austin geological society

2013-2014

AGS BULLETIN

Vol. 10

Photograph of core from the Woodbine Fm. from core workshop sponsored by BEG.

Cover: Photograph of interesting sedimentary structures interpreted to be tadpole nests in the Upper Glen Rose (see Geological Note in this issue). Photo by Leslie White.

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ABOUT THE BULLETIN

AGS Bulletin Mission

(1) summarize the previous year's activities of the Society; and (2) publish technical papers, comments, and notes concerning the earth sciences of Central Texas.

Editors

Publication and Copyright Information

The *Austin Geological Society Bulletin* is published once a year and is available through the society's Web page (www.austingeosoc.org) and select geological libraries in Central Texas. The Austin Geological Society Bulletin is owned and published by the Austin Geological Society, P.O. Box 1302, Austin, Texas 78767-1302. There is no cost for digital access to the bulletin.

About the Technical Content

Presentation

The Austin Geological Society hosts technical presentations from invited speakers concerning the natural sciences. We publish an abstract in the Society's newsletter and allow for an abstract or extended abstract in the Bulletin.

Posters

The Austin Geological Society hosts a poster session each spring. Presenters can submit an abstract concerning their poster topic. Local middle and high school students, whose earth science projects were recognized by AGS at the Austin Regional Science Festival, are invited to present their projects at the AGS poster session. Student abstracts are published herein.

Field trip

The Austin Geological Society tries to have at least one field trip per year. The summary included here provides an overview of this year's trip. Interested readers are encouraged to purchase the guide book for additional information and details.

Technical Paper

The Bulletin accepts technical papers for publication provided that the papers pertain to local or regional geologic interests. Papers must meet technical and editorial requirements described in detail on the website.

Note

The Bulletin also accepts abbreviated narratives, figures, and notes; which may be technical, historical or anecdotal in nature.

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CONTENTS

2013-14 PRESIDENT'S PRATTLE

Dennis Trombatore, Austin Geological Society President 2013-2014.

2013-2014 was an energetic year for the Society, and it was an honor to be able to lead it during this period; thanks to the membership for your confidence. We had one field trip, our first Core Workshop, and two social events/tours to round out the opportunities for the membership to participate. We had a small dues increase, and did a self-assessment to help the officers and committee chairs understand the interests of the membership. To help defray refreshment expenses, a 'pizza kitty' was established so that dues collections are not depleted by food and drink. So far it is paying for about half of the expenses of meeting food and drink. We instituted some recent faculty hires team/panel presentations and looked for additional ways to develop closer ties with the Jackson School as that organization grows and diversifies. A number of members put a lot of work into reviewing and revising our Bylaws to make them more consistent internally and with actual practice, and to help the officers enhance member participation. Early planning for the 50th anniversary was begun, and our long discussed move to 501-c-3 status was pushed forward as we are now properly registered and have the required time series of financial statements.

I would like to give a special shout-out to this year's active and engaged officers and committee chairs, and to Chock Woodruff, as he officially vacates his long-held role as 'guru' of field trips. An all-volunteer organization requires a team approach to keep things rolling, and we are continuing to roll into the coming year with more plans to support and improve the professional lives of our membership. As we move into our 50th year, we have reason to be proud of our accomplishments and expect more to come.

Austin Geological Society Officers 2012-2013

President—Dennis Trombatore
President-Elect—Jack Sharp
Vice-President—Randy Williams
Secretary—Scott Tiller
Treasurer—Mustafa Saribudak
Past President—Pete Rose

Committee Chairs

Finance—Dallas Dunlap
Field Trip—Chock Woodruff
Newsletter Editor—Dan Neal
Membership—Scott Tiller
Publications—Steve Ruppel
Student Liaison (Graduate) —Vacant
Student Liaison (Undergraduate) —Vacant
Endowed Scholarship—Shane Valentine
Education—John K. Mikels
Awards—Pete Rose
Historical—Dennis Trombatore
AGS Bulletin—Brian Hunt
AAPG—Laura Zahm

AGS VITALS

AGS Membership

Austin Geological Society has 139 paid-up members as of January 2014.

AGS Financials

AGS is still working to receive non-profit 5013(c)(3) status. Austin Geological Society is solvent, with working capital of about $3,400, and savings of about $10,000. Generally the income and expenses are balanced. This year our annual income ($5,193) is less than our expenses. This is due primarily to the costs associated with hosting the GCAGS conference. We look forward to receiving funds from GCAGS as hosts of the successful Annual Meeting in October 2012.

AGS Financial Statement *July 7, 2012 – June 19, 2013*

INCOME		**EXPENSES**	
Dues	$3,050.00	Post Office Box	$54.00
Publications	$2,128.21	Speaker Memento's	$375.00
Ads	$15.00	Refreshments	$2,181.71
		GCAGS field guides	$2,487.30
		GCAGS booth	$450.00
		GSA sponsorship	$250.00
		Webexx (website)	$244.95
		Keep Austin Beautiful (donation)	$300.00
Total Income	$5,193.21	**Total Expenses**	$6,342.96
		Checking Balance 7/7/12	$4,554.53
		Income	$5,193.21
		Total	$9,747.74
		Expenses	$6,342.96
		Checking Balance (6/19/2013)	**$3,404**
		Money Market	**$ 10,316**

Dues will rise to $25, the first dues increase in more than 15 years. This is in line with our peer societies. Student members will no longer pay dues, which we hope will encourage more student participation (we will reassess the impact of this at the end of the year). Dues are an important part of the Society's solvency, and as we move forward with the 501(c)3 designation, some additional annual expenses will be required to stay on track year to year. Looking at trends in GCAGS programs, we need to pay more attention to the flow of monies from year to year.

Endowed Scholarship Fund

This year AGS will once again award two $500 scholarships to students that will be attending the *University of Texas Field Camp*. In the past year the endowed scholarship fund gained a total of $3,168.09 and spent $476.15 on expenses related to the administration of the fund. As a result the scholarship fund gained $2691.94. Please see the fund breakdown in the table below. In order to use our funding conservatively, it was decided to maintain our traditional $1,000 award and continue to save the remaining accumulated funds. The accumulated funds will remain available to be awarded in the future, or continue to gain interest as part of the fund total.

As always, the fund is open to donations and is independently managed by the Austin Community Fund. Our Fund Manager is Meagan Longley. If you wish to make a donation or have other questions about the AGS Endowed Scholarship, please contact Shane Valentine.

Endowed Scholarship Financial Statement

	YTD 2014	2013	since 1995
Gifts	$ -	$ -	$ 5,486.00
Non-Gifts	$ -	$ -	
Grants Paid	$ -	$ 1,000.00	$ 8,050.00
Expenses	$ (79.52)	$ (476.15)	
Income	$ 251.52	$ 3,168.09	
Spendable Balance (3/06/2014)	**$ 4,500.00**		
Fund Balance (2/28/2014)	**$ 29,753.75**		

Panoramic view of the room for Susan Hovorka's talk on CO2 Sequestration.

AGS NEWS AND ACTIVITIES

Education/Outreach

The AGS Education/Outreach Committee presented at and participated in a number of geo-outreach events over the 2013-2014 year. These events included:

• Teaching the Boy Scouts Geology Merit Badge classes at the Scout's regional camp on Lake Bastrop (10/19/13 and 4/12/14).
• Judging at the Annual Central Texas Regional Science Festival, both for SciFest and AGS awards. AGS members judged in the Earth Science, Space Science & Environmental Science categories (2/20/14).
• Presenting the popular, AGS-developed program, "Rock Your World--Everyday Uses of Rocks & Minerals in YOUR World", at the annual Earth Science Week Career Fair sponsored by the UT-BEG. The audience was middle-school students from across Central Texas (10/11/13).
• Presenting on general geology, geology careers, and "Rock Your World" in the classrooms of, or at the Science Day/Science Nite events of, a number of Austin-area elementary & middle schools (various dates).
• Presenting "Rock Your World" at The Thinkery (former Austin Childrens Museum) to groups of 8 to 12 year olds, eager to learn a bit more about their earth resources...and how it's the geologists who get to find those resources (6/30/14 & 8/11/14).

AGS members who co-presented at or participated in one or more of these events are: Bob Kier, Peter Boone, Al Cherepon, Earle McBride, Robin Shaver, Brian Hunt, Jimmie Russell, Alan Andrews, Linda McCall, Randy Williams, Kristin White, Eric Radjef, John Berry, Dan Bochicchio, Laura Zahm, and John Mikels. A hearty thanks to all of you!

AGS Member John Mikels manning the Geology Presentation table at a Round Rock Elementary School Science Night. Photo by AGS member Bob Kier.

Bylaws revisions

January 2014

AGS Officers and Chairs identified some corrections and updates that needed to occur to the Society's Bylaws. A standing committee on Bylaws was convened and proposed the following for vote from membership. Those proposals were generally accepted and are reflected in the Constitution and Bylaws at the end of this Bulletin (see page 27).

- Creation of a Professional Affairs Committee to monitor and recommend action dealing with PG licensure and oversight.
- Creation of a Finance Committee, to work with the treasurer and oversee business affairs which will become more complex with the 501(c)3.

- Creation of a bylaws committee to provide continuity and management oversight of the Society's constitution and bylaws.

Ad Hoc committees:

- 3DTx: a group to work with the BEG on the Geology of Texas project, in whatever capacity required, such as fund raising, contributions, coordination, design, etc.
- Social Events and Meetings Committee: to organize social events and provide oversight for major meeting planning, to encompass GCAGS and other regional/ national meetings, 50th anniversary planning, and social events beyond monthly meetings and fieldtrips, and possible coordination with other local groups like SIPES, APES, APLA, etc.

Fossil Lab Tour

February 1, 2014

A small group of AGS members took a tour of the Vertebrate (VPL) and Non-Vertebrate (NPL) Paleontological Laboratories on the Pickle Research Center campus. The tours were led by Drs. Ann Molineux and Ernie Lundelius. In addition, the group also visited the UT Library Storage Facility.

Ann Molineux (pink sweater) and AGS members at the NPL.

Ernie Lundelius discusses the VPL collections with AGS members.

AGS members at the UT Library Storage Facility.

AGS WORKSHOP

Core Workshop: Sequence Stratigraphy, Depositional Systems, and Facies Complexity in the Woodbine Group in East Texas Field.
May 19, 2014

The Austin Geological Society and Bureau of Economic Geology (BEG) presented an all-day core workshop of the Woodbine Group in East Texas field. Following morning lectures on Woodbine sequence stratigraphy and depositional systems in the Main Conference Room at BEG, the workshop was then devoted to an afternoon's review of cores. Attendees got a hands-on view of key cores with a detailed review of depositional and reservoir facies. Participants in the core workshop encountered a variety of significant sequence-stratigraphic surfaces, including unconformities, flooding surfaces, and transgressive surfaces of erosion. A wide range of deltaic and fluvial facies were also covered, together with a review of recognition criteria for each facies and a discussion of reservoir quality. In addition, selected cores from the downdip Woodbine/Eagle Ford trend in southeast Texas will include contrasting depositional facies near the Woodbine shelf edge.

The work shop was presented by William A. Ambrose, Tucker F. Hentz, and Robert G. Loucks and is sponsored by The University of Texas at Austin, Bureau of Economic Geology State of Texas Advanced Resource Recovery (STARR) Program and the Austin Geological Society.

Robert G. Loucks discusses the core.

William A. Ambrose discusses the depositional setting of the core.

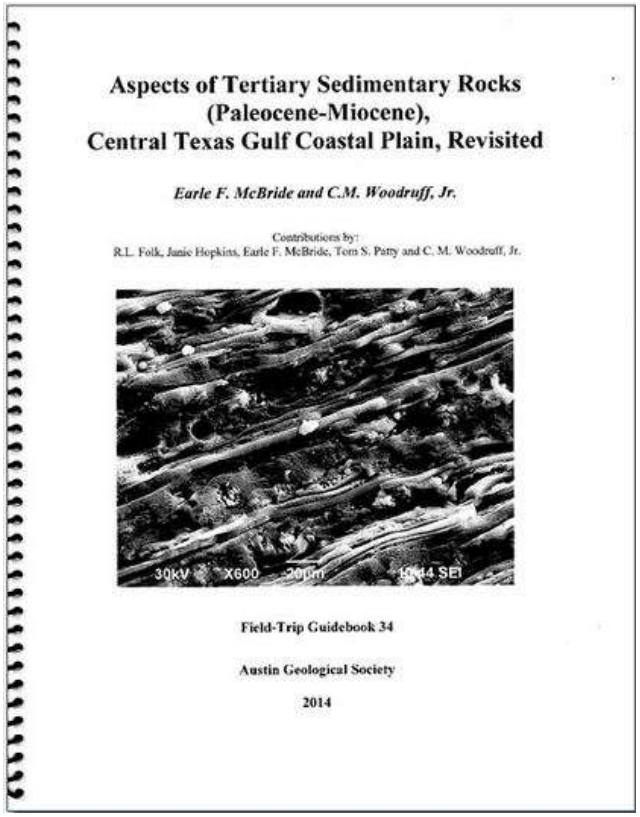
AGS FIELD TRIP

March 29, 2014

Aspects of Tertiary sedimentary rocks (Paleocene-Miocene), Central Texas Gulf Coastal Plain, Revisited

E. F. McBride and C. M. Woodruff, Jr.

The AGS Spring field trip was to visit selected Tertiary exposures (Paleocene to Miocene) of the Texas Coastal Plain. The trip visited exposures of the Calvert Bluff Formation, the Carrizo Sand, the Oakville Sand, and the Manning Formation. One stop included the Fayette County Courthouse with an eye to the petrology of rock and mortar used in this beautiful building. Field Trip Leaders were Earle McBride and Chock Woodruff; Contributions to the guidebook by R.L. Folk, Janie Hopkins, and Tom Patty. The photographs below are from John Berry and Linda McCall.



AGS Guidebook 34.

Lignite, sand, and clay quarries of the Calvert Bluff.

Fieldtrip leaders Earl McBride (left) and Chock Woodruff.

ABSTRACTS OF PRESENTATIONS

Ethical issues in communicating science and hazards to the public and the media

John Nielsen-Gammon, Gene Shepherd, Suzanne Pierce, and Cliff Frohlich
August 26, 2013
Bureau of Economic Geology

Panel members take questions from the audience.

Inspired by the recent manslaughter trial of several Italian seismologists, our panel will discuss ethical issues in communicating science and hazards to the public and the media. Suzanne Pierce from the Jackson School will talk about water, Gene Shepherd from Brigham Resources will talk about the petroleum industry, Cliff Frohlich of the Jackson School will talk about seismic events, and John Nielsen-Gammon, the State Climatologist, will talk about weather and climate. Each will make a short presentation and the floor will open for questions.

Biographies

John Nielsen-Gammon is Regents Professor of Atmospheric Sciences at Texas A&M University in College Station and serves as the Texas State Climatologist. He received his Ph.D. from the Massachusetts Institute of Technology in 1990. He is a Fellow of the American Meteorological Society. He teaches weather forecasting and climatology and does research in computer modeling, drought monitoring, historical data quality, and jet streams. He also writes a blog on weather and climate issues for the Houston Chronicle called Climate Abyss.

Gene Shepherd has served as Chief Executive Officer of Brigham Resources, LLC since April 2013. For the year prior to joining Brigham Resources, Gene served as a consultant to Anthem Ventures, LLC, which focused on oil and gas, real estate and private equity investments in the energy industry. Prior to Anthem, he served as the Chief Financial Officer of Brigham Exploration from June 2002 until the sale to Norway based Statoil ASA in December 2011. Prior to joining Brigham, Gene had approximately 20 years of financial and operational experience in the energy industry. Gene served as Integrated Energy Managing Director for the investment banking division of ABN AMRO Bank, where he executed merger and acquisition advisory and capital markets transactions for energy companies. Mr. Shepherd had a similar focus in his role at Prudential Securities Incorporated, Stephens Inc. and Merrill Lynch Capital Markets. Prior to his stint in the financial services industry, Mr. Shepherd worked for over four years as a petroleum engineer for both Amoco Production Company and the Railroad Commission of Texas. He has a B.S. in Petroleum Engineering and a MBA, both from the University of Texas at Austin.

Suzanne Pierce is a Research Assistant Professor with the Center for International Energy and Environmental Policy in the Jackson School of Geosciences and Assistant Director of the Digital Media Collaboratory in the Center for Agile

Technology at The University of Texas at Austin. A trained hydrogeologist with a focus on participatory deliberation, Dr. Pierce has prior professional background as a Scientist with Sandia National Laboratories and as the Environmental Manager for one of the world's largest metals mines. Dr. Pierce adopts a scholar-practitioner approach to integrate science-based information with human organizational systems for application to groundwater management and energy-water problems. Resultant decision support systems link participatory modeling with simulation, optimization, and multi-stakeholder concerns. Current projects include development of hydroinformatics for sustainable aquifer yield in Central Texas and South Australia, along with creation of the ENCOMPASS cyberinfrastructure for a geothermal basin in the Atacama Desert of Chile. ENCOMPASS is a scientific platform for sharing data, algorithms, and educational modules that is funded as part of the Fulbright Nexus program for energy, innovation, and engagement.

Cliff Frohlich received his Ph.D. in Physics from Cornell University, for his first full-time job he signed a one-year contract as a Research Scientist with what is now the Institute for Geophysics at the University of Texas at Austin. Subsequently he has signed 35 one-year contracts with UTIG, where he is now Associate Director. He is the author of two books: Texas Earthquakes, co-authored with Scott Davis and published by UT Press in 2002, and Deep Earthquakes, published by Cambridge University Press in 2006. Since 2009 his research has focused primarily on earthquakes possibly triggered by activities associated with oil and gas production in Texas.

Current Research at the Jackson School Presented by Professors Daniel Stockli, Liz Catlos, and Dan Breecker

October 7, 2013
Bureau of Economic Geology

Topic 1: Daniel Stockli-- Detrital Geo- and Thermochronology: How Much Can We Learn from a Single Grain?

Topic 2 : Liz Catlos -- Rock of Ages: Practicing Field Geology in Challenging International Environments

Topic 3: Dan Breecker-- Improving the Use of Fossil Soils to Determine Ancient Atmospheric CO_2 Concentrations

Daniel Stockli - Professor, Department of Geological Sciences and Institute for Geophysics, University of Texas at Austin, My research focuses on (1) the integrated application of thermochronology and geochronology to tectonic and geological problems to better understand the temporal and thermal aspects of tectonic, petrologic, stratigraphic, and geomorphologic processes. In particular, I am interested in combining structural geology with low temperature thermochronology to elucidate the spatial and temporal distribution of deformation in intra-continental rifting, orogen-parallel extension, and continental rupture leading to seafloor spreading as well as collisional tectonics (e.g., coupling of fold-and-thrust sheet and foreland basin dynamics). (2) Geo- and Thermochronometry technique development, calibration, and bench marking, with special emphasis on development of new thermochronmeters (e.g., monazite, rutile, and magnetite) and novel applications (e.g., geoarcheology, isotopic provenance, etc.)

Education
Ph.D. Geological Sciences, Stanford University

M.S. (Diplom) Geology, Swiss Federal Institute of Technology, Zurich
B.S. (Vordiplm) Geology, Swiss Federal Institute of Technology, Zurich

Liz Catlos - Dr. Elizabeth Catlos is an Associate Professor in the Dept. of Geological Sciences in the Jackson School of Geosciences at the University of Texas at Austin. She is a Fellow, a recipient of the Donath Medal (Young Scientist Award), and an elected Councilor of the Geological Society of America. As a Senior Lecturer for the U.S. Dept. of State's Fulbright Program, she taught introductory geosciences, mineralogy and petrography courses in the Dept. of Geological Engineering at Middle East Technical University in Ankara, Turkey. She served as a lead PI on a NSF-International Research Experiences for Students program in Turkey that provided American and Turkish students an opportunity to conduct hands-on field training in geophysical surveying, field mapping, GPS mapping, sampling, and provided them the tools necessary to make geochemical and petrologic observations. Her field areas are in Turkey, the Himalayas, south India, and Slovakia. Since 2010 she has been a Lead Instructor for GeoFORCE, a Jackson School of Geosciences' Education program that rewards outstanding students from select South Texas Independent School Districts and Houston schools from grades 8-12. She currently serves as Undergraduate Advisor.

Education
Ph.D. Geochemistry, University of California, Los Angeles
Phil. Cand. Geochemistry, University of California, Los Angeles
B. Sc. Chemistry w/Spec. Earth Science, University of California, San Diego

Dan Breecker - Assistant Professor, Department of Geological Sciences, University of Texas at Austin, Breecker is primarily interested in pursuing a process-based understanding of soils and the "critical zone" with the goal of determining how climate influences soils and how soils influence climate. A better understanding of modern soil processes improves the accuracy of paleosol-based paleoclimate proxies and helps quantify the fundamental role that soils play in the Earth's elemental cycling. Breecker's research incorporates both field-based studies (current projects in Texas, New Mexico, Arizona, Kansas and Tibet) and laboratory experiments (technique development and soil incubation experiments) and involves the measurement of stable isotope ratios in water, pedogenic minerals, critical zone gases and organic matter. These measurements are used to investigate chemical reactions occurring in soils and to trace material transfer between soils, caves and the atmosphere.

Education
Ph.D. Earth and Planetary Sciences, University of New Mexico
M.S. Earth and Planetary Sciences, University of New Mexico
B.A. Geology, Amherst College (Amherst, MA)

Current drought conditions and current and future water needs in the Central Texas Area

Raymond Slade, Jr.
November 4, 2013
Bureau of Economic Geology

Based on precipitation data, at least some local television weatherman have declared that the Central Texas drought has ended. However, drought has many definitions--for example, drought measures can be based on fire risk, crop soil moisture, and hydrologic conditions (i.e.,

streamflow, reservoir storage, and groundwater levels). These differing measures often produce conflicting assessments of the duration and severity of drought. For example, reservoir and groundwater levels remain very low throughout most of the State.

Additionally, many news reports have declared that the current drought is the worst on record. However, historical measurements of drought indicate that the 2011 - 2013 drought is minor compared to those in the past 100 years. Based on precipitation totals and air temperatures, the 2011 drought was declared as the worst drought on record--however a one-year drought threatens reservoir and groundwater levels much less than, for example, the seven-year drought of 1950-1957.

Severe drought presents a substantial threat to water supplies in Central Texas. 2011 Planning Data from the Texas Water Development Board document that severe drought conditions would cause 43 water suppliers in 8 of the 10 Capital Area counties to sustain municipal water shortages. Additionally, the data indicate that by 2060, severed drought conditions would cause municipal water demand to exceed water supply by 65 percent, resulting in water shortages for 66 water suppliers or about one-half of those in the area.

Biography

Raymond M. Slade, Jr. served as a Hydrologist for 33 years with the U.S. Geological Survey (USGS) in Texas until he retired about 10 years ago. He has authored about 120 reports concerning Texas water resources, with topics including the Edwards aquifer, floods, droughts, rural and urban hydrology, and water quality of surface and ground water. Raymond has served on committees and boards for many dozens of water-resource related organizations, on theses and dissertation committees for many students and as guest lecturer on water resources at several Texas universities. He has presented many talks and reports for local, statewide, and national conferences and conventions and represented the USGS and other organizations at state and federal judicial and administrative proceedings. Since his retirement from the USGS he has been an Adjunct Professor at Austin Community College, and has been a self-employed Consulting Hydrologist. He is Certified and Registered as a Professional Hydrologist with the American Institute of Hydrology.

A Drought, a Session, and a Proposition: Will the Future Be Wetter?

Robert E. Mace, Ph.D., P.G.
December 2, 2013
Bureau of Economic Geology

Drought in Texas is often followed by policy change and the current and (depending on where you live) recent drought is no exception. After the drought expanded across the state and dramatically intensified into the worst one-year drought on record in 2011, policymakers took notice and took action during the 2013 legislative session. The biggest changes concerned the Texas Water Development Board with the legislature creating an opportunity for the voters to approve a funding mechanism that would provide $2 billion from the Rainy Day Fund to help implement the state water plan. On November 5th, the voters overwhelmingly passed Proposition 6 with 73 percent for and 27 percent against. With passage, the agency will now focus on implementing the State Water Implementation Fund for Texas (SWIFT) as outlined in House Bill 4. Key deadlines include the regional water planning groups submitting prioritization standards by December 1, 2013, and a final prioritized list of projects by September 1, 2014,

and the Board adopting rules implementing House Bill 4 by March 1, 2015 (although the agency plans to complete rule-making by the end of 2014). Along with that funding opportunity came a change in agency governance: Instead of six-member part-time board the agency is now governed by a three-member full-time board. A recent reorganization of the agency has aligned agency functions to best implement SWIFT and ensure a wetter future. Other water-development-related legislation that passed concerned drought reporting (House Bill 252), implementation of drought contingency plans (House Bill 3604), water loss (House Bill 857, House Bill 1461, House Bill 3605), rainwater harvesting (House Bill 2781), seawater desalination (House Concurrent Resolution 59), xeriscaping and covenants (Senate Bill 198), water conservation (Senate Bill 385), Drought Preparedness Council (Senate Bill 662), desired future conditions (Senate Bill 1282), and exemptions in the Edwards Aquifer Authority (Senate Bill 1241).

Biography

Robert E. Mace joined the Texas Water Development Board in 1999 to manage the Groundwater Availability Modeling Program. Over the next nine years, he rose from a unit leader to director for the Groundwater Resources Division to a Deputy Executive Administrator to lead the Water Science & Conservation program area for the agency. Prior to joining the Texas Water Development Board, Dr. Mace worked eight years at the Bureau of Economic Geology at The University of Texas at Austin as a hydrologist and research scientist. Dr. Mace has a B.S. in Geophysics and an M.S. in Hydrology from the New Mexico Institute of Mining and Technology and a Ph.D. in Hydrogeology from The University of Texas at Austin.

Shales: What They Are and How They Produce

Tadeusz W. Patzek, Ph.D.
February 3, 2014
Bureau of Economic Geology

The world's incremental oil production since October 2004 has been equal to the oil production from the Bakken and Eagle Ford shales in the U.S. Increases and decreases of oil production in all other projects around the world have cancelled each other. Gas shales produce over 40 percent of natural gas in the U.S., and may produce even a larger share of domestic gas in the years to come. The price difference between American and European natural gas over the last 6 years has resulted in the cumulative savings in gas purchases in the U.S. equal to $800 billion – a real but invisible stimulus of the U.S. economy. In summary, gas and oil shales are very important to the United States and the world. But we do not understand well how the shale rock is shattered across large volumes, how this shattered rock connects to the hydrofractures, and how fluids flow from the bulk shale rock to hydrofractures. We do not understand well how to create optimal hydrofractures, so that a horizontal well produces uniformly from all perforations, and its hydrofractures have high conductances and are well-connected to the wellbore. I will try to show you how relatively simple scaling of fluid production in some 20,000 wells in different plays results in the dimensionless type curves for gas and oil production that are almost universal for a given shale play. I will try to

explain how I understand this behavior, and the many aspects of well production I do not understand yet.

Biography

Professor and Chairman, Department of Petroleum and Geosystems Engineering, The University of Texas at Austin (September 2008-present); Professor of Geoengineering (May 2002-September 2008), Department of Civil and Environmental Engineering, U.C. Berkeley; Associate Professor (June 1995-May 2002) and Assistant Professor of Petroleum Engineering (1990-1995), Department of Materials Science and Mineral Engineering, U.C. Berkeley; Senior Reservoir Engineer, Shell Western E&P, Inc. (1989-1990); Senior Research Engineer (1986-1989) and Research Engineer (1983-1986), Enhanced Recovery Research Department, Shell Development; Research Associate, Chemical Engineering Department, University of Minnesota (1981-1983); Research Associate, Chemical Engineering Research Center, Polish Academy of Sciences, Gliwice, Poland (1974-1980).

MS (1974), Ph.D. (1980), Chemical Engineering Department, Silesian Technical University, Poland

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10 Years of Field Experiences with CO2 Sequestration

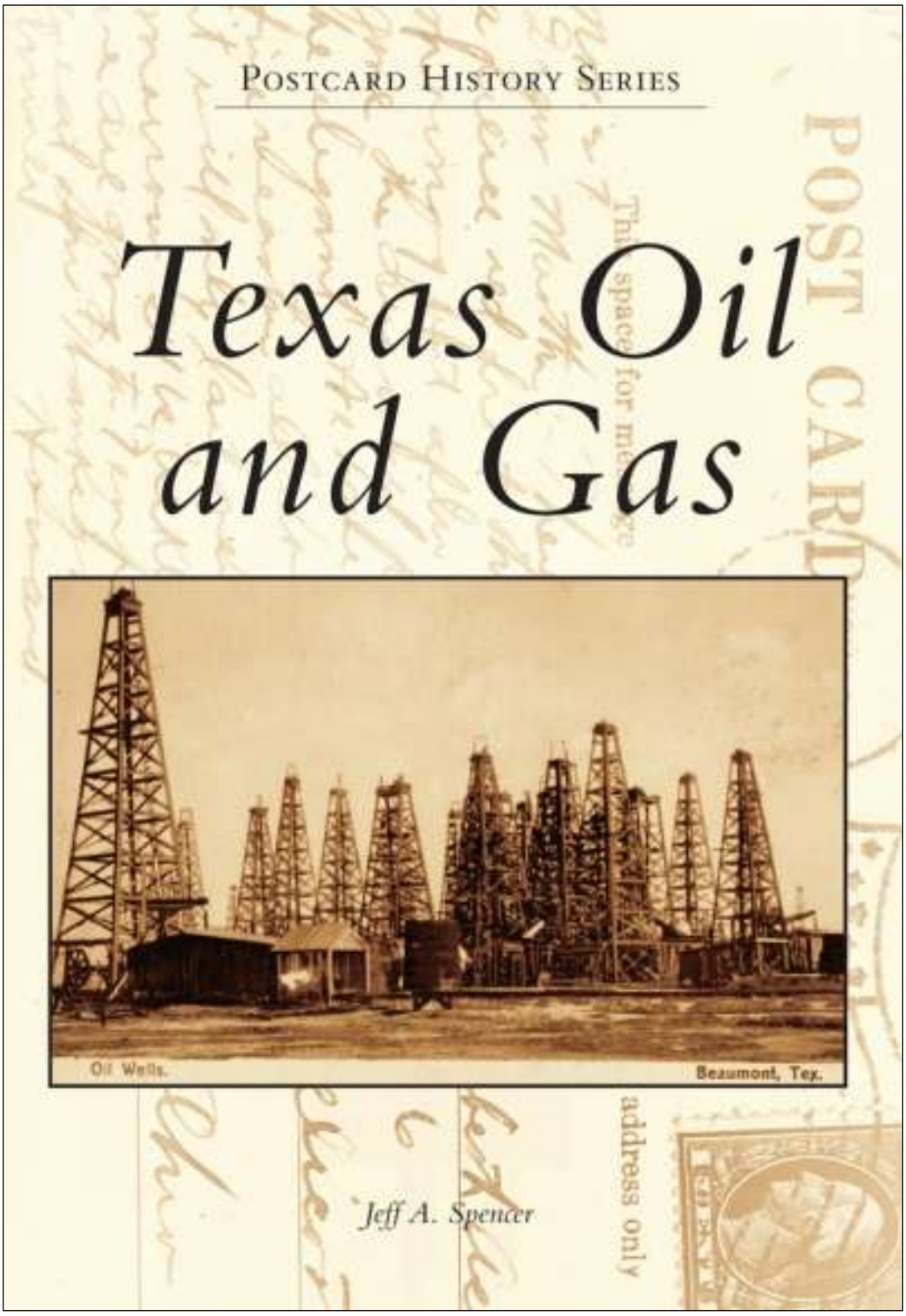
Susan D. Hovorka, Ph.D.
March 3, 2014
Bureau of Economic Geology

History of Oil and Gas Industry in Texas

Jeff Spencer
March 31, 2014
Bureau of Economic Geology

The newest addition to Arcadia Publishing's popular *Postcard History Series* is **Texas Oil and Gas** by author Jeff A. Spencer. The book boasts more than 200 vintage images of the petroleum industry in Texas. The book documents in postcards the rapid growth of the Texas petroleum industry from its beginnings near Corsicana in the 1890s through the next several decades of oil booms throughout the state.

Mr. Spencer is a Charter Member and currently serves as the President of the Petroleum History Institute. He is a geologist with Amromco Energy in Houston, Texas. He received a BS in Geology from the University of Cincinnati and a MS in Earth Sciences from the University of New Orleans. Before joining Amromco, Spencer was employed by Midstates Petroleum Company (2010-2013), Black Pool Energy (2005-2010), Samson (2005), Osprey Petroleum (2000-2005), Unocal (1998-2000), and Amoco Production Company (1981-1998). Spencer has spent most of his career exploring the Gulf Coast onshore and Gulf of Mexico shelf. He has authored or co-authored more than 20 oil field history papers, on topics such as early oil fields of Louisiana, Ohio oil field history, oil-related trade cards and oil-related postcards of West Virginia, California, Ontario, Kansas, Pennsylvania and Texas. He is co-author (with Mark J. Camp) of Ohio Oil and Gas (2008). He collects oil field-related postcards, trade cards, movie posters, stereo views and postal covers. He also serves as the Historian for the Gulf Coast Association of Geological Societies.



*The newest addition to Arcadia Publishing's popular Postcard History Series is **Texas Oil and Gas** by author Jeff A. Spencer.*

AGS POSTER SESSION

May 2014

AGS had a successful annual poster session with about 16 posters from AGS members and students. The table below lists those who presented at the meeting.

Table of Abstracts

Title	Author(s)
50 Million Years of Severe Osteopathology in Rhinocerotidae	Stilson, K.T., Davis, E.B,. and Hopkins, S.S.B.
Tadpole Nests - A Rarity	Leslie White & Travis White
Investigating the Influence of the 2011 Texas Drought on Vegetation Cover Characteristics	Halubok, M., Shi, M., Yang, Z-L.
A 250-year-old mesquite tree from Moline Cemetery, Elroy, Texas: some interpretation problems and questions raised.	John L. Berry and Elizabeth Kihlberg
Natural vs. Man-made sea-surface oil slicks: their use in petroleum exploration and oceanography	John L. Berry
A speculative cross-section of the Lufilian Arc, Zaire (DRC) and Zambia	John L. Berry
Where is all the groundwater flow coming from into the Barton Springs Pool: A geophysical case study, Part II.	Mustafa Saribudak and Nico Hauwert
How geophysical work helped redefine the geology at the Antioch Fault Zone in Onion Creek, Buda, Texas	Mustafa Saribudak, Brian Hunt and Brian Smith
How geophysical work helped redefine the geological/structural association at the volcanic outcrop of Williamson Creek, South Austin, TX	Mustafa Saribudak, Chris Caran
An Atlas of CO2 Storage Potential in the Near-Shore Waters of the Texas Coast, American Recovery and Reinvestment Act – "Gulf of Mexico Miocene CO2 Site Characterization Mega Transect" Study	Ramon Trevino
Alcoves as protected sites for Martian life, R.A. De Hon, Texas State, Department of Geography.	Rene De Hon
Hydrologic Influences of the Blanco River on the Trinity and Edwards Aquifers, Central Texas, USA	B.A. Smith, B.B. Hunt, A.G. Andrews, J.A. Watson, M.O. Gary, D.A. Wierman, AS Broun
Depth-Registration of 9-Component 3-Dimensional Seismic Data: Stephens County, Oklahoma.	Mustafa B. Al-Waily
Pore Evolution in the Eagle Ford and Barnett Shale, Texas - Results from Anhydrous Gold-Tube Pyrolysis	Lucy Tingwei Ko
Geometric and Lithic Variability within the Syndepositional Cave Graben Fault System, Guadalupe Mountains, New Mexico	Maren G. Mathisen
Proposal for small-scale Aquifer Storage and Recovery Systems in Rural Texas	Kayla Rohrbach, David Mauk, David Jeffery, and Chris Distel

SCIENCE FEST STUDENT PROJECT ABSTRACTS

May 2014

Every year AGS members volunteer to judge (February 20) at the Annual Central Texas Regional Science Festival in the Earth Science, Space Science & Environmental Science categories. AGS members select what they consider best of the earth science projects to present at the AGS Poster session and publish their abstracts in the Bulletin. Five members were selected and presented at the AGS meeting (see table); however, only one abstract was submitted for publication.

List of Students and Projects presented

Sierra Fredenrich (Vista Ridge HS, Leander ISD), "The Sequestration of Carbon Dioxide Through Coccolithophores with Supplements of Volcanic Ash and an Increased Heat Index"
Anakaren Salinas (Pflugerville MS, Pflugerville ISD), "Topography Affecting Lake Water Quality".
Eric Somoson (Harmony Science School, Charter School), "Building Beaches".
John Babiak & Aidan Kappler (Dripping Springs MS, Dripping Springs ISD), "After The Drought"
Alex Baker (Bowie HS, Austin ISD), "The Effect of Salinity on Water Desalination.

The Sequestration of Carbon Dioxide through Coccosphaerales with Supplements of Volcanic Ash and an Increased Heat Index

Sierra Fredenrich
Vista Ridge High School, Leander ISD

The research conducted during this project focused on the sequestration of carbon dioxide through Coccosphaerales, a common phytoplankton strain that contributes to a majority of the calcite, deposited in the oceans annually. The stock culture created flourished, allowing easy comparative access to other subcultures that were a part of the experiment. A solution of seawater to Coccosphaerales ratio was tested during early stages to ensure growth in the subcultures. Volcanic ash was added to a subculture, to supply an iron induced shock to the Coccosphaerales, in turn boosting their growth productivity. Under these conditions the subcultures were tested for transparency, to light, to measure the density of the cultures, as well as carbon dioxide to compare the transparency of light to the levels of carbon dioxide present in the culture. With average transparency levels being between 6.49nm and 2.49nm, the range between the test groups varied greatly. Each culture was also placed in different temperature ranges to mimic, on a micro-scale, the effects of subtropical conditions versus subarctic conditions. The collected data did not support the hypothesis, raising suspicion about the culture's health and ability to sustain itself over a long period of time. Another observation that did not the support the hypothesis was the presence of possible additional nutrient supplements present in the volcanic ash. The culture was observed to be dense, yet under the set variables to test the hypothesis, the experiment failed to meet anticipated results. The project grew from measuring the sequestration of carbon dioxide to understanding reproductive rates of the Coccosphaerales and how volcanic ash directly affected the testable groups.

Geological Note

Fossil Tadpole Nests—A Rarity

Leslie P. White and Travis G. White

An unusual pock-marked bedding surface, exposed in a Cretaceous Glen Rose outcrop (**Figure 1**), is thought to be a very rare fossil tadpole nest site. **Figures 2-5** are photos of the outcrop which is located along a bank of South Onion Creek in Hays County, Texas.

Figure 1. Photograph of South Onion Creek exposure of fossil tadpole nests. Photos in Figures 1-5 by Les and Travis White.

Figure 2.

Figure 3.

Figure 4.

Figure 5.

The identification of this pitted surface as a fossil tadpole nest was first made by Dr. James R. Underwood, a former member of the Austin Geological Society. Underwood had noticed modern, active tadpole nests in West Texas, Oklahoma, and Libya. He authored "Tadpole Nests in Libya" in the Geological Society of America Abstracts with Papers (Underwood and Grover, 1977). In the abstract he describes placing tadpoles in an aquarium with a muddy bottom and observing the development of typical nests within a few days. **Figures 6 and 7** are examples of Underwood's photos of nest sites in the field.

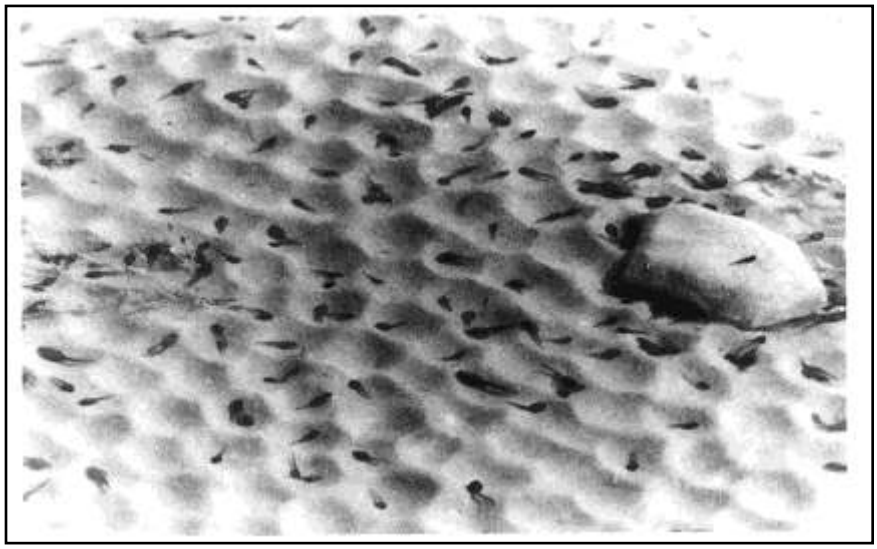


Figure 6. Field photograph of tadpole nests in the field by James R. Underwood.

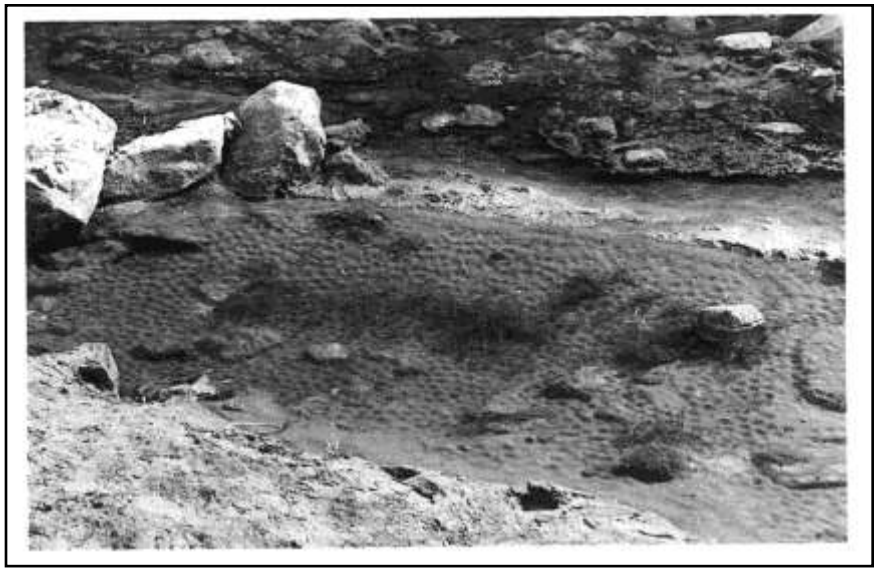


Figure 7. Field photograph of tadpole nests in the field by James R. Underwood.

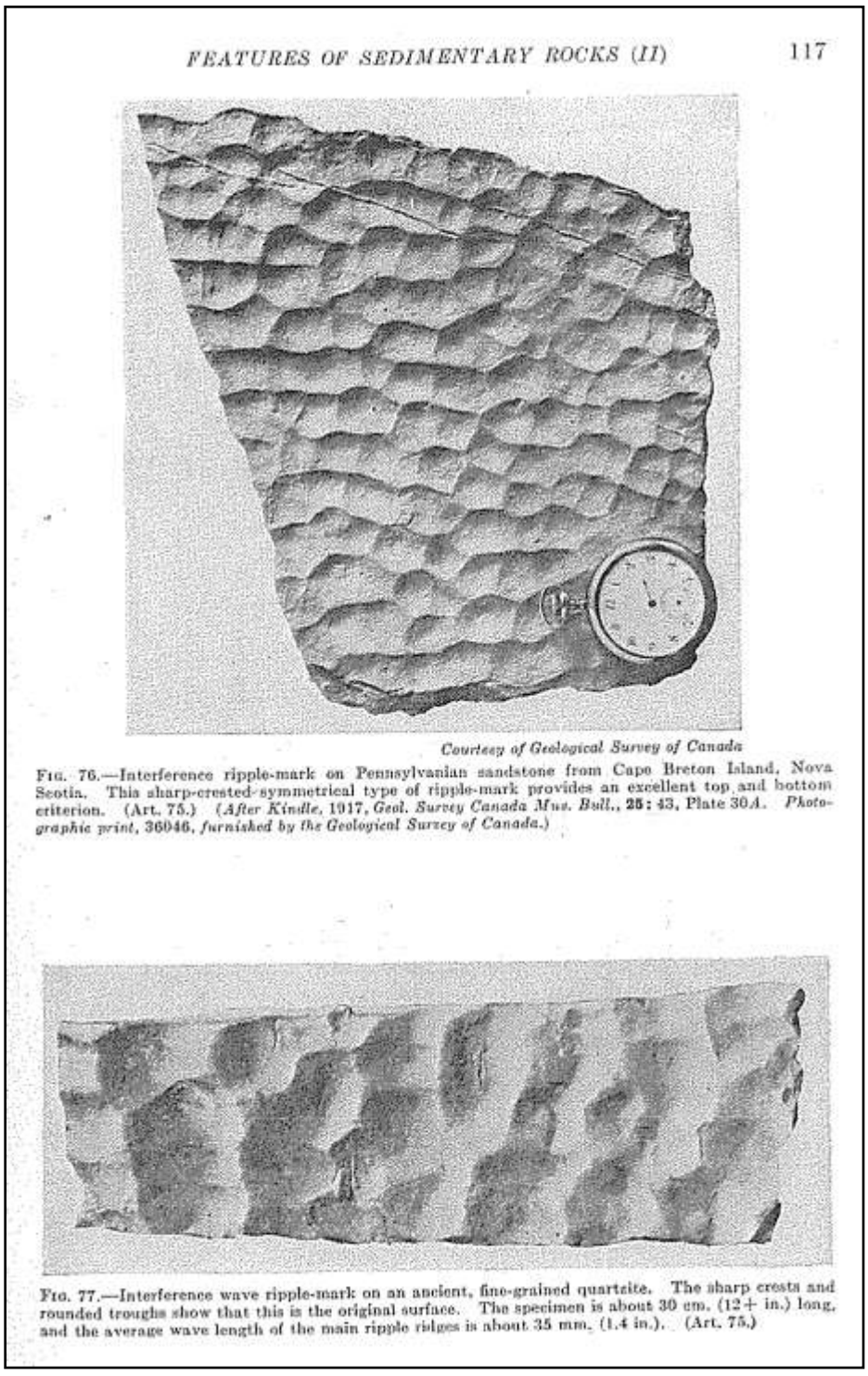
Figure 8 is a photo of "supposed tadpole nests" from Twenhofel's (1939) "Principles of Sedimentation". Upon careful examination, live tadpoles can be seen in each of the three photos.

Figure 8. "Supposed tadpole nests" from Twenhofel (1939).

The Glen Rose is famous for its Dinosaur tracks, but it is likely that tadpole nests are a much rarer trace fossil. On the other hand, fossil tadpole nests are likely to be overlooked because of their obscurity. Preservation of tadpole nests is improbable. They are formed in small, shallow and ephemeral streams, ponds and fresh-water lagoons. They are formed in unconsolidated sediment in a terrestrial environment more subject to erosion and destruction than to burial and preservation. There is an additional obstacle to the formation and preservation of tadpole nests at this particular locality. The Glen Rose is a broad, thick deposit of marine limestone. There being no known marine species of frogs, the occurrence of tadpoles nests in this rock sequence requires a period of emergence. Such an event is entirely plausible because the Glen Rose reflects shallow water deposition over a vast shelf.

Fossil tadpole nests, in spite of their meager importance, seem to incite debate. In Hitchcock's (1885) "Ichnology of New England", he describes tadpole nests from a Triassic red shale in Massachusetts. And, Shepard (1867) in The American Journal of Science asserts that these features in the red shale are, instead, interference ripples. Cameron and Estes (1971) write in the Journal of Sedimentary Petrology: "Tadpole nests are a true biogenic structure known only from the Recent. All known occurrences of supposed fossil forms have been disputed and are considered to be interference ripple marks of inorganic rather than of organic origin."

Interference ripple marks are illustrated in **figure 9** from R. R. Shrock's (1948) "Sequence in Layered Rocks". **Figure 10** is a photo of interference ripple marks from the Glen Rose Sisterdale Ripplestone.



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Courtesy of Geological Survey of Canada

FIG. 76.—Interference ripple-mark on Pennsylvanian sandstone from Cape Breton Island, Nova Scotia. This sharp-crested symmetrical type of ripple-mark provides an excellent top and bottom criterion. (Art. 75.) *(After Kindle, 1917, Geol. Survey Canada Mus. Bull., 25: 43, Plate 30A. Photographic print, 36046, furnished by the Geological Survey of Canada.)*

FIG. 77.—Interference wave ripple-mark on an ancient, fine-grained quartzite. The sharp crests and rounded troughs show that this is the original surface. The specimen is about 30 cm. (12+ in.) long, and the average wave length of the main ripple ridges is about 35 mm. (1.4 in.). (Art. 75.)

Figure 9. Interference ripple marks from Shrock (1948).

Figure 10. Photo of interference ripple marks from the Glen Rose Sisterdale Ripplestone. Photo by Les and Travis White.

Shrock writes that the lee slope of ripple marks never exceeds 43 degrees (Shrock, 1948). It can be seen in the photos above that tadpole nests, when fully formed, are steep-sided, far exceeding 43 degrees. The question arises as to how the steep sides are built and maintained in unconsolidated grains. It is conceivable that tadpoles, like Ophiomorpha, produce a substance that binds the free standing grains.

The persistent argument that apparent fossil tadpole nests are in fact interference ripple marks is somewhat irrational. As can be seen in the photos above there is little, if any, similarity between tadpole nests and interference ripple marks. However consideration should be given to the possibility that the trace fossil shown here is a better, clearer preservation than those whose identity has been questioned.

It has been proposed, from photos alone, that these depressions are some sort of boring. The pock-marked bed is only about 3 cm thick and the underlying bed is undisturbed. Further, the bottoms of the depressions are bowl-shaped, suggesting a terminus.

Given the similarity between the pock-marked surface and the active tadpole nest sites, and given the dissimilarity between this surface and interference ripple marks and borings; it is reasonable to believe that a rare fossil tadpole nest site has been found in a Glen Rose outcrop along a bank of South Onion Creek in Hays County, Texas (**Figure 11**).

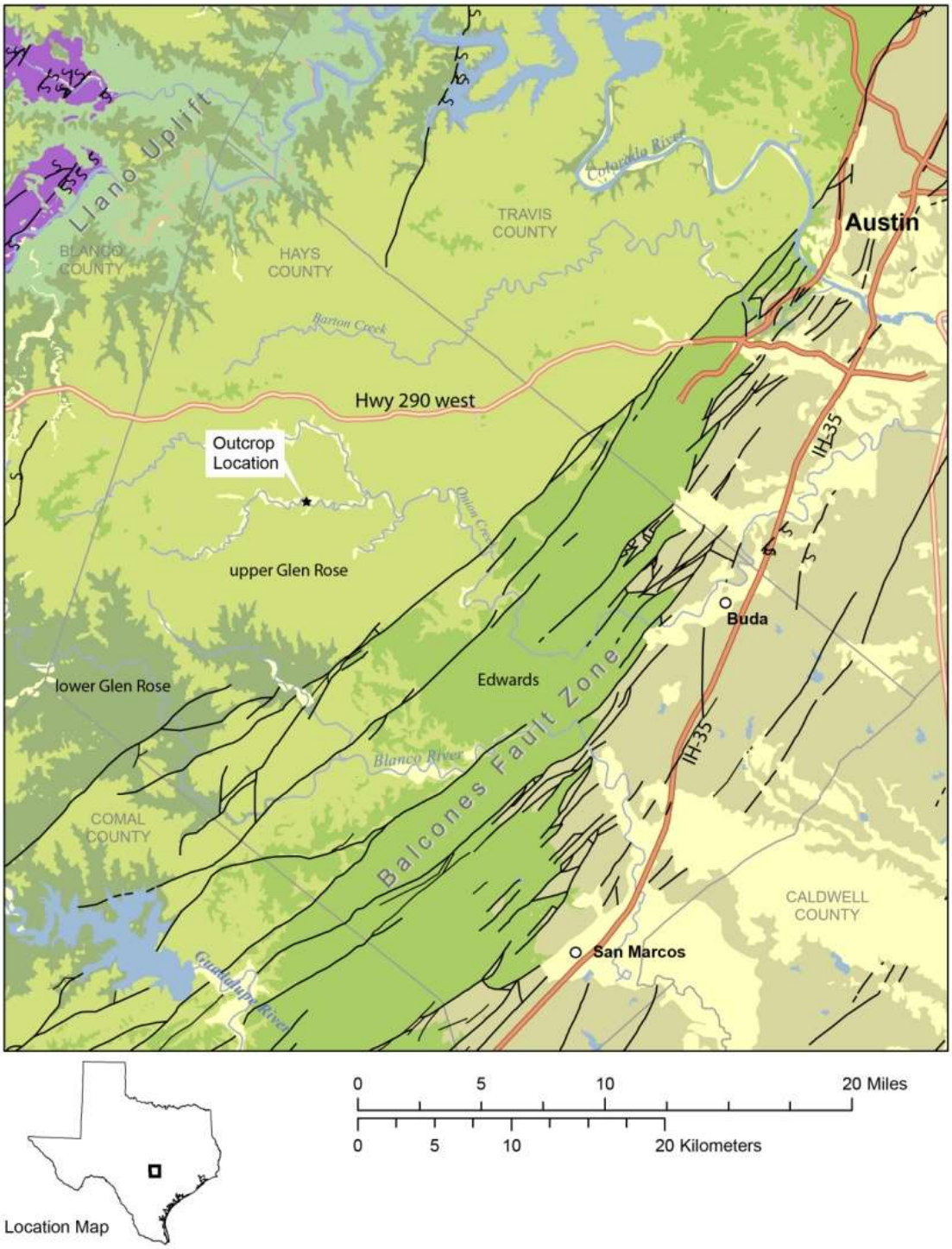

Figure 11. Location and Geologic Map. The outcrop is located along South Onion Creek in Hays County.

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AUSTIN GEOLOGICAL SOCIETY CONSTITUTION

Approved October 7, 1965
Revised December 21, 1990
Revised August 14, 1995
Revised May 1, 2000
Revised August 27, 2007
Revised October 7, 2013
Revised January 31, 2014

ARTICLE I
Name and Objectives

Section 1. This organization shall be named "Austin Geological Society."

Section 2. The objectives of the Society are:

(1) to stimulate interest in and promote advancement of geology;
(2) to facilitate discussion and dissemination of geologic information;
(3) to encourage social and professional cooperation among geologists and associated scientists;
(4) to maintain a high professional standing among the members; and
(5) to enhance public understanding of the professional activities of the members.

ARTICLE II
Membership

Section 1. The members of the Society shall consist of persons concerned with the science and practice of geology.

Section 2. Various classifications of memberships and qualifications thereof shall be established by the Bylaws of the Society.

ARTICLE III
Government

The government of the Society shall be vested in five (5) elected officers and an Executive Board. The composition of this government, the manner of selection, the terms of office, the specific duties, responsibilities, and other matters relevant to such bodies and officers shall be as provided in the Bylaws of the Society. Any responsibility and authority of government of the Society not otherwise specified in these governing documents shall be reserved for the Executive Board.

ARTICLE IV
Amendments

Amendments to this Constitution may be proposed at any time by petition signed by at least 20 percent of the Active Members or by the Executive Board. Adoption of such amendments shall be by ballot in which approval is given by at least three-fourth of the total number of Active Members. There shall be an intervening Regular Meeting before the balloting and subsequent to the submission of the amendment.

ARTICLE V
Dissolution of Society

In the event it should be deemed advisable to dissolve the Society, all assets at the time of dissolution shall be donated to a worthy geologic cause, as selected by the Executive Board.

ARTICLE VI
Bylaws

The Bylaws, consisting of six (6) *seven (7)* articles as appended hereto, are adopted and may be amended, enlarged, or reduced as provided in the Bylaws.

AUSTIN GEOLOGICAL SOCIETY BYLAWS

Revised 2014

ARTICLE I
Membership

Section 1. The membership of this organization shall be made up of Active, Honorary, and Student Members.

(1) To be eligible for Active Membership, an applicant shall have a degree in geology from a recognized college or university, or the equivalent experience, or have been actively engaged in the application of geology or related scientific or professional work for a minimum of two (2) years.
(2) Consideration for Honorary Membership shall be based on continued dedication and service to the Austin Geological Society. Honorary members shall be selected by the Executive Board. Any Active Member may submit the name of an individual to the Executive Board for consideration as an Honorary Member.
(3) Any person who is a student in good standing, studying for a degree in geology or related science, is eligible for Student Membership. Student Members shall not be eligible to vote or hold elective office.

Section 2. Any member who is in arrears of dues or legally incurred indebtedness to the Society shall be suspended from the Society. The Chair of the Membership Committee, consulting with the Treasurer, shall restore former membership status to any such suspended member when the indebtedness has been liquidated.

Section 3. All Active, Honorary, and Student Members shall be guided by the highest standards of business ethics, personal honor, and professional conduct. Any member who, after proper investigation by the Executive Board, is found guilty of violating any of these standards of conduct may be admonished, suspended, allowed to resign, or expelled from membership at the discretion of the Executive Board.

Section 4. Applicants for membership shall submit an application and dues to the Treasurer. Membership applications shall include the following information:

(1) Professional affiliation,
(2) Education, and
(3) A statement of how the prospective member qualifies for membership.

ARTICLE II
Dues and Special Assessments

Section 1. The annual dues for Active Members and Student Members of the Society shall be established at the beginning of each administrative year by the Executive Board. Dues shall be payable on or before November 1 each year. No dues shall be required of Honorary Members.

Section 2. Dues for new members who join the Society after the beginning of the administrative year shall be prorated according to the quarter of the administrative year.

Section 3. Members who are in arrears for dues and/or special assessments for a period of three (3) months shall be deemed suspended and may be dropped from the rolls at the discretion of the Membership Committee Chair.

ARTICLE III
Officers

Section 1. The officers of this organization shall be the President, President-Elect, Vice-President, Secretary, and Treasurer. The tenure of these officers shall be one (1) administrative year, except for the Secretary and Treasurer, who shall serve staggered two-year terms.

Section 2. The duties of the President shall be to preside at all meetings, call Special Meetings, appoint such committees as are not provided for in the Bylaws, and, jointly with the Secretary and Treasurer, sign all written contracts and other obligations of the Society. The President shall assume the duties of Chairperson of the Executive Board, and Technical Program Committee, and supervise the business of the Society. The President shall also be responsible for making arrangements for a meeting place for Regular Meetings and certifying the Treasurer's annual audit of financial records.

Section 3. The duties of the President-Elect and Past President shall be to participate in Executive Board meetings and the President-Elect will serve as understudy to the President. The President-Elect will assume the office of the President the following year. The President-Elect shall also serve as Chairperson of the Election Committee. The duties of the Past President will be to serve as Society parliamentarian, and to appoint and chair the Constitution and Bylaws Committee as required.

Section 4. The duties of the Vice-President shall be to assume the office of president when a vacancy for any cause occurs and assume the duties of the President during the absence or disability of the President. In addition, the Vice-President shall serve as Chairperson of the Meetings & Social Events Committee and is responsible for logistics of all regular meetings of the Society (meeting room set-up, access and close-down, audio/visual equipment, and refreshments, in consultation with the President).

Section 5. The duties of the Secretary shall be to keep the Minutes as required, to attend to all correspondence and press notices, to receive and be custodian of all documents and papers of the Society, to maintain

oversight of a current digital roster of the Society membership, to work with the Treasurer and Membership Committee Chair to maintain and utilize the digital membership roster, and to notify all Executive Board members of each Executive Board Meeting. The Secretary shall also serve as Chairperson of the Newsletter Committee. The Secretary, jointly with the President and Treasurer, shall sign all written contracts and other obligations of the Society and shall assume the duties of the President in the absence of the President and Vice-President.

Section 6. The duties of the Treasurer shall be to receive and disburse all funds as authorized by the Society, to keep accurate accounts thereof, and to submit annually a report of the Treasurer's records for auditing. The Treasurer shall work with the Secretary and Membership Chair to maintain and utilize the digital membership roster. The Treasurer shall be present or delegate a substitute to be present at each Regular Meeting to collect monies and membership applications. The Treasurer, jointly with the President and Secretary, shall sign all written contracts and other obligations of the Society, and shall assume the duties of the President in the absence of the President, Vice-President, and Secretary.

Section 7. The Executive Board shall consist of the President, President-Elect, Vice-President, Secretary, Treasurer, and the most recent available Past President. The Executive Board's duties shall be to appoint officers to fill vacancies occurring during the administrative year, except the office of President to which the Vice-President shall succeed; to serve as the Technical Program Committee, to select by simple majority, the recipients of awards and scholarships and decide, by simple majority, which activities and projects the Society will choose to fund/support/sponsor, and to have general supervision of the organization. In the event of a split vote, the President will cast the deciding ballot.

Section 8. The election of officers shall be held at the Annual Meeting. Nominations shall be made by the Election Committee, consisting of the President-Elect and at least two members appointed by the President-Elect. This Committee shall nominate one or more candidates for each elective office, to be announced in the Society Newsletter prior to the Annual Meeting. At the Annual Meeting, additional nominations may be made from the floor, following the report of the Election Committee. The Election Committee shall be responsible for preparation, distribution, collection, of ballots at the Annual Meeting, and the tabulation of the results of said balloting. The committee shall present the results of the balloting to the President of the Society during the Annual Meeting so that the newly elected officers may be presented to the Society. Voting shall be by secret ballot. Ballots shall be distributed during registration at the Annual Meeting and shall be returned to the Election Committee upon completion. If none of the candidates for a particular office obtains a majority of the votes cast, the candidate with the least number of votes shall be eliminated and a second ballot taken. If there is a tie between two candidates, a second ballot shall be taken at the Annual Meeting. If, after the second ballot, there is still a tie, the winner shall be decided by a coin toss.

ARTICLE IV
Standing Committees

Section 1. There shall be the following Standing Committees within the Society:

- Publications Committee,
- Technical Program Committee,
- Newsletter Committee,
- Field Trip Committee,
- Membership Committee,
- Web-site Committee,
- Awards & Scholarships Committee,
- Education Committee,
- AGS Bulletin Committee,
- Professional Affairs Committee,
- Finance Committee,
- Constitution and Bylaws Committee,
- Election Committee,
- Meetings & Social Events Committee

The President shall appoint a Chairperson to those committees not already chaired by an officer. These appointments shall be for one administrative year. The Chairperson of a Standing Committee may, in turn, select any additional members in good standing with the Society to his or her committee.

The President may appoint any special committees as the Executive Board may authorize.

Any Committee Chairperson or member may be removed and replaced by a new appointee upon majority action of the Executive Board.

Section 2. The purpose of the Publications Committee is to oversee the sale of Society publications and assist in the publication of any other manuscripts or documents the Executive Board may authorize.

Section 3. The function of the Technical Program Committee is to provide a program for the Regular Meetings of the Society.

Section 4. The function of the Newsletter Committee shall be to prepare and distribute a newsletter to serve as an announcement of Society Meetings.

Section 5. The purpose of the Field Trip Committee shall be to organize the Society field trips on a suggested schedule of one in the fall and one in the spring.

Section 6. The Membership Committee shall encourage membership, assist the Newsletter Chairperson, and work with the Secretary and Treasurer to maintain and utilize the digital membership roster,

Section 7. The Web-site Committee shall be responsible for the design and upkeep of the Society Web page.

Section 8. The Awards & Scholarships Committee shall nominate and recommend award and scholarship candidates to the Executive Board.

Section 9. The Education Committee shall be responsible for promoting and facilitating AGS involvement in earth science education in Austin-area schools and outreach to the general public.

Section 10. The AGS Bulletin Committee is composed of an Editor (Chairperson) and an editorial team responsible for the annual publication [of the Society] summarizing significant news and events from the preceding year, including the abstracts of talks given at the monthly meetings. It is also a forum for publication of papers and notes of regional interest.

Section 11. The Professional Affairs Committee shall monitor developing issues and rulings of the Texas Board of Professional Geoscientists and provide timely notice of such to AGS members, through notices posted in e-mail bulletins, monthly newsletters, the AGS website, or announcements at regular meetings.

Section 12. The Finance Committee shall conduct annual audits of Society finances, as reported by the AGS Treasurer, and deliver a report to the Executive Board, which shall be published timely in the AGS newsletter.

Section 13. The Constitution and Bylaws Committee shall prepare revisions of the Constitution and Bylaws, as instructed by the Executive Board, under the direction of the Past President, for consideration of the membership, consistent with the AGS Constitution and Bylaws.

Section 14. The Election Committee shall identify and recruit qualified members to stand for election to AGS officers, and oversee annual elections at the regular May meeting, consistent with Article III, section 8 of these Bylaws.

Section 15. The Meetings & Social Events Committee shall assist the Vice President with conduct of AGS meetings, as well as plan and oversee special social meetings, and/or special/technical events, consistent with Article III Section 4 of these Bylaws.

ARTICLE V
Meetings

Section 1. The meetings of the Society shall be of three classes: Regular, Executive Board, and Annual.

Section 2. The Society shall hold at least one Regular Meeting each month from August through April except that, by vote of the Executive Board, additional Regular Meetings may be held or Regular Meetings may be discontinued for a period not to exceed three months. The appropriate time and place for Regular Meetings shall be selected by the President or a delegated Committee.

Section 3. Executive Board Meetings shall be held at such times and places and for such purposes as the Executive Board deems necessary and as announced by the President.

Section 4. The Annual Meeting shall be held during the month of May at a place and time designated by the Executive Board. The purpose of this meeting will be to complete the business of the administrative year and shall include the following order of business:

(1) Report of the Executive Board, the President, the Treasurer, and the Standing Committees. Standing Committees may be considered with the report from the President.
(2) Old or unfinished business.
(3) New business.
(4) Election of new officers.
(5) Program.
(6) Presentation of new officers.

Section 5. The administrative year shall be from August 1 of one year to July 31 of the following year.

ARTICLE VI
Awards

Section 1. The Awards Committee shall submit recommendations to the Executive Board for the Public Service Award, the Distinguished Service Award, and for scholarships to be awarded by the Society.

Section 2. The Public Service Award shall be given to recognize contribution of members to the Society to public affairs and to encourage geologists to take a more active part in such affairs. The recipient shall be a member of the Society, but may be in any class of membership. This award may be given without regard to previous awards. Granting the award in any year shall be discretionary.

Section 3. The Distinguished Service Award shall be given to members who have distinguished themselves in singular and beneficial long-term service to the Society. The emphasis shall be on long-term and, at the same time, meaningful service to the Society. The term singular does not necessarily mean without precedence, but rather that the activity be specific as distinguished from general service. More than one member of the Society may be considered in any one year for the award, but Honorary Members should generally be excluded.

Section 4. Scholarships shall be awarded from an endowed scholarship fund, in accordance with the regulations set forth in those funds. In the case of the Austin Community Foundation Scholarships, the Executive Board shall award scholarship recipients from candidates recommended by the student advisors in the Jackson School at the University of Texas to the AGS Awards Committee. Granting scholarships in any year shall be discretionary, based on availability of funds and nominations presented.

ARTICLE VII
Amendments to Bylaws

Amendments to the Bylaws shall be made by vote of three-fourths of the Active Members present at any Regular Meeting, provided that due notice of the proposed amendment has been submitted to the members of the Society at least two weeks in advance of the date on which the ballot is taken, and provided that a quorum (twenty-five percent of the Active Membership as determined by the Treasurer and Membership Chair) is present at said meeting.