

MARCUS O. GARY – CURRICULUM VITAE

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EDUCATION

Ph.D. – The University of Texas at Austin, Jackson School of Geosciences – December, 2009

- Major – Hydrogeology; specializing in karst geology and groundwater flow.
- Dissertation topic – Speleogenesis and karst hydrogeology of deep phreatic caves, Sistema Zacatón, Mexico. Original research characterized and provided first documentation of second deepest underwater cave system in the world.
- Co-chief scientist of DEPTHX project – NASA funded robotic underwater cave exploration.
- National Speleological Society, Certificate of Merit; for research on deep, water-filled limestone sinks at Rancho La Azufrosa, Tamaulipas, Mexico, August 15, 2008.
- National Brunton Award – distinction in field geology, May 2002.

Bachelor of Science – The University of Texas at Austin – December 2001

- Major – Hydrogeology; minor in geography.

Associate of Science – College of Oceanering, Los Angeles, California – February 1994

- Major - Marine Technology with highest honors.
 - Studied applied commercial diving techniques for industrial and scientific purposes.
 - Specialized in emergency medical and hyperbaric treatment of diving related accidents.
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PROFESSIONAL EXPERIENCE

Edwards Aquifer Authority, Field Operations Project Manager **2011 – present**

- Bandera County River Authority and Groundwater District, Environmental Stewardship Award, July 11, 2017. For collaboration and research facilitation.
- Chair of Scientific Committee for the Hays-Trinity Groundwater Conservation District to develop a framework for the Jacobs Well Groundwater Management Zone.
- Coordinate collaborative scientific investigations with local and regional water resource stakeholders: river authorities, state and federal agencies, groundwater conservation districts, universities, NGOs, and other private entities.
- Supervise technical staff in Aquifer Science section.
- Organize and coordinate bi-annual, South Central Texas Water Research Interest Group – a regional, water agency focused workshop.
- Perform gain/loss studies on surface streams in the Edwards Aquifer recharge zone and contributing zone to determine reaches with springs or recharge features.
- Evaluate interformational flows from the Trinity Aquifer to the Edwards Aquifer.
- Plan and manage aquifer dye tracer investigations.

- Develop continuous water quality monitoring network for Comal and San Marcos Springs as a component of the Edwards Aquifer Habitat Conservations Plan.
- Collect, interpret, and report recharge data and compile quarterly reports to Texas Commission for Environmental Quality for man-made recharge structures.
- Developed diffuse aquifer recharge study; manage \$200,000/year collaborative research investigation with Bureau of Economic Geology at Camp Bullis, San Antonio, TX.
- Manage \$350,000/year program with U.S Geological Survey to monitor flow in surface water, springs, and Edwards Aquifer recharge.
- Developed, implemented, and maintain real-time weather station network across region.
- Implementation of Aquarius database for environmental data.
- Coordinate and implement monitor network related to New Braunfels Utilities brackish Edwards aquifer storage and recovery (ASR) project.
- Coordinate and manage collection of regional evapotranspiration data using eddy-covariance towers; manage \$65k/year project with Bureau of Economic Geology.

The University of Texas at Austin, Adjunct Assistant Professor/Faculty Affiliate. 2011 – present

- Teach hydrogeology field course in Department of Geological Sciences, Jackson School of Geosciences.
- Developed original course curriculum for GEO 377K/GEO 391K - *Applied Karst Hydrogeology*. Graduate and upper division undergraduate levels.
- Integrate class teaching objectives with research program at Edwards Aquifer Authority.
- Supervise M.S. and senior undergraduate thesis/capstone research.
 - Tim Eischen, 2012 – *Recharge Dynamics of the Frio River into the Edwards Aquifer: Uvalde County, Texas*; Environmental Science Capstone Project.
 - Jeffrey Watson, 2013 – *Potentiometric Surface Investigation of the Middle Trinity Aquifer in Western Hays County, Texas*; Environmental Science Capstone Project.
 - Tiffany Kocis, 2014 – *Understanding Surface Water-Groundwater Interactions on the Blanco River, Hays County, Texas*; B.S. Honors Thesis.
 - Catherine Rohan, 2014 – *Analysis of Flow at Comal Springs, Comal County, Texas*; Environmental Science Capstone Project.
 - Sam Lillard, 2015 – *Quantifying the Contribution of Barton Creek Recharge to the Edwards Aquifer*; Environmental Science Capstone Project.
 - Jenna Kromann, 2015 – *Surface Water Recharge in Karst: Edwards-Trinity Aquifers-Nueces River System*; M.S. Thesis.
 - Kendall Yates, 2016 – *Groundwater, Surface Water Interactions Along the Blanco River, Hays County, Texas*; Environmental Science Capstone Project.
 - Caroline Hackett, 2018 – *Quantifying Alluvium Effects on Karst Aquifer Recharge: Shallow Groundwater and Surface Water Exchange in the Upper Nueces River, Texas*. M.S. Thesis.

- Kelsey Parker, 2020 – *Continued Analysis of Flow at Comal Springs, Comal County, Texas*. Environmental Science Capstone Project.
- Kahne Cobarrubias, 2021 – *A Sustainability Analysis of the Edwards, Middle, and Upper Trinity Aquifers in Northern Bexar and Comal Counties, Texas*. Environmental Science Capstone Project.
- Brent Doty, 2021 (Oregon State University) – *Wicked Water Problems for South-central Texas: The Nexus of Science, Policy, and Community for a More Sustainable Future*. M.N.R. Thesis/Capstone.
- Jeffery Blain Hicks, 2022 (Tarleton State University) – *Characterization of Springs in North Central Texas*. M.S. Thesis (in progress)

Austin Discovery School, Chair, Board of Directors **2017 – 2019**

- Manage operations of local charter elementary/middle school
- Serve on Grants and Development Committee.

Manville Water Supply Corporation, Vice-president, Board of Directors **2010 – present**

- Elected board member for three terms (three-years/each)
- Vice-president (2013-2016).
- Advised large WSC (\$7,000,000 annual operating budget) that serves 80,000+ people in the rapid growth S.H. 130 growth corridor in eastern Travis and Williamson Counties (Austin and Pflugerville), Texas.
- Initiated pilot study of aquifers that supply water to Manville WSC (Edwards Aquifer, Carrizo-Wilcox Aquifer, Colorado alluvial aquifer).
- Evaluate applicability of brackish water resources and aquifer storage and recovery to expand possible available water resources.
- Implementation of automated water meter system to improve reporting efficiency.
- Coordinate water permits from Lost Pines Groundwater Conservation District.

Zara Environmental LLC, Senior Hydrogeologist **2007 – 2011**

- Manage karst recharge study at Camp Bullis, San Antonio, TX.
- Oversee karst impacts of geotechnical drilling for LCRA power lines in sensitive areas.
- Manage for dye trace study from the Blanco River to San Marcos Springs.
- Manage field operations for dye trace study in Kinney County, Texas.
- Manage field operations for dye trace study at San Felipe Springs, Del Rio, Texas.
- Perform TCEQ geologic assessments (GA) in the Edwards Aquifer Recharge Zone, including 45 miles of Loop 1604 and U.S. Highway 281 in northern San Antonio.
- Prepare groundwater technical reports for NEPA documentation.
- Prepare hydrogeologic chapters for EIS projects within the Edwards Aquifer.
- Create and manage karst feature database for Edwards Aquifer area.
- Analyze and publish reports on area-wide recharge within Camp Bullis, TX.
- Conduct downhole camera surveys - prepare reports on karst features observed in boreholes.

- Prepare groundwater sections for Edwards Aquifer Habitat Conservation Plan, USFWS permit application HCP.

United States Geological Survey, Water Resources Division

2000 – 2007

- Process groundwater and sediment samples for analysis.
- Manage data for water contamination study.
- Fabricate sampling equipment.
- Diving support for coring projects and karst monitoring projects.
- Design, installation, and operation of continuous water quality monitor – Barton Springs.
- Cave diving coordinator and Central Region Dive Safety Officer, USGS.
- Maintain and operate stream gauging stations.
- Maintain and operate automated water samplers.
- Maintain and operate variety of continuous water quality instruments.
- Field Supervisor – Geochemical investigation of Barton Springs Segment of Edwards Aquifer.
- Field Supervisor – TMDL study of Arroyo Colorado
- Field Supervisor/Data Manager – SWAP Toxic Algae study of Texas reservoirs
- Develop methods to quantify karst spring flow using acoustic Doppler velocity technology.
- Project Chief – Jacob’s Well Spring monitoring project
- Project Chief – Comal Springs/San Marcos Springs Springflow Quantification Pilot Study.

Raytheon Contractors and Engineers

1996 – 1997

- Diver recovering ICBMs on remote Pacific Ocean missile test facility – Kwajalein Atoll.
- Maintained and operated: two-manned submarine; remote underwater vehicle; side-scanning SONAR; and related search and recovery equipment.
- Conducted hyperbaric medical treatments for both diving and non-diving related conditions.
- Engineered and completed refit of hyperbaric treatment facilities.

Espey – Huston and Associates

1995 – 1996

- Diver conducting archeological surveys precluding construction on inter-coastal waterways along the Texas gulf coast.
- Operate magnetometer and rotating SONAR scanning unit for submarine surveys.
- Designed and fabricated high-pressure air regulating manifold to supply divers breathing air.

College of Oceaneering

1993 – 1995

- Maintenance supervisor of diving systems and harbor facilities for commercial diving school.
- Designed and fabricated breathing air distribution system.

- Original employment served as student work – study apprenticeship.
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APPLIED SKILLS, CERTIFICATIONS, AND PROFESSIONAL MEMBERSHIPS

- Edwards Aquifer Authority, Aquifer Science Advisory Panel (2009-2011).
 - Professional Geoscientist, State of Texas; lic. # 10386.
 - Engineer and support diver for deep cave diving project in east-central Mexico reaching world – records depths in submerged caves.
 - Geological Society of America member.
 - National Groundwater Association member
 - American Institute of Hydrology member.
 - National Speleological Society member (chair of University of Texas Chapter, 2001-2003).
 - Metal fabrication specializing in MIG welding techniques.
 - Emergency Medical Technician (EMT 1A): State of California and National Registry of Emergency Technicians.
 - Diver Medical Technician: National Board of Diving and Hyperbaric Technicians.
 - Cave diver: National Speleological Society – Cave Diving Section; National Association for Cave Diving.
 - USGS trained in water quality field methods for surface water and ground water.
 - Application of shallow sub-surface geophysical methods in hydrogeologic investigations.
 - High-precision mapping of karst features using GPS, LIDAR, SONAR, and ER geophysics
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SELECTED MEDIA ARTICLES RELATED TO RESEARCH

Nueces Turned Green for Science, not St. Paddy's: Uvalde Leader News, 2017, v. 137 no. 1, p. 1, 24.

Changing the World: Stories Celebrating 100 Years of Graduate Education at The University of Texas at Austin, University of Texas Press, 2010, p. 40-41.

Robot Seeks New Life – and New Funding – in the Abyss of Zacatón, **Science**, v. 315, no. 5810, p. 322-324.

Sinkhole Expert Says Curiosity Drives Him to Explore, **Earth/Sky: A Clear Voice for Science**, podcast aired on National Public Radio, June 13, 2007.

A Hydrobot's View into the Abyss, **Geotimes**, v. 52 no. 6, June 2007, p. 18-19.

The New Explorers: The Deep-Earth Diver, **Men's Journal**, v. 16, no. 9 (October 2007), p. 100.

Mexican Sinkhole May Lead NASA to Jupiter, **The Washington Post**, May 14, 2007, p. A06.

How Low Can Geologists Go?, **Geology.com**, June 6, 2007.

SELECTED FUNDED PROJECTS PRIOR TO EMPLOYMENT WITH ZARA ENVIRONMENTAL AND EDWARDS AQUIFER AUTHORITY

DEPTHX (The Deep Phreatic Thermal Explorer) (2004-2007) – Development and testing of autonomous underwater vehicle for exploring and characterizing deep underwater caves; Funding Organization – National Aeronautics and Space Administration
Funding amount - \$ 5,300,000.

Jacob's Well Springflow Monitoring (2005-2006) – Install and maintain continuous real-time gauge. Funding Organizations – Hays-Trinity Groundwater Conservation District / USGS
Funding Amount - \$ 120,000

San Marcos / Comal Springs Springflow Quantification (2006-2007) – Evaluate the application of Acoustic Doppler Velocity Meters to gauge spring flow.
Funding Organizations – Edwards Aquifer Authority / USGS
Funding Amount - \$ 175,000.

Jacob's Well Monitoring (2006-2008) – Continue monitoring of spring
Funding Organizations – Texas Commission for Environmental Quality / USGS
Funding amount - \$ 99,417.

SELECTED PROJECT REPORTS AT ZARA ENVIRONMENTAL

Edwards Aquifer Habitat Conservation Plan, Incidental Take Permit submitted to U. S. Fish and Wildlife Service, co-author of section on hydrogeology, December 31, 2011.

Groundwater Direct, Indirect, and Cumulative Effects – U.S. Highway 281 Environmental Impact Study, Bexar County; chapter sections prepared for Jacobs Engineering, January 12, 2011.

Geologic Assessment – U.S. Highway 281 Environmental Impact Study, Bexar County; report prepared for Jacobs Engineering, December 6, 2010.

Geologic Assessment – Loop 1604 Environmental Impact Study, Bexar County: report prepared for Michael J. Baker Jr., Inc., November 19, 2010.

Groundwater Technical Report; Spur 53, San Antonio Texas; report prepared for Texas Department of Transportation, June 25, 2010.

Hays County Karst Invertebrate Distribution and Cave Development, report prepared for Hays County and Texas Parks and Wildlife Department, July 15, 2010.

Groundwater Technical Report; Interstate Highway 10-Loop 1604 Interchange; report prepared for Cox/McClain, August 15, 2009.

Geologic Assessment – DPS Academy near Florence, Texas; report prepared for URS Corporation, November 15, 2008.

SELECTED PRESENTATIONS AND CONFERENCE SESSION CHAIRS

* invited speaker

Meeting chair and organizer, South Central Texas Water Research Interest Group, bi-annual meeting of regional water scientists, agencies, and stakeholders; December 3, 2019; June

3, 2019; December 4, 2018; June 5, 2018; December 6, 2017; June 2, 2017; December 1, 2016; June 9, 2016; December 3, 2015; June 4, 2015; December 4, 2014; June 4, 2014; December 12, 2013.

- * Hill Country Water Summit, New Braunfels, Texas, December 5, 2018, *Hydrogeologic Challenges of the Edwards and Trinity Aquifers*.
- * Sontek International Users Conference, Austin, Texas, October 3, 2018, *Application of Hydroacoustics to Characterize and Quantify Flow from Comal Springs, Texas, U.S.A.*
- * Texas Water Research Network, LBJ School of Public Affairs, September 13, 2018, *Facilitating Collaborative Groundwater Research in South-central Texas: Integrating GCD Perspectives to Address Multi-Aquifer Challenges*.
- Session Chair, Geological Society of America, Annual Convention, Seattle, Washington, *In Honor of John M. (Jack) Sharp Jr., Celebrating over 40 years of Science, Students, and Stewardship*, Session No. T13, October 22, 2017.
- Geological Society of America, Annual Convention, Seattle, Washington, October 22, 2017, *Correlation of Airborne Electromagnetic Geophysical Data with Karst Vadose Permeability*.
- * University of Texas at San Antonio, Masters Symposium, October 20, 2017, *Integration of UT's Karst Hydrogeology Field Class with EAA's Research Program*, San Antonio, Texas.
- South Central Texas Water Research Interest Group, December 3, 2015, *UT Applied Karst Hydrogeology: Integrating a university field course with an active EAA research initiative*, Bandera, Texas.
- Geological Society of America, Annual Convention, Baltimore, Maryland, November 3, 2015, *Hydrogeologic response to major floods on the Blanco River and Edwards-Trinity aquifers, central Texas, U.S.A.*
- * Session Chair, Symposium on the Application of Geophysics to Engineering and Environmental Problems, March 23, 2015, *Hydrogeophysics in the Edwards Aquifer – karst applications*, Austin, Texas.
- * The Explorers Club, Balance in Blue Conference, January 17, 2015, *The Role of Exploration in Hydrogeological Studies*, The Harte Institute, Corpus Christi, Texas.
- * Texas Master Naturalist Annual Workshop, November 5, 2014, *Hydrogeology of the Trinity and Edwards Aquifers in the Texas Hill County*, Kerrville, Texas.
- * Texas A&M University, October 16, 2014, *Groundwater Management in Texas: The Role of Conservation Districts*, Guest lecture for Dr. Brad Wilcox class, College Station, Texas.
- * Texas Invasive Species Coordinating Committee, July 9, 2014, *Evaluation of riparian water flux patterns: Upper Nueces, Sabinal, Frio, and Dry Frio Rivers, Texas in relation to the control of Arundo Donax*, Working committee update, TWDB, Austin, Texas.
- * The University of Texas at Austin, Bureau of Economic Geology, January 31, 2014, *Investigating the Edwards-Trinity Aquifer Interface: Designing a Comprehensive Study of a Complex Karst System*, BEG Friday Seminar Series, Austin, Texas.
- Session Chair, *A Tale of Two Aquifers: Deciphering Characteristics of the Edwards and Trinity Aquifers in Central Texas*, Geological Society of America South-central Section Annual meeting, Session No. 39, April 5, 2013.
- 13th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst, May 6, 2013, *Geophysical investigations of the Edwards-Trinity aquifer system at*

multiple scales: Interpreting airborne and direct-current resistivity in karst, Carlsbad, New Mexico.

Session Chair, *Interconnection of the Edwards and Trinity (Glen Rose) Aquifers*, U.S. Fish and Wildlife Karst Conservation Initiative, Austin, Texas, February 17, 2011

U.S. Fish and Wildlife Karst Conservation Initiative, February 17, 2011, *Spatial and temporal recharge variability related to groundwater interconnection of the Edwards and Trinity Aquifers, Camp Bullis, Bexar and Comal Counties, Texas*, Austin, Texas.

Session Chair, *Karst Hydrogeologic Systems of the Central United States and Northern Mexico*, Geological Society of America, 2010 North-central and South-central joint meeting, Branson, Missouri.

* Texas Speleological Association, 2010 Spring Convention, March 27, 2010, *3-D mapping and characterization of Sistema Zacatón from DEPTHX (Deep Phreatic Thermal Explorer)*, Cedar Park, Texas,.

* The University of Cincinnati Colloquium Lecturer Series, May 8, 2009, *Geologic and biologic discoveries at Sistema Zacatón: New technologies in underwater cave exploration*, Cincinnati, Ohio.

* State of Kentucky Student Technology Learning Program, May 6, 2009, *From underwater caves to outer space: A quest for extraterrestrial life*, Lexington, Kentucky.

* American Society of Civil Engineers, 11th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Aspects of Karst, September 23, 2008, *3-D mapping and characterization of Sistema Zacatón from DEPTHX (Deep Phreatic Thermal Explorer)*, Tallahassee, Florida.

* National Cave and Karst Research Institute distinguished lecturer series, January 3, 2008, *Geologic and biologic discoveries at Sistema Zacatón: New technologies in underwater cave exploration*, Carlsbad, New Mexico.

Special Session Chair, Geological Society of America, Annual Convention, Denver, CO, October 29, 2007, *The Deep Phreatic Thermal Explorer: Robotic exploration and characterization of Sistema Zacatón on the mission path to Europa*, Denver, Colorado.

* South Texas Geological Society, May 9, 2007, *From the aquifer to outer space: Unique underwater cave research in Mexico*, San Antonio, Texas.

* Geological Society of America, Annual Convention, Philadelphia, October 24, 2006, *Electrical resistivity imaging of travertine-capped sinkholes: deep lakes with lids*.

* Austin Geological Society, October 2, 2006, *Mysteries of Sistema Zacatón: A connection between caves, water, microbes and space*. Austin, Texas.

* Oklahoma State University, September 27, 2006, *Sistema Zacatón: exploring the deep underwater subsurface in search of microbial life*. Stillwater, Oklahoma.

* Texas State University, Geography 4334 class lecture (Rick Illgner, Inst.), August 31, 2006, *Principles of Hydrogeology*, San Marcos, Texas.

Hays Trinity Groundwater Conservation District, Water Conference to Pose Question: "Save it or Drain it?", August 18, 2006, *Jacob's Well Springflow, will it stop flowing?*, Wimberley, Texas.

* The Guadalupe-Blanco River Authority, May 22, *Springflow quantification pilot study*, Seguin, Texas, 2006.

- * The University of Texas Bureau of Economic Geology, Technical Seminar Series, February 17, 2006, *DEPTHX —Autonomous exploration of underwater caves as a path to search for life on Europa*. Austin, Texas.
 - * The Universidad Autonoma de Nuevo Leon Facultad de la Ciencias Tierras, XII Semana Nacional de Ciencia y Technologica, , October 24, 2005, *Exploración y Investigación del Sistema Zacatón: Pasado, Presente y Futuro*. Linares, Nuevo Leon, Mexico.
 - * Texas Water Development Board, April 8, 2005, *Deep Phreatic Thermal Explorer – DEPTHX: Exploring and characterizing deep karst aquifers*. Austin, Texas.
 - * VII Congreso Nacional de Espeleología UMAE, February 22, 2005, *Exploración y Investigación del Sistema Zacatón: Pasado, Presente y Futuro*, Monterrey, Nuevo Leon, Mexico.
 - Geological Society of America, Annual Convention, November 8, 2004, *Preliminary analysis of microbial habitats and geochemical conditions of Sistema Zacatón, Mexico*. Denver, Colorado.
 - Blanco Watershed Summit, Wimberley Valley Watershed Association and the Texas Watch program at Texas State University, July 17, 2004, *Monitoring Springs in Karst Aquifers: Continuous Data for ground-water analysis*, San Marcos, Texas.
 - * Texas Water Development Board, September 2, 2003, *Research Diving in Texas and Mexico: Collecting data in the underwater environment*, Austin, Texas.
 - Texas Speleological Association Annual Convention, May 3, 2003, *Estudios de Profundidad: Where we are, where we've been, and where we're going*, Boerne, Texas.
 - Environmental Science Institute, The University of Texas at Austin, Border Environment Conference, February 23, 2002, *Goodenough to Investigate: Requantifying Discharge and Quality of Texas' Third Largest Spring, Goodenough Springs*, Austin, Texas.
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PUBLICATIONS AND ABSTRACTS

- Smith, B.A., Hunt, B.B., Gary, M.O., Wierman, D.A., Watson, J.A., 2020, Springshed delineation in a karst aquifer in Hays County, central Texas; Proceedings of the 16th Sinkhole Conference, NCKRI Symposium 8, pp. 255-268. doi <https://doi.org/10.5038/9781733375313.1048>
- Gary, M.O.**, Hunt, B.B., Smith, B.A., Watson, J.A., and Wierman, D.A., 2019, Evaluation for the Development of a Jacob's Well Groundwater Management Zone Hays County, Texas. Technical Report prepared for the Hays Trinity Groundwater Conservation District, Hays County, Texas. Meadows Center for Water and the Environment, Texas State University at San Marcos, TX. Report: 2019-05. July 2019. 58 p.
- Hunt, B.B., Smith, B.A., **Gary, M.O.**, Wierman, D.A., Watson, J.A., 2018, Sustainable yield of Jacob's Well Springshed, Middle Trinity Aquifer, Wimberley, Texas; Geological Society of America 2018 Annual Meeting, Indianapolis, Indiana, Paper No. 75-5.
- Smith, B.A., Hunt, B.B., Wierman, D.A., **Gary, M.O.**, 2018, Groundwater flow in multiple karst aquifers of central Texas, 15th Multi-disciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst, Shepherdstown, West Virginia, April 2-4, 2018.

- Green, R.T., **Gary, M.O.**, Bertetti, P.F., Fratesi, B., Toll, N.J., 2017, Use of field measurement, field-scale experiments, and water-budget analysis to determine diffuse recharge and infiltration on karst terrains; Geological Society of America, 2017 Annual Meeting, Seattle, Washington, Paper No. 37-6.
- Gary, M.O.**, Smith, D.V., 2017, Correlation of airborne electromagnetic geophysical data with karst vadose permeability, Geological Society of America, 2017 Annual Meeting, Seattle, Washington, Paper No. 37-7.
- Caldwell, T.G., Bongiovanni, T., Young, M.H., **Gary, M.O.**, 2017, Quantifying diffuse recharge to the Edwards Aquifer using micro-meteorology and remote sensing, Geological Society of America, 2017 Annual Meeting, Seattle, Washington, Paper No. 37-8.
- Hackett, C.C., **Gary, M.O.**, Rempe, D.M., 2017, Quantifying alluvium effects on karst aquifer recharge: Shallow groundwater and surface water exchange in the upper Nueces River, Texas, Geological Society of America, 2017 Annual Meeting, Seattle, Washington, Paper No. 37-10.
- Hunt, B.B., Smith, B.A., **Gary, M.O.**, Broun, A.S., Wierman, D.A., Watson, J., Johns, D., 2017, Surface water and Groundwater interactions in the Blanco River and Onion Creek watersheds: Implications for the Trinity and Edwards aquifers of central Texas, Bulletin of the South Texas Geological Society, Vol. 57, no. 5, pp. 33-53.
- Gary, M.O.**, 2017, Sistema Zacatón, México: Volcanically controlled hypogenic karst, *Hypogenic Karst and Caves of the World*, eds. Klimchouk, A., Palmer, A.N., Audra, P., Auler, A.S., De Waele, J., Springer International Publishing, DOI 10.1007/978-3-319-53348-3, pp. 769-782.
- Schindel, G.M., **Gary, M.O.**, 2017, Hypogene processes in the Balcones Fault Zone Segment of the Edwards Aquifer of south-central Texas, *Hypogenic Karst and Caves of the World*, eds. Klimchouk, A., Palmer, A.N., Audra, P., Auler, A.S., De Waele, J., Springer International Publishing, DOI 10.1007/978-3-319-53348-3, pp. 647-652.
- Smith, B.A., Hunt, B.B., Andrews, A., Watson, J.A., **Gary, M.O.**, Wierman, D.A., Broun, A.S., 2015, Surface water-groundwater interactions along the Blanco River of central Texas, USA, *Environmental Earth Science*, v. 74, pp. 7633-7642.
- Gary, M.O.**, Hunt, B. B., Johnson, S., 2015, Hydrogeologic response to major floods on the Blanco River and Edwards – Trinity Aquifers, Central Texas, U.S.A., Geological Society of America Abstracts with Programs, 2015 Annual Meeting, Baltimore, Maryland.
- Hunt, B.B., Smith, B.A., Andrews, A., Wierman, D.A., Broun, A.S., and **Gary, M.O.**, 2015, Relay ramp structures and their influence on groundwater flow in the Edwards and Trinity Aquifers, Hays and Travis Counties, Central Texas, Proceedings of the 14th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst, National Cave and Karst Research Institute Symposium 5, pp. 189-200.
- Kromann, J.S., Sharp, J.M., and **Gary, M.O.**, 2014, Surface water recharge in karst: Nueces River system, Geological Society of America Abstracts with Programs, 2014 Annual Meeting, Vancouver, British Columbia.
- Smith, B.A., Hunt, B.B., Andrews, A.G., Watson, J.A., **Gary, M.O.**, Wierman, D.A., and Broun, A.S., 2014, Hydrologic influences of the Blanco River on the Trinity and Edwards Aquifers, Central Texas, USA, in *Hydrogeological and Environmental Investigations in Karst*

- Systems, (Eds) B. Andreo, F. Carrasco, J. Duran, P. Jimenez, and J. LaMoreaux, Environmental Earth Sciences, Springer Berlin Heidelberg, Volume 1, pp 153-161.
- Watson, J.A., Hunt, B.B., **Gary, M.O.**, Wierman, D.A., Smith, B.A., 2014, Potentiometric surface investigation of the Middle Trinity Aquifer in western Hays County, Texas: BSEACD Report of Investigations 2014-1002, October 2014, 21 p.
- Gary, M.O.**, Rucker, D.F., Smith, B.D., Smith, D.V., Befus, K., 2013, Geophysical investigations of the Edwards-Trinity aquifer system at multiple scales: Interpreting airborne and direct-current resistivity in karst, Proceedings of the 13th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst, National Cave and Karst Research Institute Symposium 2, pp. 195-206.
- Smith, D.V., Smith, B.D., Deszcz-Pan, M., **Gary, M.O.**, Clark, A., 2013, Reprocessing and interpretation of helicopter electromagnetic data over the Edwards and Trinity aquifer interface in northern Bexar County, Texas, Symposium on the Application of Geophysics to Engineering and Environmental Problems, Denver, Colorado.
- Hunt, B.B., Norris, C., **Gary, M.O.**, Wierman, D.A., Broun, A.S., Smith, B.A., 2013, Pleasant Valley Spring: A newly documented karst spring of the Texas Hill Country Trinity Aquifer, Geological Society of America Abstracts with Programs, South-central Section Annual Meeting, Austin, Texas.
- Johnson, S., Schindel, G., Veni, G., Hauwert, N., Hunt, B.B., Smith, B.A., and **Gary, M.O.**, 2012, Tracing groundwater flowpaths in the vicinity of San Marcos Springs, Texas: Edwards Aquifer Authority, San Antonio, Texas, August 2012, 139 p.
- Gary, M.O.**, 2011, Volcanogenic karst processes at Sistema Zacatón: Forming mega-porosity in a hypogene setting, Carbonate Geochemistry: Reactions and processes in aquifers and reservoirs, Karst Waters Institute, Billings, MT. p. 52-55.
- Gary, M.O.**, 2011, Interconnection of the Edwards and Trinity Aquifers, central Texas, U.S.A., 2011 International conference on karst hydrogeology and ecosystems proceedings, Bowling Green, Kentucky, p. 89.
- Gary, M.O.**, Doctor, D.H., Sharp, J.M., Jr., 2011, Aqueous geochemical evidence of volcanogenic karstification: Sistema Zacatón, Mexico, U.S. Geological Survey Karst Interest Group proceedings, Fayetteville, Arkansas, April 26–29, 2011: U.S. Geological Survey Scientific Investigations Report 2011–5031, p. 35.
- Sahl, J.W., **Gary, M.O.**, Harris, J.K., Spear, J.R., 2011, A comparative molecular analysis of water-filled sinkholes in north-eastern Mexico, Environmental Microbiology, v. 13, no. 1, p. 226-240.
- Gary, M.O.**, Shade, B., Gary, R.H., Veni, G., 2010, Spatial and temporal recharge variability related to groundwater interconnection of the Edwards and Trinity aquifers, Camp Bullis, Bexar and Comal Counties, Texas, Geological Society of America Abstracts with Programs, 2010 Joint Annual Meeting, Denver, Colorado.
- Zappitello, S.J., **Gary, M.O.**, Cowen, B., 2010, Geologic and anthropogenic controls on carbon dioxide in Edwards and Trinity limestone caves, Bexar County, Texas, Geological Society of America Abstracts with Programs, 2010 Joint Annual Meeting, Denver, Colorado.
- Meyer, N.C., **Gary, M.O.**, Spatial density analysis of karst diagenesis and aquifer recharge sensitivity, Edwards Aquifer, Texas, Geological Society of America Abstracts with Programs, 2010 Joint Annual Meeting, Denver, Colorado.

- Gary, M.O.**, 2010, Karst hydrogeology and speleogenesis of Sistema Zacatón, Association of Mexican Cave Studies, Austin, Texas, Bulletin 21, 114 p.
- Gary, M.O.**, 2010, Karstification of the Sierra Madre Oriental: A hydrogeologic record of regional diagenesis, Geological Society of America, 2010 North-central and South-central joint meeting abstracts with programs, Branson, Missouri, p. 70 (20-6).
- Swartz, B., Doctor, D.H., **Gary, M.O.**, 2010, Quantifiable characteristics for a statistical approach toward karst classification, Geological Society of America, 2010 North-central and South-central joint meeting, Branson, Missouri.
- Gary, M.O.**, 2010, Karst Hydrogeology and speleogenesis of Sistema Zacatón, The University of Texas at Austin Ph.D. dissertation, 232 pp.
- Gary, M.O.**, Sharp, J.M., Jr., 2009, Volcanogenic karstification: Implications of this hypogene process, National Cave and Karst Research Institute Symposium 1, Advances in Hypogene Karst Studies, p. 27-39.
- Stafford, K. W., Land, L., Klimchouk, A., **Gary, M.O.**, 2009 , The Pecos River Hypogene Speleogenetic Province: A New Basin-Scale Karst Paradigm for Eastern New Mexico and West Texas, National Cave and Karst Research Institute Symposium 1, Advances in Hypogene Karst Studies, p. 121-135.
- Gary, M.O.**, Halihan, T., Sharp, J.M., Jr., 2009, Detection of sub-travertine lakes using electrical resistivity imaging, Sistema Zacatón, Mexico, 15th International Congress of Speleology Proceedings, Kerrville, Texas, p. 575-579.
- Gary, M.O.**, Sahl, J., Bennett, P.C., Spear, J., Sharp, J.M., Jr., 2009, Aqueous geochemical environments of Sistema Zacatón, 15th International Congress of Speleology Proceedings, Kerrville, Texas, p. 370.
- Sahl, J., Harris, J.K., **Gary, M.O.**, Stone, W.C., Spear, J., 2009, An autonomous robotic exploration of deep phreatic sinkholes reveals a wealth of microbial diversity, 15th International Congress of Speleology Proceedings, Kerrville, Texas, p. 408-409.
- Doctor, D. H., Schwartz, B. F., **Gary, M. O.**, 2009, Preliminary development of a quantitative karst classification system, PHORMS, 15th International Congress of Speleology Proceedings, Kerrville, Texas, p. 843-848.
- Gary, M.O.**, Sharp, J.M., Jr., 2008, Volcanogenic karstification: Implications of this hypogene process, Geological Society of America Abstracts with Programs, 2008 Joint Annual Meeting, Houston, Texas, p. 343.
- Gary, M.O.**, Fairfield, N., Stone, W.C., Wettergreen, D, Kantor, G., Sharp, J.M., Jr., 2008, 3-D mapping and characterization of Sistema Zacatón from DEPTHX (Deep Phreatic Thermal Explorer), Proceedings of the 11th Multidisciplinary Conference on Sinkholes and the Engineering and Environmental Impacts of Karst, American Society of Civil Engineers Geotechnical Special Publication no. 183, pp. 202-212.
- Kiesling, R.L., Gary, R.H., and **Gary, M.O.**, 2008, Monitoring indicators of harmful Cyanobacteria in Texas: U.S. Geological Survey Fact Sheet 2008–3009, 2 p.
- Gary, M.O.**, Gary, R.H., Asquith, W.A., 2008, Evaluation of acoustic Doppler velocity meters to quantify flow from Comal Springs and San Marcos Springs, Texas, USGS Scientific Investigations Report 2008-5083, 37 p.
- Ramirez Fernandez, J.A., Velasco Tapia, F., Viera Decida, F., Vasconcelos Fernandez, J.M., **Gary, M.O.**, 2007, Tertiary interplate mafic magmatism in the Eastern Mexican alkaline province :

- Villa Aldama volcanic complex, Geological Society of America abstracts with programs, 2007 Annual Meeting, Denver, p. 390.
- Engel, A.S., Northup, D.E., **Gary, M.O.**, Gonzales, B.C., Gonzales, J., Hutchens, E., Jones, D., Macalady, J.L., Spear, J.R., Spilde, M., 2007, Focus group on caves and karst as model systems in geomicrobiology, *Frontiers in Karst Research* (book), Chapter 3, Karst Waters Institute, Martin, J.B., White, W.B. eds., pp. 90-95.
- Gary, M.O.**, 2007, Establishing Temporal Trends: The first two years of continuous monitoring at Jacob's Well Spring, Woodcreek, Texas, 15th National Nonpoint Source Monitoring Workshop, Texas Commission for Environmental Quality, Austin, Texas.
- Gary, M.O.**, Sharp, J.M., Jr., Halihan, T., and Ramirez Fernandez, J.A., 2007, Mammoth discovery: Paleontological and geophysical evidence for timing and sequence of karstification at Sistema Zacatón, Mexico: *Geol. Soc. America, Abs. with Programs (South-Central Sec. Mtg.)*, v. 39, no. 3, p. 28.
- Caramana, G., **Gary, M.O.**, 2006, Applicazioni di metodologie di immersione scientifica e ROV (Remote, Operated, Vehicle) nello studio geologic comparator die due sinkholes allagatie piú profondi del pianeta: Pozzo del Merro (Lazio, Italia Centrale), El Zacatón (Tamaulipas, Messico), Italian Institute for Environmental Protection and Research, http://www.apat.gov.it/site/_files/sinkhole/211_228.pdf
- Gary, M.O.**, Asquith, W.A., 2006, Karst spring monitoring using acoustic Doppler velocity data, Geological Society of America, 2006 Philadelphia Meeting, Topical Session T74, paper 74-3.
- Gary, M.O.**, Halihan, T., Sharp, J.M., Jr., Mouri, S., Thorstad, J., 2006, Electrical resistivity imaging of travertine-capped sinkholes: deep lakes with lids, Geological Society of America, 2006 Philadelphia Meeting, Topical Session T65, paper 218-4.
- Gary, M.O.**, Ramirez Fernandez, A.J., Sharp, J.M., Jr., 2006, Limestone dissolution driven by volcanic activity, Sistema Zacatón, México, XII Symposium on Vulcanospeleology, Tepoztlan, México, Program and Abstracts, p. 13.
- Gary, M.O.**, Sharp, J.M., Jr., 2006, Volcanogenic Karstification of Sistema Zacatón, Geological Society of America Special Paper 404: Harmon, R., Wicks, C. eds., pp. 79-89.
- Gary, M.O.**, Fairfield, N., Stone, W.C., Wettergreen, D., Kantor, G., Sharp, J.M., Jr., 2006, DEPTHX: Underwater mapping and imaging of deep karst shafts, American Association of Petroleum Geologists Annual Meeting, Houston technical program.
- Gary, M.O.**, Asquith, W.A., 2005, Monitoring Springs in Karst Aquifers, National Ground Water Association, Ground Water Summit Program and Abstract Book, San Antonio, p. 241.
- Asquith, W.A., **Gary, M.O.**, 2005, Acoustic Doppler velocity monitoring within Main Barton Spring, Barton Springs, Austin, Texas, April-September 2004 – enhancing the accuracy of springflow data, USGS Fact Sheet 2005-3044, pp. 1-4.
- Gary, M.O.**, 2005, Exploración y Investigación del Sistema Zacatón: Pasado, Presente y Futuro, VII Congreso Nacional de Espeleología UMAE, pp. 22-26.
- Gary, M.O.**, 2004, Preliminary analysis of microbial habitats and geochemical conditions of Sistema Zacatón, Mexico, Geological Society of America, 2004 Denver Annual Meeting, Abstracts with Programs v. 36 no. 5, p. 259
- Gary, M.O.**, 2004, Monitoring springs in karst aquifers, Abstract, Blanco Watershed Summit, Wimberly Valley Watershed Association, San Marcos, Texas.

- Gary, M.O.**, Asquith, W.H., Turnipseed, D.P., 2003, Using acoustic Doppler velocities to index the surface-water – ground water interface in Barton Springs, Edwards Aquifer, Central Texas, USGS Surface Water Conference Proceedings, San Antonio, p. 34.
- Gary, M.O.**, Sharp, J.M.Jr., Caramana, G., Havens, R.H., 2003, Volcanically Influenced Speleogenesis: Forming El Sistema Zacatón, Mexico and Pozzo Merro, Italy, the Deepest Phreatic Sinkholes in the World, Geological Society of America, 2003 Seattle Annual Meeting Abstracts with Programs v. 34, no. 7, p. 52.
- Van Metre, P.C., Wilson, J.T., Harwell, G.R., **Gary, M.O.**, Heitmuller, F.T., Mahler, B.J., 2003, Occurrence, trends, and sources in particle-associated contaminants in selected streams and lakes in Fort Worth, Texas, USGS Water-Resources Investigations Report 03-4169, 154 p.
- Gary, M.O.**, Sharp, J.M.Jr., Havens, R.H., Stone, W.C., 2003, Sistema Zacatón: Identifying the connection between volcanic activity and hypogenic karst in a hydrothermal phreatic cave system, *Geo²*, Section of Cave Geology and Geography of the National Speleological Society, Volume 29, No. 3 & 4, pp. 1-14.
- Mahler, B.J., Canova, M.G., **Gary, M.O.**, 2002, Occurrence of selected volatile organic compounds and soluble pesticides in Texas public water-supply source waters, 1999-2001, USGS Fact Sheet 020-02, pp. 1-4.
- Gary, M.O.**, 2002, "Understanding Zacatón: Exploration and initial Interpretation of the world's deepest known phreatic sinkhole and related karst features", *Hydrogeology and Biology of Post-Paleozoic Carbonate Aquifers*, Karst Waters Institute Special Publication #7, pp. 141-145.
- Mahler, B.J., **Gary, M.O.**, Canova, M.G., Strom, E.W., Fahlquist, L, Dorsey, M.E., 2002, Volatile organic compound and pesticide data for public water-supply reservoirs and wells, Texas, 1999-2001, USGS Open-File Report 02-093, 105 p.
- Gary, M.O.**, Stone W.C., 2002, Creating a multi-sourced, high resolution 3-D karst aquifer model using LADAR, SONAR, and Earth Resistivity datasets, Terrain Analysis for Water Resources Applications Symposium, University of Texas Center for Research in Water Resources, December 16-20, Austin, Texas, <http://www.crwr.utexas.edu/terrainAnalysis/abstracts.cfm>.
- Gary, M.O.**, 2001, Los Cenotes de Rancho La Azufrosa, Association of Mexican Cave Studies Activities Newsletter, Vol. 24, pp. 31-38.
- Gary, M.O.**, 2000, Speleogenesis of Zacatón and cenotes of Rancho La Azufrosa, Proceedings of the 20th Annual Symposium/American Academy of Underwater Sciences, October, 2000, p. 55-56.
- Gary, M.O.**, 2000, Genesis and Evolution of Massive Cenotes, Tamaulipas, Mexico, Abstracts Geological Society of America South-Central Region Annual Meeting, Fayette, Arkansas. p. 39.