THE GEOLOGICAL SOCIETY OF AMERICA®
GEOLOGY AND HEALTH DIVISION

Geology and Health Division Newsletter

Volume 7, Number 1 – October 2012

http://rock.geosociety.org/GeoHealth/index.html

Inside This Issue

The Geology and Health Division is seeking volunteers to serve on various committees for the GEOMED 2013 conference to be held in the Washington, DC area in August 2013. Contact Bob Finkelman (bobf@utdallas.edu).

Division News and Events

Election Results

The Geology and Health Division (GHD) is pleased to announce Suzette Morman as the new 2nd Vice Chair. Suzette has a MS, Geology, 2005, from the University of Alabama, and MPH in Public Health, 2009, from the University of Colorado. She is currently a Research Geologist with U.S. Geological Survey in Denver, Colorado. Her current research investigates the interface between poorly understood earth materials and human health utilizing simulated biofluids. Other research interests include linking earth science and public health databases to elucidate diseases potentially related to earth materials and earth processes and the effects of climatic variability on drylands and implications for human health. Since 2010, Suzette has worked with the University of Colorado, School of Public Health to create interdisciplinary practicum and capstone opportunities for MPH students. This program introduces students to the geological knowledge and tools applicable to related public health problems. Suzette has authored or coauthored 12 peer reviewed publications related to geology and health. Suzette is an active member of the American Public Health Association, where she has presented research as well as organized and moderated several sessions for the Environmental and Occupational Health Division. A GSA member since 1996, Suzette was the Membership Chair for the Geology and Health Division this year.

We would like to thank Malcolm Siegel and Dibyendu (Dibs) Sarkar for strengthening GHD by running for the position and although they fell short in this close contest, we look forward to their continued involvement in the Division.

Geology and Health Division Award

The first GHD award will be presented to E. Lynn Savage of Brooklyn College. The Division Meritorious Service Award is awarded to Lynn for her efforts to establish the GHD, for her service as the Division's first Chair, and for her decades long efforts to promote geology and health. The award will be presented at the Division business meeting in Charlotte (Tues, Nov. 6, 5:45 PM, Room 212AB).

Division News and Events (cont.)

GSA 2012 Annual Meeting

Geosciences: Investing in the Future. November 4-7, Charlotte, NC (meeting website – http://geosociety.org/meetings/2012/).

Geology and Health Sessions and Events

- GHD Luncheon and presentation by Gabriel Filippelli: *Integrating Environmental and Social Health Concepts to Reduce Lead Exposure Risks in Urban Youth*
  Tues. Nov 6 12:00 PM, Room 212A&B
- Geology and Health Division Business Meeting
  Tues. Nov 6 5:45-6:45 PM, Room 212AB
- Geology and Society Distinguished Lecture: *Energy and Global Sustainability*, Mohamed El-Ashry, Senior Fellow United Nations Foundation
  Tues. Nov 6 5:45-6:45 PM, Room 208B
- T1. Sources, Transport, Fate, and Toxicology of Trace Elements and Organics in the Environment
- T9. Geochemistry of Urban Environments
- T33. Frontiers in Coal Science: From Basic Research to Applied Technology
- T50. Alterations in Water Environment and Human Health Consequences
- T51. Geology and Health: Getting the Word Out
  Tues, Nov. 6, 1:30-5:30, Room 212A&B
- T61. Research and Instructional Approaches of Access and Inclusion to Increase Diversity in the Geosciences

Other Geology and Health News

Springer, in collaboration with the International Medical Geology Association, will be releasing a revised and updated (and less expensive) edition of the award winning book ***Essentials of Medical Geology***. Look for it in early 2013.

Newsletter Contributions

The Geology and Health Division welcomes contributions to our newsletter. Please send newsworthy items to the Newsletter Editor, Jean Morrison (jmorrison@usgs.gov).

Chair's Message

This year the Division has undertaken a major step in our development by volunteering to host the 5th International Conference on Medical Geology. I have been asked by our past Chair, Syed Hasan, to take on the responsibilities of chairing this important event. So, although my term as Division Chair is winding down, my involvement with the Division is ratcheting up. The MEDGEO 2013 (see update below) conference will provide the Division with a unique opportunity to host our national and international colleagues and to showcase the work of our members and colleagues to the scientific community and federal agencies in the Washington, D.C. area. I look forward to seeing you at this important event. Please note that Division members will receive a $50 discount on the registration fee.

At this time it is traditional and appropriate for me to acknowledge the support that I received from my colleagues. My thanks go out to Saugata Datta (1st Vice Chair), Tom Darrah (2nd Vice Chair), Kevin Nick (Secretary), and Syed Hasan (Past Chair) for their invaluable support and encouragement. They helped to make this year productive and satisfying.

In addition, many Division members have stepped up to Chair or to serve on various committees. These include: Saugata Datta, Program Committee; Alan Jacobs who did double duty on the Nominations and Awards Committees; Suzette Morman, Membership Committee; Motomu Ibaraki, Fund Raising Committee; Tom Darrah, Outreach Committee; and Jean Morrison, Newsletter editor. I want to express my sincere appreciation to them and to the committee members for their important service to the Division.

Although this has been a busy and productive year for the Division much work remains to be done. It is virtually impossible for Division leadership to recognize the critical issues, and then to devise and implement a plan of action during a one-year term. Therefore, the incoming 2nd Vice Chair and subsequent Division officers will be serving two-year terms. The longer terms will allow the officers to better meet the needs of the Division membership. Perhaps the most pressing current issue is the stagnant membership numbers. To be a vital organization we must continue to grow by attracting new members and retaining current members. I ask each and every one of you to help by promoting the Division to your colleagues and to anyone who may be interested in the important work supported by the Geology and Health Division.

Bob Finkelman
bobf@utdallas.edu

Division Personnel

Current officers through 2012

- Robert B. Finkelman, Chair
- Saugata Datta, 1st Vice Chair
- Thomas Darrah, 2nd Vice Chair
- Kevin E. Nick, Secretary-Treasurer
- Syed Hasan, Past Chair

In-Coming Officers (2012-2014)

- Saugata Datta, Chair
- Thomas Darrah, 1st Vice Chair
- Suzettte Morman, 2nd Vice Chair
- Kevin E. Nick, Secretary-Treasurer
- Robert B. Finkelman, Past Chair

The Chair, 1st Vice Chair and 2nd Vice Chair advance in succession biennially. The Secretary-Treasurer carries out a three-year term.

GSA Councilor/Division Liaison Representative to the Geology and Health Division for the period July 2011 to June 2015: **John M. Holbrook**.

***Suzette Morman** joins the Geology and Health Division Management Board, effective October 2012.*

Please consider serving on a Geology and Health Division Committee for 2012-2014
To volunteer, nominate someone or learn more, please contact Bob Finkelman at bobf@utdalls.edu The Division needs you and welcomes your contributions!

Division Committee Service

JTPC Representative: Robert Finkelman

Program Committee: Saugata Datta (chair sdatta@ksu.edu),

Nominations and Awards Committees: Allan Jacobs (chair amjacobs@ysu.edu), Gabriel Filippelli, Kevin Nick, Geoffrey Plumlee, Catherine Skinner

Membership Committee: Suzette Morman smorman@usgs.gov

Fundraising Committee: Motomu Ibaraki ibaraki.1@osu.edu

Outreach Committee: Tom Darrah Thomas.darrah@umb.edu

Newsletter Editor: Jean Morrison jmorrison@usgs.gov

GEOMED 2013 conference committee: Robert B. Finkelman (chair), Catherine Skinner, Syed Hasan, Ester Sztein, Tom Darrah, Saugata Datta, Kevin Nick, Monica Gowan

Newsletter Contributions
The Division welcomes your contributions to the newsletter. Please send ideas and announcements to the newsletter editor, Jean Morrison (jmorrison@usgs.gov).

MEDGEO 2013 5th International Conference on Medical Geology

The Natural Environment & Health: Hidden Dangers, Unlimited Opportunities

August 25-29, Hilton Crystal City Hotel, Arlington VA

http://rock.geosociety.org/GeoHealth/MEDGEO_2013/Welcome.html.

Hosted by the GSA's **Geology and Health Division** under the apices of the **International Medical Geology Association (IMGA)**

Current Proposed Session Topics and Chairs include:

- Arsenic in the Environment - Dib Sarkar sarkard@mail.montclair.edu
- Asbestos: Environmental contamination and health effects - Eduardo Capitani, capitani@fcm.unicamp.br
- Biogeochemical monitoring and treatment of disease - Ariel Anbar, anbar@asu.edu
  Climate Change and Human Health - Wendy Thomas, wthomas@ametsoc.org
- Energy related health issues - Tee Guidotti, tee.guidotti@gmail.com
- Health impacts of natural dust - Heather Jameison, jameison@geology.queensu.ca
- Health impacts of global artisanal mining - Geoff Plumlee, gplumlee@usgs.gov
- IMGA Chapters - Laura Ruhl, lsruhl@ualr.edu
- Legacy of natural disasters - Stanley Williams, stan.williams@asu.edu & Claire Horwell, claire.horwell@durham.ac.uk
- Medical geography - Joseph Oppong, joseph.oppong@unt.edu
- Medical geology impacts on children's health - (Invited: Jerome Paulson, jpaulson@childrensnational.org
- Military applications of medical geology - Jose Centano, jose.centano@afncr.af.mil
- Occupational health issues - Xi Huang, xi.huang@nyumc.org
- Soils in medical geology - Invited Cliff Johnston, clays@purdue.edu
- Therapeutic uses of geologic materials - Lynda Williams, lynda.williams@asu.edu
- Urban medical geology issues - Howard Mielke, hmielke@tulane.edu
- Veterinary geology - Invited Jan Myburgh, jan.myburgh@up.ac.za
- Water-related medical geology issues - Giora Rytwo, giorarytwo@gmail.com
  Mercury and Environmental Health: Paleo-historical, Legacy and Contemporary Effects and Challenges – Earl Brooks, webgeology@aim.com, and Nick Robins, narobins@ncsu.edu
- General Geology and Health Session - TBD

Details for short course offerings, welcoming reception, banquet, student activities and evening bus tours (D.C., USGS headquarters, National Museum of Health and Medicine, Smithsonian Institution, and Arlington National Cemetery) can be found at http://rock.geosociety.org/GeoHealth/MEDGEO_2013/Welcome.html.

We invite your suggestions on additional sessions and on any aspect of the conference. You can send your questions or suggestions to Bob Finkelman at bobf@utdallas.edu. We look forward to seeing you at this important and exciting event.

Medical Geology in the News

A Day in the Life: Brenda Buck

By Madeline Fisher

This article is reprinted with permission from the Soil Science Society of America's Soil Horizon publication.

Hiking, horseback riding, and working on her family's remote Montana ranch as a child, Brenda Buck was filled with questions: Why does a river flow here and mountains loom over there? Why does this field look different from that one? Geology, her parents told her, is where the answers lay. "Okay," she replied, "that's what I want to do." And she has now, for more than 20 years.

It turns out, though, that the actual trajectory of her career would be much harder to foresee. Buck, a professor of geology at the University of Nevada, Las Vegas, has studied everything now from agronomy to ancient soils to archeology—and, lately, the most unexpected subject of all: medical geology. How did she arrive here? By doing the same thing she did as a child, she says: "You keep chasing the questions that come up." Here's what else she has to say about her path.

Soil Horizons: Let's start with medical geology. What is it?

Buck: Medical geology is an interdisciplinary field studying how the earth affects human and animal health. Because soils are commonly the interface between the earth and people or animals, soil science is an extremely important component of medical geology.

Soil Horizons: What's a typical day like for you as a medical geologist? Do your activities differ much from those of soil scientists and geologists in other fields?

Buck: What's different in my work is that I have to speak many different scientific "languages." To be successful in medical geology, you need to be able to communicate with medical doctors, toxicologists, epidemiologists, public health specialists, geologists, mineralogists, soil scientists, and chemists. And everybody speaks a different scientific language and has different ways of visualizing and tackling problems. I spend a significant amount of time gathering these specialists together and facilitating everyone working together as a team. This often requires me to translate what one person said in a language that another scientist can understand. I never thought this was a special talent until I realized how often and easy it is for people to not under- stand one another. This leads to friction and misunderstanding that can slow or prevent collaboration.

Otherwise, like most academics, I am busy teaching all levels of students from high school students working in my lab, to undergraduates, graduates, and post- docs, as well as supervising faculty who work with me. I also run a self-supported research laboratory, publish papers, do fieldwork, serve on committees, and somewhere in there try to find a "life"!

Soil Horizons: How did you get interested in geology and soil science?

Buck: I knew I wanted to be a geologist when I was five years old as I worked on my family's cattle ranch in western Montana. Later, as a graduate student working for the U.S. Geological Survey (USGS) as a summer intern, I was introduced to paleosols (ancient soils that are buried and preserved and are now part of the rock record) and found the idea of ancient landscapes fascinating. Then, while doing my M.S. thesis on paleosols, I wanted to better understand modern soils because geologists often say, "The key to the past is the present." This drove me to pursue my Ph.D. in agronomy. Since then I've worked on arid soils and paleosols all over the world—in 18 countries on six continents so far—and answered questions pertaining to archaeology, paleoclimate,

landscape evolution, heavy metal and radionuclide contamination, geologic hazards, tectonics, soil genesis, and other applications. Recently, I started doing work on dust in the Las Vegas Valley, and this led to my work in medical geology. Currently, we have an ongoing human health risk assessment, for the Bureau of Land Management, on mineral dust from the Nellis Dunes Recreational Area. Our research group includes toxicologists, medical doctors, and biochemists, as well as geologists, soil scientists, and geochemists. We're particularly interested in this area because approximately 300,000 people a year use Nellis Dunes for off-road-vehicle (ORV) recreation, and the dust contains the highest concentration of arsenic measured from a natural surface. Importantly, dust is generated by both natural (wind) and anthropogenic (ORV driving) processes.

Soil Horizons: Tell me about dust: Why is it important to study in the context of human health? Is human exposure to dust increasing? Or are we just now realizing the potential health effects?

Buck: Dust is important to study in the context of human health because the air we breathe is an enormous source of exposure. And human exposure to dust is increasing, especially with expanding and accelerating land use: recreation, urbanization, farming, and so on. All these activities change the surface of the land, and this increases dust—more so in drier climates.

The potential health effects have long been recognized, so this isn't new. What's needed though is better interaction between specialists. For example, there is a long history of medical professionals performing experiments with mineral dusts to determine carcinogenicity. But, they often didn't work with geologists or soil scientists to adequately characterize the materials they were testing because they weren't aware of the complexity of natural dusts or even individual minerals. Therefore, there is much more research that's needed to know which specific minerals, in what crystal form, with what chemical compositions, and in what combinations and quantities, cause disease. There's also much work to be done to better understand the transport of these materials into human populations.

As far as personally realizing the health effects, I think that depends on your experience. I certainly had no idea what the potential consequences to dust expo- sure were until a few years ago. I've spent most of my life digging soil pits and breathing in enormous amounts of dust without giving it a second thought. I think it would be very beneficial for soil scientists in particular to become more aware of the potential negative health effects of mineral dusts and do more to protect themselves and, especially, their students.

Soil Horizons: What's the research question most on your mind right now?

Buck: Right now I'm really excited to work with the USGS's John Wesley Powell Center for Analysis and Synthesis, looking at the distribution of fibrous erionite in the United States and the implications for human health (see: http://powellcenter.usgs.gov/current_projects.php#DistributionHighlights). Fibrous minerals are a concern for health because some silicate minerals can form long, very thin crystals that can cause lung disease.

Erionite, for example, is a fibrous zeolite mineral that in laboratory studies has been found to be between 200 to 800 times more carcinogenic than some asbestos minerals. But unlike asbestos minerals, erionite is not regulated. Erionite is the cause of an epidemic of malignant mesothelioma in Cappadocia, Turkey, and my colleagues recently found that erionite-containing rocks were being used to gravel roads in North Dakota. (It's important to note, though, that fibrous minerals are not hazardous unless they become airborne, making them available for human exposure.)

For our study, we're gathering existing GIS datasets relating to fibrous mineral occurrences, local and regional geology, soils, climate, dust generation potential, population density, and

the prevalence of relevant diseases. We'll use this information to help reduce the risks of future exposure and disease, and to better understand the mechanisms that cause some silicate minerals to cause disease, while others do not. This project is just starting, and the Natural Resources Conservation Service has been a huge help in contributing soils databases to this project.

Besides erionite, I'm also working with scientists at the University of Hawaii School of Medicine to test if other fibrous minerals could cause disease. In particular, we're interested in two fibrous minerals that commonly occur in arid soils, palygorskite and sepiolite.

Soil Horizons: What's the most rewarding thing you've learned through your research?

Buck: The most rewarding part of my research is knowing that our findings will save lives. Through our work, we can help people avoid exposure to hazardous materials and lead healthier and longer lives.

Soil Horizons: Is medical geology a growing field? Any advice for students who might want to pursue it in the future?

Buck: Medical geology is a growing area of research, and there's definitely a demand for people who can successfully communicate in more than one scientific field—whatever field you choose. My advice for students interested in this topic—or any multidisciplinary topic—would be the following:

1. Become an expert in something that isn't just medical geology. You need a backup plan in case you can't find a good fit for your skill set—especially initially.
2. Become exceedingly well trained in all that you do. You'll be competing with people who only focus on one field, whereas you need to be an expert in at least two, if not more.
3. Expect to be lonely. My experience is that people in each field often will perceive you as an outsider and be reluctant to embrace you into their group. Hang in there…this, too, will pass.
4. Be creative about finding funding. Traditional sources may not want to fund research that doesn't fit nicely into their boxes.

However, remember that the major breakthroughs in science generally occur at the intersections between disciplines. No matter what field(s) you go into, I think the extra work it takes to be able to communicate with other disciplines is well worth it! I don't regret my choices at all!

Student Projects in Geology and Health

Probabilistic risk assessment of groundwater contaminated with arsenic

Matt Rankin, Department of Geology, Kansas State University (Supervisor: Dr. Saugata Datta, Associate Professor, Geology)

Using geological and geochemical parameters of subsurface groundwater/contaminant transport modeling, statistics, and GIS, the study aims at developing a probabilistic risk assessment of groundwater contaminated with arsenic (As) in Kansas. The goal is to be able to predict if an area in Kansas could have As-contaminated groundwater just by inserting the respective values of the parameters for the given area into the model. The geological and geochemical parameters will be assigned numerical values and based on their relative contribution (weighting factor) to As contamination, the model should be able to identify areas of known As-contaminated groundwater. Ideally the model will be able to determine As contamination in the Kansas groundwater by inputting parameter values from all over the state.

The research will demonstrate the significance of geological factors in human and ecological health. Since it includes areas that are relatively inaccessible where natural contamination of drinking water supplies have not been probed in adequate depth, the work will highlight potential health impacts and enable the Kansas Department of Health and Environment (KDHE) to use the research results to plan detailed investigations and develop remediation guidelines.

Natural Antibacterial Clays Research at ASU

Sandra Londono, School of Earth and Space Exploration, Arizona State University (Supervisor: Lynda Williams)

Clays have been known for their medicinal properties since prehistory and they are currently used in pharmaceutical and cosmetic preparations due to their sorption capacity and rheological properties. Less explored are the properties displayed by certain natural clays capable of destroying bacteria or significantly inhibiting their growth. While the antibacterial mode of action is not yet completely unraveled, researchers have linked their toxicity with metal species -particularly reduced Fe^{2+}- which can produce deleterious effects to cells via reactive oxygen species (ROS) production. ROS are reaction products of molecular oxygen with metals that can damage cell components such as membranes, proteins and DNA. Keith Morrison, PhD student at ASU is currently studying a clay deposit in the U.S. that is seems to act in this way. Other antibacterial clays appear to require contact between the clay mineral and bacteria in order to be toxic. Such a type of clay may be acting by a combination of physical, electrical and chemical forces that act synergistically with the aqueous components to impede bacterial viability. We are currently testing this idea for AMZ clay, a clay from the Colombian Amazon used for medicinal purposes by the native Uitoto people. An SEM image of *E.coli* and AMZ clay is shown in Fig 1.

The objective of our research is to evaluate the mineralogical, geochemical and physical characteristics that can make certain clays natural antibacterials to human pathogens. Using a multidisciplinary approach and combining methods from geology, geochemistry and microbiology, we aim to understand what is required for a clay to act as a bactericide. The outcomes of our study could find applications in the pharmaceuticals, therapies for topical infections, biotechnology and material science; and it is also a contribution to the growing field of geomicrobiology.

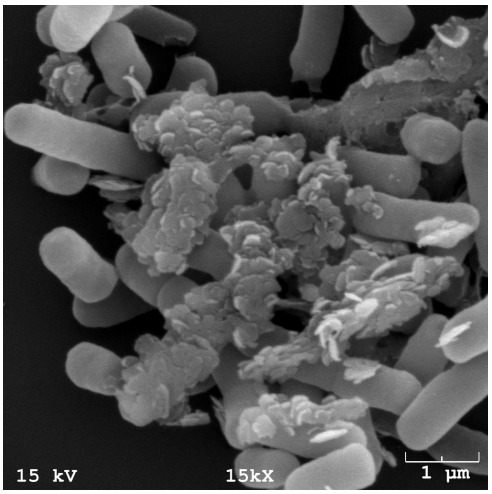

Figure 1. SEM Image of AZ clay mixed with E.coli. The antibacterial effect of this clay is currenly being studied at ASU

Tungsten Biogeochemistry - an emerging contaminant in the environment

Chad Hobson, Department of Geology, Kansas State University (Supervisor: Dr. Saugata Datta, Associate Professor, Geology)

Tungsten has recently been classified as an emerging contaminant by the EPA. Information on tungsten's chemical behavior in the environment is extremely limited and that is what gives this project so much importance. I am looking specifically at the fate and transport of tungsten through near surface sediment and how this can be facilitated by water. By analyzing the mineralogy and chemical parameters the goal is to come up with a geochemical model to elucidate how tungsten behaves once it is introduced into the environment. This work uses many different analytical approaches to gain the required information. A very important piece of the puzzle is to understand the oxidation states of the elements that are being analyzed. To do this, we use solid state techniques like μXANES and bulk XANES/EXAFS. Other forms of spectroscopy are also utilized such as HR/ICP-MS, ICP-OES, XRD, SEM EDX. All these tools help to gather chemical parameters needed to characterize the system. The task is to understand and define this system so we can achieve our goal of modeling tungsten in the environment.

Collecting water samples for W analyses from Hoisington Kansas

Characterization of petrography and hydrogeochemistry of the Arbuckle saline aquifer in Kansas

Robinson Barker, Department of Geology, Kansas State University (Supervisor: Dr. Saugata Datta, Associate Professor, Geology)

My master's research at Kansas State University has been to characterize the petrography and hydrogeochemistry of the Arbuckle saline aquifer in Kansas to provide baseline data for a proposed CO_2 injection and storage project. A large group of researchers is studying the potential of the Arbuckle saline aquifer in south central Kansas to sequester CO_2, and I have had the opportunity to provide valuable

geochemical data that informs large scale geochemical models and sheds light onto potential contamination issues.

1600 feet of core was collected from the formation and 12 water samples from different depths in an experimental well. Thin section, XRD and SEM analysis have allowed for comprehensive mineralogical description. Hydrogeochemical analyses by IC and ICP-MS has allowed insight into the major and minor elements that comprise the aquifer. How the dolomitic aquifer and brine will react with injected CO_2 is crucial information when modeling the long term fate of CO_2 and determining potential contamination issues. Supercritical flow experiments using collected core and brine samples have provided information as to what reactions will occur. Geochemical modeling has helped us understand the chemical equilibrium of the brine before injection which will provide a baseline for monitoring efforts when CO_2 is injected.

Monitoring the physical parameters of brine pumped from 5000 feet using a HACH hydrolab MS5

Geochemical significance of As and Mn toxicity in groundwaters from Murshidabad District, West Bengal, India

M. S. Sankar, Department of Geology, Kansas State University (Supervisor: Dr. Saugata Datta, Associate Professor, Geology):

Mass poisoning of arsenic has affected roughly 60 million people in the Bengal Basin (Bangladesh and West Bengal, India). Elevated levels of Manganese (Mn) is another alarming issue in the groundwaters of this region (MCLs: As<10µg/L and Mn< 0.4mg/l). The study area is the Murshidabad block , which is located in the south central part of Bengal basin. Various studies have shown that microbial mediated reductive dissolution of FeOOH is one of the major mechanisms by which sediment (<50m depth) bound arsenic is released into groundwater. The role of organic matter in the distribution of As in the Bengal

basin groundwaters has been discussed by various researchers. The main focus of the current research is to find out possible sources organic matter and its role in controlling As and Mn in the shallow aquifers of this region. Many studies of As poisoning from groundwater sources, including those for the Ganges delta, have suffered in their attempts to identify processes responsible for As mobilization owing to a lack of aqueous and solid phase speciation data and specific inclusion of process-oriented investigations. The chief contribution of the current research would be the developing understanding of As hydrogeochemistry in Bengal basin aquifers will be linking field investigations of groundwater flow and evolving As species concentrations with changing aquifer/groundwater geochemistry to solid phase As, Fe, and possible Mn speciation determined using conventional sediment geochemical techniques and state-of-the-art X-ray absorption spectroscopy.

Sample collection at a village in Murshidabad District, Bengal, India

Health impacts from pollution resulting from hydraulic fracturing

Julia Wise, Department of Geology, University of Cincinnati, Cincinnati, OH (Supervisor: Dr. Amy Townsend-Small).

My research addresses the concern over pollution from Hydraulic Fracturing. After attending community meetings, meeting with various doctors, and reviewing public health literature I selected a suite of chemicals that are of concern to the public and health professionals. These include salts, metals, methane, and BTEX (Benzene, toluene, ethylbenzene, and xylene). Data will be collected from water sources including private wells and ground water. As well as measuring concentrations of these contaminants (some of these) in air. I hope to track these compounds as they travel from air and water into soil, plants and small mammals. Essentially, work towards understanding how humans may be exposed to these compounds that are of concern to human health. Based in Ohio I have the opportunity to develop a time series measuring the concentrations of these contaminants as the natural gas industry develops in Ohio first , creating a baseline data set and then as industry increases continuing to monitor concentrations.

Upcoming Meetings (Dates and Deadlines)

American Public Health Association 140th Annual Meeting San Francisco, CA	27-31 Oct 2012
SEATAC North America 33rd Annual Meeting Long Beach, CA	11-15 Nov 2012
AGU Fall Meeting San Francisco, CA	3-7 Dec 2012
32nd Annual Meeting for Risk Analysis San Francisco, CA	9-12 Dec 2012
GSA Northeastern Section Bretton Woods, NH **Abstract deadline: 11 Dec 2012**	18-20 March 2013
GSA Southeastern Section San Juan, PR **Abstract deadline: 11 Dec 2012**	20-21 March 2013
GSA South-Central Section Austin, TX **Abstract deadline: 15 Jan 2013**	4-5 April 2013
GSA North-Central Section Kalamazoo, MI	2-3 May 2013
GSA Rocky Mountain Meeting Gunnison, CO	15-17 May 2013
GSA Cordilleran Section Fresno, CA	20-22 May 2013
MEDGEO 2013 Washington, DC	25-29 Aug 2013

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GSA Division GEOLOGY & HEALTH Annual Report 2012

12 September 2012 (***Prepared by Kevin Nick***)

1. Division Purpose and Mission

Purpose. The Geology and Health Division is concerned with the intersection of the geological environment with health, disease, pathology and death in modern and fossil humans, animals and plants. The interests of the Geology and Health Division focus on geology and its interdisciplinary relationship to medicine, biology, chemistry, and other sciences.

The Geology and Health Division:
a) brings together an interdisciplinary range of scientists and practitioners interested in these issues;
b) facilitates the presentation and discussion of relevant problems and ideas;
c) promotes research and publication of relevant studies;
d) cooperates with other divisions and the sections of the Society and with other scientific organizations in fostering, aiding, furthering, and promoting research in relevant areas;
e) fosters recognition of significant contributions and achievements;
f) encourages and mentors interested students in these interdisciplinary related issues; and
g) advises and assists the officers and committees of the Society in matters pertaining to the interests of the members of the Geology and Health Division.

2. Division Personnel

Officers and Management Board (2011-2012):

Chair: Robert B. Finkelman
First Vice-Chair: Saugata Datta
Second Vice-Chair: Thomas Darrah
Secretary-Treasurer: Kevin E. Nick
Immediate Past Chair: Syed E. Hasan
Council Liaison: Robert Tracy
All contact information is available at the division website:
http://rock.geosociety.org/GeoHealth/personnel.html

In-Coming Officers (2012-2014):

Chair: Saugata Datta
1st Vice Chair: Thomas Darrah
2nd Vice Chair: elections still in progress
Secretary-Treasurer: Kevin E. Nick

3. Committees

JTPC Representative: Robert B. Finkelman
Program committee: Saugata Datta (chair)
Nomination and awards committee: Alan Jacobs (chair), Gabriel Filippelli, Kevin Nick, Geoffrey Plumlee, Catherine Skinner
Fundraising committee: Motumu Ibaraki (chair)
Membership committee: Suzette Morman (chair)
Outreach committee: Tom Darrah (chair)
GEOMED 2013 conference committee: Robert B. Finkelman (chair), Catherine Skinner, Syed Hasan, Ester Sztein, Tom Darrah, Saugata Datta, Kevin Nick, Monica Gowan.
Newsletter editor: Jean M. Morrison

4. Communication

Website

The division maintains a website on the GSA server. The address is:
http://rock.geosociety.org/GeoHealth/index.html

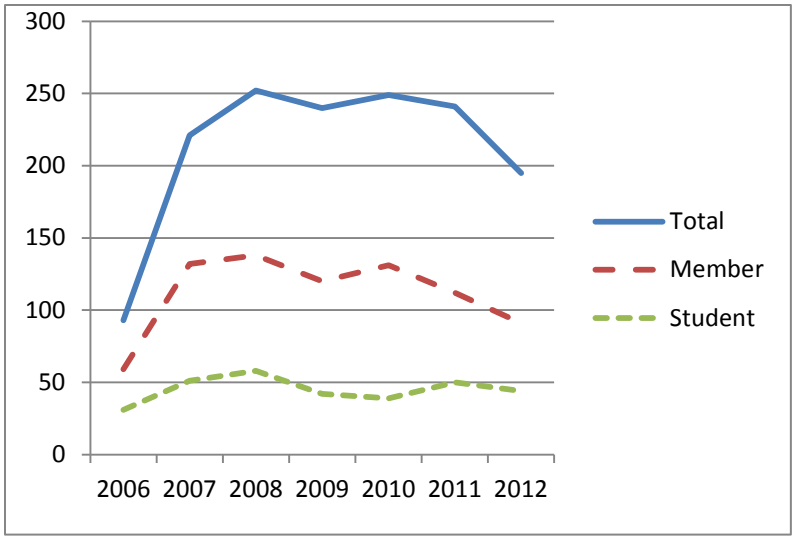
Newsletter and Publications:

A newsletter and periodic blast emails are sent to members via GSA Wesley Hill. All newsletters are also posted and archived on the division website http://rock.geosociety.org/GeoHealth/newsletters.html. Contact information for Wesley Hill: "WHill@Geosociety.org." This year we added a newsletter editor, Jean Morrison, to the division committee personnel.

5. Membership Information

For the year 2012 membership breakdown:

Member/Fellow	91
Senior Member / Fellow	47
Honorary Fellow	0
Recent Graduate	11
Student	44
K-12 Teacher	1
Affiliate	1
Total	195



Membership trends since the inception of the Division

6. Finances - Summary

Our account currently stands at $7322.86
Last year $646.08 was spent, mostly on lunches for the Division annual meeting.
No monetary awards or grants, such as travel grants to students, were made this year.
The finance committee has set up guidelines for its activities. Their report is attached in Appendix A.

7. Activities (2011-12)

Annual Business Meeting – 2011

The division's annual business meeting was held on Monday, October 10, 2011 from 12:15 – 1:15 pm in the Minneapolis Convention Center Room 203AB. 20 people attended.

- The meeting was chaired by Robert Finkelman in the absence of Syed Hasan.
- A letter from Syed Hasan thanking participants for their support and looking forward to activities including hosting GEOMED 2013 was read.
- Report on finance and membership.
- Announcements of:
    - 2011 sessions
    - New meetings in 2012
- Report on the use of social networks in geology and health
- Robert Tracy, our new division liaison was introduced and spoke briefly on the effect of soil ingestion on the health of horses. State public health departments may need advice on this issue.
- There will be a geology and health meeting at the IGC conference.
- Syed Hasan will coordinate a chapter on geology and health for the GSA 2013 anniversary volume.
- A certificate of affiliation between IMGA and GHD from IMGA was presented. Plans to host the 5th annual IMGA meeting were presented and volunteers requested. Hope to include several other organizations including: AGI, USGS, NSF, EPA, PAHO, WHO, CDC, NIH.
- Three publishers have approached the division exploring a book on the practical aspects of how to be a medical geologist.
- Springer publishers are starting Springer Briefs on medical geology.
- New committees were announced and volunteers requested.
- We want to increase our attendance and visibility. The following were suggested:
    - Take talks from the IMGA meeting to the GSA 2013 meeting.
    - GHD could broker speakers for seminar presentations in academic settings.
    - Reach out to the margins of the topic to include more participants.
- IMGA is compiling a list of educational resources and are requesting input.

Nominations and Awards

Professor Lynn Savage was nominated and recommended for the Division's Meritorious Service Award. See Appendix B for the committee report.

Planning for volume on Geology and Health for the GSA 125th anniversary

Syed Hasan has contacted possible authors for an article to be included in the anniversary volume and explored some review topics.

GSA Annual Meeting Denver, CO November 2011

T97. Temporal Trends in Anthropogenic Contaminants from Lacustrine, Coastal, and Marine Sediment Cores: The Good, the Bad, and the Future
T88. Minerals, Microbes, and Health I
T88. Minerals, Microbes, and Health II
T89. Geochemistry of Atmospheric Particulates: From Sources to Impacts on the Environment and Health
T12. Arsenic in Geologic Systems (Posters)
T10. The Hydrogeologic and Regulatory Environments of Phosphate Mining and Processing
T12. Arsenic in Geologic Systems I
T12. Arsenic in Geologic Systems II

8. Hosting IMGA MEDGEO 2013 Meeting

The division will host the International Medical Geology Association 5th International Conference in 2013. Summary information for meeting planning is below.

Conference Theme: The Natural Environment & Health Hidden Dangers, Unlimited Opportunities
Date: August 25-29, 2013
Venue: Hilton Crystal City Hotel, Arlington VA
Sponsoring organizations: IMGA, USGS, EPA
Affiliated organizations:
Overall organization: Robert B. Finkelman
Liaisons at GSA: William Cox and Nancy Wright
Liaisons at IMGA: Olle Selinus, Jose Centeno, Nelly Mañay

Conference coordinating committee: H. Catherine Skinner; Ester Sztein; Saverio Fiore; Syed E. Hasan; Martin Schoonen; Saugata Datta Kevin E. Nick; Thomas Darrah; Lynda Williams; Brenda Buck; Monica E. Gowan; Wendy Thomas; Hassina Mouri; Malcolm Siegel; Eduardo da Silva; Maria Armienta; Zheng Baoshan; Yo Sumartojo; Constantia Achilleos

Fundraising committee: Saugata Datta, Martin Schoonen

Promotion committee: Brenda Buck

Technical Program Committee: Lynda Williams, Arizona State Univ ; Catherine Skinner, Yale Univ.; Eduardo de Capitani, Brazil; Ahmet Umran, and Merel Dogan, Univ. Iowa; Jojok Sumartojo, Marietta, Georgia; Dibyendu Sarkar, Montclaire State Univ.; Tee Guidotti, consultant; Claire Horwell, Durham University, UK

Session Topics with Chairs
1. Arsenic in the Environment - Dib Sarkar
2. Asbestos: Environmental contamination and health effects - Eduardo Capitani
3. Biogeochemical monitoring and treatment of disease - Ariel Anbar
4. Climate Change and Human Health - Wendy Thomas
5. Energy related health issues - Tee Guidotti
6. Health impacts of natural dust - Heather Jameison
7. Health impacts of global artisanal mining - Geoff Plumlee
8. IMGA Chapters - Laura Ruhl
9. Legacy of natural disasters - Stanley Williams, and Claire Horwell
10. Medical geography - Joseph Oppong

11. Medical geology impacts on children's health - Jerome Paulson and Heather Gingerich
12. Military applications of medical geology - Jose Centano
13. Occupational health issues - Xi Huang
14. Soils in medical geology - Invited Cliff Johnston
15. Therapeutic uses of geologic materials - Lynda Williams
16. Urban medical geology issues - Howard Mielke
17. Veterinary geology - Jan Myburgh
18. Water-related medical geology issues - Giora Rytwo
19. General Session

Appendix A. Report from Geology and Health Fundraising Committee

March 11, 2012
By: Motomu Ibaraki and Julie Suleski

Keys for Fundraising Activity

There is a strong relationship between interest level and the willingness to donate to an organization. Since its creation, the Geology and Health division has sought to advance research, educate students, and communicate the importance of the field. Our fundraising activities must reflect our shared commitment to advancing this field and broadening the division's potential. An organized and targeted approach will increase the effectiveness of donation solicitations. The division must first establish preliminary objectives to quantify fundraising goals and objectives. Through the creation of a mission statement and delineation of fundraising goals, target donors will be properly identified and provided pertinent fundraising information. The division must also create an effective fundraising marketing campaign by outlining the donor solicitation parameters. This will ensure that donors are effectively targeted and fundraising activities in turn benefit the organization and donors.

Preliminary Objectives

Establish a Mission Statement and Goal

A mission statement serves several purposes. It ensures that the division is continually establishing goals and working in directions that further its core values. It effectively communicates the purpose and focus of the division to potential donors. The goal of the division can change from year to year, but should always be in support of the division's mission. Specifying a goal annually benefits the division by becoming the jumping off point for fundraising. For example, if the goal is to "Increase students' exposure to the field of Geology and Health" the fundraising can be geared towards increasing student participation at the annual meeting, developing student division chapters at universities, etc. A fund-raising motto should be built upon the goal.

Set Fundraising Objectives

A realistic assessment should be made of the division's planned activities and objectives for the coming year. Based on this, fundraising goals should be established. It is important to communicate to potential donors that the division is seeking funds in order to accomplish a set objective, whether it be the attendance of 100 students or the development of a journal. To this end, the division needs a fundraising window, a period of time in which the funds will be used, and specific items that the funds will be used to purchase. Since most companies and individuals limit their donations to annual gifts, this should be done on an annual basis.

Determine Budget Cycles

As mentioned above, most companies and individuals prefer to make annual donations. The peak time for donations is the fourth quarter, since it is as this time that donors are best aware of their financial ability to make donations, and because it is often the end of the tax year. The division might find it more beneficial, however, to make an annual solicitation for donations just prior to the annual GSA meeting so that donors will have the maximum opportunity for exposure at that time.

Target Sponsors

In order to maximize the effectiveness of a marketing campaign for donations, the division should identify key donor groups and cater donation solicitation materials specifically to those groups. The benefits of the donations and the activities of the division should be presented to each group with their

specific interests in mind. For instance, one group may be retired or active geologists. They would be most interested in the cutting-edge research that the division is presenting, and would also be receptive to the desire to sponsor geology students to attend the annual meeting. A core tenet of the division is that Geology and Health issues affect everyone, so the marketing materials should effectively communicate how the division's activities affect the target group or individual.

Tax Benefits

It is important that organizations and individuals be provided the tax status of the GSA, the specific division, and any other tax-related information that could affect the amount and timing of their donations. This information should be collected, reviewed, and incorporated concisely into marketing materials.

Specific Fundraising Activities

Establish Deadlines

The division should have an annual donations drive. Placing a deadline on donations helps to ensure that donors make a commitment. Most organizations have yearly budgets for donations. By limiting drives to once a year, it allows companies and individuals to donate their maximum allotment without concern that they will be contacted again at other times during the year. When drives are limited to once a year, the division can also better use its advertising budget to create attractive and effective solicitation materials. Recipients are more likely to read through advertising material that comes only once a year, whereas they tend to tune out material that is sent to them repeatedly. This also allows the division to more accurately measure its fundraising success.

Delineate Specific gifts

Donors prefer to know that their donations are going to be used for specific benefits for the organization they are donating to. Although it can be useful to list specific items that bulk donations will eventually be used for, donors should be allowed to "purchase" specific gifts, ranging from the purchase of reference materials to the sponsorship of student meeting attendees. Reference materials can have a printed label attached to them, noting that they are the result of a gift by a specific donor. Students who are sponsored can have the sponsor's company logo or name on their attendee badge. Allowing donors to purchase specific gifts also allows them to see how much money is required for the division's activities, which is something donors typically underestimate. It also serves to illustrate the variety of items that the division uses the funds for.

Some donors may be unable to donate money, but may instead be able to donate time. These enthusiastic donors should not be overlooked. Volunteer opportunities should be identified, from unskilled to skilled, from once-only to more frequent, and from individual to group. The division should identify specific volunteer opportunities and also list them in their donation solicitations. Companies will often organize volunteer missions within their organization, and they will be more willing to do so if the volunteer opportunities are clearly described. Smaller businesses may be able to donate services such as printing brochures or truck rentals for field trips. Larger organizations may be able to donate field trip space, meals, or meeting venues. This is an excellent way for the GSA to gain exposure for the division and to expose those outside the field to what the division does.

Personalize Donations

Companies and individuals have many options for donations. Sometimes the decision to donate comes down to a personal feeling that their donation is going to help someone or make a difference. Key to illustrating how important donation are to the division, personal stories should be included in the advertising materials. For instance, students who have benefitted from a donation should write a brief

story about how attending the meeting enhanced their education and made a difference in their career/life goals. The committee chair should write an open letter explaining how important donations and sponsors are to the survival and success of the organization. Committee members or session attendees should explain how through the existence of the division they have been able to research and communicate important information.

Create Sponsorship Tiers
In order to direct donors to donate money, donation tiers should be created such as Bronze, Silver, Gold and Platinum, with preset donation amounts. This encourages donors to maximize their contributions. Each level should also offer the donors different rewards/recognition. Donors should receive a gift (geology-related) and award for their contributions. Bronze donors can receive a certificate of appreciation; Silver and Gold members can receive a plaque; and Platinum donors can receive a large plaque and award. This allows the donor organization or individual to display the symbol of recognition in their place of business for PR purposes, and in turn allows the GSA and division the opportunity to advertise via the award.

Sponsorship Advertising
In exchange for donations, organizations and individuals should be recognized in division publications and/or on the Web site. A primary motivation for organizations donating is recognition for their efforts. There are several ways that donors can be rewarded through advertising, as mentioned above. In addition, it is essential that organizations and individuals have their names printed in the GSA or division annual newsletter, and at the Web site. Platinum donors should be allowed to post a message alongside their name explaining why they made the donation, or whatever else they wish to express that is relevant to their donations.

Disclosure
Companies and individuals interested in learning how previous years' donations were used should have access to an annual giving report. The report should also show what the fundraising goals for the year were and if the goals were met. The purpose of the report should be to disclose donation information, but also to encourage continued giving. This is achieved by showing that donations were used effectively and efficiently. Personal stories should also be places in conjunction with the report to personalize the information.

Alternative Donations
An additional way for the organization to raise funds is through the sale of items through affiliate relationships. For example, the division can select "recommended reading" texts at its Web site and refer visitors to Amazon.com, and then receive a percentage of the sale of books. No transaction processing is required. Memorabilia such as t-shirts, bags, and caps, are another way that the organization can earn money through sales, but this requires the purchase of products and the managing of inventory. This might be a fruitful endeavor to seek with the assistance of a volunteer organization that can oversee the process and in return advertise on the products.

Ease of Donating
It is important that when organizations or individuals make the decision to donate, they are able to do so quickly and easily. The Web site should allow for credit card and PayPal donations. The Web site's donation section should be divided into three sections: Tiers, Gifts, and Individual Donations. The user can add a Tier, for instance, to their cart and then check-out. Payment processing can be handled through PayPal services, though an embedded module. Receipts should be generated that are suitable for IRS documentation. Donation solicitation materials should include a donation form and pre-printed envelope.

The form should list all donation options, making it easy for donors to select their donation amounts. Donation websites run by organizations such as Challenge – The First Giving Website1 can be employed as alternative giving portals for individuals who prefer to donate through other organizations.

1 Firstgiving.com is one of several online giving sites that brings 501C non-profits together with fundraisers and donors wanting to make an impact through fundraising. Firstgiving was founded in 2003 as the US subsidiary of UK-based Justgiving. Based in Somerville, MA, Firstgiving has helped over 2 million people raise more than $100 million for over 30,000 different nonprofit organizations since 2003.

Summary

The Geology and Health division provides a forum for researchers in the fields of geology, public health, and communication to present research in this cutting edge and growing field. Fundraising activities are an essential part of our ongoing commitment to encourage students, young scholars, and established scientists in their research endeavors. Through the diversified and targeted approach described above, we believe we can establish fundraising goals and effectively achieve them to assist us in our overall support of the GSA.

Appendix B. Report from the Nominations and Awards Committee

March 31, 2012
By: Alan Jacobs, Committee Chair

The GSA Geology and Health Division Awards Committee currently consists of Gabriel Filippelli, Kevin Nick, Geoffrey Plumlee, Catherine Skinner, and me (Alan Jacobs, chair).

Considerable coordination must transpire before an award can be finalized. Our committee has been formed to lay the groundwork for Division awards. Here is the framework in which the Awards Committee would administer the awards process.

Division By-Laws would be followed (Article VI--Committees and Division Representatives, No. 2 (c) as revised).
GSA approval states that awards of the Division will include "(i) The Distinguished Service Award for sustained contributions to the profession, (ii) The Meritorious Service Award for service to the Geology and Health Division, and (iii) The best Publication Award to students and professionals for outstanding scholarly contribution to the discipline."
The awards listed above are "unnamed awards." A named award would have the formal name of an honored person (e.g. "Leonardo Da Vinci (sic) Award for the Advancement of Geology and Health), and would have an April 1 deadline for submitting the name of the awardee to the GSA (as opposed to student and unnamed awards that have a deadline of August 1).
The Division is responsible for administering the awards, including advertisements, nominations, and selection of the awardees. This committee would make recommendations to the Division Officers and Management Board for their final decision.
After the final selections, we must send the information to the GSA by Aug 1, which is the deadline for student and professional "unnamed awards."
For advertising for nominations through GSA, we could use GSA Today (submitted two months before publication) or the on-line newsletter GSA Connection (submitted by the first week of the release month).

Bob Finkelman brought to our attention a self-nomination from Professor E. Lynn Savage, Brooklyn College, CUNY. Professor Savage was instrumental in founding this Division and was its first Chair. She requested to be considered for the GSA Distinguished Service Award. The request was received by GSA and forwarded to the Division. The Awards committee considered this request and made recommendations for The Distinguished Service Award or The Meritorious Service Award as defined in our By-Laws, Article VI, No. 2 (c). The results of our considerations are as follows:
Three (3) votes (of 5) were in favor of recommending Professor Savage for the Division's Meritorious Service Award. One (1) vote was for recommending her for the GSA Distinguished Service Award. One (1) vote was for tabling a decision until after the general membership had a chance to discuss this issue.
The committee is referring these recommendations to the Division Officers and Management Board.