

# LARRY D. McKAY

## Jones Professor of Hydrogeology

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## Education

1992 PhD, Earth Sciences, University of Waterloo, Ontario, Canada  
1981 Bachelors of Applied Science, Geological Engineering, Univ. of British Columbia

## Appointments and Professional Experience

2004-present *Jones Professor of Hydrogeology*, Dept. Earth & Planetary Sciences, Univ. of TN  
2009-2017 *Head*, Department of Earth & Planetary Sciences, Univ. of Tennessee  
2004-2007 *Associate Head*, Department of Earth and Planetary Sciences, Univ. of Tennessee  
1998-2004 *Jones Associate Professor of Hydrogeology*, Dept. of Geol. Sci. Univ. of TN  
1993-1998 *Jones Assistant Professor of Hydrogeology*, Dept. of Geol. Sci., Univ. of TN  
1992 *Post-doctoral Researcher*, Geological Survey of Denmark, Copenhagen  
1981-1986 *Consulting Engineer* in western Canada and South America on groundwater supply, geotechnical, and mining-related projects

## Academic Awards and Scholarships

2011 Elected *Fellow of the American Assoc. for the Advancement of Science (AAAS)*  
2009 Elected *Fellow of the Geological Society of America (GSA)*  
2008-09 *Geological Society of America, Birdsall-Dreiss Distinguished Lecturer*. Visited ~55 universities or research institutes in the U.S., Canada, Europe, etc.  
2000 UT College of Arts and Sciences *Junior Faculty Research Award*  
1998 UT Chancellor's Award for *Professional Promise in Research*  
1996-2001 UT/ORNL Science Alliance *Faculty Research Awards* (\$5000/yr)  
1988-1990 Natural Sciences & Eng. Research Council (NSERC) - *Postgraduate Scholarship*  
1986-1987 NALACO/Canadian Council of Professional Engineers Scholarship  
1981 Dr. A.E. Aho Memorial *Award for Academic Excellence*

## Professional Registration and Membership

1984-2017 *Registered Professional Engineer*, Association of Professional Engineers and Geoscientists of British Columbia, Canada  
Currently Member of the American Association for the Advancement of Science (AAAS), American Geophysical Union (AGU), Consortium of Universities for the Advancement of Hydrologic Sciences (CUAHSI), Geological Society of America (GSA), International Association of Hydrogeologists (IAH), National Ground Water Association (NGWA), and the East Tennessee Geological Society (ETGS)

## **Scholarly Interests**

### ***Paleofloods and Paleoclimate***

I am currently involved in research on paleo-flood deposits on the Tennessee River and its tributaries to determine the frequency and stage of major floods in the late Holocene (150 to 3000 years B.P.). This work involves sampling sediments in backwaters and terraces to re-construct the history of major flood events. Timing of flood events is determined using radiocarbon dating of organic matter in buried soil horizons. The data is used to improve flood risk prediction for nuclear power plants and is funded by the Electric Power Research Institute, with TVA support. A related project focuses on contamination from industrial sources in Chattanooga and Knoxville. For this project, students identify urban areas with rapid flood deposition based on GIS studies of the geomorphology and age dating using cesium-137. The sediments are then tested for industrial contaminants that are commonly found in streams, such as PAH's, PCB's, lead and chromium.

### ***Groundwater flow and contaminant transport in fractured clay-rich sediments***

One of my principal research interests is the hydrogeology of fine-grained, highly weathered and fractured media. This began with research on the influence of fractures on groundwater flow and contaminant transport in glacial tills in Ontario and Denmark, then continued with a focus on fine-grained residuum in east Tennessee. Projects include fundamental research on the origin of fractures and macropores on hydraulic conductivity and groundwater flow. I am also involved in research on transport and remediation of contaminants in fractured, clay-rich sediments, including research at field sites on the DOE Oak Ridge Reservation and the former Volunteer Army Ammunition Plant in Chattanooga.

### ***Microbial fate and transport in Groundwater and Surface Water***

I carried out field experiments on transport of solutes, colloidal particles, bacteriophage and bacteria in fractured glacial clays in Canada and Denmark, as well as in fractured clay-rich residual soils in east Tennessee. These experiments demonstrated that fractured clay soils provide much less protection against microbial contamination than commonly thought. In recent years, the research was expanded, in collaboration with Dr. Alice Layton (UT-CEB) to include investigations of microbial water quality in groundwater in east Tennessee, as well as a study of the impact of latrines and sewage ponds on water quality in wells in rural Bangladesh.

### ***Career Planning, Undergraduate Education, Diversity and Outreach***

I am strongly committed to helping our students, through teaching and scholarly activities, such as funded projects aimed at improving the student experience. I teach two courses in career planning: a PhD level 3-credit course on Academic & Research Career Planning in Science and Engineering (with Prof. Terry Hazen), and a 1-credit undergraduate course on Career Planning for Science Majors. I presented talks on the courses at several conferences and a number of universities. I plan to submit a paper on this work to the Journal of Earth Science Education. I also received a major (\$416K) research grant from NSF in 2015 for "Engagement of students and faculty at community colleges to enhance recruitment to 4-year geoscience programs". I have also worked on several projects funded by NSF and NIEH aimed at community environmental education/outreach or increasing diversity in geoscience and environmental programs.

## Peer-reviewed Journal Publications

(69 published, Web of Science h-index = 22)

- Gates, C., E. Perfect, B. Lokitz, J. Brabazon, L.D. McKay, J. Tyner, 2018, Transient analysis of advancing contact angle measurements on polished rock surfaces, *Advances in Water Resources*. doi:10.1016/j.advwatres.2018.03.017
- Paradis, C.J., E.R. Dixon, L.M. Lui, A.P. Arkin, J.C. Parker, J.D. Istok, E. Perfect, L.D. McKay, T.C. Hazen, 2018, Improved analytical model for predicting mixing-adjusted breakthrough curves during push-pull tests, *Ground Water*. doi:10.1111/gwat.12770.
- Paradis, C.J., L.D. McKay, E. Perfect, J. Istok, T.C. Hazen, 2017, Push-pull tests for estimating effective porosity: Expanded analytical solution and in situ application, *Hydrogeology Journal*. DOI 10.1007/s10040-017-1672-3.
- Cheng, C., S.C. Cropper, E. Perfect, L.D. McKay, M. Kang, 2017, Upscaling capillary pressure-saturation functions using different reference pressure elevations, *Vadose Zone J.* 16(8), doi:10.2136/vzj2017.03.0054
- Cropper, S.C., E. Perfect, C. Cheng, L.D. McKay, 2017, Evaluation of TrueCell program for estimating point capillary pressure – saturation parameters for flint sand, *Geoderma*, 287, 90–97.
- Vulava, V., S. Vaughn, L.D. McKay, S.G. Driese, L.W. Cooper, F. Menn, N. Levine, G.S. Sayler, 2016, Flood-induced transport of PAHs from streambed coal tar deposits, *Science of the Total Environment*. <http://dx.doi.org/10.1016/j.scitotenv.2016.09.222>
- Donnelly, B., E. Perfect, L.D. McKay, P.J. Lemiszki, V.H. DiStefano, L.M. Anovitz, J. McFarlane, R.E. Hale, and C-L. Cheng, 2016, Capillary pressure-saturation relationships for gas shale’s measured using a water activity meter, *J. of Natural Gas Science and Engineering*, <http://dx.doi.org/10.1016/j.jmgse.2016.05014>.
- Paradis, C.J., S. Jagadamma, D.B. Watson, L.D. McKay, T.C. Hazen, M. Park, J.D. Istok, 2016, In situ mobility of uranium in the presence of nitrate following sulfate-reducing conditions, *J. Contaminant Hydrology*, v. 187, 55-64.
- Cheng, C.L., E. Perfect, B. Donnelly, H.Z. Bilheux, A.S. Tremsin, L.D. McKay, V.H. DiStefano, J.C. Cai, and L.J. Santodonato, 2015, Rapid imbibition of water in fractures within unsaturated sedimentary rock, *Advances in Water Resources*, v. 77, 82-89, doi:10.1016/j.advwatres.2015.01.010.
- Layton, A., A. Chauhan, D. Williams, B. Mailloux, P. Knappett, A. Ferguson, L.D. McKay, Md. J. Alam, Kazi Matin Ahmed, A. van Geen, G. Sayler, 2014, Metagenomes of microbial communities in arsenic and pathogen contaminated well and surface water from Bangladesh, *Genome Announcements*, v. 2, 6, November/December.
- Roy, A., E. Perfect, W.M. Dunne and L.D. McKay, 2014, A technique for revealing scale-dependent patterns in fracture spacing data, *J. Geophys. Res. Solid Earth*, 119, doi:10.1002/2013JB010647.
- Cheng, C., M. \*Gragg, E. Perfect, M.D. White, P.L. Lemiszki, and L.D. McKay, 2013, Sensitivity of injection costs to input petrophysical parameters in numerical geologic carbon sequestration models, *Intl. Journal of Greenhouse Gas Control*, v. 18, 277-284.
- Dere, A.L., T.S. White, R. April, B. Reynolds, T. Miller, E. Knapp, L.D. McKay, and S. L. Brantley, 2013, Climate dependence of feldspar weathering in shale soils along a latitudinal gradient, *Geochimica et Cosmochimica Acta*,

doi.org/10.1016/j.gca.2013.08.001.

- Knappett, P., L.D. McKay, A. Layton, D. Williams, M. Alam, B. Mailloux, A. Ferguson, P. Culligan, M. Serre, M. Emch, K. Matin Ahmed, G. Sayler & A. van Geen, 2012, Unsealed tubewells lead to increased contamination of drinking water, *J. of Water and Health*, v. 10, no. 4, 565-578.
- Ferguson, A.S., A. Layton, B. Mailloux, P. Culligan, D. Williams, A. Smartt, G. Sayler, J. Feighery, L.D. McKay, P. Knappett, E. Alexandrova, T. Arbit, M. Emch, V. Escamilla, K. Matin, M. Alam, P. Streatfield, M. Yunus, A. van Geen, 2012, Comparison of fecal indicators with pathogenic bacteria and rotavirus in groundwater, *Science of the Total Environment*, vol. 431, 314-322.
- Lavoie, B., M. Mayes and L.D. McKay, 2012, Transport of explosive residue surrogates in saturated porous media, *Water, Air & Soil Pollution*, Vol. 223, No. 5, 1983-93.
- Vulava, V., L.D. McKay, M. Broholm, J. McCarthy, S. Driese and G. Sayler, 2012, Dissolution and transport of coal tar compounds in fractured clay-rich residuum, *J. of Hazardous Materials*, vol. 203, 283-289.
- Knappett, P., L.D. McKay, A. Layton, D. Williams, M. Alam, M. Huq, J. Mey, J. Feighery, P. Culligan, B. Mailloux, J. Zhuang, V. Escamilla, M. Emch, E. Perfect, G. Sayler, K. Matin Ahmed, A. van Geen, 2011, Implications of fecal bacteria input from latrine-polluted ponds to sandy aquifers, *Environ. Sci. Technol.*, vol. 46, No. 3, 1361-1370.
- Wu, J., A. van Geen, K. Ahmed, Y. Akita, Md. J. Alam, P. Culligan, V. Escamilla, J. Feighery, A. Ferguson, P. Knappett, B. Mailloux, L.D. McKay, M. Serre, P.K. Streetfield, Md. Yunus, M. Emch, 2011, Increase in diarrheal disease associated with arsenic mitigation in Bangladesh, *PLoS-One*, Vol. 6, No. 12, e29593.
- Ferguson, A., B. Mailloux, K. Ahmed, A. van Geen, L.D. McKay, and P. Culligan, 2011, Hand pumps as reservoirs for microbial contamination of well water, *Journal of Water and Health*, vol. 9, issue 4, 708-717.
- Knappett, P., V. Escamilla, A. Layton, L.D. McKay, M. Emch, D. Williams, Md. R. Huq, Md. J. Alam, L. Farhana, B. Mailloux, A. Ferguson, G. Sayler, K. M. Ahmed and A. van Geen, 2011, Impact of population and latrines on fecal contamination of ponds in rural Bangladesh *Science of the Total Environment*, vol. 409, issue 17, 3174-3182
- Driese, S., Schultz, B., and L.D. McKay, 2011, Genesis of clay-rich soils from carbonate bedrock on upland surfaces in the valley and ridge province in eastern TN, U.S.A., *Southeastern Geology*, v. 48, No. 1, 1-22.
- van Geen, A., K.M. Ahmed, Y. Akita, Md. J. Alam, P.J. Culligan, J. Feighery, A. Ferguson, M. Emch, V. Escamilla, P. Knappett, A. Layton, B. Mailloux, L.D. McKay, J. Mey, M. Serre, P. Streatfield and M. Yunus, 2011, Fecal contamination of shallow tubewells in Bangladesh inversely related to arsenic, *Environmental Science & Technology*, Vol. 45, No. 4, 1199-1205.
- McKay, L.D., 2011, Foreword: Pathogens and fecal indicators in groundwater, *Ground Water*, vol. 49, no. 1, 1-3.
- Tithof, P.K., S.M. Richards, M. Algayyar, F. Menn, V. Vulava, L.D. McKay, J. Sanseverino, G. Sayler, D. Tucker, C. Leslie, K. Lu and K. Ramos, 2011, Activation of group IVC phospholipase A<sub>2</sub> by polycyclic aromatic hydrocarbons induces apoptosis of human coronary artery endothelial cells, *Archives of Toxicol.*, Vol. 85, No. 6, 623-634.
- Johnson, T., L.D. McKay, A. Layton, G. S. Fout, S. Jones, G. Johnson, J. Cashdollar, D. Ahling, L. Villegas, D. Williams and G. Sayler, 2011, Viral and bacterial contamination in karst

- aquifers in eastern Tennessee, U.S.A., *Ground Water*, Vol. 49, No. 1, 98-110.
- Knappett, P., A. Layton, L.D. McKay, D. Williams, B. Mailloux, Md. R. Huq, Md. J. Alam, K. Matin Ahmed, Y. Akita, M. Serre, G. Sayler, and A. van Geen, 2011, Effectiveness of ultrafiltration for sampling microorganisms in ground water, *Ground Water*, Vol. 49, No. 1, 53-65.
- Driese, S.G., G.A. Ludvigson, J.A. Roberts, D.A. Fowle, L.A. González, J.J. Smith, V.M. Vulava and L.D. McKay, 2010, Micromorphology and stable isotope geochemistry of historical pedogenic siderite formed in PAH-contaminated alluvial clay soils, Tennessee, USA, *J. of Sedimentary Research*, v. 80, 943-954.
- Zhuang, J., N. Goeppert, C. Tu, J. McCarthy, E. Perfect, and L.D. McKay, 2010, Colloid transport with wetting fronts: Interactive effects of solution surface tension and ionic strength, *Water Research*. Vol. 44, Issue 4, 1270-1278.
- Mayes, M.A., G. Tang, P. Jardine, L.D. McKay, X. Yin, M. Pace, J. Parker, F. Zhang, T. Melhorn, R. Dansby-Sparks, 2009, Influence of sedimentary bedding on reactive transport parameters under unsaturated conditions, *Soil Sci. Soc. America Journal*, 73:1938-1946.
- Bell, A., A. Layton, L.D. McKay, D. Williams, R. Gentry and G. Sayler, 2009, Factors influencing the persistence of fecal *Bacteroides* in stream water, *J. of Environ. Quality*, 38, 1224-1232.
- Knappett, P., M.B. Emelko, J. Zhuang, and L.D. McKay, 2008, Transport and retention of MS-2 bacteriophage and microspheres in saturated porous media: Impact of ionic strength and grain size, *Water Research*, doi:10.1016/j.watres.2008.07.041.
- Kenst, A., E. Perfect, S. Wilhelm, J. Zhuang, J. McCarthy, and L.D. McKay, 2008, Virus transport during infiltration of a wetting front into initially unsaturated sand columns, *Environmental Science & Technology*, 42, 1102-1108.
- Driese, S.G., Z. Li, and L.D. McKay, 2008, Evidence for high-frequency mid-Holocene climate changes recorded in alluvial floodplain catena, southeastern Tennessee, USA, *J. of Quaternary Research*, 69, 276-291.
- Roy, A., E. Perfect, W.M. Dunne, and L.D. McKay, 2007, Fractal characterization of fracture networks: An improved box-counting technique, *Journal of Geophysical Research*, 112, B12201, doi:10.1029/2006JB004582.
- Gentry, R.W., A. Layton, L.D. McKay, J. McCarthy, D. Williams, S. Koirala, and G. Sayler, 2007, Efficacy of *Bacteroides* for reducing uncertainty for source fecal loads in a mixed use watershed, *Journal of Environmental Quality*, 36, 1324-1330.
- Pace, M., M. Mayes, P. Jardine, L.D. McKay, X.L. Yin, T.L. Mehlhorn, Q. Liu, H. Gurleyuk, and J. Zachara, 2007, Transport of Sr<sup>2+</sup> and SrEDTA<sup>2-</sup> in partially-saturated and heterogeneous sediments, *Journal of Contaminant Hydrology*, 91, 267-287.
- Vulava, V., L.D. McKay, S.G. Driese, F. Menn and G. Sayler, 2007, Distribution and transport of coal tar derived PAHs in fine-grained residuum, *Chemosphere*, 68, 554-563.
- Gentry, R.W., J.F. McCarthy, A. Layton, L.D. McKay, V. Garret, D. Williams, S. Koirala, G. Sayler, 2006, *E. coli* loading at or near base flow in a mixed use watershed, *Journal of Environmental Quality*, 35, 2244-2249.
- Layton, A.C., L.D. McKay, D.W. Williams, V. Garrett, and G.S. Sayler, 2006, Development of *Bacteroides* 16S rRNA gene TaqMan™ PCR assays for the quantification of fecal source pollution in water samples: *Applied and Environ. Microbiol.*, 72(6), 4214-4224.
- Lenczewski, M., L.D. McKay, A. Pitner, S. Driese, and V. Vulava, 2006, Pure-phase transport and dissolution of TCE in sedimentary rock saprolite, *Ground Water*: 44(3), 406-414.

- McKay, L.D., S.E. Driese, K. Smith, and M. Vepraskas, 2005, Hydrogeology and pedology of saprolite formed from sedimentary rock parent material, eastern TN, U.S.A., *Geoderma*: 126, 27-45.
- Jorgenson, P.R., L.D. McKay, and J. Kistrup, 2004, Aquifer vulnerability to pesticide migration through till aquitards, *Ground Water*, 42(6), 841-855.
- Lenczewski, M.E., L.D. McKay, and A. Layton, 2004, Biodegradation of TCE in undisturbed columns of fractured saprolite: *Ground Water*, 42(2), 534-541.
- Driese, S. and L. McKay, 2004, Epi-fluorescence micromorphology of saprolite reveals evidence for colloid transport and retention in microscale pore systems: *Geoderma*, 121, 143-152.
- McCarthy, J. and L.D. McKay, 2004, Colloid transport in the subsurface: Past, present and future challenges, *Vadose Zone Journal*, 3, 326-337.
- Perfect, E., L.D. McKay, S.G. Driese, S.C. Cropper, G. Kammerer, and J.H. Dane, 2004, Scaling capillary pressure-saturation relations for saprolite, Correction for uncertainty introduced by measurements on tall columns, *Vadose Zone Journal*, 3, 493-501.
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## **Peer-reviewed Monographs and Book Chapters (2)**

- Gentry, R.W., L.D. McKay, N. Thonnard, J.L. Anderson, D. Larsen, J.K. Carmichael, and D.K. Solomon, 2006, Novel techniques for investigating recharge to the Memphis aquifer, *AWWA Research Foundation*, IWA Publishing, 97 p.
- McKay, L.D., 1998, Hydrogeology and groundwater contamination, Chapt. 1 in *Microbial pathogens within aquifers: Principles and protocols*, S.D. Pillai, Editor, Springer-Verlag Publ., Berlin, Germany.

## **Guest Editor of Pathogens Issue for Journal of Ground Water**

Dr. McKay was the Guest Editor for a Theme Issue on Pathogens and Fecal Indicators for the *Journal of Ground Water*. Eleven articles were accepted for the special issue, which was published in January of 2011.

## **Grants or Contracts (career total ~\$2.6 M as PI and \$2.5M as Co-PI)**

### ***Research Grants - current***

- \$415,988 NSF, GP-IMPACT: Engagement of Students and Faculty at Community Colleges to Enhance Recruitment to 4-Year Geoscience Programs (L. McKay, PI; Sally Horn, Co-PI), 03/01/2016 – 02/28/2019.
- \$168,260 Electric Power Research Institute, Paleoflood research workshop and phase I investigations (L. McKay, PI; Sally Horn, Liem Tran and Howard Cyr, Co-PI's). 11/20/2015 – 12/31/2018.

**Research Grants - funded and completed**

- \$22,500 Subcontract to Penn State for NSF CZO project (L. McKay, PI for UT subcontract; S. Driese, Co-PI) Shale Hills Critical Zone Observatory, 2009-2012.
- \$192,182 Subcontract from UT-Batelle for SERDP (DOE-DOD-EPA) project (L. McKay, UT -PI), Mobility of particulate and dissolved munitions constituents in the vadose zone at operational ranges, Jan/09 to Dec/11.
- \$242,000 Subcontract from Columbia University for National Institute of Health project (L. McKay, UT- PI; A. Layton, Co-PI), Does arsenic mitigation in Bangladesh increase exposure to bacterial and viral pathogens? Aug/07 – July/10.
- \$146,936 Tetra Tech Env. and Dept. of Defense (L. McKay, PI; J. Sanseverino, Co-PI), Volunteer Army Ammunition Plant – Bench-scale remediation studies, Aug/07 – Jan /09.
- \$60,000 TN Dept. of Environment and Conservation (A. Layton, PI; L. McKay and R. Gentry, Co-PIs) Determination of sources and concentrations of fecal bacteria in selected watersheds in Tennessee, June 1/07 – Dec 31/08.
- \$100,000 NSF (G. Baker, PI; L. McKay, C. Mora and M. Rogge, Co-PIs) Enhancing diversity via targeted education and outreach through the East TN Geosci. Program, 2007-2009.
- \$972,000 National Institute of Environmental Health, (M. Rogge, PI; L. McKay one of 7 Co-PI's) Alton Park/Piney Woods Environmental Health and Justice Collaborative. Term 2005-2009.
- \$125,000 TN Dept. of Environment and Conservation (L. McKay, PI; J. McCarthy and R. Gentry are Co-PI's), Development of improved methods for fluorescent dye tracing, 2005-2007.
- \$41,728 Tetra Tech Env. and Department of Defense (L. McKay, PI; V. Vulava, Co-PI), Groundwater age-dating with 3H/3He and CFCs at the Volunteer Army Ammunition Plant, term April/05 to May/06.
- \$50,000 TN Dept. of Environment and Conservation (L. McKay, PI; A. Layton and R. Gentry, Co-PI's), Determination of sources and concentration of fecal bacteria in Chatata and Oostanaula Creeks, term 2005-2006.
- \$160,000 National Science Foundation (E. Perfect, PI; L. McKay and 2 others are Co-PI's), Acquisition of an unsaturated flow apparatus (UFA) with technical support to investigate hydrologic processes in the vadose zone, term 2003-05.
- \$161,920 TN Dept. of Environment and Conservation, (R. Gentry, PI; L. McKay and J. McCarthy are Co-PI's) Efficacy of using algae chloroplasts and Berillyum-7 to aid in designation of aquifers as Ground Water Under the Direct Influence of Surface Water (GWUDI), term 2004-2006.
- \$188,611 TN Dept. of Environment and Conservation, (L. McKay, PI; A. Layton, Co-PI) Assessing the extent of viral contamination in fractured and karstic aquifers, 2002-2004.
- \$34,070 US Geological Survey, (R. Gentry, PI; L. McKay, Co-PI) Evaluation of pathogen occurrence and causation within the Stock Creek watershed (Knox County) as a model for watershed restoration, term 2003-04
- \$22,000 TN Dept. of Environment and Conservation, (L. McKay, PI; A. Layton, Co-PI) Testing of real-time PCR assays for the quantification of *E. coli* and host-specific fecal anaerobes in Stock Creek, term 2003-2004.
- \$25,000 TN Dept. of Environment and Conservation, (R. Gentry, PI; L. McKay, Co-PI) An evaluation of watershed management practices & occurrence of *E. coli*, term 2003-2004.



- \$397,031. Dept. of Energy, Basic Energy Sciences Program, (N. Thonnard, PI, L. McKay, Co-PI), Completion of Kr-81 and Kr-85 analysis development and testing in aquifer recharge studies, term 2001-04
- \$375,883. National Science Foundation, (N. Thonnard, PI, L. McKay, Co-PI), Development completion of rare krypton isotope analysis and validation, term 2001-04
- \$30,000. TN Dept. of Environment and Conservation, (L. McKay, PI, A. Layton, Co-PI) Development and testing of real-time PCR assays for the quantification of E. coli and host-specific fecal anaerobes in surface waters, term 2002-03
- \$75,000. American Water Works Assoc. Research Fund and Memphis Light, Gas and Water, (R. Gentry, PI, L. McKay & others, Co-PIs), Utilization of environmental tracers to investigate recharge to the Memphis aquifer. Term 2000-03
- \$23,956. US Geological Survey, (L. McKay, PI), Investigation of factors controlling transport of microbial pathogens in saprolite soils, term 2001-02
- \$24,000. ORNL subcontract (L. McKay, Co-PI), Quantifying the bio-availability of chromium in contaminated soils, term 2000-01.
- \$85,000. US Geol Survey, (N. Thonnard, PI, L. McKay & others, Co-PIs) Development and testing of Krypton tracers for use in groundwater, term 1997-99.
- \$599,000. Dept. of Energy, Dense organic solvents in the subsurface (L. McKay, PI), this includes UT subcontracts to ORNL and Univ. of Waterloo, term 1996-2000
- \$160,000. Dept. of Energy/ORNL, Colloids in groundwater (L. McKay, PI), term 1996-1999.
- ~\$150,000. ORNL/DOE, (L. McKay, PI) Projects related to migration of contaminants in fractured and highly weathered bedrock at the Oak Ridge Reservation, term 1993-96.

## **GSA Hydrogeology Division Birdsall-Dreiss Distinguished Lecturer**

I was selected as the 2008 Birdsall-Dreiss Distinguished Lecturer by the Geological Society of America Hydrogeology Division. I prepared three lectures, as shown below, which host institutions could request.

***Cracks in the Clay*** – a lecture on the influence of fractures, root holes and other macropores on groundwater flow and contaminant transport in fine-grained sedimentary deposits

***Germes and Geology*** – a lecture on the development and application of emerging microbial sampling and detection methods on investigations of pathogens and fecal indicators in streams and aquifers

***Chattanooga Creek*** – a case history on environmental contamination and social impacts related to a former coal gasification plant located in a low income neighborhood.

I gave one or more of the Birdsall-Dreiss lectures at ~50 universities, research institutions or conferences in 2008 and 2009. Locations in 2008 include: University of Tennessee, Dhaka Univ., Bangladesh, Florida International Univ., Univ. of South Florida, Tulane Univ., LSU, College of Charleston, Hollings Marine Station, SC, USGS – Richmond, VA, College of William and Mary, Clemson Univ., Stanford Univ., USGS – Menlo Park, CA, UC Davis, Univ. of Toronto, Univ. of Waterloo, Appalachian State Univ., UNC – Chapel Hill, NGWA GW Summit, MIT, U. Mass. – Amherst, Smith College, Boston Univ., Univ. of Kansas, Univ. of Arkansas, Penn State Univ., ETH – Zurich, Switzerland, EAWAGS, Switzerland, Karl Eberhard's Univ., Tubingen, Germany,

UFZ – Leipzig, Germany, Univ. of Goettingen, Germany, Univ. of Copenhagen, Denmark, UMB – As, Norway, Northern Illinois Univ., Iowa State Univ., Univ. of Northern B.C., Univ. of B.C., Univ. of Ottawa, Queen’s Univ., Univ. of Montana – Missoula, GSA Annual Meeting, Grand Valley State Univ. and Michigan State Univ. Follow-up talks as the “former Birdsall-Dreiss Lecturer” were given in 2009 at Canterbury Univ. and Lincoln Univ. (both in New Zealand), Univ. of New South Wales, Flinders Univ. and the IAH Conference (all in Australia) and at Baylor Univ. in Texas.

## **Invited Talks at Conferences, Seminars or Institutions**

McKay, L.D., Cracks in the Clay, School of Environmental Science and Engineering, Chang’an University, Xian, China, May 9, 2018.

McKay, L.D., Career Mentoring in the Geosciences, School of Environmental Science and Engineering, Chang’an University, Xian, China, May 10, 2018.

McKay, L.D., Cracks in the Clay, Xian Research Institute, CCTEG, Xian, China, May 9, 2018.

McKay, L.D., et al., Evidence of paleofloods in floodplains on the Tennessee River from Decatur, TN to Knoxville, Tennessee Valley Authority Workshop on Paleohydrology, Chattanooga, TN, Feb 21-22, 2018.

McKay, L.D., Cracks in the Clay, Geology Department Seminar series, Texas A&M University, Feb 10, 2017.

McKay, L.D., The Changing Role of Career Mentoring, Geology Department Lunch-time Brown-bag series, Texas A&M University, Feb 9, 2017.

McKay, L.D., Science and engineering academic career planning: In the classroom and beyond, Oak Ridge Post-Doctoral Association Seminar Series, July 13, 2015.

McKay, L.D., Germs and Geology, Dept of Geology Seminar, University of Delaware, April, 4, 2013.

McKay, L.D., A. Layton, P. Knappett, B. Mailloux, P. Culligan, A. Ferguson, J. Feighery, M. Emch, V. Escamilla, M. Serre, Y. Akita, J. Wu, K. Matin, M. Alam, M. Yunus, K. Streatfield and A. van Geen, An overview of hydrogeological and societal factors influencing fecal contamination and waterborne disease in aquifers in rural Bangladesh, Conference on Assessing Pathogen Fate, Transport and Risk in Natural and Engineered Water Treatment, Banff, Alberta, Canada, Sept 23-26, 2012.

McKay, L.D., Germs and Geology, 1<sup>st</sup> Annual Watershed Symposium, University of Tennessee, Knoxville, TN, Nov 14, 2011.

Mayes, M., B. Lavoie, L.D. McKay and S. Minkin, Mobility of particulate and dissolved munitions constituents in the vadose zone at operational ranges, SERDP/ESTCP Environmental Technology Technical Symposium, Washington, D.C., Nov. 30 – Dec. 1, 2010.

van Geen, A., K. Ahmed, Y. Akita, J. Alam, P. Culligan, M. Emch, V. Escamilla, J. Feighery, A. Ferguson, P. Knappett, A. Layton, B. Mailloux, L.D. McKay, M. Serre, P. Streatfield, M. Yunus, J. Wu. (5 separate talks or posters), I – Identifying sources, II – Impact on diarrheal disease, III – Pathogens and indicators, IV – Identifying sources, V – Confounding factors, National Institutes of Health Ecology and Evolution of Infectious Disease – Investigator’s Conference, Atlantic City, NJ, March 23-24, 2010.

McKay, L.D., Germs and Geology, Southeastern Center for Emerging Biologic Threats –

- Conference on factors influencing emerging infectious diseases in the southeast, Emory Univ., Atlanta, GA, June 23-24, 2009.
- McKay, L.D., P. Knappett and A. Layton, Efficiency of hollow-fiber filtration methods for microbial sampling in groundwater, Canadian Water Network Pathogens Consortium Meeting, Calgary, Alberta, Canada, Sept. 4-5, 2008.
- McKay, L.D., Flow and transport in fractured clays, Taught 2-day short course sponsored by the Geological Institute at the University of Copenhagen, June 18-19, 2008.
- McKay, L.D., Pathways and mechanisms for rapid pathogen transport, Canadian Water Network Pathogens Consortium Meeting, Toronto, Ontario, Canada, June 12-13, 2007.
- McKay, L.D., Groundwater flow and contaminant transport in fractured and/or weathered clay-rich deposits, Annual Mtg. of the Geol. Soc. America, Philadelphia, PA, Oct 22-25/06.
- McKay, L.D. and A. Layton, The UT-CEB Pathogen Initiative: Goals, achievements and future plans, TDEC-WPC Workshop, Burns, TN, Oct 5-6, 2006.
- Layton, A., D. Williams, R. Gentry and L.D. McKay, The use of *Bacteroides* sp. for fecal source identification in Tennessee, TDEC-WPC Workshop, Burns, TN, Oct 5-6, 2006
- McKay, L.D. and A. Layton, Recent research on detection and transport of fecal indicators in streams and groundwater, Centers for Disease Control, Atlanta, GA, Aug 15, 2006.
- McKay, L.D., Hydrologic applications of new methods of detecting waterborne pathogens and fecal indicators, Canadian Water Network Pathogens Consortium Meeting, Toronto, Ontario, Canada, June 5-6, 2006.
- McKay, L.D., Clays, contaminants and country music: Research adventures in Tennessee, Earth Science Symposium, University of Waterloo, Ont., Feb 2, 2006.
- McKay, L.D., Groundwater flow and contaminant transport in sedimentary rock saprolite, Annual Oliver Lecture, Dept. of Geol. Sciences, Univ. of Texas, Austin, TX, Sept 29/05.
- McKay, L.D., Hydrological applications of recent advances in detecting/monitoring pathogens and fecal indicators, Dept. of Geol. Sci., Univ. of Texas, Austin, TX, Sept 30/05.
- McKay, L.D., and A. Layton, *Bacteroides* as an indicator of fecal sources, Florida Departments of Health and Environment, Promoting Public Health Through Safe Water Conference, Orlando, FL, January 19-20, 2005.
- McKay, L.D. and A. Layton, Fecal source tracking using *Bacteroides* and Real Time PCR, Promoting Public Health through Safe Water Conference, Florida Depts. of Health and Environ. Protection, Jan 19-20, 2005.
- McKay, L.D., and A. Layton, *Bacteroides* as an indicator of fecal sources, Florida Departments of Health and Environment, Promoting Public Health Through Safe Water Conference, Orlando, FL, January 19-20, 2005.
- Therrien, R. and L.D. McKay, Modeling flow and transport in media, Co-taught 5-day short course sponsored by the Geological Institute at the University of Copenhagen, May 10-14, 2004.
- McKay, L.D., Groundwater flow and contaminant transport in sedimentary rock saprolite, Department of Geological Sciences, University of Nevada, Reno, NV, Feb 6/04.
- McKay, L.D., V.M. Vulava, F. Menn, and G. Saylor, Fate and transport of coal tar in Chattanooga Creek, TN, Seminar at EPA – Office of Research and Development, Cincinnati, OH, July 1, 2003.
- McKay, L.D., Influence of pore structure on groundwater flow and contaminant transport in sedimentary rock saprolite, Dept. of Geological Sciences, Univ. of Wisconsin, Madison, WI, May 2, 2003.
- McKay, L.D., Fate and transport of coal tar and other industrial contaminants in the streambed

- and floodplain, Chattanooga Creek, TN, Dept. of Geological Sciences, Univ. of Wisconsin, Madison, WI, May 2, 2003.
- McKay, L.D., Influence of pore structure on groundwater flow and contaminant transport in sedimentary rock saprolite, Dept. of Geological and Environmental Sciences, Univ. of Northern Illinois, DeKalb, IL, May 1, 2003.
- McKay, L.D., Transport of microbial pathogens and pathogen surrogates in saprolite subsoils, TN Div Meeting, American Water Resources Assoc., Nashville, TN, Apr 3-5, 2002.
- McKay, L.D., Groundwater flow and contaminant transport in sedimentary rock saprolite, **Keynote Speaker** at the 10<sup>th</sup> Annual Clemson Hydrogeology Symposium, Clemson, SC, April 18-19, 2002.
- McKay, L.D., Groundwater flow and contaminant transport in sedimentary rock saprolite, Geological Sciences Seminar, University of Alabama, Tuscaloosa, AL, Jan 30, 2002.
- Riitti-Shati, M., L.D. McKay, S.G. Driese, and K.H. Smith, Hydrologic significance of infilling of fractures and macropores with pedogenic clay and Fe/Mn oxide in saprolite derived from sedimentary rock. Workshop on Water Flow and Contaminant Transport in Fractured Aquitards, Hebrew Univ. of Jerusalem, Israel, May 22-25, 2001.
- McKay, L.D., Integration of field and laboratory studies of microbial transport in fractured saprolite, Invited speaker at GSA Meeting, San Francisco, CA, Dec 15-19, 2000.
- McKay, L.D., Groundwater flow and contaminant transport investigations at ORNL, Dept. of Geological Sciences Seminar, Virginia Tech. Univ., Blacksburg, VA, Sept. 14, 2000.
- McKay, L.D., Experimental investigations of groundwater flow and contaminant transport in fractured tills, **Keynote Speaker** at workshop sponsored by Water Management Assoc. of Ohio, USGS, NGWA and Ohio State Univ., Columbus, OH, May 9-10, 2000.
- McKay, L.D., Experimental investigations of colloid and solute transport in fractured clay-rich materials, Workshop on Geochemical Perspectives on Environmental Processes sponsored by Washington Univ. of St. Louis, St. Louis, MO, April 26-29, 2000.
- McKay, L.D., Field and laboratory studies of DNAPL behavior in fractured and highly weathered shales, Univ. Consortium Solvents-in-Groundwater Research Program, Queen's Univ., Kingston, Ont., May 11-13, 1999.
- McKay, L.D., Invited participant in Workshop on conceptual models of flow and transport in the fractured vadose zone, sponsored by National Academy of Science, National Research Council, and DOE, Irvine, CA, Mar. 18-19, 1999.
- McKay, L.D., Contaminant transport in highly weathered and fractured shales, **Keynote Speaker** Conf. on mass transport in fractured aquitards, Univ. of Copenhagen, Denmark, May, 1998.
- McKay, L.D., J. Sanseverino, P. Jardine, S. Brooks, J. Cherry, and B. Parker, Behaviour of dense, immiscible solvents in fractured clay-rich soils, U.S. Dept. of Energy, Environ. Management Science Program Workshop, Chicago, IL, July, 1998.
- McKay, L.D., Transport of microorganisms and microspheres in fractured residual soils, Invited speaker in symposium on new and emerging concerns in transport, modelling and detection of pathogens in the environment, Annual meeting of the American Society for Agronomy and the Soil Science Society of America, Baltimore, MD, October, 1998.
- McKay, L.D., Contaminant transport in highly weathered and fractured shales, Dept. of Environmental Engineering Seminar, Vanderbilt Univ., Nashville, TN, March 16, 1998.
- Thonnard, N., L.D. McKay, Emerging new ultra-sensitive analytical techniques using resonance ionization: Applications in groundwater dating, ATV Conference, Shaeffergarden, Denmark, April 23, 1997.

- McKay, L.D., Behavior of DNAPLs in fractured shale saprolite, Univ. Consortium Solvents-in-Groundwater Research Program, Univ. of Toronto, Toronto, Ont., Oct 6-8, 1997.
- McKay, L.D., Influence of fractures on groundwater flow and contaminant migration in low-hydraulic conductivity materials, Invited abstract presented at International Containment Technology Workshop, sponsored by U.S. EPA and U.S. Dept. of Energy, Baltimore, MD, Aug 30/95.
- McKay, L.D., Nature of contaminant transport in fractured unlithified aquitards, **Keynote speaker** at Geol. Soc. of America, Penrose Confer., Racine, WI, June 15-20, 1994.
- McKay, L. D., Contaminant migration experiments and field studies in fractured clay tills, Invited speaker, Symposium on joints in fine-grained materials and contaminant remediation strategies, Ohio Academy of Science Annual Meeting, Toledo, OH, April 22-24, 1994.

## **Talks at Conferences, Seminars or Workshops**

- McKay, L.D., S. Horn, S. Drumheller, C. Sumrall, K. Ellis, A. Steen, Engaging community college students in experiential learning at the University of Tennessee, Southeast Section Meeting of the Geological Society of America, Knoxville, TN, April 12-13, 2018.
- Putt, A.D., B. Adams, K. Fitzgerald, K. McBride, L.D. McKay, T. Hazen, Ultramicrobacteria in uranium contaminated Y-12 groundwater, Southeast Section Meeting of the Geological Society of America, Knoxville, TN, April 12-13, 2018.
- Perilla-Castillo, P., S. Horn, H. Cyr, M. Boehm, L.D. McKay, Event layers in cores from the Tennessee River floodplain: Description, interpretation, and implications, Southeast Section Meeting of the Geological Society of America, Knoxville, TN, April 12-13, 2018.
- Wenhold, L., L. Tran, L.D. McKay, Employing ArcGIS and government databases in planning investigations of floodplain contamination in Knoxville, TN, Southeast Section Meeting of the Geological Society of America, Knoxville, TN, April 12-13, 2018.
- Meyers, M., T. Geissberger, L.D. McKay, A GIS approach to water quality monitoring and assessment in Knox County, TN, Southeast Section Meeting of the Geological Society of America, Knoxville, TN, April 12-13, 2018.
- Horn, S.P., H.J. Cyr, M.S. Boehm, P. J. Perilla, L.D. McKay, L. Tran, Stratigraphic evidence of late Holocene flooding along the Tennessee River, American Association of Geographers Annual Meeting, New Orleans, LA, April 10-14, 2018.
- Paradis, C., L.D. McKay, T. Hazen, Exposure history dependence of microbial mediated substrate transformation in groundwater, National Ground Water Association Annual Meeting, Nashville, TN, Dec. 4-7, 2017.
- Tran, L., S. Horn, L.D. McKay, H. Cyr, A paleoflood desktop survey on the upper Tennessee River, Southeast Division Meeting of the American Association of Geographers, Nov 19-20, 2017, Starkville, MS.
- McKay, L.D., H. Cyr, L. Tran, S. Horn, Sedimentary signature of Holocene flood deposits in upper reaches of the Tennessee River, Geological Society of America – Annual Meeting, Seattle, WA, Oct. 22-25, 2017.
- Drumheller, S.K., C. Sumrall, T. Gates, A. Steen, S. Horn, L.D. McKay, Including citizen and student scientists in actualistic taphnomic research: The good, the bad and the smelly, Geological Society of America – Annual Meeting, Seattle, WA, Oct. 22-25, 2017.
- Patullo, M., M. Mayes, R. Effroymsen, E. Perfect and L.D. McKay, Soil sealing by algae: An

- alternative to plastic outdoor cultivation pond liners, Intl. Conference on Algal Biomass, Biofuels and Bioproducts, Miami, FL, June 18-21, 2017.
- Fristoe, K., S. Hadjiharalambous, L.D. McKay, S. Horn, S. Drumheller-Horton, GEOPATHS: Assessing Engagement of Students and Faculty at Community Colleges to Enhance Recruitment to 4-Year Geoscience Programs, NSF INCLUDES Conference: Multi-Scale Evaluation in STEM Education, Knoxville, TN, Feb. 22-24, 2017.
- Perfect, E., B. Donnelly, L.D. McKay, P. Lemiszki, V. DiStefano, L. Anovitz, J. McFarlane, R. Hale, and C.L. Chen, Gas shale capillary-pressure saturation relations determined using a water activity meter, AGU Annual Meeting, San Francisco, CA, Dec 12-16, 2016
- McKay, L.D., S. Horn, K. Affholter, C. Cropper, S. Drumheller, K. Ellis, K. Fristoe, J. Jones, C. Hadjiharalambous, A. Lee, A. Steen and C. Sumrall, Engaging community college transfer students in Tennessee to improve recruitment, retention and success in 4-year geoscience programs, Geological Society of America Annual Meeting, Denver, CO, Sept 25-28, 2016.
- Tran, L., S. Horn, L.D. McKay and H. Cyr, A multi-level landscape/landform classification to identify possible sites for paleoflood investigation, Fifth International Paleoflood Conference, Rapid City, SD, Sept 12-15, 2016.
- McKay, L.D. and T.C. Hazen, Evaluating the effectiveness of a “for-credit” course in academic career preparation, Geological Society of America Meeting, Baltimore, MD, November 1-4, 2015.
- McKay, L.D., D. Street, A. Layton, R.W. Hunter and A. Ludwig, Impact of cropland manure application on water quality at the UT Little River Dairy Farm, TN AWRA Symposium, Montgomery-Bell, TN, April 1-3, 2015.
- Cheng, C.L., E. Perfect, L.D. McKay, et al., Neutron imaging rapid water imbibition in fractures and matrix in sedimentary rock cores, American Physical Society Annual Meeting, San Antonio, TX, March 2-6, 2015.
- McKay, L.D., D. Street, A. Layton, R.W. Hunter, and A. Ludwig, The impact of cropland manure application on water quality in surface water, drain tile discharge and groundwater at a university dairy farm, Geological Society of America, Annual Meeting, Vancouver, BC, Canada, Oct 19-22, 2014.
- Paradis, C.J., ... L.D. McKay and T.C. Hazen, The memory effect: In-situ electron donor biodegradation rates as a function of exposure history in a shallow groundwater system, Geological Society of America, Annual Meeting, Vancouver, BC, Canada, Oct 19-22, 2014.
- Ayers, K., A. Layton and L.D. McKay, Factors influencing diarrheal pathogen presence in groundwater tubewells of Bangladesh, American Society for Microbiology General Meeting, Denver, CO, May 18-21, 2013.
- Moskal, J., M. Friday, A. Dere, L.D. McKay, Saprolite fabric in weathered shale in east Tennessee with comparison to Pennsylvania and Puerto Rico, SE Section Meeting, Geol. Society of America, San Juan, Puerto Rico, March 20-21, 2013
- Hunter, R.W., L.D. McKay, A. Layton, M. Borchardt, Measuring microbial and nutrient-related impacts of dairy operations on streams and groundwater at a university dairy research center, Conference on Assessing Pathogen Fate, Transport and Risk in Natural and Engineered Water Treatment, Banff, Alberta, Canada, Sept 23-26, 2012.
- Ayers, K., A. Layton, A. Smartt, L. McKay, A. van Geen and G. Sayler, Presence of diarrheal

- disease pathogens in Bangladesh surface water and well water, TN Water Resources Symposium, Burns, TN April 11-13/2012
- McKay, L.D., et al., The value of field occurrence studies of fecal contamination in aquifers and wells, Geological Society of America, Annual Meeting, Minneapolis, MN, Oct 9-12, 2011.
- Knappett, P., L.D. McKay, et al., Transport of fecal bacteria from ponds to aquifers in rural Bangladesh: The role of adjacent grain size, GSA Fragile Earth Conference, Munich, Germany, Sept 4-7, 2011.
- Culligan, P., ...L.D. McKay, et al., Aquifers and tubewells as vehicles of diarrheal disease in Bangladesh: Ecological and hydrogeological factors, National Institutes of Health Ecology and Evolution of Infectious Disease – Investigator’s Conference, Spring 2011.
- McKay, L.D., R.W. Hunter, J. Lee, Hydrogeologic controls on water quality at a university dairy farm, TN Water Resources Symposium, Montgomery Bell State Park, April 13-15, 2011.
- McKay, L.D., J. Zhang, D. Williams, B. Lavoie, F. Bogle, et al., Bench-scale treatability using chemical agents in clay-rich residuum contaminated with residues from explosives manufacturing, TN Water Resources Symposium, Montgomery Bell State Park, April 13-15, 2011.
- McKay, L.D., J. Zhang, D. Williams, B. Lavoie, F. Bogle, et al., Bench-scale treatability using chemical agents in clay-rich residuum contaminated with residues from explosives manufacturing, TN Water Resources Symposium, Montgomery Bell State Park, April 13-15, 2011.
- McKay, L.D., R.W. Hunter, J. Lee, Hydrogeologic controls on water quality at a university dairy farm, American Geophysical Union – Annual Meeting, San Francisco, CA, Dec 13-17, 2010.
- Van Geen, L., ...L.D. McKay, et al., Could arsenic mitigation lead to increased diarrheal disease in Bangladesh?, American Geophysical Union – Annual Meeting, San Francisco, CA, Dec 13-17, 2010.
- Feighery, J., ...L.D. McKay, et al., Comparing laboratory column test treatments with field profiles of fecal indicator bacteria and virus from concentrated source areas, American Geophysical Union – Annual Meeting, San Francisco, CA, Dec 13-17, 2010.
- Knappett, P., ...L.D. McKay, et al., Factors influencing fecal contamination in ponds of Bangladesh, American Geophysical Union – Annual Meeting, San Francisco, CA, Dec 13-17, 2010.
- Britto, R., M. Patel, F. Bogle, and L.D. McKay, Comparison of ozone and alkaline hydrolysis testing of DNT in saturated soils, Batelle Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA, May 24-27, 2010.
- Lavoie, B., S. Minkin, M. Mayes, J. Biggerstaff, E. Perfect and L.D. McKay, Transport of dissolved and particulate explosive compounds in saturated flow column experiments, GSA NE-SE Joint Regional Meeting, Baltimore, MD, March 13-16, 2010.
- Layton, A., D. Williams, L.D. McKay, and J. Farmer, Identifying and detecting waterborne pathogens in Tennessee, TN Water Resources Symposium, Montgomery Bell State Park, April, 2010
- Mayes, M.A., L.D. McKay, F. Zhang, K. Koehn, E. Perfect and B. Lavoie, Mobility of particulate and dissolved munitions constituents in the vadose zone at operational ranges – 1. Susceptibility Analysis, SERDP (DoD) Conference, Washington, D.C., Dec 2009.
- Mayes, M.A., L.D. McKay, J. Biggerstaff, B. Lavoie, S. Minkin, and E. Perfect, Mobility of

- particulate and dissolved munitions constituents in the vadose zone at operational ranges – 2. Transport Studies, SERDP (DoD) Conference, Washington, D.C., Dec 2009.
- Knappett, P., L.D. McKay, A. Layton and others, Transport of fecal microorganisms from latrine ponds to aquifers in Bangladesh, AGU Annual Meeting, San Francisco, CA, Dec 2009.
- Driese, S., G. Ludvigson, J. Roberts, D. Fowle, L. Gonzalez, L.D. McKay and V. Vulava, Formation of pedogenic siderite in PAH-contaminated alluvial clay soils, Tennessee, USA: Part I: Insights from field relationships and micromorphology, GSA Annual Meeting, Portland, OR, October, 2009.
- Ludvigson, G., S. Driese, J. Roberts, D. Fowle, L. Gonzalez, L.D. McKay and V. Vulava, Formation of pedogenic siderite in PAH-contaminated alluvial clay soils, Tennessee, USA: Part II: Stable isotope data on modern analogue for a deep-time paleoclimate proxy, GSA Annual Meeting, Portland, OR, October, 2009.
- McKay, L.D., J. Zhuang and E. Perfect, Transport of colloids with transient wetting fronts, First International Conference on Microbial Transport and Survival in Porous Media, Niagara on the Lake, Ontario, May 10-13, 2009.
- DiClaudio, M., J. Sanseverino, J. Easter, L.D. McKay, A. Layton and G. Sayler, Reduction of toxicity of nitroaromatic-contaminated soils as detected by *Saccharomyces cerevisiae* BLYR, Annual Meeting of American Society for Microbiology, Philadelphia, PA, May 17-21, 2009.
- Knappett, P., L.D. McKay, A. Layton, et al., Ultrafiltration performance as determined by recovery of in situ bacteria and viruses, First International Conference on Microbial Transport and Survival in Porous Media, Niagara on the Lake, Ontario, May 10-13, 2009.
- Brown, T., L.D. McKay and J. McCarthy, Fluorescence characterization of carbonate aquifers in East Tennessee, AGU Chapman Conference, Birmingham, UK, Oct 20-23, 2008.
- Knappett, P.S., L.D. McKay, A. Layton et al., Investigating fecal contamination pathways to an unconfined sandy aquifer in Bangladesh, GSA – ASA Joint Annual Meeting, Houston, TX, Oct 5-9, 2008.
- Donat, R., E. Perfect, R. Gentry, L.D. McKay and E. van den Berg, Modeling the scale-dependent relationship between effective and slug test-determined saturated hydraulic conductivities, GSA – ASA Joint Annual Meeting, Houston, TX, Oct 5-9, 2008.
- Brown, T., L.D. McKay, J. Zhuang and S. Jones, Factors Inhibiting the Implementation of Low-concentration dye tracer tests, NGWA Ground Water Summit, Memphis, TN Mar 30 – Apr 3, 2008.
- Knappett, P., L.D. McKay and A. Layton, The efficacy of Bacteroides as a fecal tracer in shallow groundwater, NGWA Ground Water Summit, Memphis, TN Mar 30 – Apr 3, 2008.
- Knappett, P., M. Emelko, J. Zhuang and L.D. McKay, Transport and retention of MS-2 bacteriophage and bacteria-sized microspheres in saturated porous media, ISMAR Conference, Phoenix, AZ, Oct 28-Nov 2, 2007.
- Bell, A., D. Williams, L.D. McKay and A. Layton, Physical factors influencing fecal persistence and concentration in stream water, American Soc. for Microbiol. Annual Meeting, Toronto, Ont., May 21-25, 2007.
- McKay, L.D., V. Vulava, et al., Estimating recharge through a 7 – 40 m thick layer of fine-grained residuum using tritium/helium and CFCs, TN Water Resources Symposium, Burns, TN, Apr 17-19, 2007.
- Rogge, M., K. Davis and L.D. McKay, Chattanooga Creek and the Neighborhood Environmental College, TN Water Resources Symposium, Burns, TN, Apr 17-19, 2007.



- T. Brown, L.D. McKay, et al., Organic fluorophores in drinking water: Implications for dye tracing and source characterization, TN Water Resources Symposium, Burns, TN, Apr 17-19, 2007.
- McKay, L.D., Groundwater flow and contaminant transport in fractured and weathered clay-rich deposits, Geol. Society of America Annual Meeting, Philadelphia, PA, Oct 22-25, 2006.
- Brown, T., L.D. McKay, J. McCarthy, R. Gentry and S. Jones, Evaluation of the influence of background fluorescence on low concentration dye tracer tests, , Geol. Society of America Annual Meeting, Philadelphia, PA, Oct 22-25, 2006
- McKay, L.D., Environmental fate and transport of coal tar compounds in Chattanooga Creek, Chattanooga Creek Environ. Research and Community Action Conf., Sept. 22, 2006.
- Gentry, R., J. McCarthy, A. Layton, L.D. McKay, S. Koirala, Using hydrologic tracers as a risk assessment tool in a karst, ASCE-EWRI Conf., Omaha, NE, May 21-25, 2006.
- Layton, A., D. Williams, R. Gentry and L.D. McKay, Bacteroides as an alternative to E. coli as a fecal indicator, TN Water Resources Symposium, Burns, TN, Apr 19-21, 2006.
- Bell, A., A. Layton and L.D. McKay, Survival and transport of Bacteroides in streams, TN Water Resources Symposium, Burns, TN, Apr 19-21, 2006.
- Tu, C., J. Zhuang, N. Goepfert, J. McCarthy and L.D. McKay, Transport of colloids by transient wetting fronts, TN Water Resources Symposium, Burns, TN, Apr 19-21, 2006.
- Brown, T., L.D. McKay, J. McCarthy and R. Gentry, Development and testing of methods for dye tracing in the sub-visual range, TN Water Resources Symposium, Burns, TN, Apr 19-21, 2006.
- McKay, L.D., et al., Estimating recharge to residuum-mantled karst aquifers using tritium/helium and CFCs, SE Section GSA Meeting, Knoxville, TN, Mar 23-24, 2006.
- Layton, A. L.D. McKay and R. Gentry, Monitoring fecal concentrations and sources in streams using Real Time PCR assays for Bacteroides, SE Section GSA Meeting, Knoxville, TN, Mar 23-24, 2006.
- Brown, T. and L.D. McKay, Groundwater characterization of the Grigsby Hollow area, SE Section GSA Meeting, Knoxville, TN, Mar 23-24, 2006. SE Section GSA Meeting, Knoxville, TN, Mar 23-24, 2006.
- Tu, C., J. Zhuang, J. McCarthy, and L.D. McKay, Transport of colloids in unsaturated porous media, SE Section GSA Meeting, Knoxville, TN, Mar 23-24, 2006.
- Bell, A., L.D. McKay and A. Layton, Survival and transport of Bacteroides in streams, SE Section GSA Meeting, Knoxville, TN, Mar 23-24, 2006.
- McKay, L.D., V. Vulava, et al., Estimating recharge through a 7-40 m thick layer of fine-grained residuum using tritium/helium and CFCs, AGU Annual Meeting, San Francisco, CA Dec 4-9, 2005.
- McKay, L.D., Groundwater flow and contaminant transport in sedimentary rock saprolite, Department of Geological Sciences, University of Texas, Austin, TX, Sept 29/05.
- McKay, L.D., Hydrological applications of recent advances in detecting/monitoring pathogens and fecal indicators, Dept. of Geol. Sci., Univ. of Texas, Austin, TX, Sept 30/05.
- Gentry, R., L.D. McKay, A. Layton, and J. McCarthy, Development of novel tracer techniques for better understanding of karst transport characteristics and surface water influences, ASCE-EWRI Congress, Anchorage, AK, May 15-19, 2005.
- McKay, L.D., A. Layton and R. Gentry, Bacteroides as a host-specific indicator of fecal contamination in water using Real Time PCR, NGWA Ground Water Summit, San Antonio, TX, Apr 17-20, 2005.

- Johnson, T., L.D. McKay, et al., Quantification of enterovirus and Hepatitis A virus in East Tennessee ground water using Real Time RT PCR, NGWA Ground Water Summit, San Antonio, TX, Apr 17-20, 2005.
- Baldwin, T., A. Layton, L.D. McKay, et al., Monitoring enterovirus and Hepatitis A virus in wells and springs in East Tennessee, TN Water Resources Symposium, Burns, TN Apr 13-15, 2005.
- McKay, L.D., A. Layton and R. Gentry, Development and testing of RT PCR assays for determining fecal loading and source identification in streams and groundwater, TN EPSCoR Environmental Summit, Cookeville, TN, Feb 16-17, 2005.
- Gentry, R.W., L.D. McKay, D. Larsen, J. Carmichael, D.K. Solomon, N. Thonnard, and J. Anderson, Inter-aquifer dynamics in and near an aquitard window in Shelby County, TN, American Geophysical Union, Annual Meeting, San Francisco, Dec 8-12<sup>th</sup>, 2003.
- McKay, L.D., V. Vulava, S. Driese, F. Menn, and G. Sayler, Distribution and transport of coal tar derived PAH compounds in fine-grained alluvial deposits, Geol. Soc. of America, Annual Meeting, Seattle, WA, Nov 2-5<sup>th</sup>, 2003.
- Driese, S.G., Z. Li, R. Livingston, and L.D. McKay, Holocene alluvial floodplain catena related to differences in soil drainage: possible altithermal (mid-Holocene) climate record in the southeastern U.S., Geol. Soc. of America, Annual Meeting, Seattle, WA, Nov 2-5<sup>th</sup>, 2003.
- Perfect, E., S.G. Driese, and L.D. McKay, Hydrogeology of sedimentary rock saprolite in eastern Tennessee: an overview, Soil Science Soc. of America Annual Meeting, Denver, CO, Nov 3-5<sup>th</sup>, 2003.
- Layton, A.C., D. Williams, G. Sayler and L.D. McKay, Validation of a real-time PCR method for the quantification of E. coli in surface water, Tennessee Water Resources Symposium, Montgomery Bell State Park, April 9-11<sup>th</sup>, 2003.
- Baldwin, T., L.D. McKay, S. Jones, and A. Layton, Assessing the extent of viral contamination in wells and springs in fractured and/or karst aquifers in eastern Tennessee, **Winner of Best Poster Award**, Tennessee Water Resources Symposium, Montgomery Bell State Park, April 9-11<sup>th</sup>, 2003.
- Perfect, E., S. Cropper, L. McKay, S. Driese, J. Dane, G. Kammerer, Scaling capillary pressure head – saturation relationships for saprolite: Correction for uncertainty introduced by pressure cell measurements in tall columns, AGU Annual Meeting, San Francisco, CA, Dec 15, 2002.
- Vulava, V.M., Menn, F-M, McKay, L.D., Easter, J.P., Sayler, G.S., Post-cleanup Monitoring and Fate of Coal Tar in Chattanooga Creek Sediments, Society for Environmental Toxicology and Chemistry (SETAC) Conference, Salt Lake City, Nov, 2002.
- McKay, LD, SG Driese, and KH Smith, Controls on hydraulic conductivity in soil and saprolite derived from sedimentary rock, Annual Meeting of Geol. Soc. of America, Denver, Oct 27-30, 2002.
- Driese, S.G., C.A. Stiles and L.D. McKay, Mass-Balance Geochemistry of Sedimentary Rock Saprolite: Effects of Pedogenesis on Variable Interbedded Lithologies, Annual Meeting of Geol. Soc. of America, Denver, Oct 27-30, 2002.
- Cropper, S.C., E. Perfect, L.D. McKay, and S.G. Driese, Capillary pressure-saturation curves for air and DNAPL entry into a water-saturated fractured shale saprolite, Annual Meeting of Geol. Soc. of America, Denver, Oct 27-30, 2002.
- Lenczewski, M., L.D. McKay, and A. Layton, Anaerobic biodegradation of TCE in laboratory columns of fractured saprolite, Annual Meeting of Geol. Soc. of America, Denver, Oct

- 27-30, 2002.
- McKay, L.D., and S. Driese, Groundwater flow and contaminant transport in saprolite subsoils in east Tennessee, Tennessee Water Resources Symposium, Montgomery Bell State Park, April 3-5<sup>th</sup>, 2002.
- Gentry, R.W., D. Larsen, J. Carmichael, and L. McKay, Development of the Shelby Farms Study Site For the Purpose of Studying Recharge Mechanisms to the Memphis Aquifer Near Window Sites, Tennessee Water Resources Symposium, Montgomery Bell State Park, April 3-5<sup>th</sup>, 2002
- McKay, L.D., S.G. Driese, and K.H. Smith, A new conceptual model for controls on hydraulic conductivity in soil and saprolite derived from sedimentary rock, AGU Annual Meeting, San Francisco, CA, Dec 10-14, 2001.
- Driese, S.G., and L.D. McKay, Lithologic and pedogenic influences on porosity distribution in sedimentary rock-derived saprolite, Soil Sci. Soc. of America, Annual Meeting, Charlotte, NC, Oct 21-25, 2001.
- Lenczewski, M.E., A. Layton, and L.D. McKay, Microbial population shifts in groundwater exposed to TCE, GSA Penrose Conference, somewhere in Great Britain, fall/00
- Pitner, A.H., and L.D. McKay, A laboratory investigation of trichloroethylene (TCE) entry and dissolution in large columns of fractured shale saprolite from the Oak Ridge Reservation in east Tennessee, SE Section Meeting, GSA, Charleston, SC, March 23-24, 2000.
- McKay, L.D., Contaminant transport in fractured and weathered shale, National Ground Water Assoc., Annual Meeting, Nashville, TN, Dec 3-6, 1999.
- Gentry, R.W., L.D. McKay, D. Larsen, A novel approach for investigating the susceptibility of the Memphis aquifer to non-point source pollution through windows in the upper Claiborne confining layer, National Ground Water Assoc., Annual Meeting, Nashville, TN, Dec 3-6, 1999.
- Thonnard, N., C.F. Joyner, W. Dong, L.D. McKay, Application of emerging new environmental tracers, 85Kr and 3H/3He, to age-dating young groundwater in an investigation of recharge of the Memphis aquifer, National Ground Water Assoc., Annual Meeting, Nashville, TN, Dec 3-6, 1999.
- McKay, L.D., S.G. Driese, Influence of pore structure on groundwater flow and contaminant transport in mudrock saprolite, Oak Ridge, TN, Geol. Soc. America, Annual Meeting, Denver, CO, Oct 25-28, 1999.
- Lenczewski, M., L.D. McKay, A. Layton, Trichloroethylene biodegradation in large undisturbed columns of fractured weathered shale in east Tennessee, ASM 4th International Symposium on Subsurface Microbiology, Vail, CO, Aug 22-27, 1999.
- Lenczewski, M., L.D. McKay, A. Layton, Biodegradation of trichloroethylene in fractured weathered shale in east TN, American Soc. for Microbiology, Chicago, IL, May 31, 1999.
- Lenczewski, M., L. McKay, J. Sanseverino, A. Layton, Biodegradation of TCE in fractured shale saprolite, TN Water Res. Assoc. Meeting, Nashville, TN, Apr. 12-14, 1999.
- Pitner, A.H., L.D. McKay, M. Lenczewski, DNAPL entry, dissolution and diffusion in fractured shale saprolite, TN Water Resour. Assoc. Meeting, Nashville, TN, Apr 12-14, 1999.
- Penfield, C.P., S.G. Driese, L.D. McKay, and C.A. Stiles, Influence of porosity, clay mineralogy and geochemistry on groundwater flow in saprolite at SWSA-7, Oak Ridge National Lab, SE Section Meeting, Geol. Soc. America, Athens, GA, Mar 25-26, 1999.
- Lenczewski, M., L.D. McKay, J. Sanseverino, and C. Knight, Sorption and microbiological factors controlling the fate and transport of TCE in fractured shale saprolite, Conference

- on mass transport in fractured aquifers and aquitards, Univ. of Copenhagen, Copenhagen, Denmark, May, 1998.
- Haun, D.D., L.D. McKay, and J. McCarthy, The role of electrostatic attachment on particle transport in fractured shale saprolite, Conference on mass transport in fractured aquifers and aquitards, Univ. of Copenhagen, Copenhagen, Denmark, May, 1998.
- Fredericia, J., L.D. McKay, M. Lenczewski, and J. Morthorst, Spatial variability of contaminant transport in fractured till, Avedore, Denmark, Conference on mass transport in fractured aquifers and aquitards, Univ. of Copenhagen, Copenhagen, Denmark, May, 1998.
- Kolodziejski, A., McKay, L.D., N. Thonnard, Development of Krypton-85 as an emerging tool for age-dating groundwater, 7th TN Water Resour. Symposium, Nashville, TN, Feb 24-26, 1997.
- Cropper, C.S., and L.D. McKay, Investigations of air and DNAPL entry and migration in large saturated columns of fractured shale saprolite, Petroleum Hydrocarbons and Organic Chemicals in Ground Water, Confer. sponsored by API and NGWA, Houston, TX, Nov 12-14, 1997.
- Cropper, S., L.D. McKay, Investigations of air and DNAPL entry and migration in large columns of fractured shale saprolite, 7th TN Water Resour. Symposium, Nashville, TN, Feb 24-26, 1997.
- McKay, L.D., D. Cumbie, A. Harton, Factors influencing colloid transport in fractured shale saprolite, GSA Annual Meeting, Salt Lake City, UT, Oct 20-23, 1997.
- Howard, K., L.D. McKay, J. McCarthy, Behavior of fluorobenzoic acid groundwater tracers in a highly fractured shale saprolite, GSA Annual Meeting, Salt Lake City, UT, Oct 20-23, 1997.
- Thonnard, N., L.D. McKay, et al., Status of laser-based krypton-85 analysis development for dating of young groundwater, GSA Annual Meeting, Salt Lake City, UT, Oct 20-23, 1997.
- Cumbie, D.H., L.D. McKay, and A.D. Harton, Laboratory scale investigations of colloidal transport in fractured shale saprolite, AGU Hydrol. Days Conf., Fort Collins, CO, Apr 15-19, 1996. **Best MS student Presentation Award.**
- McKay, L.D., Field-scale bacteriophage transport experiments in fractured clays and shales, Amer. Soc. Microbiol. (ASM) General Meeting, New Orleans, LA, May 19-23, 1996.
- Harton, A., L.D. McKay, Influence of flow rate on lab-scale bacteriophage transport experiments in weathered and fractured shale, ASM General Meeting, New Orleans, LA, May 19-30, 1996.
- Cropper, S., L.D. McKay, Investigations of air and DNAPL entry in saturated columns of fractured shale saprolite, 41st Annual Midwest Groundwater Confer., Lexington, KY, Sept 29-Oct 1, 1996.
- Kolodziejski, A., L.D. McKay, N. Thonnard, Development of krypton-85 as an emerging tool for age-dating groundwater, 41st Annual Midwest Groundwater Confer., Lexington, KY, Sept 29-Oct 1, 1996.
- McKay, L.D., An overview of contaminant transport in fractured clay-rich deposits, GSA Annual Meeting, Denver, CO, Oct 28-31, 1996.
- Kammer, T., L.D. McKay, Incorporation of hydrogeology into the curriculum of an Appalachian field mapping camp, GSA Annual Meeting, Denver, CO, Oct 28-31, 1996.
- Cumbie, D.H., L.D. McKay, Laboratory investigations of the influence of particle diameter on transport of latex microspheres in fractured shale saprolite, AGU Fall Meeting, Dec 15-19, 1996. **Outstanding Student Paper Award.**

- McKay, L.D., W. D. Sanford, J. Strong-Gunderson, and V. De Enriquez, Microbial tracer experiments in a fractured shale near Oak Ridge, Tennessee, Paper presented at Intl. Assoc. of Hydrogeol. Congress, Edmonton, Alberta, Canada, June 5-10, 1995.
- McKay, L.D., K. Novakowski, and J. McCarthy, Groundwater sampling in fractured clay and rock, Abstract presented at EPA Workshop on Groundwater Sampling, Dallas, TX, Nov 30-Dec 2/93.
- McKay, L.D., K. Hinsby, J. Morthorst, and M. Lenczewski, Field and laboratory tracer experiments in fractured clayey till in Denmark, Abstract presented at fall meeting of the Geol. Soc. of America, Boston, MA, Oct 24-28/93.
- McKay, L.D., and J. A. Cherry, Groundwater research in clay-rich glacial tills in southwestern Ontario, Paper presented at International Symposium on Groundwater Pollution, Danish Technical University, Copenhagen, Denmark, May 20-22, 1992.
- McKay, L.D., and J. A. Cherry, Groundwater research in clay-rich glacial tills in southwestern Ontario, Paper presented at Intl. Association of Hydrogeologists Congress, Hamilton, Ontario, Canada, May 10-14, 1992.

## **Supervision of Graduate Students and Post-doctoral Researchers**

### ***Doctoral Candidates, with most recent employment status (5 completed, 2 in-progress)***

- Lenczewski, Melissa, 2001, Biodegradation of TCE in a fractured shale saprolite near Oak Ridge, TN. Associate Professor at Northern Illinois University.
- Pace, Molly, 2005, Unsaturated flow and transport of <sup>90</sup>Sr, Co(II)EDTA and U(VI) in undisturbed cores from the Hanford Formation, Hanford, WA. Co-supervised with Dr. P. Jardine, ORNL.
- Mayes, Melanie, 2006, Hydrologic, geochemical and sedimentary processes governing the transport of radionuclides in Hanford region sediments. Staff scientist at Oak Ridge National Laboratory. Co-supervised with Dr. P. Jardine, ORNL.
- Knappett, Peter, 2010, Sources and transport pathways of fecal bacteria and pathogens to aquifers in rural Bangladesh. Assistant Professor at Texas A&M University. Co-supervised with Dr. A. Layton, UTK.
- Charles Paradis, 2017, Groundwater Ecosystem Responses to Repeated Exposures of Electron Donors. Co-supervised with Dr. T. Hazen, UTK. Post-doc at Los Alamos National Laboratory.
- Paula Perilla, in-progress, Paleoflood indicators in the Tennessee River valley, started August 2017, co-supervised with Dr. S. Horn.
- Andrew Putt, in-progress, Biodegradation of organic contaminants in shallow aquifers, started August 2017, co-supervised with Dr. T. Hazen.

### ***Masters Students, with most recent employment status (19 completed, 2 in-progress)***

- Stafford, Paige, 1995, Simulation of a field-scale tritium tracer experiment in a fractured, weathered shale using discrete-fracture/matrix-diffusion and equivalent porous medium models. Network services administrator at ORNL. Co-supervised with Dr. L. Toran, ORNL.
- Harton, Angela, 1996, Influence of flow rate on transport of bacteriophage in fractured shale

- Saprolite. Environmental consultant in Virginia.
- Cumbie, Dennis, 1997, Influence of particle diameter on transport of colloids in shale saprolite. Geologist with the state of Maryland.
- Howard, Kevin, 1997, Factors influencing transport behavior of PFBA's in a highly weathered shale saprolite. Environmental consultant in Oak Ridge, TN. Co-supervised with Dr. J. McCarthy, ORNL.
- Zondlo, Tom, 1998, Development and testing of underwater thermal and chemical survey methods for locating karst spring discharge. Environmental consultant in Knoxville.
- Cropper, Clark, 1998, Investigations of air/DNAPL entry and migration in undisturbed columns of saprolite. Professor at Volunteer State Community College.
- Haun, Deirdre, 1998, Influence of chemical perturbations on mobility of colloids in a fractured shale saprolite. Co-supervised with Dr. J. McCarthy, ORNL.
- Pitner, Andrew, 2000, Influence of immiscible matrix entry and aqueous diffusion on distribution of TCE contamination in fractured shale saprolite. Geologist for the state of North Carolina.
- Stewart, Melanie, 2001, Bioavailability of chromium in contaminated soils. Technician in the UT College of Agriculture Sciences and Natural Resources. Co-supervised with Dr. P. Jardine, ORNL.
- Smith, Kevin, 2001, Influence of illuviated clays and soil cements on hydraulic conductivity in saprolite derived from sedimentary rock. Environmental consultant in the western US. Co-supervised with Dr. S. Driese, UT.
- Johnson, Trisha, 2005, Extent and seasonal variability of bacterial and viral contamination in karst aquifers. Geologist with the State of Utah. Co-supervised with Dr. A. Layton, UT.
- Dickerson, Syreeta, 2005, The influence of seasonal flooding on distribution of coal tar compounds in Chattanooga Creek floodplain sediments. Environmental manager at the Oak Ridge Y-12 site.
- Schultz, Bryan, 2005, Pore structure and grain size distribution in thick profiles of fine-grained residuum developed from weathering of Knox Group limestone. Knox County High School teacher. Co-supervised with Dr. S. Driese, UT.
- Bell, Alyssa, 2007, Investigations of physical and chemical factors influencing fecal persistence and concentration in stream water. Post-doc at the National History Museum of Los Angeles County. Co-supervised with Dr. Alice Layton, UT.
- Brown, Terri, 2009, Fluorescence characterization of karst aquifers in East Tennessee. Instructor at Lincoln Memorial University, TN.
- Lavoie, Beth, 2010, Fate and transport of particulate explosive residues in soils at active Department of Defence testing ranges. Environmental consultant in California. Co-supervised with Dr. Melanie Mayes, ORNL.
- Ayers, Kati, 2013, Factors influencing diarrheal pathogen presence in tubewells in Bangladesh. Lab technician in Kentucky. Co-supervised with Dr. Alice Layton, UT.
- Hunter, Robert, 2013, Hydrogeology of the UT Little River Animal Agriculture Research Unit and impacts of dairy operations on groundwater. Environmental consultant in Tennessee.
- Street, Derek, 2014, Quantitative characterization and waterborne transport of fecal indicators at the Little River Animal and Agriculture and Environmental Research Unit. Environmental consultant in Connecticut. Co-supervised with Dr. Alice Layton, UT.
- Adams, Benjamin, in-progress, Changes in hydraulic conductivity in fractured porous media following injection of emulsified vegetable oil (EVO). Co-supervised with Dr. Terry

Hazen, UT.

Leah Wenhold, in-progress, Contaminant transport and deposition in flood plains in urban watersheds, started August 2017.

### ***Post-doctoral Researchers and Visiting Scientists***

Dr. Vijay Vulava, Federal Institute of Technology, Zurich, Switzerland (2001-2006)  
Ms. Nadine Goeppert, PhD Candidate at Karlsruhe Univ., Germany (May – Nov/2005)  
Dr. Sid Jones, Northwestern Univ. (2002-2004)  
Dr. Mette Broholm, Danish Technical University (summer 2001)  
Dr. Miri Rietti-Shati, Weizmann Institute, Israel. (2000-2001)

## **Courses Taught**

Geol 103 – Earths' Environment (1996, 2002, 06, 07, 09, 10 & 2012)  
Geol 103 – Earths' Environment Lab (2015)  
Geol 440 – Field Camp (co-taught with 3 other faculty in 1996, 97, 98, 99, 2000 & 2002)  
Geol 455 – Environmental Geology (co-taught in 2011, 2013 & 2014; sole instructor in 2018)  
Geol/CE 485 – Principles of Hydrogeology (1993, 94, 95, 97, 97, 98, 99, 02, 03, 06, 10, 13 & 16)  
Geol 486 – Hydrogeology Lab (1998, 99, 2000, 2001)  
Geol 490 – Careers in Geology and Environmental Studies (2015 & 17)  
Geol 585 – Contaminant Hydrogeology (1994, 96, 98, 2000, 02, 04, 06, 09 & 17)  
Geol 586 – Field and Lab Methods in Hydrogeology (1995, 97, 99, 2003, 05, 07, 09 & 2012)  
Geol 685 – Seminar in Hydrogeology (2000, 03, 05 & 2007)  
Geol 690 – Seminar on Academic Careers in the Earth Sciences (2008, 2011, 2014, 2016, & 2018)

## **Service and Outreach at the University of Tennessee**

***Department Head (2009 – 2017)*** with major achievements listed below

### Merger of Environmental Studies with Geology and growth of the combined major

- Merged Geology and the Environmental Studies Independent Degree Program into a combined major with separate concentrations in each area
- Developed a systematic recruiting effort to recruit majors from 100-level classes
- Result was an increase in Geology & Environmental Studies (GES) majors from <50 students in 2009 (in Geology major) to ~140 in 2016 (with ~80 in Geology concentration and ~60 in ES concentration)
- Graduation rates for undergraduate majors have risen from less than 10 per year prior to 2009, to approximately 38 students per year in 2015/16

### Tenure-track searches and retention efforts

- Target of Opportunity/Diversity hire of Dr. Annette Engel in 2010-2011
- Spousal Accommodation tenure-track hire for Dr. J. Emery in 2011
- Successful retention counter-offer to Dr. Devon Burr in 2011
- Spousal Accommodation tenure-track hire for Dr. C. Sumrall in 2012
- Spousal Accommodation tenure-track search & hire for Dr. A. Steen in 2014

- Tenure-track search & hire for Dr. A. Szyrkiewicz in 2013
- Tenure-track search & hire for Dr. M. McCanta in 2016

#### Alumni Development and Fund Raising

- Starting in 2011, I established a series of alumni funded “Faculty Achievement Awards or Endowments”. These include:
  - o 4 new endowments given to deserving faculty. Total amount of each endowment ranges from \$25 to \$120K and two were eligible for the “Chancellor’s Challenge”
  - o 6 new term awards given out to deserving faculty members at \$3-5K year over a 5 year period (total amount of each award ranges from \$15 to \$25K)
- Helped establish the Ryan B. Edwards Memorial Endowment in Spring/2012. Current value of endowment is approximately \$100K
- Helped establish the TW and Clare Garrett Graduate Fellowship Endowment (\$100K)
- Helped establish the Shan Shanmugam Graduate Fellowship Endowment (\$25K)
- Helped establish the Nancy and Jimmy Walls discretionary Endowment (\$125K)
- Set up the Strong Hall Endowment, for departmental gifts tied to name recognition in EPS space in the new Strong Hall building. Gift agreements and bequests totaling approximately \$690K have already been signed. Approximately  $\frac{3}{4}$  of the agreements are with donors who hadn’t previously made a major gift to UT.
- Served as panelist or speaker in UT Development 101 Workshop (2013, 2014 & 2016)

#### Academic Program Review (2012) & Mid-Cycle Review (2016)

- Prepared Self-study, Strategic Plan and organized most of the activities for a highly successful APR. Currently preparing for Sept/16 mid-cycle review

#### SACS Accreditation Plan

- Helped develop SACS outcomes and assessment plans for EPS BS, MS & PhD programs in Spring/2013

#### Faculty and Alumni Award Nominations (successful)

- Assisted in successful nomination of Hap McSween for 2016 UT President’s Award
- Hap McSween 2015 College Senior Teaching Award
- Josh Emery 2015 Chancellor’s Award for Professional Promise in Research
- Linda Kah 2015 Chancellor’s Senior Research Award
- Don Byerly (Emeritus faculty) 2015 Fellow of the Geological Society of America
- Hap McSween for 2014 Macebearer
- Melody Branch (Office Manager) 2014 Chancellor’s Service Award
- Assisted in successful nomination of Hap McSween for 2013 SEC Professor of the Year
- Annette Engel 2013 College Junior Research Award
- Micah Jessup 2013 Chancellor’s Award for Promise in Research
- Melanie Mayes (ORNL-UT Joint Fellow) 2014 AAAS Fellow Award
- Peter Knappett (PhD 2010) 2014 Geol. Society of America, Kohout Early Career Award
- Linda Kah 2013 Fellow of Geological Society of America
- Annette Engel 2013 College Award for Professional Promise in Research
- Devon Burr 2011 College Junior Research Award
- Larry Taylor 2011 College Senior Research Award



### ***Department Service Activities***

- Member of Undergraduate Program Committee 2017-18
- Chair of Alumni Affairs Committee 2017-18
- Department Head 2009-2017
- Associate Department Head 2004 – 2007
- Director of Graduate Studies 1998 – 2001 and 2002 – 2004
- Member of Graduate Program Committee 1997 – 1998 and 2001 – 2002
- Member of Graduate Admissions Committee 2003 – 2004
- Chair of Discretionary Fund Committee in 2001 – 2003 and 2007 – 2008
- Chair of Adjunct Appointments Committee 1996 – 2003
- Chaired EPS Faculty Searches in 2004, 2005 and 2010 and served as committee member for searches in 1999, 2000 and 2001
- Chaired Peer-Teaching Review Committees in 1998, 1999, 2000, 2001, 2004 & 2009
- Member of the Undergraduate Program Committee 1993 – 1997
- Faculty peer mentor 2001 – 2004
- Member of space and facilities committee 1999, 2000 and 2003
- Editor or Co-Editor of departmental newsletter 2005, 2006, 2007 and 2012 – 2015
- Participant in Earth Science Day Outreach activities (~600 students visited UT each year) in 2001, 2002 and 2003
- Chaired UT Geological Sciences/ORNL Science Alliance summer internship program 1994 – 1996

### ***College and University Service Activities***

- President's Program Effectiveness Task Force, 2017-18
- Member of Faculty Senate, 2017-present
- Provost's Committee for Top 25/VolVision refresh, 2015-16
- Participant in UT Leadership class, May 2015 to 2016
- Member of Search Committee for Associate Vice-Chancellor of Human Resources 2015
- Member of Geography Academic Program Review Committee 2014
- Panel member for Library Faculty Review Workshop 2013
- Vice-Provost's committee for Top 25 Faculty Priorities 2013
- Chaired external search for Head of Ecology and Evolutionary Biology 2013
- Presenter at UT Fund Raising 101 Workshop, January/2013 & 2014
- Chaired search for Head of Physics Department 2012
- Participated and was honored at the UT Campaign for Tennessee Finale Dinner in 2012
- Co-taught Provost's Workshop for new Department Heads 2012
- Chaired search for Arts & Sciences Information Specialist in 2011
- Committee for programming and design of EPS space for new Strong Hall 2011 – present
- Member of Haines-Morris Proposal Review Committee 2009
- Head reviews for Physics 2006, Music 2007 and Psychology
- Member of the search committee for a Governor's Chair in Climate Change 2010
- Member of UT Research Council 2006 – 2007
- Member of the Dean's Advisory Council 2002 – 2004
- Member of Biosystems Engineering and Environmental Science Academic Program Review 2003 and mid-cycle review in 2007

- Member of Civil and Environmental Engineering (CEE) Academic Program Review 1999
- Member of faculty search committees in CEE in 2002 and 2003
- Member of Cooperative Ecosystems Studies Unit (CESU) Panel 1998
- Cartographic Information Center review 1997

### ***Outreach***

- Boy Scouts of America - Geology Merit Badge Camp Instructor 2016, 2017 & 2018
- UT Earth Science Day activities for up to 700 K-12 students in 2001, 2002, 2003, 2006, 2007 and 2009
- Rock Talks for West Hills Elementary, Fairview Elementary, Gibbs Elementary and Cub Scouts 1998 to 2007
- College of Arts and Sciences Pre-Game Showcase Speaker, 2001 and 2009
- Howard High School and South Chattanooga Community Center student workshops
- Taught two lectures for the Chattanooga “Neighborhood Environmental College” 2007
- Chaired the Chattanooga Creek Environmental Research and Community Action Conference, held on September 22, 2006
- College Speakers Bureau and other talks for O’Connor Senior Citizens Center, Knoxville Woman’s Club, Erin Presbyterian Senior Sack Lunch, South Doyle Homeowners Association, Pellissippi Genealogical and Historical Society, Civitan, Kiwanis, STOP, UT Alumni College
- Keynote Speaker for Tennessee Jr. Science and Humanities Symposium 2010
- Participant in Knox County Schools - Jobs Fair 2010
- Workshop trainer and judge for Science Olympiad 2011 and 2012
- Hosted field trips by hydrogeology classes from TN Tech, East Tennessee State University, Middle Tennessee State University, and Clemson University; usually one visiting class per year since 2006
- Featured in media for WBIR, Knoxville News Sentinel, local radio, College of Arts & Sciences – Higher Ground, E-Torch alumni publication and TN Today

## **Professional Service**

### ***Editorial Service and Manuscript Reviews***

- Associate Editor for the Journal of Ground Water 1996 – 2005
- Editor of Special pathogens issue of Ground Water 2011
- Peer reviewer for Water Resources Research, Journal of Contaminant Hydrology, Environmental Science and Technology, Journal of Environmental Quality, Journal of Hydrology, Canadian Geotechnical Journal, Kuwaiti Journal of Science, Vadose Zone Journal, FEMS Reviews, Ohio Journal of Science and others
- Reviewed 3<sup>rd</sup> and 4<sup>th</sup> Editions of “Applied Hydrogeology” for the publisher

### ***Proposal Reviews and Panels***

- Peer reviewer of proposals for National Science Foundation, Department of Energy, Environmental Protection Agency, US Geological Survey, National Sciences and Engineering Research Council (Canada), Petroleum Research Fund

- Service on peer review panels for NSF/NIEH Ecology of Infectious Disease program 2012, 2013 and 2014
- Service on External Advisory Committee for the Canadian Water Network 2006 – 2009
- Service on peer review panels for Department of Energy 1997 and 1999

***Reviews for Government Agencies and Legal Cases***

- TN Dept. of Environment and Conservation – Independent Review Panel for Oak Ridge Reservation Offsite Groundwater Data 2013 – 2015
- Reviews of depositions and expert witness reports for environmental contamination cases involving contractors for the State of Tennessee and Knox County 2012 and 2015

***Reviews of Faculty Promotion Files and External Dissertation Examiner***

- P&T external reviewer for universities in US and abroad in 2016, 2014, 2013, 2010, 2008, 2007, 2005, 2003
- Dissertation examiner McMaster University, Ontario 2012
- Dissertation examiner University of Otago, New Zealand 2010

***Professional Association Service***

- Geological Society of America – Annual Program Committee Member 2017-2022
- Chaired sessions at the Geological Society of America Conference 2018, 2015, 2011, 2006, 2002, 1997 and 1995
- Chaired sessions for TN Water Resources Symposium, Montgomery Bell State Park, 2007
- Chaired session at NGWA Groundwater Summit, San Antonio, TX 2005
- Chaired sessions for Southeast Section of Geological Society of America 1995 and 2006