

# ANNETTE SUMMERS ENGEL

## UNIVERSITY OF TENNESSEE DEPARTMENT OF EARTH AND PLANETARY SCIENCES

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### EDUCATION

<b>Ph.D. Geological Sciences</b>	2004	The University of Texas at Austin, Austin, Texas Dissertation Advisor: P.C. Bennett
<b>M.Sc. Biological Sciences</b>	1999	University of Cincinnati, Cincinnati, Ohio Thesis Advisor: B.K. Kinkle
<b>M.Sc. Geology</b>	1997	University of Cincinnati, Cincinnati, Ohio Thesis Advisor: W. Huff
<b>B.A. Geology</b>	1995	Wittenberg University, Springfield, Ohio Senior Thesis Advisor: J.R. Ritter

### PROFESSIONAL EXPERIENCE

- August 2011 – present. **Jones Associate Professor of Aqueous Geochemistry.** University of Tennessee, Department of Earth and Planetary Sciences, Knoxville, Tennessee.
- August 2011 – May 2012. **Adjunct Associate Professor.** Louisiana State University, Department of Geology & Geophysics
- May 2010 – July 2011. **Associate Professor of Geomicrobiology.** Louisiana State University, joint appointment to the Department of Geology & Geophysics (primary department, 75%) and Department of Biological Sciences (secondary department, 25%)
- 2010-2013. **Adjunct Doctoral Graduate Faculty.** Texas State University, Department of Biology, San Marcos, Texas
- 2004 –2010. **Assistant Professor of Geomicrobiology.** Louisiana State University, joint appointment to the Department of Geology & Geophysics and Department of Biological Sciences (secondary)
- 1999 - 2004. **Research and/or Graduate Teaching Assistant.** University of Texas at Austin, Dept. Geological Sciences. Funded by National Science Foundation, John Jackson Fellowship for Hydrology, and University of Texas Endowed Presidential Fellowship.
- 1997 - 1999. **Graduate Teaching Assistant.** Univ. of Cincinnati, Dept. Biological Sciences.
- 1995 - 1996. **Graduate Teaching Assistant.** University of Cincinnati, Dept. of Geology.
- 1995. **Petroleum Geologist, Intern.** Timan Pechura Companies (Exxon), Houston, TX

### RESEARCH INTERESTS

General: low-temperature aqueous geochemistry; geomicrobiology; microbial ecology  
Specific research areas: groundwater and karst microbial ecology; microbiology of extreme environments; microbial effects on carbonate dissolution; sulfur and carbon biogeochemical cycles; dissolved organic matter cycling and processes; chemolithoautotrophic processes; microbial diversity of marine bivalve symbiotic associations; marine wetland biogeochemistry

## AWARDS AND RECOGNITION OF SCHOLARLY ACHIEVEMENT

### National

- National Speleological Society **Science Award** (2014) <http://caves.org/committee/award/>  
Citation: “The NSS Science Award recognizes an individual NSS member who has made significant contributions to the science of speleology.... Annette is described as tireless, enthusiastic, a great teacher, and an inspiration to her students....” From NSS News November 2014, 72(11):9.
- **Fellow** of the Geological Society of America (2012)  
Citation: Engel “...has made important scientific contributions to the field of biogeochemistry of the subsurface environment, particularly in karst terrain. Her work has led to new insights into biological processing of chemical compounds in aphotic and hydrothermal settings and more recently along the Gulf Coast.” From GSA Today July 2012, 22(7):13.
- **Fellow** of the National Speleological Society (2003) (<6% of the membership reaches Fellow status; nominated and elected by peers and committee)

### University

- G.M. Hall Professorship for Extraordinary Service, Department of Earth and Planetary Sciences, Strong Hall New Building Committee, University of Tennessee (2014)
- UT Quest Scholar of the Week, October 7, 2013 <<http://quest.utk.edu/scholar-of-the-week/>>
- **Excellence in Research/Creative Achievement Award**, College of Arts and Sciences, University of Tennessee (2013)
- G.M. Hall Professorship for Extraordinary Service, Department of Earth and Planetary Sciences, Graduate Program SACS Development, University of Tennessee (2013)
- Junior Class Student-Athlete Faculty Appreciation, The Thornton Center and Intercollegiate Athletes, University of Tennessee (2012)
- Honored (with nine other faculty) at LSU vs. Mississippi State football game (92,000+ in attendance) for 2010 Gulf of Mexico BP/Macondo Oil Spill Research Response, LSU Office of the Vice Chancellor for Research and Economic Development, Sept. 18, 2010  
<http://www.lsu.edu/ur/ocur/lsunews/MediaCenterNews/2010/09/item19517.html>  
Citation: “So many of our researchers have participated in extensive research and service related to the disaster in the Gulf,” said Doris Carver, interim vice chancellor of research and economic development. “These 10 faculty and staff members are representative of many from the LSU community who demonstrated a strong sense of public service, produced substantial research efforts and also demonstrated commitment above and beyond their normal research and teaching obligations. All of our faculty who worked hard to ensure that the oil would be cleaned, analyzed and mitigated are to be applauded.”
- Faculty Research Award from the College of Science, Louisiana State University, March 2010
- “2009 LSU Rainmaker”, Louisiana St. Univ. Office of Research & Economic Development
- “2008 LSU Rainmaker”, Louisiana St. Univ. Office of Research & Economic Development

### Graduate Awards

- Wayne Franklin Bowman Endowed Presidential Scholarship and Fellowship, University of Texas at Austin (2003-2004)
- Outstanding Geology Student Award (2003) Competitive award, Houston Geological Society
- John Jackson Fellowship for Hydrogeology, University of Texas-Austin \$10,000 (2000)
- Cave Research Foundation Karst Fellowship \$2500 (1997-1998)
- **Charles A. and Anne Morrow Lindbergh Foundation Award** \$10,420 (1997-1998)
- Geological Society of America distinguished grant recipient \$1590 (1997)

- **James G. Mitchell Award, National Speleological Society**, competitive award at national meeting for best speaker under 25 years of age \$300 (1996)
- Isabel and Mary Neff Fellowship (\$18,000 for stipend, tuition, and fees) from the University of Cincinnati, Arts and Sciences College, recognizes one woman and her research (1996-1997)
- Sunderman Award for Teaching Excellence from the Geology Alumni Association and the Geology Department of the University of Cincinnati \$150 (1996)

## RESEARCH SUPPORT AND GRANT ACTIVITIES

### Summary (August 2004 – February 2015):

Federal & Private funding	= \$3,389,431 (\$2,327,974 since August 2011)
Other Funding (State, University)	= \$ 642,036 (\$ 138,361 since August 2011)
Total Funding since 2004	= \$4,031,467

### Current Support

- 1) \$38,000 **Student Technology Fee Award** 2014-2015, College of Arts and Sciences, University of Tennessee “*ICS-2100 and software upgrade.*” 07/01/14-06/30/15.
- 2) \$25,000 **Cave Conservancy Foundation** “*Distribution and conservation of cave biodiversity in the Valley and Ridge*” Principal Investigator. With co-PIs M. Niemiller (Univ. KY), K. Zigler (Univ. South), Danté Fenolio (San Antonio Zoo), and K. Denise Kendall (Univ. KY) 01/01/14-12/31/15.
- 3) \$794,388 **National Science Foundation** “*Dimensions: Collaborative Research: Functional diversity of chemosymbiosis in lucinid bivalves from coastal biomes*” Principal Investigator/Project Director. Total award \$1,627,102 with co-PIs Laurie Anderson, SD School of Mines and Technology, and Barbara Campbell, Clemson University. 01/01/14-12/31/18.
- 4) \$849,057 **Gulf of Mexico Research Initiative RFP-IV** “*Coastal Waters Consortium-II*” Subcontract through Louisiana University Marine Consortium. N. Rabalais, lead PI. Total award ~\$16,000,000, with 12 other co-PIs. 01/2015-12/2017.
- 5) \$551,797 **Gulf of Mexico Research Initiative RFP-I** “*The Effects of the Macondo Oil Spill on Coastal Ecosystems*” Subcontract from Louisiana Universities Marine Consortium, Nancy Rabalais lead PI. Total award \$12,185,000, with 11 other co-PIs. 09/2011-12/2014

### Previous Support

- 1) \$149,834 **National Science Foundation** IOS-1041941 “*EAGER: Dual Symbiosis in Lucinid Bivalves*” Lead PI with L. Anderson (LSU). 8/1/10 – 7/31/12. Transfer to UTK \$107,732; no-cost extension through 07/2014. Completed.
- 2) \$39,000 **SARIF** and \$40,000 **College of Arts and Sciences** for *Fourier Transform Infrared Spectrophotometer and Chemical Imaging system*. Lead PI with five other faculty members across three departments (EPS, Microbiology, CEE) and two colleges (Arts and Sciences and Engineering). 10/2012 – 07/2013. Completed.
- 3) \$21,361 **Institute for a Secure and Sustainable Environment (ISSE)** Equipment Acquisition Opportunity, University of Tennessee. 04/2013 – 06/2013. Sole PI. Completed.

- 4) \$278,154 **National Science Foundation** (Geobiology & Low Temperature Geochemistry Program through ARRA) EAR-0844364 “*The Speciation and Behavior of Sulfur Gases in Biogeochemical Processes*” Lead PI with A. Prange and F.J. Hormes (CAMD, LSU). 7/1/09 – 6/30/13. Subcontract to UTK for years 3 & 4 for \$49,996. Completed.
- 5) \$140,000 Northern Gulf Institute **Year 1 Block Grant from The Gulf of Mexico Research Initiative** “*Effects of Oil, Dispersant, and Remediation-related Human Activities on Marsh Plants and Associated Insects and Mollusks,*” L.Hooper-Bui lead PI, with 5 other co-PIs. 9/10-12/11). Completed.
- 6) \$150,000 **LSU Gulf of Mexico Oil Spill Research Program (Year 1 Block Grant from The Gulf of Mexico Research Initiative)** “*Analysis of Samples Collected to Measure Effects of Stressors on Coastal Wetlands,*” R.E. Turner lead PI, with 3 other co-PIs; 0.1 month/yr. 9/10-8/11. Completed.
- 7) \$149,999 **LSU Gulf of Mexico Oil Spill Research Program (Year 1 Block Grant from The Gulf of Mexico Research Initiative)** “*Elementally Resolved Chemistry of the Evolution of the Oil Spill,*” R. Kurtz lead PI, with 6 other co-PIs. 9/10-8/11. Completed.
- 8) \$40,437 **Louisiana Board of Regents** (Traditional Enhancement) LEQSF(2010-11)-ENH-TR-06 “*Acquisition of Spectroscopy Instrumentation to Characterize Dissolved Organic Matter*” 7/1/10 – 6/30/11. Sole PI. Completed.
- 9) \$10,000 **Louisiana Board of Regents** (Pilot fund for New Research Program) NSF(2010)-PFUND-174 “*Characterization and isolation of microbially-produced dissolved organic matter in caves*” Sole PI. 1/1/10-2/28/11. Completed.
- 10) \$145,000 **Louisiana Board of Regents** (Traditional Enhancement) “*Acquisition of a Variable Pressure Scanning Electron Microscope with Cryostage and EDX for Cell, Developmental and Microbiology Research and Education*” PI: J. Larkin; Co-PIs (each with 14% credit): B. Christner, A.S. Engel, F. Galvez, C. Hart, G. King, and K. Svoboda (Dept. Biological Sciences) 7/1/09 – 6/30/10. Completed.
- 11) \$10,000 **Faculty Research Grant**, “*Sulfur Speciation using XANES Spectroscopy to Interpret Natural Sulfur Biological Signatures*” Lead PI with A. Prange, CAMD. 7/1/07 - 9/30/08. Completed.
- 12) \$130,100 **Louisiana Board of Regents** (Traditional Enhancement) “*Instrumentation Enhancement for Analytical Geochemistry Teaching and Research*” LEQSF(2007-08)-ENH-TR-13. Lead PI with H. Bao and W. Blanford, Dept. Geology & Geophysics. 7/1/07 - 6/30/08. Completed.
- 13) \$191,750 **National Science Foundation** (Systematic Biology and Biological Inventories Program) DEB-0640835 “*Collaborative Research: Epsilonproteobacteria from Terrestrial Springs and Caves*”, LSU Lead Institution (sole PI), with B.J. Campbell, Univ. Delaware, collaborating. 7/15/07 - 5/31/11. Includes \$23,000 supplement to take students to Slovenia for field research and participation in the 16th International Karstological School “Classic Karst”, Postojna, Slovenia, and support for a post-doctoral researcher. Completed.
- 14) \$109,452 **National Science Foundation** (Geobiology & Low Temperature Geochemistry Program) EAR-0544960 “*Collaborative Research: Biogeochemical controls on antimony and arsenic mobility in a siliceous hydrothermal system*” Sole PI at LSU (collaborating with U Texas-Austin) 9/15/06 - 9/14/09. Completed.
- 15) \$138,678 **Louisiana Board of Regents** (Research Competitiveness Subprogram) “*Geomicrobiology of the Bad-water Transition Zone of the Edwards Aquifer, Central Texas:*

*Geological and ecological implications of the chemoautotrophically-based groundwater ecosystem*” (LEQSF(2006-09)-RD-A-03 Sole PI) 7/1/06 - 6/30/10. Completed.

- 16) \$2,500 **Louisiana Board of Regents** “Travel Grant for Emerging Faculty” and **LSU** travel grants (Dept. Geology & Geophysics and Office of Research & Economic Development Junior Faculty Travel Program) to support attendance for invited presentation at International Mineralogical Association meeting, Kobe, Japan. Completed.
- 17) \$10,000 **Faculty Research Grant** Louisiana State University. “*Geomicrobiology of the ‘Bad-water’ Transition Zone of the Edwards Aquifer, Central Texas*” (Sole PI) 7/1/05 - 6/30/06. Completed.
- 18) \$5,000 **Council for Research**. Summer Stipend Program, Louisiana State University. “*Bad-water microbes in the Edwards Aquifer, Central Texas*” (Sole PI) 7/1/05 - 7/30/05 Completed.
- 19) \$11,960 **Louisiana Board of Regents** (Pilot fund for New Research Program). “*Exploratory Research to Understand the Biogeography and Evolutionary History of Novel ‘Epsilonproteobacteria’ from Terrestrial Sulfur Springs*” NSF/LEQSF(2005)-Pfund-04 (Sole PI) 2/1/05 - 1/31/06. Completed.

## LISTING OF RESEARCH PUBLICATIONS

Google Scholar h-index = 17; i10-index = 22; total citations >1300

### Edited Books with Scholarly Introductions

- (4) **Engel, A.S.** (editor) 2015 release date. Microbial Life of Cave Systems. DeGruyter Publishing House series “Life in Extreme Environments.” ~340 pp (14 chapters; 98 illustrations; 14 tables). In press.
- (3) Klimchouk, A., Sasowsky, I.D., Mylroie, J., Engel, S.A., **Engel, A.S.** (editors) (2014) Hypogene Cave Morphologies. Selected papers and abstracts of the symposium held February 2 through 7, 2014, San Salvador Island, Bahamas. Karst Waters Institute Special Publication 18: Leesburg, Virginia, 111 p.
- (2) **Engel, A.S.**, Engel, S.A., Moore, P.J., and DuChene, H. (editors) (2011) Carbonate Geochemistry: Reactions and Processes in Aquifers and Reservoirs, Karst Waters Institute Special Publication 16: Leesburg, Virginia, 84 p.
- (1) **Engel, A.S.**, and Engel, S.A. (editors) (2009) Select Field Guides to Cave and Karst Lands of the United States. Karst Waters Institute Special Publication 15, Leesburg, VA, 184 p.

### Published Shorter Works

- G = Graduate student in my research group
- U = Undergraduate student in my research group
- PD = Postdoctoral research associate conducting research financed by my grant
- CG = collaborating graduate student from another
- CU = collaborating undergraduate student from another institution
- CPD = collaborating post-doctoral research associate from another institution

### Peer-reviewed Journals and Scholarly Book Chapters

- (48) Turner, R.E., Overton, E.B., Ashton, B.M.<sup>CPD</sup>, Miles, M.S., McClenachan, G., Hooper-Bui, L., **Engel, A.S.**, Swenson, E.M., Lee, J.M., Milan, C.S., Gao, H. (2014) Distribution

- and recovery trajectory of Macondo (Mississippi Canyon 252) oil in Louisiana salt marshes. *Marine Pollution Bulletin*. <http://dx.doi.org/10.1016/j.marpolbul.2014.08.011>.
- (47) Headd, B.<sup>G</sup>, **Engel, A.S.** (2014) Congruency among bacterial communities from terrestrial sulfidic springs. *Frontiers in Microbiology*. DOI: 10.3389/fmicb.2014.00473.
- (46) Hooper-Bui, L., Rabalais, N.N., **Engel, A.S.**, Turner, R.E., McClenachan, G., Robert, B., Overton, E.B., Justic, D., Strudivant, K., Brown, K., Conover, J. (2014) Overview of Research into the coastal effects of the Macondo Blowout from the Coastal Waters Consortium: A GoMRI Consortium. *International Oil Spill Conference Proceedings*. American Petroleum Institute. 1:604-617. <http://dx.doi.org/10.7901/2169-3358-2014.1.604>
- (45) **Engel, A.S.**, Gupta, A.<sup>G</sup> (2014) Regime shift in sandy beach microbial communities following *Deepwater Horizon* oil spill remediation efforts. *PLoS One*. 9(7): e102934, DOI:10.1371/journal.pone.0102934.
- (44) **Engel, A.S.**, Bovenkamp, G.L.<sup>CPD</sup>, Prange, A., Hormes, F.J. (2014) In situ speciation of sulfur vapors using X-ray absorption near edge structure spectroscopy. *Chemical Geology*. 380: 1-6. DOI: 10.1016/j.chemgeo.2014.04.019.
- (43) Yin, J., Rekepalli, B., Patel, P. Drennen, C.<sup>G</sup>, **Engel, A.S.** (2014) Instrumenting genomic sequence analysis pipeline mothur on shared memory architecture. XSEDE '14 Proceedings of the 2014 Annual Conference on Extreme Science and Engineering Discovery Environment, ACM, New York, New York; DOI:10.1145/2616498.2616505.
- (42) Hutchins, B.<sup>CG</sup>, Schwartz, B., **Engel, A.S.** (2013) Environmental controls on organic matter production and transport across surface-subsurface and geochemical boundaries in the Edwards Aquifer, Texas, USA. *Acta Carsologica* 42/2-3: 245–259.
- (41) Keenan, S.<sup>G</sup>, **Engel, A.S.**, Elsey, R.M. (2013) The alligator gut microbiome and implications for archosaur symbiosis. *Scientific Reports*. 3:2877. DOI:10.1038/srep02877.
- (40) **Engel, A.S.**, Paoletti, M.G., Beggio, M.<sup>CU</sup>, Dorigo, L., Pamio, A., Gomiero, T., Furlan, C., Brilli, M., Bertoni, R., Dreon, A.L. (2013) Comparative microbial community composition from secondary carbonate (moonmilk) deposits: implications for the *Cansiliella servadeii* cave hygropetric food web. *International Journal of Speleology*. 42: 181-192. DOI: 10.5038/1827-806X.42.3.2.
- (39) Paoletti, M.G., Mazzon, L., Sanudo, I.Z., Simonato, M., Beggio, M., Dreon, A.L., Pamio, A., Brilli, M., Dorigo, L., **Engel, A.S.**, Tondello, A., Baldan, B., Concheri, G., Squartini, A<sup>†</sup> (2013) A unique midgut-associated bacterial community hosted by the cave beetle *Cansiliella servadeii* (Coleoptera: Leptodirini) reveals parallel phylogenetic divergences from universal gut-specific ancestors. *BMC Microbiology*. 13:129. DOI:10.1186/1471-2180-13-129.
- (38) Headd, B.<sup>G</sup>, **Engel, A.S.** (2013) Evidence for niche partitioning revealed by the distribution of sulfur oxidation genes collected from areas of a terrestrial sulfidic spring with differing geochemical conditions. *Applied and Environmental Microbiology*. 79: 1171-1182. DOI:10.1128/AEM.02812-12.
- (37) Gray, C.J.<sup>G</sup> and **Engel, A.S.** (2013) Microbial diversity and impact on carbonate geochemistry across a changing geochemical gradient. *The ISME Journal*. 7: 325:337. DOI:10.1038/ismej.2012.105. (Nature Publishing Group journal)
- (36) **Engel, A.S.**, Johnson, L.R.<sup>G</sup>, Porter, M.L.<sup>PD</sup> (2013) Arsenite oxidase gene diversity among Chloroflexi and Proteobacteria from El Tatio Geyser Field, Chile. *FEMS Microbiology Ecology*. 83: 745–756. DOI: 10.1111/1574-6941.12030.

- (35) Lee, N.M., Liebl, W.E., **Engel, A.S.**, Porter, M.L. (2013) Cave biofilm metagenomics. In: Nelson K. (ed.) *Encyclopedia of Metagenomics*: Springer-Verlag Berlin Heidelberg, SpringerReference www.springerreference.com. DOI: 10.1007/978-1-4614-6418-1\_718-2
- (34) Green-Garcia, A.M.<sup>G</sup> and **Engel, A.S.** (2012) Bacterial diversity of siliciclastic sediments in a *Thalassia testudinum* meadow and the implications for *Luciniscia nassula* chemosymbiosis. *Estuarine, Coastal and Shelf Science*. 112: 153-16. <http://dx.doi.org/10.1016/j.ecss.2012.07.010>.
- (33) Rossmassler, K.<sup>CG</sup>, **Engel, A.S.**, Twing, K.<sup>CG</sup>, Hanson, T.E, Campbell, B.J. (2012) Drivers of *Epsilonproteobacteria* community composition in sulfidic caves and springs. *FEMS Microbiology Ecology*. 79:421-432. DOI:10.1111/j.1574-6941.2011.01231.x
- (32) **Engel, A.S.** (2012) Microbes, in Culver, D. and W. White, (eds.) *Encyclopedia of Caves*. 2<sup>nd</sup> Edition, p. 490-499. (peer-reviewed)
- (31) **Engel, A.S.** (2012) Chemoautotrophy, in Culver, D. and W. White, (eds.) *Encyclopedia of Caves*. 2<sup>nd</sup> Edition. p. 125-134. (peer-reviewed)
- (30) Lee, N.M., Meiginger, D.B., Aubrecht, R., Kovacic, L., Saiz-Jimenez, C. Baskar, S.R., Schleifer, K.-H., Liebl, W., Porter, M.L., **Engel, A.S.** (2012) Life in caves, in Bell, E. (ed.) *Life at Extremes: Environments, Organisms and Strategies for Survival*. CAB Publishing. p. 302-344. (peer-reviewed)
- (29) **Engel, A.S.** and Randall, K.<sup>G</sup> (2011) Experimental evidence for microbially-mediated carbonate dissolution from the saline water zone of the Edwards Aquifer, Central Texas. *Geomicrobiology Journal*. 28(3): 313-327.
- (28) Paoletti, M.G., Beggio, M.<sup>CG</sup>, Dreon, A.L., Pamio, A., Gomiero, T., Brilli, M., Dorigo L., Concheri G., Squartini A., **Engel, A.S.** (2011) A new foodweb based on microbes in calcitic caves: The *Cansiliella* (beetles) case in Northern Italy. *International Journal of Speleology*. 40: 45-52. DOI:10.5038/1827-806X.40.1.6.
- (27) **Engel, A.S.** (2011) Karst ecosystems, in Reitner, J., and Thiel, V. (eds.), *Encyclopedia of Geobiology*, Springer Encyclopedia of Earth Sciences Series (EESS, formerly Kluwer Edition), Berlin Encyclopedia of Earth Sciences Series, pp. 521-53. DOI: 10.1007/978-1-4020-9212-1. (peer-reviewed)
- (26) **Engel, A.S.**, Meisinger, D.B.<sup>CG</sup>, Porter, M.L.<sup>PD</sup>, Payn, R.<sup>CPD</sup>, Schmid, M., Stern, L.A., Schleifer, K.-H., Lee, N.M.<sup>†</sup> (2010) Linking phylogenetic and functional diversity to nutrient spiraling in microbial mats from Lower Kane Cave (USA). *The ISME Journal*. 4:98–110; DOI:10.1038/ismej.2009.91.
- (25) Birdwell, J.E.<sup>PD</sup>, and **Engel, A.S.** (2010) Characterization of dissolved organic matter in cave and spring waters using UV-Vis absorbance and fluorescence spectroscopies. *Organic Geochemistry*. 41: 270-280.
- (24) **Engel, A.S.** (2010) Microbial diversity of cave ecosystems, in Barton, L., Mandl, M., and Loy, A. (eds.), *Geomicrobiology: Molecular & Environmental Perspectives*, Springer. p. 219-238. DOI:10.1007/978-90-481-9204-5\_10. (peer-reviewed)
- (23) **Engel, A.S.**, and Engel, S.A. (2009) A field guide for the karst of Carter Caves State Resort Park and the surrounding area, northeastern Kentucky, in Engel, A.S. and Engel, S.A. (editors) *Select Field Guides to Cave and Karst Lands of the United States: Twenty years of science and exploration*. Karst Waters Institute Special Publication 15: Leesburg, Virginia, p. 87-109.
- (22) Birdwell, J.E.<sup>PD</sup> and **Engel, A.S.** (2009) Variability in terrestrial and microbial contributions to dissolved organic matter fluorescence in the Edwards Aquifer, Central

- Texas. *Journal of Cave and Karst Studies*. 71: 144-156. (includes published cover photograph for the issue)
- (21) Landrum, J.T.<sup>CG</sup>, Bennett, P.C., **Engel, A.S.**, Alsina, M.<sup>CG</sup>, Pastén, P., Milliken, K. (2009) Partitioning geochemistry of arsenic and antimony, El Tatio Geysir Field, Chile. *Applied Geochemistry*. 24: 664-676. DOI:10.1016/j.apgeochem.2008.12.024
  - (20) Porter, M.L.\*<sup>PD</sup>, **Engel, A.S.\***, Kane, T.C.<sup>+</sup>, Kinkle, B.K. (2009) Productivity-diversity relationships from chemolithoautotrophically based sulfidic karst systems. *International Journal of Speleology*. 38(1): 27-40 (\*equal contribution; +deceased).
  - (19) **Engel, A.S.** (2009) Sulfur-rich karst systems, in Palmer, A.N. and Palmer, M.V. (eds.), Caves and Karst of the USA. National Speleological Society: Huntsville, Alabama, p. 404.
  - (18) Porter, M.L.<sup>PD</sup> and **Engel, A.S.** (2008) Diversity of uncultured *Epsilonproteobacteria* from terrestrial sulfidic caves and springs. *Applied and Environmental Microbiology*. 74(15): 4973-4977. DOI:10.1128/AEM.02915-07
  - (17) Porter, M.L.<sup>PD</sup>, and **Engel, A.S.** (2008) Balancing the conservation needs of sulphidic caves and karst with tourism, economic development, and scientific study: *Cave and Karst Science*. 35:19-24.
  - (16) **Engel, A.S.** and Northup, D.E. (2008) Focus group on caves and karst as model systems in geomicrobiology, in Martin, J. and White, W.B. (eds.), Frontiers in Karst Research, Karst Waters Institute Special Publication 13: Leesburg, Virginia, p. 90-95.
  - (15) **Engel, A.S.**, and Northup, D.E. (2008) Caves and karst as model systems for advancing the microbial sciences, in Martin, J. and White, W.B. (eds.), Frontiers in Karst Research, Karst Waters Institute Special Publication 13, Leesburg, Virginia: 37-8. (peer-reviewed)
  - (14) **Engel, A.S.** (2007) Observations on the biodiversity of sulfidic karst habitats. *Journal of Cave and Karst Studies*. 69(1): 187-206.
  - (13) **Engel, A.S.**, Lichtenberg, H.<sup>CG</sup>, Prange, A., Hormes, J. (2007) Speciation of sulfur from naturally-occurring, filamentous microbial mats from sulfidic cave springs using x-ray absorption near edge spectroscopy. *FEMS Microbiology Letters*. 269(1): 54-62. DOI:10.1111/j.1574-6968.2006.00600.x.
  - (12) Meisinger, D.B.\*<sup>CG</sup>, Zimmermann, J.\*<sup>CPD</sup>, Ludwig, W., Schleifer, K.-H., Wanner, G., Schmid, M., Bennett, P.C., **Engel, A.S.**, and Lee, N. (2007) *In situ* detection of novel *Acidobacteria* in microbial mats from a chemoautotrophically-based cave ecosystem. *Environmental Microbiology*. 9(6): 1523-1534. (\* equal contribution) DOI:10.1111/j.1462-2920.2007.01271.x. (included published cover of the issue)
  - (11) Bennett, P.C., and **Engel, A.S.** (2007) Microbial sulfur cycling in a sulfidic cave, in Bullen, T.D., and Wang, Y. (eds.), Water-Rock Interaction, Taylor & Francis Group, London: 853-858.
  - (10) Campbell, B.J.\*<sup>CG</sup>, **Engel, A.S.\***, Porter, M.L.<sup>CPD</sup>, and Takai, K. (2006) The versatile *Epsilon-proteobacteria*: Key players in sulphidic habitats. *Nature Reviews Microbiology*. 4:458-468. (\* equal contribution)
  - (9) Phoenix, V.R.<sup>CPD</sup>, Bennett, P.C., **Engel, A. S.**, Tyler, S.W., and Ferris F.G. (2006) Chilean high-altitude hot spring sinters: a model system for UV screening mechanisms by early Precambrian cyanobacteria. *Geobiology*. 4: 15-28.
  - (8) Bennett, P.C., **Engel, A.S.**, Roberts, J.A. (2006) Counting and imaging bacteria on mineral surfaces, in Maurice, P.A., Warren, L.A. (eds.), Methods of Investigating Microbial-Mineral Interactions, CMS Workshop Lectures, Vol. 14, The Clay Mineral Society, Chantilly, Virginia: 37-77. (peer-reviewed)

- (7) **Engel, A.S.** (2005) Chemoautotrophy, *in* Culver, D. and W. White, (eds.) Encyclopedia of Caves, p. 90-102. (peer-reviewed)
- (6) Bennett, P.C., and **Engel, A.S.** (2005) Microbial contributions to karstification, *in* Gadd, G.M., Semple, K.T., and Lappin-Scott, H.M. (eds.), Micro-organisms and Earth Systems – Advances in Geomicrobiology, Society for General Microbiology (SGM) Symposium 65, Cambridge University Press: 345-363. (peer-reviewed)
- (5) **Engel, A.S.**, Porter, M.L., Stern, L.A., Quinlan, S.<sup>CU</sup>, Bennett, P.C. (2004) Bacterial diversity and ecosystem function of filamentous microbial mats from aphotic (cave) sulfidic springs dominated by chemolithoautotrophic “*Epsilonproteobacteria*.” *FEMS Microbiology Ecology*. 51: 31-53.
- (4) **Engel, A.S.**, Stern, L.A., and Bennett, P.C. (2004) Microbial contributions to cave formation: new insights into sulfuric acid speleogenesis. *Geology*. 32(5): 369-372.
- (3) **Engel, A.S.**, Lee, N., Porter, M.L., Stern, L.A., Bennett, P.C., and Wagner, M. (2003) Filamentous “*Epsilonproteobacteria*” dominate microbial mats in sulfidic caves. *Applied and Environmental Microbiology*. 69(9): 5503-5511.
- (2) **Engel, A.S.**, Porter, M.L., Kinkle, B.K., and Kane, T.C. (2001) Ecological assessment and geological significance of microbial communities from Cesspool Cave, Virginia. *Geomicrobiology Journal*. 18:259-274.
- (1) Vlasceanu, L., Sarbu, S., **Engel, A.S.**, and Kinkle, B.K. (2000) Acidic, cave-wall biofilms from the Frasassi Caves, Italy. *Geomicrobiology Journal*. 17:125-139.

#### ***In Review or In Press Peer-reviews Journals and Scholarly Book Chapters***

- (1) Paterson, A.T., **Engel, A.S.** (IN PRESS) Predicting bacterial diversity in caves associated with sulfuric acid speleogenesis, *in* Engel, A.S. (ed.) Microbial Life of Cave Systems. Chapter 9. DeGruyter Publishing House.
- (2) **Engel, A.S.** (IN PRESS) Bringing microbes into focus for cave science: An introduction, *in* Engel, A.S. (ed.) Microbial Life of Cave Systems. Chapter 1. DeGruyter Publishing House.
- (3) Keenan, S.W.<sup>G</sup>, **Engel, A.S.**, Roy, A., Bovenkamp, G.L. (IN REVIEW) Evaluating bone diagenesis and fossilization with X-ray absorption spectroscopy. *Chemical Geology*.
- (4) Niemiller, M.L.<sup>CDP</sup>, Zigler, K.S., Stephen, C.D.R.<sup>CG</sup>, Carter, E.T.<sup>CG</sup>, Paterson, A.T., Taylor, S.J., **Engel, A.S.** (IN REVIEW) Vertebrate fauna in caves of the east Tennessee Valley and Ridge region (USA). *Journal of Cave and Karst Studies*.
- (5) Brannen-Donnelly, K.<sup>G</sup>, **Engel, A.S.** (IN REVISION) Bacterial diversity differences along an epigenic cave stream reveal evidence for succession. *Frontiers in Microbiology*.

#### ***Edited, editor-reviewed, scholarly conference proceedings, & other publications***

- (15) **Engel, A.S.** (2013) The caves that microbes built – The frontier of cave and karst science, *in* Filippi, M. and Bosák, P. (eds.). Proceedings of the 16th International Congress of Speleology, July 21-28 Brno, Czech Republic. Vol. 1, p. 22-25. Extended abstract for invited plenary lecture.
- (14) **Engel, A.S.** (2013) Microbial processes in sulfidic hypogene karst, *in* Filippi, M. and Bosák, P. (eds.). Proceedings of the 16th International Congress of Speleology, July 21-28 Brno, Czech Republic. Vol. 1, p.391-394.
- (13) Brown, T. <sup>G</sup>, **Engel, A.S.**, Brannen, K.M.<sup>G</sup>, Birdwell, J.E. (2011) Estimating aquifer contributions to carbon cycle budgets based on dissolved organic matter characterization in karst aquifers, *in* Engel, A.S., Engel, S.A., Moore, P.J., and DuChene, H. (eds.), Carbonate

Geochemistry: Reactions and Processes in Aquifers and Reservoirs, Karst Waters Institute Special Publication 16: Leesburg, Virginia, p. 8-9.

- (12) **Engel, A.S.** (2010) Incorporating the *Deepwater Horizon* oil spill into geomicrobiology courses. *National Association of Geoscience Teachers e-News Magazine*. Sept. 2010. <<http://nagt.org/nagt/enews/sep10/summers.html>>
- (11) **Engel, A.S.** (2010) Book Review - Cave Biology: Life in Darkness. Aldemaro Romero: *Integrative and Comparative Biology*. 50 (4): 689-691. doi: 10.1093/icb/icq067 First published online: June 4, 2010.
- (10) Brannen, K.M.<sup>U</sup>, **Engel, A.S.**, and Birdwell, J.E.<sup>PD</sup> (2009) Tracing the origins of chromophoric dissolved matter in karst aquifers, in White, W.B. (ed.), Proceedings of the 15<sup>th</sup> International Congress of Speleology, vol. 1, symposia part 1, p. 354-359.
- (9) Paoletti, M.G., Beggio, M.<sup>CU</sup>, Pamio, A., Gomiero, T., Brilli, M., Dreon, A.L., Toniello, V., and **Engel, A.S.** (2009) Comparison of three moonmilk cave habitats associated with troglobitic beetles, in White, W.B. (ed.), Proceedings of the 15<sup>th</sup> International Congress of Speleology, vol. 1, symposia part 1, p. 400-403.
- (8) **Engel, A.S.**, Meisinger, D.B.<sup>CG</sup>, Porter, M.L.<sup>PD</sup>, Schmid, M., and Lee, N.M. (2009) Caves as model systems for the evolution of a complex biosphere in a chemolithoautotrophic subsurface, Special Issue: Abstracts from the Eighth European Workshop on Astrobiology (EANA): *Origins of Life and Evolution of Biospheres* DOI:10.1007/s11084-008-9155-0.
- (7) **Engel, A.S.** and K.W. Randall<sup>G</sup> (2008) Microbially enhanced carbonate dissolution in karst aquifers, in Sasowsky, I.D., Feazel, C.T., Mylroie, J.E., Palmer, A.N., and Palmer, M.V. (eds.), Karst from Recent to Reservoirs, Karst Waters Institute Special Publication 14: Leesburg, Virginia, p. 52-56.
- (6) **Engel, A.S.**, and Bennett, P.C. (2008) Lower Kane Cave, Wyoming: Where biology and geology meet, in Rhinehart, R. (ed.), National Speleological Society Rocky Mountain Section Regional Field Guide, p. 43-57.
- (5) Stern, L.A., **Engel, A.S.**, Bennett, P.C., and Porter, M.L. (2002) Subaqueous and subaerial speleogenesis in a sulfidic cave, in Martin, J.B., Wicks, C.M., and Sasowsky, I.D. (eds.), Hydrogeology and Biology of Post- Paleozoic Carbonate Aquifers, Karst Waters Institute Special Publication 7: Leesburg, Virginia, p. 89-91.
- (4) **Engel, A.S.**, Bennett, P.C., and Stern, L.A. (2001) Biogeochemical diversity of microbial mats from Lower Kane Cave, Wyoming, USA, in Weber, J., Jamroz, E., Drozd, J., and Karczewska, A. (eds.) Biogeochemical Processes and Cycling of Elements in the Environment. 15<sup>th</sup> Int Symposium of Environmental Biogeochemistry, Wroclaw, Poland: p. 135-136.
- (3) **Engel, A.S.** (2000) Microbially-enhanced weathering in subsurface environments: Sulfur-oxidizing bacteria and the cave environment, in Onac, B. and Tamaş, T. (eds.) Karst Studies and Problems: 2000 and Beyond. Friends of Karst Special Meeting. Cluj, Romania: p. 130-134.
- (2) **Summers Engel, A.**, Sarbu, S., Badescu, A., Lascu, C., Sasowsky, I., and W. Huff. (1997) A study of cave sediment from Movile Cave, Southern Dobrogea, Romania. Proceedings of the 12<sup>th</sup> International Congress of Speleology, Las Chaux-de-Fonds, Switzerland. Vol. 1: p. 25-28.
- (1) Krekeler, M.P.S., **Summers Engel, A.**, Engel, S., Mixon, D., and M. Ragsdale. (1997) Sedimentology, clay mineralogy, and geochemistry of cave sediment from Hard

Baker Cave, Rockcastle County, Kentucky, USA. Proceedings of the 12<sup>th</sup> International Congress of Speleology, Las Chaux-de-Fonds, Switzerland. Vol. 1: p. 21-24.

## **PARTICIPATION IN PROFESSIONAL MEETINGS, CONFERENCES, & WORKSHOPS**

### **Last 3 years**

\* = denotes presentation I gave or will give; underlined names are students, <sup>G</sup> = graduate, <sup>U</sup> = undergraduate

#### 2015 so far

- (158) Doty, T.W., **Engel, A.S.** (2015) Microbial diversity fluctuations within mangrove-associated sediments that harbor the lucinid bivalve, *Phacoides pectinatus*, and their free-living bacterial endosymbionts. 2<sup>nd</sup> Annual Southeastern Biogeochemistry Symposium, Atlanta, GA, March 28-29, 2015. (poster presentation)
- (157) **Engel, A.S.**, Paterson, A.T. Ecosystem responses to changing microbial community compositions as a function of natural and anthropogenic stressors in Louisiana coastal marshes. Gulf of Mexico Oil Spill and Ecosystem Science Conference, Houston, Texas, February 16-19, 2015.
- (156) Beeler, S.<sup>U</sup>, Paterson, A.T., **Engel, A.S.** (2015) Microbial community response to natural organic matter enrichments after being primed by Deepwater Horizon oiling. Gulf of Mexico Oil Spill and Ecosystem Science Conference, Houston, Texas, February 16-19, 2015.
- (155) Keenan, S.W., Elsey, R.M., **Engel, A.** The good, the bad, and the unknown: microbial symbiosis of the American alligator (*Alligator mississippiensis*). Symposia of the Society for Integrative and Comparative Biology, West Palm Beach, Florida, January 3-7, 2015 (talk)

#### 2014

- (154) Goemann, A.<sup>G</sup>, **Engel, A.S.** (2014) Physical and geochemical parameters governing the distribution of lucinid clams and associated symbiotic bacteria. International Society for Environmental Biogeochemistry Short Course and Research Colloquium, on "Interfacial Processes in Environmental Biogeochemistry," Cancun, Mexico, November 16-21, 2014. (oral presentation)
- (153) Beeler, S.A.<sup>U</sup>, Paterson, A., **Engel, A.** Microbial degradation of organic matter and community response in coastal marshes. 2<sup>nd</sup> Midwest Geobiology Symposium, Chicago, IL, September 27, 2014 (poster).
- (152) Brannen, K.M.<sup>G</sup>, **Engel, A.S.** How prevalent are transported microorganisms to the microbial community of an epigenic cave stream? International Symposium on Subsurface Microbiology, Pacific Grove, CA, Oct. 5-10, 2014. (poster)
- (151) Brown, T.<sup>G</sup>, Brannen, K.M.<sup>G</sup>, **Engel, A.S.**, Piffner, S. Diurnal changes in carbon cycling dynamics in an oligotrophic karst aquifer under base flow conditions. International Symposium on Subsurface Microbiology, Pacific Grove, CA, Oct. 5-10, 2014. (oral presentation)
- (150) Brown, T.<sup>G</sup>, **Engel, A.S.** Nitrogen enrichment of autochthonous dissolved organic matter in a surface-influenced karst aquifer. International Symposium on Subsurface Microbiology, Pacific Grove, CA, Oct. 5-10, 2014. (oral presentation)
- (149) **Engel, A.S.\***, Rossmassler, K.<sup>CPD</sup>, Hanson, T.E., Paterson, A.P., Campbell, B.J. Functional potential of Epsilonproteobacteria in sulfidic karst microbial communities. International Symposium on Subsurface Microbiology, Pacific Grove, CA, Oct. 5-10, 2014 (oral presentation).

- (148) Anderson, L.C., Roopnarine, P.D., Roopnarine, D., Fry, B., **Engel, A.S.** Coastal ecosystem changes associated with the 2010 Deepwater Horizon oil spill and their implications for the fossil record. 4<sup>th</sup> International Palaeontological Congress, Mendoza, Argentina. Sept 28 – Oct 3, 2014 (talk).
- (147) Anderson, L.C., Long, B., **Engel, A.S.** Calibrating morphometric proxies of chemosymbiosis: A test case using Lucinidae (Bivalvia). 4<sup>th</sup> International Palaeontological Congress, Mendoza, Argentina. Sept 28 – Oct 3, 2014 (talk)
- (146) **Engel, A.S.\*** Functional microbiology of karst: towards the development of a unifying model for cave ecology based on ‘omics. National Speleological Society convention, Huntsville, Alabama. July 14-18, 2014 (talk).
- (145) **Engel, A.S.\*** Microbial activities at environmental gradients in cave and karst ecosystems. 22<sup>nd</sup> International Karstological School, Postojna, Slovenia. **Invited talk.**
- (144) Keenan, S.W.<sup>G</sup>, **Engel, A.S.**, Roy, A., Bovenkamp, G.L. From bone to fossil: early diagenesis of apatite. Goldschmidt, June 8-13, 2014. Sacramento, CA. **Invited talk.**
- (143) Beeler, S.<sup>U</sup>, Paterson, A.T., Drennen, C.<sup>G</sup>, **Engel, A.S.** Microbial degradation of labile organic matter from *Spartina alterniflora*-dominated marshes. Goldschmidt, June 8-13, 2014. Sacramento, CA. (poster presentation)
- (142) **Engel, A.S.**, Prange, A., Bovenkamp, G.L., Peng, Y., Hormes, F.J. Isotopic and compositional characterization of sulphur gases and condensates formed after heating sulphur-containing solids: Implications for sedimentary records. Goldschmidt, June 8-13, 2014. Sacramento, CA. (oral presentation)
- (141) Hooper-Bui, L.M., Turner, R.E., Overton, E., **Engel, A.S.**, Rabalais, N., Parsons, M., Justic, D., Taylor, S., Kearney, M., Roberts, B.J., et al. (2014) Key insights into the coastal effects of the Macondo Blowout from the Coastal Waters Consortium: A GoMRI Consortium. International Oil Spill Conference, Savannah, Georgia, May 5-8, 2014.
- (140) Vishni, L.<sup>U</sup>, Paterson, A.T., **Engel, A.S.** Evaluating the effects of disturbance on microbial diversity from marsh sediment and water at Grand Isle, Louisiana. 1<sup>st</sup> Annual Southeastern Biogeochemistry Symposium, Atlanta, GA, April 5-6, 2014. (poster presentation)
- (139) Parker, L.<sup>U</sup>, Brown, T.<sup>G</sup>, **Engel, A.S.** Extended alkaline incubation times to quantify protein content in karstic aquifers and other oligotrophic groundwater systems. 1<sup>st</sup> Annual Southeastern Biogeochemistry Symposium, Atlanta, GA, April 5-6, 2014. (poster)
- (138) Brannen, K.M.<sup>G</sup>, **Engel, A.S.** Seasonality influences allochthonous organic matter and microbial community diversity in a cave stream. 1<sup>st</sup> Annual Southeastern Biogeochemistry Symposium, Atlanta, GA, April 5-6, 2014. (poster presentation)
- (137) Beeler, S.<sup>U</sup>, Paterson, A.T., **Engel, A.S.** Degradation of *Spartina alterniflora*-derived dissolved organic matter by marsh sediment communities. 1<sup>st</sup> Annual Southeastern Biogeochemistry Symposium, Atlanta, GA, April 5-6, 2014. (poster presentation)
- (136) **Engel, A.S.**, Drennen, C.<sup>G</sup>, Paterson, A., Liu, C.<sup>G</sup>, Turner, R.E., Overton, E. (2014) Differences in petroleum hydrocarbon compounds from Louisiana coastal marshes correspond to specific changes in microbial community composition. 2<sup>nd</sup> Gulf of Mexico Oil Spill and Ecosystem Science Conference, Mobile, AL, Jan. 26-30, 2014. **Invited oral presentation.**
- (135) Drennen, C.<sup>G</sup>, **Engel, A.S.** (2014) Increased marsh deterioration associated with changes in microbial diversity following the 2010 Deepwater Horizon oil spill. 2<sup>nd</sup> Gulf of Mexico Oil Spill and Ecosystem Science Conference, Mobile, AL, Jan. 26-30. (poster presentation)

- (134) Turner, R., Overton, E.B., Meyer, B., Miles, M., McClenachan, G., Hopper-Bui, L, **Engel, A.S.**, Lee, J., Milan, C., Gao, H. (2014) Trajectory of changing DWH oil in Louisiana marshes, 2010-2013. 2<sup>nd</sup> Gulf of Mexico Oil Spill and Ecosystem Science Conference, Mobile, AL, Jan. 26-30. (poster presentation)

## 2013

- (133) Drennen, C.<sup>G</sup>, **Engel, A.S.**, Turner, R.E. (2013) Response and recovery of microbial communities in Louisiana coastal marshes after the Deepwater Horizon oil spill and possible implications for marsh erosion. 22<sup>nd</sup> Biennial Conference of the Coastal and Estuarine Research Federation, "Toward Resilient Coasts and Estuaries, Science for Sustainable Solutions," 3-7 November 2013, San Diego, CA. (poster; **2<sup>nd</sup> best poster award**)
- (132) Dietz, C.<sup>G</sup>, **Engel, A.S.** (2013) Metagenomic analysis of the *Phacoides pectinatus* endosymbiont consortium reveals metabolic versatility and potential adaptation to anthropogenic disturbances. 22<sup>nd</sup> Biennial Conference of the Coastal and Estuarine Research Federation, "Toward Resilient Coasts and Estuaries, Science for Sustainable Solutions," 3-7 November 2013, San Diego, CA. (poster presentation)
- (131) **Engel, A.S.\***, Gupta, A.<sup>G</sup> (2013) Impact of remediation efforts on the diversity of sandy beach microbial communities following the Gulf of Mexico oil spill. 22<sup>nd</sup> Biennial Conference of the Coastal and Estuarine Research Federation, "Toward Resilient Coasts and Estuaries, Science for Sustainable Solutions," 3-7 November 2013, San Diego, CA. (oral presentation)
- (130) Harmon, D.<sup>U</sup>, Brannen, K.M.<sup>G</sup>, Keenan, S.W.<sup>G</sup>, **Engel, A.S.** (2013) Drip water chemistry from the Cascade Cave system, Kentucky, and implications for epikarst-derived microbial communities. Geological Society of America meeting, Denver, CO, October 27-30, 2013. (poster)
- (129) Beeler, S.A.<sup>U</sup>, Brannen, K.M.<sup>G</sup>, **Engel, A.S.** (2013) Seasonal variations in degradation of dissolved organic matter by groundwater microbial communities in a karst systems. Geological Society of America meeting, Denver, CO, October 27-30, 2013. (poster)
- (128) Brown, T.<sup>G</sup>, **Engel, A.S.** (2013) Assessing the transfer and transformation of colloidal and particulate organic matter in karst ecosystems. Geological Society of America meeting, Denver, CO October 27-30, 2013.
- (127) Keenan, S.W.<sup>G</sup>, **Engel, A.S.** (2013) Assessing fossil bone depositional environment from structural and compositional changes. Geological Society of America meeting, Denver, CO October 27-30, 2013.
- (126) Keenan, S.W.<sup>G</sup>, Engel, A.S. (2013) Visualizing the early diagenesis of bone. 2<sup>nd</sup> annual Midwest Geobiology Symposium. Indiana University-Purdue University Indianapolis, Sept. 28, 2013, p. 41. (oral presentation)
- (125) Harmon, D.<sup>U</sup>, Brannen, K.M.<sup>G</sup>, Keenan, S.W.<sup>G</sup>, **Engel, A.S.** (2013) Physical and geochemical controls on cave dripwater microbial diversity. 2<sup>nd</sup> annual Midwest Geobiology Symposium. Indiana University-Purdue University Indianapolis, Sept. 28, 2013, p. 33. (poster).
- (124) **Engel, A.S.\***, Brannen, K.M.<sup>G</sup>, Brown, T.<sup>G</sup>, Beeler, S.<sup>U</sup> (2013) Seasonal changes to cave stream microbial communities influence dissolved organic matter production and transformations. Program guide to the 70th annual National Speleological Society convention, Shippensburg, PA, 2013, p. 41.

- (123) Keenan, S.W.<sup>G</sup>, **Engel, A.S.** (2013) Geochemical analysis of *Alligator* sp. bone preserved in a paleosinkhole, the Gray Fossil Site, TN. Program guide to the 70th annual National Speleological Society convention, Shippensburg, PA, 2013, p. 39.
- (122) **Engel, A.S.\***, Liu, C.<sup>G</sup>, Anderson, L.A., Hooper-Bui, L., Turner, R.E. (2013) Multiple stressors impact marsh sediment bacterial diversity after the Gulf of Mexico oil spill. Gulf of Mexico Oil Spill and Ecosystem Science Conference, New Orleans, Louisiana, Jan. 21-23. (oral presentation)
- (121) Drennen, C.<sup>G</sup>, Liu, C.<sup>G</sup>, **Engel, A.S.** (2013) Similarity among microbial communities from Louisiana coastal marshes reveals potential to respond to disturbance. Gulf of Mexico Oil Spill and Ecosystem Science Conference, New Orleans, Louisiana, Jan. 21-23. (poster presentation)
- (120) Brannen, K.M.<sup>G</sup>, **Engel, A.S.**, Larson, E.R.<sup>U</sup> (2013) Microbial controls on in situ production of dissolved organic matter, *in* Fong, D.W., Culver, D.C., Veni, G., Engel, S.A. (eds.) Carbon and Boundaries in Karst, Abstracts of the conference held January 7 – 13, 2013, Carlsbad, New Mexico. Karst Waters Institute Special Publication 17, Karst Waters Institute, Leesburg, Virginia. p. 2. (poster presentation).
- (119) Brown, T.<sup>G</sup>, **Engel, A.S.**, Pfiffner, S. (2013) Component isolation and lipid profiling to characterize dissolved organic matter transformations along a groundwater flow path, *in* Fong, D.W., Culver, D.C., Veni, G., Engel, S.A. (eds.) Carbon and Boundaries in Karst, Abstracts of the conference held January 7 – 13, 2013, Carlsbad, New Mexico. Karst Waters Institute Special Publication 17, Karst Waters Institute, Leesburg, Virginia. p. 4. (poster presentation).
- (118) **Engel, A.S.\*** (2013) Microbial activities at geochemical interfaces in cave and karst environments, *in* Fong, D.W., Culver, D.C., Veni, G., Engel, S.A. (eds.) Carbon and Boundaries in Karst, Abstracts of the conference held January 7 – 13, 2013, Carlsbad, New Mexico. Karst Waters Institute Special Publication 17, Karst Waters Institute, Leesburg, Virginia. p. 10. (Invited oral presentation and session chair).

### **Keynote or Invited Speaker**

#### **Last 3 years**

- 2015      Ball State University, Department of Chemistry/Environmental Sciences, Muncie, IN
- 2014      Vanderbilt University, Department Earth & Environmental Sciences, Nashville, TN  
 Tennessee Cave and Karst Working Group, Tennessee Cave Survey, University of the South, Sewanee, Tennessee (Invited Speaker)  
 Sigma Xi - University of Tennessee chapter (Invited Keynote Speaker)  
 22<sup>nd</sup> International Karstological School, Postojna, Slovenia (**Plenary Speaker**)  
 Southwest University, Departments of Geology and Geography, Chongqing, China  
 UNESCO International Research Center on Karst, Guilin, China. International Training Course specializing on Karst Microbiology
- 2013      “Carbon and Boundaries in Karst,” Karst Waters Institute, Carlsbad, New Mexico (Invited Speaker)  
 East Tennessee Grotto, Oak Ridge, TN  
 International Congress of Speleology, Brno, Czech Republic (**Plenary Speaker**)

- 2012 Tennessee Cave and Karst Working Group, “Identification, Study, and Preservation of Cave and Karst Resources in Tennessee (and Beyond),” Knoxville, TN  
 Biosciences Division, Oak Ridge National Laboratory Microbial Ecology & Physiology Group, TN  
 2<sup>nd</sup> International Geobiology Conference: Critical Zone Observatories for Sustainable Soil Development and Beyond. Wuhan, China (Invited Speaker)  
 University of Tennessee, Department of Microbiology  
 University of Kentucky, Karst Critical Zone Observatory Workshop, Lexington, KY

## CONTRIBUTIONS TO THE PROFESSION & SCHOLARLY SERVICE ACTIVITIES

### Membership in Professional Organizations

Coastal and Estuarine Research Federation	2013-present
American Chemical Society	2013-present
International Society for Microbial Ecology	2010-present
International Symbiosis Society	2009-present
Karst Waters Institute (Director, Officer)	2005-present
AAAS	2003-present
American Geophysical Union	2000-present
American Society of Microbiology	1998-present
Geological Society of America ( <b>Fellow</b> )	1996-present
Sigma Xi (Full Member)	1994-present
National Speleological Society (#31319Life, JM, SA, <b>Fellow</b> )	1987-present

### Service to governmental agencies at the international, federal, state & local levels

- December 16-20, 2013: NASA Exobiology and Evolutionary Biology Panelist, NASA, proposal review panel.
- April 24-26, 2013: National Science Foundation Panelist, Critical Zone Observatories, proposal review panel.
- June 6-8, 2011. Committee of Visitors - Surface Earth Processes, National Science Foundation. *The COV (8 people nationally) reviews the research core-programs in the EAR Surface Earth Processes (SEP) Section: Geobiology and Low-Temperature Geochemistry, Geomorphology and Land Use Dynamics, Hydrologic Sciences, and Sedimentary Geology and Paleobiology; the review was from 2008-2010. The report can be downloaded at: [http://www.nsf.gov/od/iaa/activities/cov/geo/2011/REPORT%20OF%20THE%20COV-SEP%202008-2010\\_Submitted%2023%20June%202011.pdf](http://www.nsf.gov/od/iaa/activities/cov/geo/2011/REPORT%20OF%20THE%20COV-SEP%202008-2010_Submitted%2023%20June%202011.pdf)*
- February 21-26, 2011: NASA Exobiology and Evolutionary Biology Panelist, NASA, proposal review panel.
- July 14-16, 2010: National Science Foundation Panelist, Dimensions of Biodiversity, Division of Environmental Biology, proposal review panel.
- October 26 – 28, 2009: National Science Foundation Panelist, Systematic Biology and Biodiversity Inventories, Division of Environmental Biology, proposal review panel.
- April 2006: National Science Foundation Panelist, Geobiology and Low Temperature Geochemistry Panel, Earth Sciences Research, proposal review panel.

### **Leadership in public & private organizations (using professional expertise)**

- November 2014: Chair, Graduate Student Scholarship Program for Cave Conservancy Foundation
- November 2013 – present: Board Member, Cave Conservancy of the Virginias (501(c)3 organization) (elected position).
- April 2012 – present: Awards Committee, Cave Conservancy of the Virginias (501(c)3 organization)
- 2011 – present: Member of the International Advisory Committee, International Society for Environmental Biogeochemistry (501(c)3 organization) (elected position)
- March 2009 – March 2015: Vice-President of Communications, Karst Waters Institute. August, 2007 – March 2009: Assistant Webmaster, Karst Waters Institute. Appointed.
- March 2005 – 2008; reelected to 2011: Board of Directors, Karst Waters Institute (501(c)3) (elected position).

### **University Service and Participation (Department, College, University)**

#### **August 2011- Present (University of Tennessee)**

- October 2014-present: Member, Diversity ad hoc committee, Dept. Earth and Planetary Sciences
- Sept. 2014 – present: Member, Executive Committee, Dept. Earth and Planetary Sciences; member as a consequence of being Director of Graduate Studies
- August 2012 – present: **Director of Graduate Studies, Dept Earth and Planetary Sciences**, Graduate Program Committee, (member of committee August 2011-June 2012).
- June 2012 – present: Member of the Strong Hall Ad Hoc Committee, Dept Earth and Planetary Sciences.
- August 2011 – present: Member of the Graduate Program Committee, Dept. Earth and Planetary Sciences
- August 2011 – present: Member of the Watershed Science Minor program faculty