Curriculum Vitae

Research interests

My interests are in Microbial Biogeochemistry by using an integrated approach of molecular biology, microbial biomarkers, microbial isolation and culturing, and geochemical and mineralogical tools. My specific interests are to study the microbial community structure, functions, and physiological pathways that support biogeochemical processes in the subsurface, which provide insights for geological and microbial co-evolution on Earth; to study the interactions between microbes and minerals, especially the impact of microbes on weathering, biomineralization, and geochemical cycling such as Fe and Mn.

Microbes can be found at greater extremes of temperature, acidity, alkalinity, and salinity. The study of microbial life in the deep subsurface can provide insights into: how life may have evolved in the extreme physical and chemical conditions dominating the early earth, and how microorganisms play a role in shaping their surroundings. To investigate the genetic and functional diversity of life in the deep subsurface, I am interested in to use the integrated approaches to address several specific questions: (1) Population structure and dynamics – how do microbial communities very among different fine geochemical gradients? (2) Metabolic and functional potential – what are energy sources and primary producers for the deep habitats; can we used observed concentrations of biologically important compounds (i.e. H_2, NO^{2-}, NO^{3-}, Fe^{3+}, SeO_4^{2-}, As^{5+}, CO, Fe^{2+}, H_2S, S^0, $S_2O_3^{2-}$, SO_3^{2-}, SO_4^{2-}, CH_4, and CO_2), to make predictions regarding metabolic potentials of microbial inhabitants? (3) Linking structure and function of microbial communities – how do microbial functional groups organize together, and how do microbes communicate with each other.

I am interested in microbe-mineral interactions and the geological and ecological implications of these interactions in environments. Specifically, I am interested in (1) The processes by metal (Fe(III) or Mn(IV))-reducing and metal(Fe(II) or Mn(II))-oxidizing bacteria dissolve and precipitate iron or manganese-bearing minerals. Electron microscopy (TEM and SEM) and other high resolution imaging techniques provide a unique opportunity to directly image mineral-microbe interface. X-ray diffraction supplies the mineral structure details. Biogeochemical interfacial reactions are ultimately expressions of biochemical and physical processes at mineral surfaces that are mediated by bio-molecules at nanometer scale. (2) The consequences of microbial metal redox processes for the fate of organic and inorganic pollutants in natural environments such as dehalogenation of organic compounds, bioremediation of uranium. 3) Elemental cycles. Microbial mediated anaerobic Fe(II)-Fe(III) cycling are associated with nitrate-reducing, dissimilatory iron-reducing and sulfate-reducing bacteria. Biogeochemical iron/manganese cycle integrates with nitrogen and sulfur cycles.

Address
Gengxin Zhang
Oak Ridge National Laboratory 865-574-7379
Bldg. 1505, Room 307 E-mail: zhangg@ornl.gov
Oak Ridge, TN 37831

Education:

Research Associate (Aug. 2007 ~ present) Bioscience Division, Oak Ridge National Laboratory, Oak Ridge, TN

Research Associate (May. 2006 ~ Jul. 2007) Civil & Environmental Engineering, The Pennsylvania State University, University Park, PA

Ph.D. (2006) Geology, Miami University, Oxford, OH

M.S. (2001) Organic Geochemistry, Lanzhou Institute of Geology, Chinese Academy of Sciences, China

B.A. (1997) Geology, Xi'an Engineering University, China

Professional experience:

Research and Teaching Assistant, Geology Department, Maim University, January 2002–present.

Engineer, Lanzhou Institute of Geology, Chinese Academy of Sciences, China, December 2000 - December 2001

Research Assistant, Lanzhou Institute of Geology, Chinese Academy of Sciences, China, July 1998- December 2000

Assistant Engineer, China Geological Survey, Xinjiang , China, July 1997-July 1998

Technical expertise:

Molecular techniques: PCR, sequencing, cloning, Southern, Northern, DNA hybridization, protein isolation, Terminal-Restriction Fragment Length Polymorphism (T-RFLP), Fluorescent In Situ Hybridization (FISH), Stable-Isotope Probing (SIP), Confocal Laser Scanning Microscopy (CLSM), Phospholipid fatty acid (PLFA) extraction and identification.

Bioinformatic tools: MatLab, BioJava, BioPerl, GCG, ARB, MEGA and PAUP softwares.

Isolation and culture techniques: thermophilic, anaerobic Fe(III) reducing and Fe(II) oxidizing bacterial isolations; plating, and roll-tube methods for extreme thermophilic microbial isolations.

Mineralogical and geochemical techniques: scanning electron microscope (SEM), Transmission Electron Microscopy (TEM), X-ray diffraction (XRD), Atomic Force Microscopy (AFM), Gas Chromatography / Mass Spectrometry (GC-MS), GC-ir-MS, Fourier transform infrared spectroscopy (FTIR), High Performance Liquid Chromatography (HPLC), ICP-MS and liquid chromatography/ mass spectrometry (LC/MS).

Professional affiliations:
American Society for Microbiology
Geological Society of America
American Geophysical Union
Clay Mineral Society

Publications:

PUBLISHED JOURNAL ARTICLES

Zhang, G.X., Dong, H.L., Xu, Z.Q., Zhao, D.G., and Zhang, C.L. (2005) Microbial Diversity in Ultra-High-Pressure Rocks and Fluids from the Chinese Continental Scientific Drilling Project in China. *Applied and Environmental Microbiology*, 71(6), 3213-3227. ***(This paper was reported in Miami University newsletter – "The Report".)***

Zhang, G.X., Dong, H.L, Jiang, H.C., Xu, Z.Q., and Eberl, D.D. (2006) Unique microbial community in drilling fluids from Chinese Continental Scientific drilling. *Geomicrobiology Journal*, 23(6), 499-514.

Dong, H.L., **Zhang, G.X**, Jiang, H., Yu, C., Chapman, L.P., Lucas, C.R., and Fields, M.W. (2006) Microbial Diversity in Water and Sediment of Lake Qinghai: The Largest Inland Saline Lake in China. *Microbiology Ecology*, 51, 65-82.

Jiang, H.C., Dong, H.L., **Zhang, G.X.**, Yu, B.S., Chapman, L.R., and Fields, M.W. (2006) Microbial diversity in water and sediment of Lake Chaka, an athalassohaline lake in northwestern China. *Applied and Environmental Microbiology*, 72(6), 3832-3845.

Zhang G.X., Dong H., Kim J., and Eberl D. D. (2007) Microbial Reduction of Structural Fe^{3+} in Nontronite by a Thermophilic Bacterium and its Roles in Promoting the Smectite to Illite Reaction. *American Mineralogist* 92, 1411-1419.

Zhang G.X., Kim J., Dong H., and Andre J. S. (2007) Microbial effects in promoting the smectite to illite reaction: Role of organic matter intercalated in the interlayer. *American Mineralogist* 92, 1401-1410.

Xia Yanqing, **Zhang G.X.**, (2002) Investigation of mechanisms of formation of biphenyls and benzonaphthothiophenes by simulation experiment. *Science in China* (series D), 45 (5), 392-398.

Lei Tianzhu, **Zhang G.X.**, Qiu Junli, Xia Yanqing, Nan Qingyun, (2005) Oxidant-elemental sulfur as an effective promoter for transformation of organic matter to hydrocarbons at moderate-low temperatures. *Chinese Journal of Geochemistry*, 24 (3), 265-272.

Lei Tianzhu, **Zhang G.X.**, Qiu Junli, Xia Yanqing, Nan Qingyun, (2006) Effects of element sulfur on carbon isotopic fractionation of methane. *Petroleum Geology & Experiment*, 28 (2), 173-176.

Zhang G.X., Dong H.L., Chakraborty R., Hedlund B.P., Kukkadapu R.K., Kim J., Hazen T., and Xu Z.Q. (2007) Evidence for Microbial-Mediated Iron Redox cycle in the Deep Subsurface. *Environmental Microbiology*, Submitted

Zhang G.X., Burgos W.D., Hui T. (2007) Metabolically active fungi communities in acidic mine drainage and their effects on redox cycling of manganese. *Applied and Environmental Microbiology,* Submitted.

Zhang G.X., Senko J.M., Kelly S. D., Tan H., Kemner K. M. and Burgos W.D. (2007) The effects of Fe(III) in nontronite on bioreduction of uranium(VI). *Geochimica Et Cosmochimica Acta*, Submitted.

Zhang G.X., Senko J.M., Kelly S. D., Tan H., Kemner K. M. and Burgos W.D. (2007) influence of iron in chlorite on bioreduction and reoxidation of uranium. *Preparation for Geochimica Et Cosmochimica Acta*, Submitted.

PENDING JOURNAL ARTICLES

Zhang G.X., Dong H.L., and Burgos W.D. (2007) Nanoparticles as antimicrobial agent on microbial activity: a case study on iron-reducing bacteria. *In Preparation for Environmental Science & Technology.*

Abstracts:

Zhang, G., Dong, H., Xu, Z., Yang, J., Zhang, Z., Cohen, C., and Balkwill, D.L. (2003) Microbial community in ultra-high pressure metamorphic rocks from Chinese continental scientific deep drilling. The American Society for Microbiology 103rd General Meeting, May 18-22, 2003, Washington, DC.

Zhang, G., Jang, H., Dong, H., and Xu, Z. (2004) Microbial diversity in drilling fluid from Chinese Continental Scientific Deep Drilling. The American Society for

Microbiology 104rd General Meeting, May 23-27, 2004, New Orleans, Louisiana.

Zhang, G., Jasi, D.P., and Dong, H. (2004) Bioavailability of organic matter intercalated into nontronite clay. The Clay Minerals Society 41st Annual Meeting, June 19-24, 2004, Richland, Washington.

Zhang, G., Dong, H., and Eberl, D.D. (2005) Microbial Reduction of Structural Fe(III) in Nontronite by a Thermophilic Bacterium and its Roles in Promoting the Smectite-illite Reaction. The Clay Minerals Society 42st Annual Meeting, June 11-15, 2004, Burlington, Vermont.

Zhang, G., Kim, J., and Dong, H. (2005) Bioavailability of organic matter intercalated in the nontronite structure. The Clay Minerals Society 42st Annual Meeting, June 11-15, 2004, Burlington, Vermont.

Zhang, G., and Dong, H. (2005) Microbial Reduction of Structural Fe(III) in Nontronite by Thermophilic Bacteria and its Roles in Promoting the Smectite-illite Reaction. The Joint International Symposia for Subsurface Microbiology (ISSM 2005) and Environmental Biogeochemistry (ISEB XVII), August 14-19, 2005. Jackson Hole, Wyoming.

Jiang, H., Zhang, G., Dong, H., Yu, B., and Fields, M.W. (2004) Microbial diversity in sediments of Lake Chaka: an inland alkaline lake in Northwestern China. Geological Society of America Abstracts with Programs, Vol. 36, No. 5, p. 360

Dong, H., Zhang, G., Yu, B., Jiang, H., and Jaisi, D.P. (2004) Microbial diversity in sediments from Lake Qinghai: the largest inland saline lake in China. 104th American Society for Microbiology, New Orleans, May, 2004.

Miller, M., Zhang, G., Jiang, H., Dong, H., and Fields, M.W. (2005) Growth and Metal Reduction in the Presence of Elevated Borate Levels by *Alkaliphilus metalliredigens*, American Society for Microbiology annual meeting, Atlanta, GA.

Honors and awards:

Geological Society of American, Student Research Grant award, 2003.

Geological Society of American, Student Research Grant award, 2004.

Geological Society of American, Student Research Grant award, 2005.

Clay Mineral Society, Student Research Grant award, 2003.

Clay Mineral Society, Student Travel Grant Award, 2004.

Clay Mineral Society, Student Travel Grant Award, 2005.

American Society for Microbiology, Student Travel Grant Award for The Joint International Symposia for Subsurface Microbiology (ISSM 2005) and Environmental Biogeochemistry (ISEB XVII), 2005

Graduate Student Achievement award, Miami University, 2005

References:

Dr Hailiang Dong
Department of Geology
Miami University
Phone: 513-529-2517 email dongh@muohio.edu
Relationship: Ph. D Advisor;

Dr William D. Burgos
Civil & Environmental Engineering
The Pennsylvania State University
Phone: 814-863-0578 email: WDB3@engr.psu.edu
Relationship: Postdoc Advisor

Dr Matthew W Fields
Department of microbiology
Montana State University
Phone: 406-994-7340 email: fields@erc.montana.edu
Relationship: Ph. D. committee member