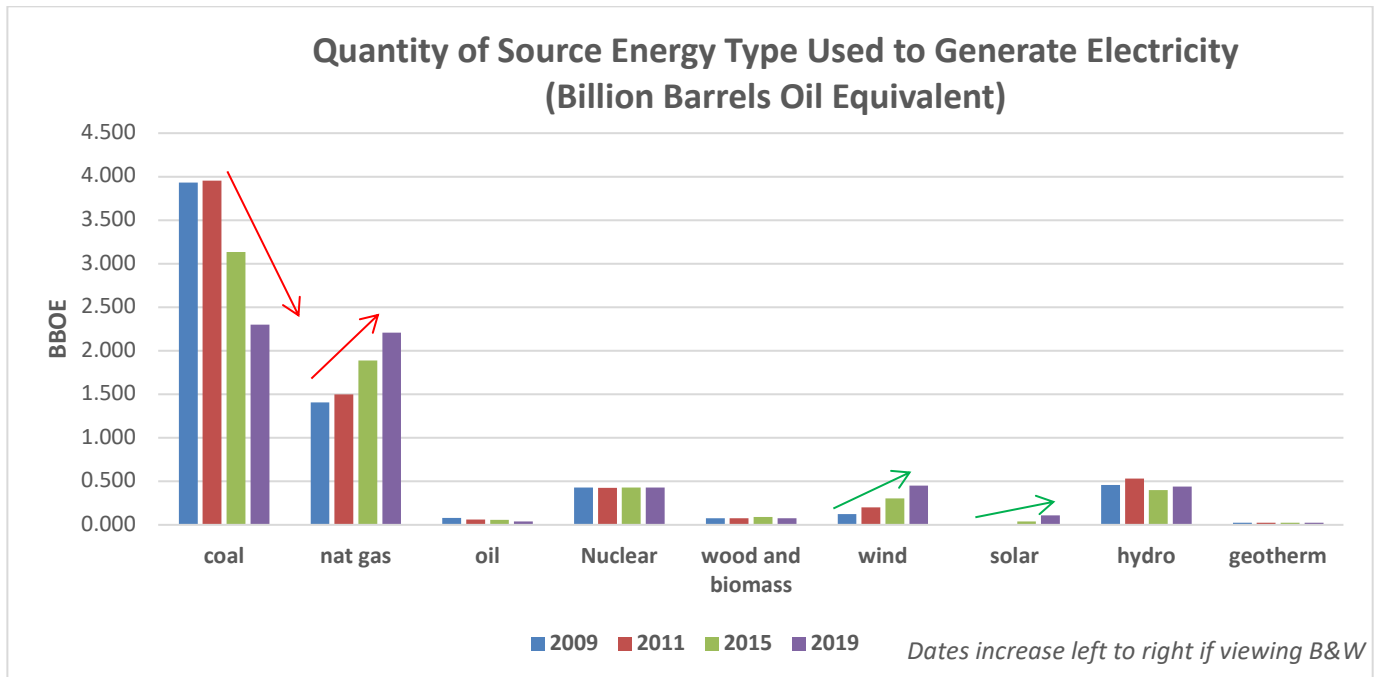
Energy Reality in America, Revisited, continued...

Electricity

Last issue I described the total spectrum of U.S. energy consumption based on the energy content of each major source. It revealed, no surprise, that despite rapid gains in renewable energy output, fossil fuels are still, far and away, king of the energy supply arena. In fact, we consume more combined fossil fuel energy (oil, natural gas, and coal) now than 10 years ago when I first published the Energy Reality Series.

This issue I discuss the subset of electrical generation. Electricity is generated by a large basket of energy sources that fall into three major categories: fossil fuels, nuclear, and renewables. What I wanted to determine, same as in the total energy article, was how much each energy type contributes to the total electrical grid. Again, to base the comparisons on energy content, I have converted all source values to the same energy unit, in this case barrels of oil equivalent (BOE). All data is provided by the Energy Information Administration (EIA).

Below is a bar chart showing the annual consumption of each energy source used for electrical generation during selected years covering 2009-2019. (See the November, 2020 President's Letter which explains how and why the selected years were chosen).



Quantity of Source Energy Types Used to generate electricity for selected years, 2009-2019. Arrows indicate noteworthy trends.

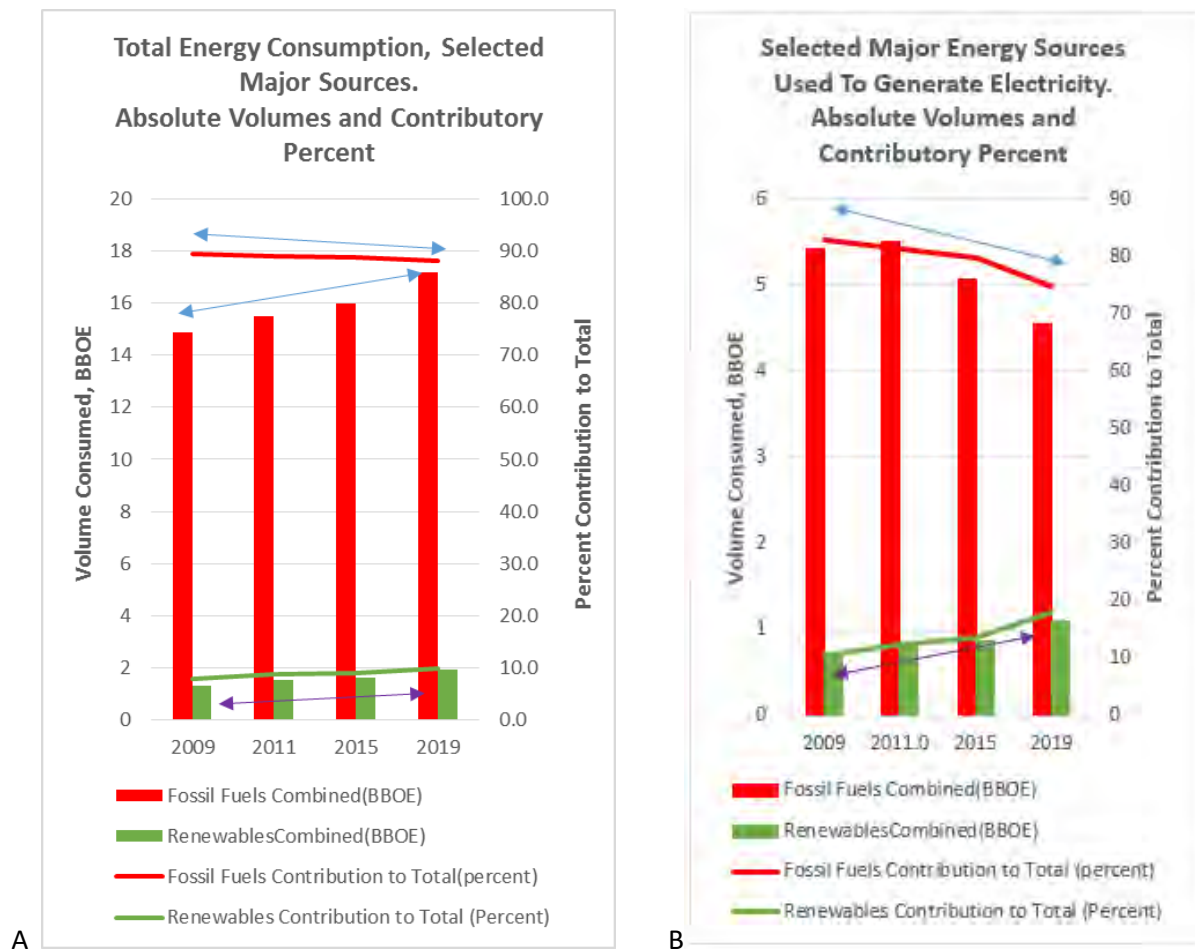
Much like the total U.S. energy consumption trend (see last issue, November, 2020), natural gas usage has increased at the expense of coal. Some renewables have gained rapidly, while nuclear has remained constant. The major deviation from the total energy pattern is with oil. While gaining significantly in overall U.S. consumption, its use in electricity generation remains miniscule over the selected time period. This is entirely due to its preferred usage for transportation and petrochemicals.

Looking a little deeper, coal consumption for electricity generation has fallen into a virtual tie with natural gas*, going from a 60/21 percent coal/gas split in 2009 to a 37/36 percent split in 2019.

Renewables gained primarily from advances in wind output (264% increase in output over the 10 year span). In 2019, wind contribution to the electrical grid was 7%, nearly equal to hydroelectric output, which for decades was the single largest renewable electricity producer. Solar energy, while increasing its contribution to the electrical grid over 5000% (!), remains a miniscule provider, adding only 1.8% to

the total. By comparison, coal and natural gas contributed 37 and 36 percent respectively to the electrical grid.

The charts below compare total energy consumption of two of the three major energy groups that are used to generate electricity. The two groups displayed are combined fossil fuels (oil, natural gas, and coal) and combined renewable energy (wind, hydro, solar, wood, and geothermal). I'm leaving out the third major energy group, nuclear energy, only because it is so consistent - there is virtually no change over the last 10 years, and to include it would just make the charts busier and harder to interpret.



Consumption comparison of combined fossil fuels to combined renewable energy sources. Absolute volumes shown as bars, relative percent contribution to total shown as lines. A) Total overall energy consumption, B) Electrical generation. Arrows highlight general trends – see text.

(Note: Percent contributions do not add to 100% because nuclear energy is not included in these charts. See text for explanation.)

Note that in Total Energy Consumed (figure A), fossil fuels consumed in 2019 was 2.4 BBOE more than 10 years earlier (blue arrows), while renewables increased 0.9 BBOE (purple arrow). At the same time, as a percentage of total energy consumed, fossil fuels decreased 1.5%, while renewables increased 1.9%. Meanwhile, regarding Electrical Energy Generation (figure B), fossil fuel consumption decreased 0.87 BBOE, with its contribution to the total grid decreasing 8.1% (blue arrow). Renewably sourced electricity, on the other hand, increased 0.41 BBOE with its contribution to the total grid increasing 7.6% (purple arrow).

Renewables clearly are impacting the energy bucket, particularly (and not surprisingly) in electricity generation. But these charts also highlight the gargantuan difference in energy capacity and capture potential between the two major categories. Renewables, as a class, generally have such low energy density that, given current technology, scaling them up to satisfy the entire U.S. power consumption appetite is, frankly, very unlikely to impossible to engineer. The concentrated energy density of fossil fuels (and uranium for that matter) is the very reason they have been the primary electrical power drivers over the last 70 years or more. Absent a major breakthrough in electrical storage or energy conversion, the numbers show that renewable energy, while able to capture a portion of the electrical energy pie, cannot replace fossil fuels in the generation of electricity.

Next issue: the one energy source currently available that could, conceivably, replace fossil fuels for generating electricity.

***Author post script:** you may have read EIA claims that in 2019, for the first time, natural gas actually generated more electricity than coal. My analysis, based on EIA's own consumption data, show coal still

holds a very slight lead. This apparent discrepancy is most likely due to differences in power plant design for gas versus coal. Many natural gas fired power plants run combined-cycle processes, while coal plants do not. This enhances the electrical power output for natural gas per Btu relative to coal. However, accounting for potential efficiency differences in plant designs is beyond the scope of this study. Suffice to say, in 2019 the raw energy consumed to generate electricity from coal and gas is nearly equal.

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A tall oil rig is illuminated with green lights at night. The background is a stylized American flag with blue stars and stripes. The rig is positioned on the right side of the image, and the sky is a mix of blue and purple hues, suggesting a sunset or sunrise.

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CBGS President's Letter

CBGS Board 2020-2021

President- Dr. Subbarao Yelisetti

Vice President- Dr. Mohammed Ahmed

Secretary/ Treasurer-Charles Benson

TAMUK student representative- Monica Estrada

TAMUCC student representative- Ryan Turner

CBGS Scholarships

The Coastal Bend Geophysical Society (CBGS) has donated \$10,000 to the Department of Physics and Geosciences, Texas A&M University-Kingsville in support of the multidisciplinary Petrophysics Graduate Program that has been requested. These funds will be used as scholarships in attracting quality graduate students.

The board awarded three scholarships of \$2,000 each to undergraduate geophysics majors from Texas A&M University-College Station, University of Houston and Texas A&M University-Kingsville. We will be awarding the scholarships again this year.

Scholarship Requirements

Criteria for awarding the Scholarship from Coastal Bend Geophysical Society of Corpus Christi, Texas:

1. Scholarships are open to undergraduate or graduate students.
2. Must have declared major in Geophysics, or Geology with a concentration in Geophysics or Petrophysics.
3. Preference is given to students attending Coastal Bend schools (TAMU-K, TAMU-CC and Del Mar College), then to Coastal Bend natives attending other universities.
4. Must have a GPA of at least 3.0 and be in good standing with the school.
5. Must make effort to attend a Coastal Bend Geophysical Society Meeting in Corpus Christi Texas after being awarded a scholarship to be recognized by the society.

News

- At the time of writing this report, the U.S. crude futures have gained 144% over the past eight months to around \$46 a barrel, as reported by Scott DiSavino on reuters.com.
- According to data from Baker Hughes, the U.S. oil and gas rig count rose to 323 as of Dec 4th, which is about 60% below this time last year.
- U.S. crude oil production rose 286,000 barrels per day in September to 10.86 million bpd as reported by By Jessica Resnick-Ault, Scott DiSavino.

CBGS Business

CBGS currently has 43 active members, 4 honorary members, and 40 student members. Raised \$1,450 towards student scholarships through membership revenue.

CBGS workshops/talks

CBGS organized **2020 SEG Distinguished Lecture** entitled “*Automating seismic data analysis and interpretation*” by Sergey Fomel on February, 11th, 2020, from 11:30 am -12:30 pm.

Sergey’s biography and abstract can be found at

<https://seg.org/Education/Lectures/Distinguished-Lectures/2020-DL-Fomel>

CBGS has also hosted another lecture entitled “*Spectral Extrapolation and Acoustic Inversion for the Characterization of An Ultra-thin Reservoir*” by Charles Puryear on March 4th, 12-1 pm.

CBGS recently co-hosted the Ocean Discovery Lecture entitled “*Hunting the Magnetic Field through Ocean Drilling*” by Dr. Lisa Tauxe on Dec 1, 11 am-12:30 pm.

CBGS will be hosting a talk entitled “*Links Between Sediment Properties and Megathrust Slip Behavior – the Cascadia Example*” by Dr. Shuoshuo Han on February 17th at noon.

CBGS is looking forward to offer workshops/talks in the future. Topic/speaker suggestions are welcome. Email your suggestions to Subbarao.Yelisetti@tamuk.edu

New Degree Tracks at TAMUK and Graduate Scholarships

- Texas A&M University-Kingsville (TAMUK) started its first cohort of MS Petrophysics program in Fall 2018. If you are interested in joining this program in Spring 2021, please contact the graduate coordinator for MS in Petrophysics, Dr. Subbarao Yelisetti at Subbarao.Yelisetti@tamuk.edu.
- The Department of Physics and Geosciences at TAMUK is offering competitive scholarships for MS Petrophysics students. For additional details about the program and scholarships, please visit the website:
<https://www.tamuk.edu/artsci/departments/phge/phys/academics/gp.html>
- **BS degree in Geophysics, Minor in Geophysics and Certification in Geophysics** offered at Texas A&M University-Kingsville since Fall 2017. Interested students can contact Dr. Subbarao Yelisetti (Subbarao.Yelisetti@tamuk.edu) for additional information.

Education/Events

-SEG

SEG 2020 annual meeting will be held in Denver, CO from 26th Sep- 1st Oct. See <https://seg.org/AM/> for additional details.

See <https://seg.org/Education/Lectures/Distinguished-Lectures> for information about upcoming SEG distinguished lecture in Houston and other locations.

See <https://seg.org/Education/Lectures/Honorary-Lectures> for SEG honorary lecture locations in Texas.

-AGU

2020 Fall AGU annual meeting will be held in San Francisco, CA from December 1-17th, 2020.
<https://www.agu.org/Fall-Meeting>

Monthly Saving

"If I were investing in oil and gas stocks, there is one question I would ask CEO's: What portion of your capital is going to have to go in to stay even" - Gwyn Morgan, CEO of Encana, CAPP Conference, June 2002.

Monthly Summary

| Texas Oil and Gas Info | Current Month | Last Month | Difference | |
|-------------------------------|----------------------|--------------------------|--------------------------|----------|
| Texas Production | MMBO/BCF | MMBO/BCF | MMBO/BCF | |
| Oil | 135.4 | 138.8 | -3.4 | August |
| Condensate | 20.7 | 20.8 | -0.1 | August |
| Gas | 843.0 | 847.5 | -4.5 | August |
| | Current Month | Yr to date - 2020 | Yr to date - 2019 | |
| Texas Drilling Permits | 382 | 5890 | 10059 | November |
| Oil wells | 102 | 1448 | 2701 | November |
| Gas wells | 36 | 396 | 712 | November |
| Oil and Gas wells | 226 | 3702 | 5875 | November |
| Other | 9 | 110 | 113 | November |
| Total Completions | 965 | 19242 | 14972 | November |
| Oil Completions | 803 | 15120 | 11732 | November |
| Gas Completions | 162 | 4122 | 3240 | November |
| New Field Discoveries | 0 | 9 | 43 | November |
| Other | 283 | 6510 | 5585 | November |

Subbarao Yelisetti
 President, CBGS



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GEOPHYSICAL FIELD TEST SITE INSTALLED

Geophysical Test Site Provides New Resource to Students, Researchers at TAMU-CC

Read the Full Article Online: [CLICK HERE](#)

CORPUS CHRISTI, Texas – A new Geophysical Test Site (GTS) gives students at Texas A&M University-Corpus Christi an opportunity to employ the latest state-of-the-art techniques of investigating subsurface objects in a rare, hands-on field laboratory.

“The Geophysical Test Site provides an ideal platform that can be used to enhance teaching and research activities in southern Texas,” said Dr. Mohamed Ahmed, Assistant Professor of Geophysics in the College of Science and Engineering. “Field-based exercises enhance students’ engagement and performance because this allows them to learn through active exploration and interaction.”

The GTS was constructed on the university’s Momentum Campus in Corpus Christi from February to March. The construction was partially funded by the **Corpus Christi Geological Society**.



Thanks so much to the Corpus Christi Geological Society for their contribution and a commitment to earth science education in the Coastal Bend!

Randy Bissell, Membership

ZOOM
VIRTUAL MEETING
WEDNESDAY, JANUARY 6TH, 2021
11:00AM

**Watch your email, you will receive a notification & invitation a week
in advance for the planned upcoming event**

**What Processes Control Widely Observed Patterns in Deep-Water
Channel Fill Stratigraphy? Integrating Seafloor and Outcrop Data
Uncovers Surprising Results**

Abstract

I will review patterns of deep-water channel fill stratigraphy, based largely on outcrop investigations of Upper Cretaceous units in southern Chile (Tres Pasos Formation, Magallanes Basin). Linking observations from Chile to those from many other basins around the world, I will identify a series of channel fill characteristics that have been unsatisfactorily explained to date. To demonstrate a relatively poorly established link between sedimentary processes and stratigraphic products in deep-water channel systems, I will compare deep-water channels and their deposits to the more comprehensive meandering river facies model. I will then introduce observations of the modern Bute Inlet submarine channel system (British Columbia, Canada), including time-lapse bathymetry data, which reveals that upstream migrating knickpoints are the most important mechanism of deep-water channel maintenance. These observations inspire reinterpretation of the stratigraphic record in Chile, providing a unique opportunity to link sedimentary processes to products. In addition to the fundamental relevance of this work to understanding deep-water sedimentary systems, the outcomes of the analyses are useful for multi-scale predictions of connectivity in subsurface reservoirs.

Biography

Steve Hubbard joined the faculty in the Department of Geoscience at the University of Calgary in 2006, shortly after completing his PhD at Stanford University. Prior to his PhD he obtained BSc and MSc degrees at the University of Alberta and worked as a geologist at Shell Canada. His research, teaching, and student mentorship is focused on topics in siliciclastic sedimentology and stratigraphy, as well as applications to petroleum geology. He specializes in the processes and products of channelized depositional system

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WEDNESDAY, JANUARY 20, 2021
12:00PM

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**Selected Topics in Geoethics
Presented by: David M. Abbot, Jr., AIPG-CPG Ethics Columnist and
Ethics Chairman Emeritus**

Abstract

This presentation will briefly review the development of geoethics and then examine a number of goethical issues including: ethical but upsetting geoscience studies (hurricane impacts, coastal sinking, & rockfall zoning), the sustainability of depleting natural resources, protecting classic outcrops, disclosing uncertainties (be the bookie but not the bettor), the usefulness of geoscience models, and geodiversity and inclusion in the composition of the geoscience profession.

Presenter

Since 1989 I have been writing about geoscience professional ethics issues. My “Professional Ethics & Practices” column in the American Institute of Professional Geologist’s magazine, The Professional Geologist, began in 1995 and as of January 2021, 176 columns have been published. I’ve given short courses on professional ethics around the US for many years. I’ve written 65 ethics related articles for AIPG, AAPG, the EFG, AusIMM, SEG, and other international groups over the years. I was appointed AAPG’s Distinguished Lecturer for Ethics in 2018-19.

ZOOM
VIRTUAL MEETING
WEDNESDAY, FEBRUARY 17, 2021
12:00 NOON

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Speaker: Dr. Shuoshuo Han, Research Associate, University of Texas Institute for Geophysics

Title: Links Between Sediment Properties and Megathrust Slip Behavior – the Cascadia Example

Abstract:

At sediment-rich subduction zones like Cascadia, megathrust slip behavior and forearc deformation are tightly linked to the physical properties and in situ stresses within the underthrust and accreted sediments. Using seismic velocities derived from long-offset multichannel seismic data, we find offshore Washington where the megathrust is inferred to be strongly locked, over-consolidated sediments near the deformation front are incorporated into a strong outer wedge, with little sediment subducted. In contrast, offshore Central Oregon where reduced locking is inferred, a thick under-consolidated sediment sequence is subducting, and is probably associated with elevated pore fluid pressures on the megathrust. Our results suggest that the consolidation state of the sediments near the deformation front is an important factor contributing to megathrust slip behavior and its along-strike variation.

Using full-waveform inversion (FWI) we resolve fine-scale velocity structure of the incoming sediments offshore central Oregon and Washington. Offshore central Oregon, we find a ~400-m-thick low-velocity interval initiates ~7 km seaward of the deformation front beneath the stratigraphic boundary between Astoria Fan sediments and abyssal plain turbidites. This low velocity interval is likely associated with anomalously high porosity that developed due to poor drainage beneath a thin layer of low permeability. Further landward, décollement develops within this interval with along-strike variations in depth of a few hundred meters. In contrast, offshore Washington, we do not observe low velocity intervals in the incoming sediment section near the deformation front and the décollement is only ~200 m above the basement. Our results suggest that the presence of a low permeability layer at the base of Astoria Fan

sediments with fluid overpressures below it, may play an important role in forming a shallow décollement offshore central Oregon.

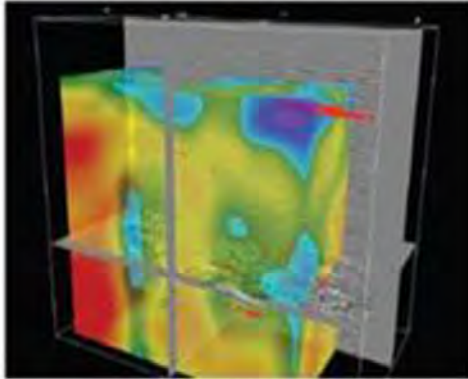
Biography



Shuoshuo Han is a marine geophysicist interested in the structure, tectonic processes, and related hazards at subduction zones, and the formation and evolution of oceanic lithosphere. She obtained BSc from Peking University in 2008 and Ph.D. from Columbia University in 2015. In her research, she uses active source seismic data to image the detailed structures of the sediment, oceanic crust and uppermost mantle. She also integrates seismic data with ocean drilling data to constrain physical properties, and infer in-situ stress states of the subsurface. Her recent studies have focused on the Cascadia subduction zone offshore the west coast of the US and Canada and the Hikurangi subduction zone offshore New Zealand. She has participated in 6 research cruises and spent about ~ 6 months at sea.

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Topical Index-Table of Contents to the Professional Ethics and Practices Columns

A topically based Index-Table of Contents, "pe&p index.xls" covering columns, articles, and letters to the editor that have been referred to in the PE&P columns in Excel format is on the AIPG web site in the Ethics section. This Index-Table of Contents is updated as each issue of the TPG is published. You can use it to find those items addressing a particular area of concern. Suggestions for improvements should be sent to David Abbott, dmageol@msn.com

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303-394-0321, dmageol@msn.com

Geoscience Workforce Growth in a Dynamically Changing Economy

Christopher Keane and Maeve Boland of AGI recently published "Dilemmas of promoting geoscience workforce growth in a dynamically changing economy".¹ They state, "The geosciences as an occupation are experiencing substantial change, with a combination of economic cycles, mass retirements, and rapid technological innovation. For the next generation of geoscientists, flexibility and well-defined competencies will be key to employment resilience." However, geoscience employment has changed dramatically from the 1960s and 70s when 70% of geoscientists were in the petroleum business. When oil prices fell in 1986, as in previous downturns, large numbers of petroleum geoscientists became unemployed. Some were able to transition to environmental or hydrologic jobs, but the available positions in these areas soon filled. The development of horizontal drilling methods and improved hydraulic fracturing techniques led to a new boom in the petroleum sector, including related environmental and hydrogeology jobs but this boom ended in 2014. The mining industry also runs through boom and bust cycles as well as changing focus: uranium in the mid-70s until the Three Mile Island incident, then copper, then gold, etc. But the fluctuating petroleum business was the best indicator of geoscience enrollments.

The Master's degree has become the main degree needed in the private sector. This means at least a 6-year academic commitment that coexists with 5- to 10-year cycles in the various geoscience industries. Also affecting the academy are efforts to increase degree completions in minimum time and cost cutting

in order to control tuition increases. Given the employment cycles, acquiring a broad geoscience-area base coupled with advanced math, chemistry, and physics is needed to provide students and early graduates with the flexibility to enter into and stay in a changing employment environment.

Perhaps it is time to look at AIPG's geoscience education requirements. AIPG's *Education for Professional Practice* was last updated in February 2007 and is due for an update. Specifically, I believe that basic chemistry, physics, and statistics, should be added along with increasing the total number of qualifying semester or quarter hours. Perhaps looking at different career tracks like GIS should also be considered. I urge students and young professionals to read Keane and Boland's paper and reflect on what constitutes a broad geoscience-area base along with a foundation in other basic sciences. Contribute your ideas as comments on this topic.

Demystifying Personal Brand for Resources Professionals

David Yeates' article, "Demystifying personal brand for resources professionals" appears elsewhere in this TPG issue. Your "personal brand" is your professional reputation that is based on those who know who you are and what you can do. As Yeates points out, it is about being remembered and about being interesting. There are a variety of ways of building a personal brand. Publishing is one way. You will recognize the names of our long-term Student Columnists Nancy Price, Stephanie Jarvis, and Kristina Portabib if you've been reading the TPG for the past decade or so. Likewise, you'll recognize the names of Michael Urban and our various editors. Participation

as a member of a Section and National Committees or regular participation in Section and National meetings assist in building name recognition and reputation. Becoming a recognized expert in a particular area is another way. Again, there are lots of ways to build a personal brand and it pays to do so.

Ethical but Upsetting Geoscience Research

Thomas Pözlner and Florian Ortner's paper, "Ethical but upsetting geoscience research: a case study" addresses an issue that will become increasingly important.² Examples of such research include hydrocarbon exploration near population centers, including those where the population is moving into traditional exploration and development areas, nuclear waste repositories, and geohazards. Geoscience studies on such topics are not ethically wrong simply because someone is upset by the study or its conclusions, although such upsets should be recognized. Pözlner and Ortner's example involved an investigation of the impacts of climate change on geohazards in areas of high topographic relief that are popular tourist destinations, and may have a relatively high population. Pözlner and Ortner's example led to one hypothetical option of abandoning the present development in some of these areas. When the local news media reported this, the local population and its political leaders simply did not want the option discussed and demanded that the research be stopped.

The classic example of an ethical but upsetting scientific study is the subject of Henrik Ibsen's *Enemy of the People* (1882, available from several web sites). The protagonist is a doctor in a small, southern Norwegian town who discovers that the town's spa, which is the town's economic base, is polluted. His disclosure

1. <http://www.annalsofgeophysics.eu/index.php/annals/article/viewFile/7411/6812>, accessed 2/16/18.

2. <http://www.annalsofgeophysics.eu/index.php/annals/article/view/7506>, accessed 2/16/18.

of his findings leads to ostracism of the doctor and his family.

A US example of this would be to observe that because of pervasive down-to-the-coast faulting and resultant elevation decreases, sea level rise, and demonstrated adverse hurricane impact, development along the Gulf Coast should be restricted and that rather than rebuilding, Houston, New Orleans, etc. should be moved north to higher ground. I can already hear the roars of disapproval and outrage the previous sentence can produce. But the elevation decrease, sea level, rise, and hurricane impacts are well known. Are the consequences of this really being addressed?

Here in Colorado, rockfall is a real problem in areas of higher relief and the Cretaceous shales are well-known for slumping. But real estate developers don't want to hear about such things even when things occur such as that illustrated in the picture to the right from the Glenwood Springs, CO, *Post Independent* for April 7, 2004.

Geoethics Papers

The two preceding topics discussed papers published in the *Annals of Geophysics*, v. 60, 2017 by the International Association for Promoting Geoethics (IAPG). Other papers from this volume that are available for free download currently (Dec '17) are:

- A Concept of Society-Earth-Centric Narratives by Martin Bohle, Anna Sibilla, and Robert Casals I Grails
- Delivering Sustainable Development Goals: The Need for a New International Resource Governance Framework by Edmund Nickless
- Furthering Ethical Requirements for Applied Earth Science by Martin Bohle and Erle C. Ellis
- Geoethics in Science Communication: The Relationship between Media and Geoscientists by Franco Foresta Martin and Silvia Peppoloni
- Geoethics: ethical, social and cultural implications in geosciences by Silvia Peppoloni and Giuseppe Di Capua
- Geoscience Engagement in Global Development Frameworks by Joel C. Gill and Florence Bullough
- Geosciences at the Service of Society: The Path Traced by Antonio Stoppani by Stefania Lucchesi
- Green Mining – A Holistic Concept for Sustainable and Acceptable Mineral Production by Pekka Nurmi



On the Contribution of Philosophical and Geoscientific Inquiry to Geoethics (qua Applied Ethics) by Thomas Pözlzer

Public Policies, Social Perception and Media Content on Fracking: An Analysis in the Spanish Context by Emilia Hermelinda Lopera-Pareja, Ana Garcia Laso, and Domingo Alfonso Martin-Sanchez

Some Fundamental Issues in Geoethics by David M. Abbott, Jr.

The Cape Town Statement on Geoethics by Giuseppe Di Capua, Silvia Peppoloni, and Peter T. Bobrowsky

The Role for a Large Scientific Society in Addressing Harassment and Work Climate Issues by Billy M. Williams, Christine McEntee, Brooks Hanson, and Randy Townsend

The range of topics in these papers provides an example of the relatively new and growing field of geoethics. These papers and others that will be included in this volume and published shortly can be downloaded for free from <http://www.geoethics.org/geoethics-ag2017> and select the title, accessed 12/7/17.

Geoethics and Sustainability

In my January 2018 column (165) I included the *Geoethical Promise* and associated *Fundamental Values of*

Geoethics. The last two points of the *Fundamental Values of Geoethics* are:

- Ensuring sustainability of economic and social activities in order to assure future generations' supply of energy and other natural resources;
- Promoting geo-education and outreach for all, to further sustainable economic development, geohazard prevention and mitigation, environmental protection, and increased societal resilience and well-being.

I commented, "The aspiration to ensure the sustainability of the supply of energy and other natural resources for future generations conflicts with the fact that the supplies of energy and other natural resources are depletable, that individual deposits have a limited extent."

The November 2017 issue of the *European Geologist*, v. 44, contains four papers addressing aspects of this problem. They are:

- Thompson, J., Eagle, L., & Bonham, O., Resources for future generations—understanding earth and people
- Langefeld, O., Future mining—thoughts on mining trends
- Grennan, E.F., and Clifford, J.A., Resource sustainability—geology is the solution

Rokavec, D., Mezga, K., & Melitica, S., How to increase future mineral supply from EU sources

Grennan and Clifford's paper, Resource sustainability—geology is the solution, addresses the sustainability issue directly and honestly. Their abstract states:

The question of resource sustainability was developed during the late 1960s and lies at the core of a number of alarmist reports compiled at that time, none of which had a geological perspective. The public perception of geology is that it has little, if any, impact on their everyday lives. This is, of course, a fallacy. Geology is one of the central factors that impacts, and needs to be considered, across a range of

public policy issues and it is noteworthy that in all of these reports exploration risk is never considered. At present Europe is dependent on imports of raw materials from countries which do not necessarily have good environmental standards. If Europe really wants a quality environmental future, it must encourage the discovery of its own resources and not develop policies that inhibit their development. Europe can only ensure a secure, and sustainable, supply of raw materials for its industrial base by doing this.

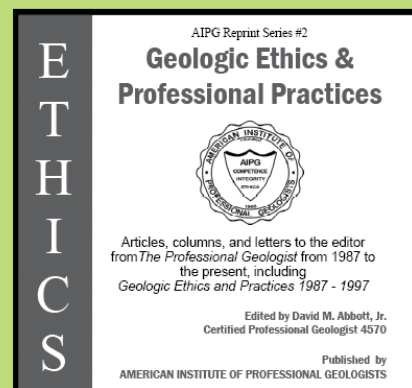
Thompson, Eagle, and Bonham's paper addresses the need for public education in order to properly address

the sustainability issue. They observe, "To succeed, we [the general public] must fully understand the earth, from the critical processes that concentrate resources to the environment and climate that support life. Simultaneously, we [the extractive industries] must engage broadly with people to fully understand needs and concerns, inform effective policy, and provide the knowledge to support future generations." I've inserted my definitions of "we" in the quote. Public education and understanding is critical and this needs to come from the extractive industries (mining, petroleum, recycling, etc.). Only then can sustainability be properly addressed.

Geologic Ethics & Professional Practices is now available on CD

This CD is a collection of articles, columns, letters to the editor, and other material addressing professional ethics and general issues of professional geologic practice that were printed in *The Professional Geologist*. It includes an electronic version of the now out-of-print *Geologic Ethics and Professional Practices 1987-1997*, AIPG Reprint Series #1. The intent of this CD is collection of this material in a single place so that the issues and questions raised by the material may be more conveniently studied. The intended 'students' of this CD include everyone interested in the topic, from the new student of geology to professors emeritus, working geologists, retired geologists, and those interested in the geologic profession.

AIPG members will be able to update their copy of this CD by regularly downloading the pe&p index.xls file from the www.aipg.org under "Ethics" and by downloading the electronic version of *The Professional Geologist* from the members only area of the AIPG website. The cost of the CD is \$25 for members, \$35 for non-members, \$15 for student members and \$18 for non-member students, plus shipping and handling. To order go to www.aipg.org.



Members,

Please notify headquarters if you know of a member who has passed. We would like to honor our members in remembrance.

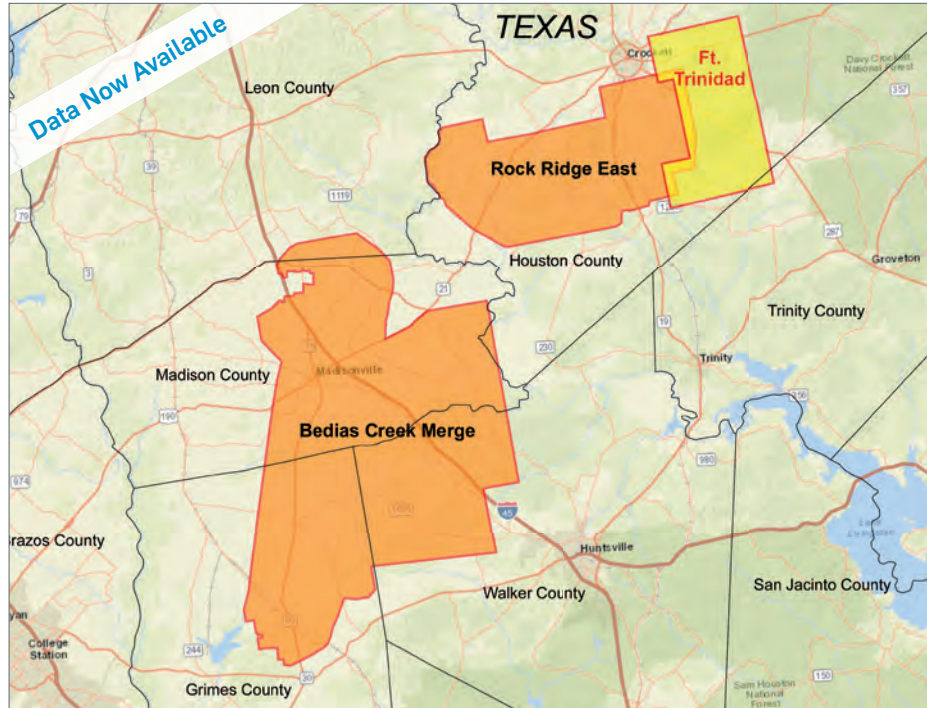
Message from Central Michigan University Student Chapter on Attending the 2017 Annual Meeting in Nashville

This past fall five our student members attended the AIPG National Conference in Nashville, TN. It was without a doubt one of the best things we have done in our college career! For most of us it was our first time being to a conference of this caliber. The atmosphere was fun and inviting, and we plan to send students to Colorado Springs this upcoming Fall.



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Topical Index-Table of Contents to the Professional Ethics and Practices Columns

A topically based Index-Table of Contents, "pe&p index.xls" covering columns, articles, and letters to the editor that have been referred to in the PE&P columns in Excel format is on the AIPG web site in the Ethics section. This Index-Table of Contents is updated as each issue of the TPG is published. You can use it to find those items addressing a particular area of concern. Suggestions for improvements should be sent to David Abbott, dmageol@msn.com

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Climate Change, Younger Members, and AIPG's Membership

Some of AIPG's membership (primarily older members?) remain skeptical of climate change for a variety of reasons. Other AIPG members (particularly Students and Young Professionals) are convinced of the reality of climate change. A problem can arise when one of the skeptics clearly expresses this skepticism as a Section or other leader in AIPG and these views (plus a leadership position) cause those convinced of climate change to wonder whether AIPG is a worthwhile organization for them. As an organization, AIPG cannot afford to drive away actual and potential younger members.

I asked **Brandy Barnes**, the 2018 Young Professional Member of the National ExCom, for her thoughts on the subject. She replied,

Our organization has specific goals to uphold professionalism and ethics in all types of geoscience professions. Communication, professionalism, and problem-solving skills are key skills for the young scientist (or scientists) as they seek growth in their careers. Having a firm grasp of these key components will ensure that the young scientist is successful navigating the most effective and efficient path when that path is not always clear due to differing opinions in the industry. There is a widespread generational gap in the geosciences; with that comes the understanding that geology is evolving, and scientific techniques are improving. Humans are very opinionated, and your colleagues, coworkers, and employers may not share your own views. This only gives you more opportunities to express and expand your skills in professionalism and communication.

A couple of things to keep in mind moving forward: we need to understand that the organization does not support specific views and we also should consider the context in which we present material. Be aware of your communication strategies and of upholding the values of AIPG. A young professional can benefit from mentorships and learning from the wisdom of our senior members and the growth and changes that have taken place throughout their careers. For those in our industry, we need to be patient as the young scientists learn and grow; they have different mindsets and experiences from previous generations.

Ideologies may vary by generation, but as long as professionalism is at the forefront, progress can be achieved. They are the future of our organization and the geosciences, we can all work together to create a stronger foundation for our professional community.

To our students and young professional members, consider the same. Your mentors have walked a different path than you likely will. Do not be discouraged by people who think differently from you, but find new ways to encourage people to review your opinions or data. Do not create a habit of fleeing during disagreements; understand why people think the way they do and move forward. Make progress and practice those skills of communication, professionalism, and problem solving. The "art of listening" is a rewarding tool that can be utilized in every aspect of life. Consider this quote from Bryan H. McGill, "One of the most sincere forms of respect is actually listening to what another has to say."

In general, I believe this is an important topic and fabulous practice for all of our members. Always be an advocate for yourself and the profession, we all can grow and become even better communicators and professionals, which in turn benefits our future in the geoscience community.

The following topic, "Environmental Disenfranchisement," discusses a related issue. Also, the articles, *Climate Change: Are We Changing or Not?* and William Greenslade's review of *What science reveals about the nature of endless climate change* address aspects of climate change.

Environmental Disenfranchisement

A very interesting article, "Louisiana coastal loss drives 'environmental disenfranchisement,'" in the September 2018 *AAPG Explorer* focused on the work of Sam Bentley of the Louisiana State University's College of Science and the study of the changing coast line of Louisiana. Bentley points out that, "Conditions are dire for much of the coastal region of the Mississippi River Delta and our children will see a coastal landscape that we might not recognize." The well-known changes in the Mississippi's discharge point, the migration of deltas, have led to the buildup of land in one area and subsidence in others. More recently, human activity of various kinds has impacted this process. For example, Bentley notes that the damming of the Missouri River cut the sediment load delivered to the Mississippi River Delta by "50 percent or more." Bentley states that the biggest factors affecting coastal Louisiana—erosion plus subsidence plus sea level rise—have led to shrinkage of the coast that negatively impacts coastal communities. People have been voluntarily leaving coastal areas because of flooding risks from hurricanes and subsidence.

Bentley calls this “environmental disenfranchisement.” Debates about how to deal with the issue and potential solutions that cost huge sums of money are heated and have not reached conclusions.

The impacts of hurricanes and sea level rise are not limited to Louisiana. They occur along the whole Gulf coast and much of the Atlantic coast. This Fall Hurricane Florence savaged the Carolina coast and Hurricane Michael essentially wiped out towns on the Florida panhandle. The projected damage to buildings and infrastructure are enormous. But the cost of insurance for hurricane damage in coastal areas is nowhere near high enough to cover the actual payouts. Florida law limits what insurers can charge in order to keep rates affordable.¹ If the cost did cover actuarial losses, few if any could afford to live in the coast areas. This would be another form of “environmental disenfranchisement” as defined by Bentley. On the other hand, what about the negative impact of higher insurance rates on the rest of us needed to cover the losses suffered by those pay less than actuarial rates? Given climate change and rising sea levels, should people be allowed to rebuild on these coastal areas? Should the following requirements be enforced if rebuilding is allowed?:

- The full actuarial cost of hurricane insurance should be charged.
- Building codes should require that buildings be able to withstand Category 5 storms (there was one example of such a home in Mexico Beach, FL)

These requirements will make homes very expensive, pricing most people out of the market. This exacerbates Bentley’s environmental disenfranchisement of people in the area but relieves the rest of us from having to pay for those same people to live in a known geohazard area.

The Primary Responsibility of Geotechnical Engineers and Hydrologists

The article, “Thoughts on the responsibility of geotechnical engineers and hydrologists in mining,” by R.J. Sheets in the September 2018 issue of *Mining Engineering* is an excellent and in-depth

look (through the use of examples) at the responsibilities of geotechnical engineers and hydrologists (<http://me.smenet.org/abstract.cfm?preview=1&articleID=8493&page=32>, for a summary). Sheets maintains that their primary responsibility is the safety of all affected parties, on and off site, something not emphasized sufficiently in schools, which focus on learning professional tools more than their real-world application (including all the messy, conflicting, and missing data that are facts of professional practice and that are omitted from simplified school examples). I urge everyone to read this thoughtful article. Another article in the same issue of *Mining Engineering*, “Imminent Danger: characterizing uncertainty in critically hazardous mining situations,” by B.M. Elher, J. Hrica, and D.R. Willmer is also worth reading (<http://me.smenet.org/abstract.cfm?articleID=8490&page=47>, for abstract). While both articles deal specifically with mining issues, the observations are generally applicable.

Don’t Forget Your Hand Lens!

Editorial note: the text of this topic that is not italicized is from J. Bruce Gemmell’s article, “Don’t forget your hand lens!” published in the SEG Newsletter, October 2018, p. 6, and is included with permission from Gemmell and the SEG. Gemmell is the 2018 Society of Economic Geologists President.

Good exploration relies on expert knowledge and experience to identify ground with the potential to host substantial mineral resources. However, today’s exploration is ever more heavily relying on computer-aided analysis and portable field devices—to the detriment of good field skills—to derive information from which important, and costly, decisions are being made. This to me is a concern.

Now is the time to put the geology back into economic geology. Fieldwork is critically important—be it field mapping, pit or underground mapping, or core logging. Many times in recent years, I have visited company field areas to examine outcrops or core and found (1) many of the recent graduates do not use, or sometimes do not even have, a hand lens, (2) many do not know how to use a compass for structural measurements, and (3) geologists

and field technicians are not allowed to use dilute HCl to determine the carbonate species, due to company health and safety regulations. How have we come to this?

One of the many reasons is the reliance on portable devices (SWIR, pXRF) or core scanning technologies to provide basic observational information. While these tools can give valuable information, if the mineral geoscientist does not have the basic skills and knowledge to know if the information they are getting from these devices is right or useful, this can be dangerous. For instance, the early model SWIR devices would tend to identify paragonite as a common mineral in hydrothermal alteration, but a check of the lithochemistry of the same rock would show it contains no sodium (later models of this technology have rectified this issue), and if a pXRF is not calibrated and standardized properly you can obtain geochemical data, but it is meaningless—problem!

I believe that the most basic and fundamental observations for a minerals geoscientist to make are mineral and rock identification, followed by structural geology. These skills are sorely lacking in many new graduates simply because, through no fault of their own, they are not taught these skills in their undergraduate or graduate educations. Many of their lecturers and professors lack these skills, owing to their own education or experiences, and therefore they do not teach basic field skills and techniques to their students. In addition, many universities are dramatically scaling back fieldwork in their curriculum or abolishing it altogether, as it constitutes a liability they are not willing to risk.

As a consequence, the fieldwork component of many student research projects and theses can be poor or lacking altogether. Many recent papers in the economic geology scientific literature are devoid of good, basic geologic descriptions of the areas/deposits, and many do not have decent geologic maps and cross sections, espe-

1. https://www.washingtonpost.com/news/monkey-cage/wp/2017/09/13/the-strange-story-of-how-floridas-lawmakers-subsidized-hurricane-insurance/?noredirect=on&utm_term=.9e9719bf1508

cially from a structural standpoint. This lack of basic geologic control makes all the accompanying geochemical or geophysical data and interpretations much less useful than they could be. Unfortunately, many of the scientific funding agencies around the world do not think funding for fieldwork is worthwhile, and hence many academics cannot get funding to carry out basic fieldwork. This has the unfortunate effect that many academics and their students are now undertaking "box of rocks" research instead of undertaking fieldwork and obtain-

ing the geologic observations and context for the samples collected. This is not a good situation for the new graduates going into mineral exploration or minerals geoscience research.

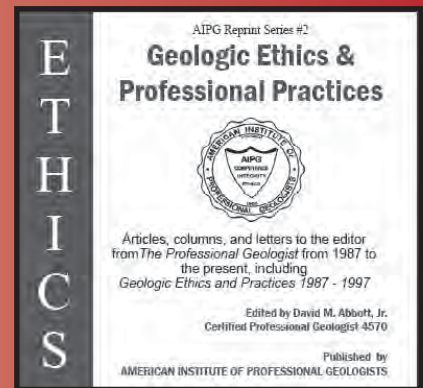
Gemmell goes on to suggest various ways the Society of Economic Geologists address these issues, suggestions that are SEG specific. Gemmell's observations on the need for a good background in basic field geology and mapping are critically important for geologic work. As S. Roden and T. Smith state, "The key message that needs to be remembered in the area of field sampling is that errors introduced at this stage of

the data generation process are, in most instances, the largest errors introduced into a program and that these errors cannot be rectified in the subsequent processing of the sample. Errors created in the field can only be rectified in the field" (2001, Sampling and analysis protocols and their role in mineral exploration and new resource development, in Mineral Resource and Ore Reserve Estimation—The AusIMM Guide to Good Practice: AusIMM Monograph 23). The lab cannot make up for poor observations or sampling in the field. And lab conclusions are only valuable if they can be applied in the field and help the understanding of what is seen in the field.

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This CD is a collection of articles, columns, letters to the editor, and other material addressing professional ethics and general issues of professional geologic practice that were printed in *The Professional Geologist*. It includes an electronic version of the now out-of-print *Geologic Ethics and Professional Practices 1987-1997*, AIPG Reprint Series #1. The intent of this CD is collection of this material in a single place so that the issues and questions raised by the material may be more conveniently studied. The intended 'students' of this CD include everyone interested in the topic, from the new student of geology to professors emeritus, working geologists, retired geologists, and those interested in the geologic profession.

AIPG members will be able to update their copy of this CD by regularly downloading the pe&p index.xls file from the www.aipg.org under "Ethics" and by downloading the electronic version of *The Professional Geologist* from the members only area of the AIPG website. The cost of the CD is \$25 for members, \$35 for non-members, \$15 for student members and \$18 for non-member students, plus shipping and handling. To order go to www.aipg.org.



The SEC's Final Rule on Modernization of Property Disclosures for Mining Registrants

David M. Abbott, Jr., CPG-04570

The US Securities and Exchange Commission issued Release 33-10570, the final rule on Modernization of Property Disclosures for Mining Registrants, www.sec.gov/rules/final/2018/33-10570.pdf, on October 31, 2018. This 455-page release represents a substantial revision of the SEC's proposed rules issued in June 2016 and brings the mining disclosure requirements much closer to but not in precise conformity to the internationally recognized CRIRSCO-templates definitions and disclosure guidelines such as the *SME Guide for Reporting Exploration Information, Mineral Resources, and Mineral Reserves* (2017). The SEC will not concede control of its disclosure rules. These new rules will become final 60 days after publication in the Federal Register (about January 1, 2019). Registrants engaged in mining operations must comply with the final rule amendments for the first fiscal year beginning on or after January 1, 2021. Industry Guide 7 will remain effective until all registrants are required to comply with the

final rules, at which time Industry Guide 7 will be rescinded. This two-year delay for compliance will allow mining firms to become familiar with the new rules and prepare appropriate reports such as the Technical Report Summary that must be completed for all material properties containing estimated mineral resources and mineral reserves.

The full implications of these new rules are just beginning to be understood as are comparisons with existing internationally recognized disclosure systems. A committee consisting of members of the Society for Mining, Metallurgy, and Exploration (SME) and the National Mining Association (NMA) has been commenting on the SEC's proposed rules for over 2 years and will be assembling comments, compliance suggestions, and related documents on the new SEC rules over the coming months. Those interested in the process should contact David Abbott, CPG, former SEC geologist, and member of the SME/NMA committee for further information, dmageol@msn.com.

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Structure and Mesozoic Stratigraphy of Northeast Mexico, prepared by numerous authors, variously paginated. 76 p., 38 p., 1984.
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Bartell Pass
Blackjack
Burgentine Lake
Copano Bay, South
Estes Cove
Fulton Beach
Goose Island
Half Moon Reef
Nine Mile Point
Rockport, West
St. Charles
Tally Island
Tract 831-G.O.M. (offshore)
Virginia

BEE COUNTY

Caesar
Mosca
Nomanna
Orangedale(2)
Ray-Wilcox
San Domingo

Tulsita Wilcox

Strauch_Wilcox

BROOKS COUNTY

Ann Mag
Boedecker
Cage Ranch
Encintas
ERF

Gyp Hill
Gyp Hill West

Loma Blanca

Mariposa

Mills Bennett

Pita

Tio Ayola

Tres Encinos

CALHOUN COUNTY

Appling
Coloma Creek, North
Heyser

Lavaca Bay

Long Mott

Magnolia Beach

Mosquito Point

Olivia

Panther Reef

Powderhorn

Seadrift, N.W.

Steamboat Pass

Webb Point

S.E. Zoller

CAMERON COUNTY

Holly Beach
Luffles
San Martin (2)
Three Islands, East

Vista Del Mar

COLORADO COUNTY

E. Ramsey
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Graceland S. Fault Blk

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Anna Barre

Cook

Nordheim

Smith Creek

Warmley

Yorktown, South

DUVAL COUNTY

DCR-49

Four Seasons

Good Friday

Hagist Ranch

Herbst

Loma Novia

Petrox

Seven Sisters

Seventy Six, South

Starr Bright, West

GOLIAD COUNTY

Berclair

North Blanconia

Bombs

Boyce

Cabeza Creek, South

Goliad, West

St Armo

Terrell Point

HIDALGO COUNTY

Alamo/Donna

Donna

Edinburg, West

Flores-Jeffress

Foy

Hidalgo

LA Blanca

McAllen& Pharr

McAllen Ranch

Mercedes

Monte Christo, North

Penitas

San Fordyce

San Carlos

San Salvador

S. Santallana

Shary

Tabasco

Weslaco, North

Weslaco, South

JACKSON COUNTY

Carancahua Creek

Francitas

Ganado & Ganado Deep

LaWard, North

Little Kentucky

Maurbro

StewartSwan Lake

Swan Lake, East

Texana, North

West Ranch

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Chaparosa

Thompsonville,N.E.

JIM WELLS COUNTY

Freeborn

Hoelscher

Palito Blanco

Wade City

KARNES COUNTY

Burnell

Coy City

Person

Runge

KENEDY COUNTY

Candelaria

Julian

Julian, North

Laguna Madre

Rita

Stillman

KLEBERG COUNTY

Alazan

Alazan, North

Big Caesar

Borregos

Chevron (offshore)

Laguna Larga

Seeligson

Sprint (offshore)

LA SALLE COUNTY

Pearsall

HAWKVILLE:EAGLEFORD

LAVACA COUNTY

Hallettsville

Hope

Southwest Speaks

Southwest Speaks Deep

LIVE OAK COUNTY

Atkinson

Braslau

Chapa

Clayton

Dunn

Harris

Houdman

Kittie West-Salt Creek

Lucille

Sierra Vista

Tom Lyne

White Creek

White Creek, East

MATAGORDA COUNTY

Collegeport

MCMULLEN COUNTY

Arnold-Weldon

Brazil

Devil's Waterhole

Hostetter

Hostetter, North

NUECES COUNTY

Agua Dulce (3)

Arnold-David

Arnold-David, North

Baldwin Deep

Calallen

Chapman Ranch

Corpus Christi, N.W.

Corpus Christi West C.C.

Encinal Channel

Flour Bluff/Flour Bluff, East

GOM St 9045(offshore)

Indian Point

Mustang Island

Mustang Island, West

Mustang Island St.

889S(offshore)

Nueces Bay/Nueces Bay

West

Perro Rojo

Pita Island

Ramada

Redfish Bay

Riverside

Riverside, South

Saxet

Shield

Stedman Island

Turkey Creek

REFUGIO COUNTY

Bonnieview/Packery Flats

Greta

La Rosa

Lake Pasture

Refugio, New

Tom O'Connor

SAN PATRICIO COUNTY

Angelita East

Commonwealth

Encino

Enos Cooper

Geronimo

Harvey

Hiberia

Hodges

Mathis, East

McCampbell Deep/Aransas Pass

Midway

Midway, North

Odem

Plymouth

Portilla (2)

Taft

Taft, East

White Point, East

STARR COUNTY

El Tanque

Garcia

Hinde

La Reforma, S.W.

Lyda

Ricaby

Rincon

Rincon, North

Ross

San Roman

Sun

Yturria

VICTORIA COUNTY

Helen Gohike, S.W.

Keeran, North

Marcado Creek

McFaddin

Meyersville

Placedo

WEBB COUNTY

Aquilares/Glen Martin

Big Cowboy

Bruni, S.E.

Cabezon

Carr Lobo

Davis

Hirsch

Juanita

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Nicholson

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Olmitos

Tom Walsh

WHARTON COUNTY

Black Owl

WILLACY COUNTY

Chile Vieja

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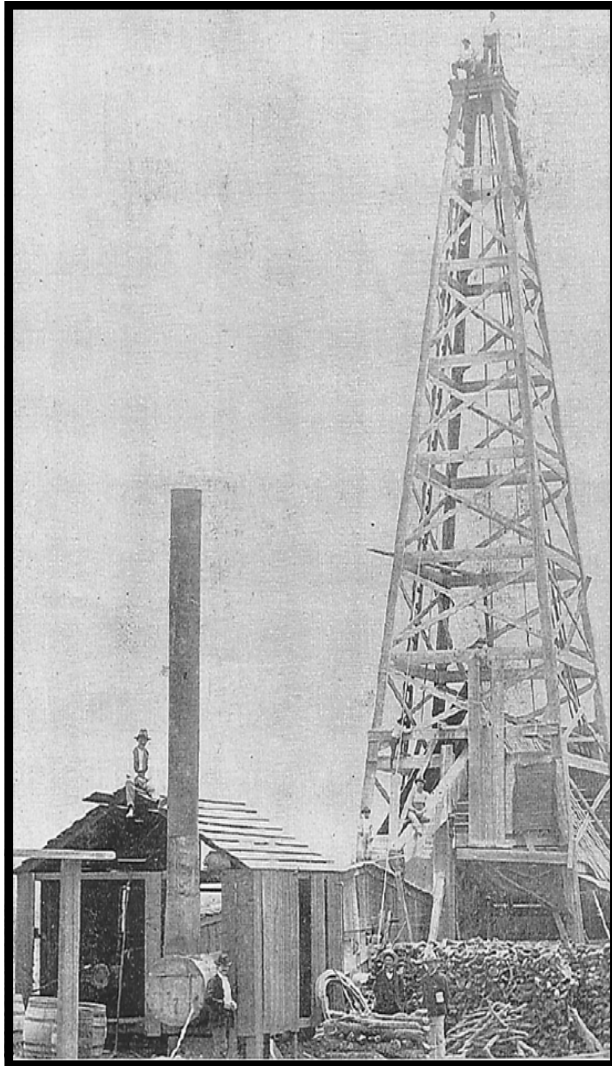
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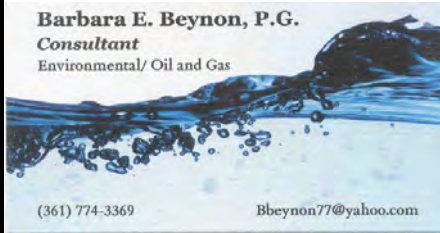
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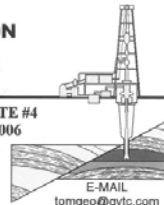
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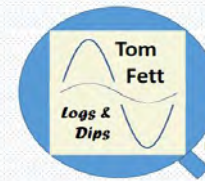
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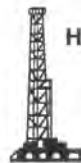


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