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Monitoring Student Achievements Through Writing an Argumentative Scientific Essay
Mossbah M. Kolhas, CPG-10180

An International Perspective on the Value of AIPG Beyond Our Borders
Bill Feyerabend, CPG-11047

Thank You for 25 Years!
Andrew H. Wulff, Michael T. May, MEM-0586

Wine and Dine ArcGIS®: Tips From the Self Taught User to the Beginner
Michael A. DeVasto, MEM-2281

High Commodity Prices Do Not Translate into Exploration Bliss
James Hersch, CPG-06511

California Section History

Carbon Sequestration Potential in Simulated Saline Lake Waters
Scott N. Yurman, SA-3000 and Daniel M. Deocampo

Evaluating Anomalous Surface Water Lead Results Associated With the TVA Kingston Ash Recovery Project
Joseph P. Kraycik, MEM-0113, Stephen D. Bower
Rock J. Vitale, and William J. Rogers

AIPG History will be found throughout this publication.
U.S. Geoscience Enrollments and Degrees Grow Robustly in 2011-2012

The 2011-2012 academic year saw strong growth in U.S. undergraduate enrollments, continuing the nearly decade-long trend. Also, the 2010-2011 enrollment levels saw upward revisions based on additional updates provided by academic departments. The 2011-2012 preliminary data show an increase of 3.3% for undergraduate enrollments, and approximately a 3% decrease in graduate enrollments. Graduate enrollments nearly always are revised upward when they are confirmed in the following year, so we believe that final results will show flat or even modest increases. In addition, numerous departments have been reporting trouble accommodating the rapid expansion seen over the prior five years, so this level trend probably represents the general capacity of graduate students in the U.S. Also, particularly strong growth is being reported by departments in the Gulf Coast and by Northeastern public universities.

Key Facts
Enrollments: 26,897 undergraduates, 10,221 graduate students
Degrees: 3,281 Bachelors, 1,541 Master’s, 600 Doctorates

Geoscience degrees conferred in the U.S. continued their upward trend, with over 3,200 Bachelor’s degrees awarded in 2011-2012. Also, the 2010-2011 number was revised upward based on new updates from programs. Of particular note is the strong 44% increase in 2011-2012 in Master’s degrees awarded, rising to 1,541. This robust growth was confirmed by a strong increase, and in some cases doubling, of awarded Master’s in environmental science programs nationwide and geology programs in the Gulf Coast and Northeast. Doctorates remained generally steady, continuing its long-term trend.

- Christopher M. Keane and Carolyn Wilson
Editor’s Note

This article presents a method to assess student comprehension of scientific concepts through the technique of an argumentative essay. In this article, the author has chosen climate change, and specifically global warming, as the basis for an argumentative essay. Without offering an opinion of his own, Dr. Kolkas presents two lines of evidence, and asks the students to argue for or against an anthropogenic basis for global warming based on the evidence provided. This article was reviewed by the National Executive Committee for suitability in TPG.

Introduction

Based on the National Science Education Standards, the most recent reform in science education requires developing strategies that engage students in authentic inquiry or research that entails reading, thinking, writing, and discussion. These goals can be achieved by preparing and writing an argumentative essay. Through this project, students learn the processes of searching and collecting information, build up ideas and ways of thinking, gain skill in debating specific topics, and write professional papers to express their point of view. Discussion may follow the written stage, when students are given the opportunity to defend their points of view.

The example presented below is a topic that was given to students at high school and college levels by the author. The following steps have proved useful in the overall process.

Select a Topic

To select a topic for an argumentative essay, two conflicting points of view must be chosen to ensure success. Student knowledge and interest in a specific topic will give them the confidence to argue a position based on a logical exposition of their scientific research.

Consider Both Sides of the Topic and Take a Position

Once the topic is selected, the student prepares a list of evidences supporting both sides of the argument, and then chooses a side to support. In the planning stage of the essay, rationale arguments for the opposing position should be considered and included in the debate. The main objectives of the essay are to present both sides of the issue, assess each alternative, and express an opinion based on the evidence.

Collect Evidence

Unlike the emotional circumstances of face-to-face argument, the argumentative essay provides strong evidence to support the premise without too much drama and anxiety. Students may explore both sides of the debate and briefly provide the evidence to support one side or the other.

Writing Phase

An argumentative essay contains three main parts: the introduction, the body, and the conclusions. The length of these parts may vary based on the length of the assigned task.

1. Introduction of the topic and declaration of the student position

As in any essay, the first paragraph should contain a brief explanation of the topic, some background information or review of previous studies, and a thesis statement. In this case, the thesis will be a statement of the student’s position on a particularly controversial topic, the origin of global warming.

2. Present both sides of the argument

The substance of the argument from both sides should be very clear in the written essay. The student should clearly state the strongest aspects of each side of the argument.

3. Conclusions

The student should conclude the essay by clearly stating a point of view with a summary of the reasons. The student may also point out the reasons against the alternative viewpoint.

Tips for Your Essay:

a. Design a clear outline for your research
b. Avoid any emotional language and be professional throughout your discussion. Don’t use ad hominem attacks to support your case.
c. Don’t contrive evidence to support your view. Always use legitimate data
d. Cite your sources in the body of the essay, and provide a reference list.
e. Be prepared to defend your side by knowing the strongest arguments for the other side. You might be challenged by your teacher or by other students.

Global warming: A Geologic Example Confronting Society

Global warming may result from greenhouse gases released during the combustion of fossil fuels, such as oil, natural gas
and coal, are burned for energy. Moreover, greenhouse gases can be produced by natural processes such as volcanism, and may also cause global warming (Linzen, 2007, Spencer, 2007, Thornhill, 2007).

One school of scientists believes that global warming has resulted from anthropogenic activities, primarily during and after the industrial revolution that began in the 19th century. The supporting evidence is the data presented in the following graph (Figure 1). This school of thought asserts that atmospheric carbon dioxide concentrations have risen sharply since the Industrial Revolution, and is a central cause of global warming.

Another school of geoscientists strongly support the concept that natural cycles of global warming and cooling have characterized the geologic past since the early history of planet Earth. These scientists claim that in the context of the past 600 million years of Earth history, concentrations of CO₂ were as much as 25 times higher than today and there were no catastrophic “tipping points.” Atmospheric CO₂ levels today are near an all-time low as compared to the Cambrian Period, for example, when CO₂ levels were some 25 times higher than those today. Figure 2 provides evidence of this point of view.

Assignment

Now, what do you think about the reasons for global warming? Is it a natural or anthropogenic phenomenon? Argue this subject in detail and clearly state your point of view with the supporting evidence.

HAVE FUN!!!

References


Dr. Kolkas is currently an educator at the Dept. of Engineering Science and Physics, College of Staten Island of the City University of NY and Fort Hamilton High School, Brooklyn, NY. Prior to these positions and for a period of 10 years, Dr. Kolkas was a senior geologist and petrophysicist at the Rensselaer Center of Applied Geology, Troy, NY, in the fields of sedimentology, petrophysics of oil and gas reservoirs, geoscience education, and environmental geosciences.

Figure 1. Global carbon dioxide emissions from human activities, 1750-2004. The data source is Marland, Boden, and Andres, 2008. This particular graph is found at www.myclimatechange.net; search the latter site for “1750” to find the graph.

Figure 2: Phanerozoic carbon dioxide (Rohde, 2013).

1. Editor’s note – on a general level, an explanation of “tipping point” can be found on Wikipedia at http://en.wikipedia.org/wiki/Tipping_point_(climatology). The latter URL address also provides references for further reading.
An International Perspective on the Value of AIPG Beyond our Borders

Bill Feyerabend, CPG-11047

The following is an opinion by the author.

It has been almost twenty years since I took my first expatriate job in Peru. At the time I had twenty years’ experience in the U.S. and was hired to be project manager with a crew of Peruvian geologists, each with a few years experience, to do mapping, core-logging and sampling. During the intervening years I have grown professionally, and subsequently worked in Mexico, Guyana, Venezuela, Colombia, Bolivia, Chile, Saudi Arabia and Ghana. AIPG membership and CPG status has generated work as a Qualified Person (QP) and I have fourteen technical reports under my belt, including several for properties in other countries. During my time overseas I have seen geologists from other countries grow professionally as well, many reaching the level of expertise I had attained 20 years ago. I’ve had the pleasure of working with young African geologists and field geologists, Project Managers and Country Managers in Latin America, many of whom certainly struck me as well educated and very professional individuals who by any measure are the equal of their North American counterparts.

Seeing the growth in exploration, discovery and development of ore deposits in other countries, and the professional growth of the indigenous geologists, it occurred to me that a big part of the future of mining will be in those countries and, therefore, the future of organizations such as AIPG should include helping those professionals. I have started to talk to those foreign geologists individually and point out that they should begin to plan for ten or twenty years down the road when the mountains are higher and steeper by upgrading themselves with AIPG and SME membership and by learning English. I had the notion that the best thing I could do to encourage buy-in to that line of thought was to give them credit in the technical reports. I called the Ontario Securities and Exchange Commission to inquire about the matter. It turned out that I was the second person in a month to call about exactly that and the point seemed to be a reasonable and possible goal. The guidance I was given was to include their names as contributors on the title page while making the responsible author’s name very clear. As an example, the “Technical Report Update on the San Lucas Gold Property, Durango State, Mexico” dated July 19, 2011 shows that there are no SEDAR issues with giving credit to others as contributors: https://www.otciq.com/otciq/ajax/showFinancialReportById.pdf?id=57485

I am aware that outside the U.S., certain requirements for CPG status can be difficult such as verifying degrees and experience. However, I do not see any of those problems as insurmountable. I have found it personally rewarding to mention and, hopefully, plant a seed in the mind of other peoples to begin thinking of the future. However, as with most of us, I look at things from my personal standpoint. For the younger in heart and body there may be other arguments such as being able to submit articles for publication in TPG or the job-hunting benefits from having a broad contact network.

From what I have seen, I believe that the world of the future will be best served by a mining profession peopled by a collage of skin colors and languages who are encouraged by organizations such as AIPG to have and maintain more international contacts and to continually become more knowledgeable, professional and ethical. To that end, I intend to keep mentioning AIPG to geologists I meet and I hope that AIPG makes international growth an organizational cornerstone.

My elevator speech for myself is that I have over thirty years of experience at every stage from initial reconnaissance to discovery, development and continued exploration during production with most metal and some industrial mineral commodities. I have worked from sea level to 4,000 meters in ten countries on three continents. I have been through the complete cycle from discovery hole to production at the Mesquite and Chimney Creek mines in the United States and discovered the Paguanta deposit in Chile. I have been a member of AIPG since 2007 and have written fourteen technical reports. I am a Distinguished Toastmaster, a non-current private pilot, published newspaper writer and am looking forward after the 2013 PDAC Convention to completing the Simon Fraser University course on the duties of company directors. I hang my hat in Arizona with my wife who is Peruvian, and trained in publishing and public relations, and our two bilingual children.

Bill Feyerabend (center) with geologists and workers in Colombia.
Wright State University Student Chapter Announces Officers-The 2012-2013 officers are President Greg Geise, SA-3812, Vice President John Christenson, SA-3107, Secretary Leslie Williams, SA-3871, and Treasurer Paul Fleischman, SA-3624.

Students respond to the Getting a Job article printed in the Jan/Feb TPG-I loved this article, as a recent graduate struggling to find a job, I have found it very encouraging and informative. Thanks!

James Haddad, SA-3530

Dear Ron,

This is a great article! I had a student in here yesterday and I gave him some of this advice, but this will be so much more helpful - he's headed to Mobile for an interview later this week so I've already got it forwarded to him. And our student members have received it - I will forward it on even more. And I just opened the TPG - thanks for sending that.

Randa Harris, Instructor West Georgia University

Letter to the Editor

On the history of the last TPG, an excellent issue and has consistently maintained that quality, a correction, page 20, is needed. Tom Beveridge is not from Texas, rather Missouri. He was State Geologist at that time, signed my AIPG membership award as the secretary, Martin Van Couvering as the president. Membership certificate dated 12 Dec. 1964. Another Survey employee, Jim Martin, joined the same time. Tom was my boss until he took the easy way out of a demanding job and became a university of Missouri Rolla professor.

Jim Williams, CPG-00374 AIPG Charter member, Missouri Section

Members in the News

LBG Names Four Senior Associates

January 29, 2013—Leggette, Brashears & Graham, Inc. (LBG), a professional groundwater and environmental engineering services firm, has named Brad Granley, Brad Cross, Bill Stein, CPG-10441 and John Nelson Senior Associates.

Based in the firm’s St. Paul, Minnesota office, Mr. Granley has over 18 years of environmental engineering experience. He is primarily involved in serving the solid waste industry and has pioneered the use of phytoremediation for the on-site treatment of landfill leachate. His expertise in this area has led to multiple first-of-its-kind projects in the US and Mexico and has helped to develop a new line of business for LBG. His other areas of expertise include the design, installation, and operation and maintenance of large soil and groundwater remediation systems. His projects have received numerous awards for innovation and engineering excellence from the American Council of Engineering Companies (ACEC) and the American Academy of Environmental Engineers (AAEE) on both a regional and national level. A registered Professional Engineer in Minnesota, Mr. Granley received a B.S. degree in agricultural engineering from the University of Minnesota. He is a member of the Minnesota Ground Water Association and the Construction Specifications Institute, and is also active in the Minnesota chapter of the ACEC.

Based in the Austin, Texas office of LBG Guyton Associates, Mr. Cross has over 25 years of experience in groundwater and surface-water hydrology, water resources, environmental assessments, and project management. He previously served for 15 years at the Texas Commission on Environmental Quality and also served as a consultant to the U. S. Environmental Protection Agency in the development of regulatory guidelines for the 1996 Amendments to the Safe Drinking Water Act. A Professional Geologist in Texas, Mr. Cross earned a B.S. degree in geology from the University of Texas at El Paso. He is a member of the American Institute of Professional Geologists and the American Federation of Mineralogical Societies.

Mr. Stein has worked with LBG-Guyton Associates in Austin, Texas for over 21 years following over four years with the US Geological Survey in San Antonio. His expertise is in the field of hydrogeology and includes evaluation of groundwater systems in all of the major and many of the minor aquifers in Texas. He has provided well designs and planning of drilling programs, supervised well construction and conducted testing of wells for private and public entities.

Mr. Stein is a Professional Geoscientist in Texas and a Certified Professional Geologist by the American Institute of Professional Geologists. He received bachelor and master of science degrees in geology from the University of Texas at San Antonio.

Based in the Houston, Texas office of LBG-Guyton Associates, Mr. Nelson has more than 23 years of experience in groundwater resource evaluation and development and the planning, design, construction, testing, rehabilitation and repair of small-capacity to large-capacity public supply and industrial water wells. He has managed numerous projects involving major and minor aquifers throughout Texas and has worked on groundwater projects in other states including Nevada, Arizona, Michigan, Missouri and Alabama. A licensed Professional Geoscientist in Texas and a Registered Professional Geologist in Mississippi, Mr. Nelson received an M.S. degree in geology from Mississippi State University and a B.S. in geology from Murray State University. He is a member of the Association of Environmental and Engineering Geologists, the Houston Geological Society, and the Texas Ground Water Association.

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Thank You for 25 Years!

The following members have received their 25 year pin and certificate. Your dedication to AIPG throughout the years is truly appreciated. It has ensured the growth and success of the Institute. Please join AIPG headquarters in thanking these members for their continuous support.

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Intentional Learning for Career Success

Andrew H. Wulff and Michael T. May MEM-0586

Abstract

Many students must be trained in how to be intentional in their learning of principles of geology and this is made more difficult because geology is a multi-disciplinary science supported by allied science. Students must be able to apply basic principles, laws and procedures in multiple ways to address problem solving in myriad sub-disciplines. We identify typical challenges students face which can be as basic as not fully understanding that seemingly disparate topics are inherently connected. Such understanding is critical for initial employment as well as professional advancement. We present curriculum ideas that have been successful for us and our students which entail students actively doing geology and not just learning about it. This includes students becoming involved as peer mentors, engaging in professional conferences in a meaningful way, tapping into the knowledge of industry professionals, and conducting independent research through hands-on experiences in analytical and field methods.

Key words – Learning, Geoscience Careers, Mentoring, Peer Mentors, Analytical Methods, Environmental Geology, Field Methods

Introduction

Mentoring of undergraduate students by both faculty and peers is being emphasized at many universities and colleges, partly because of the importance of context in enabling real learning to occur. Retention of material diminishes over the duration of typical lecture periods such that very little is retained by the end of a period. Much of this loss appears to be because students are not driven to learn the material out of a sense of its importance, but rather by grades. Faculty who can articulate the practical importance of the material may do so through case studies, journal articles and anecdotal experiences. Hands-on activities in instrumental analysis of earth materials coupled with determining detection limits, calibrations, evaluating the validity of data sets, and careful sample preparation model professional responsibilities and can be offered in courses in analytical techniques. Early immersion in geological mapping and field research, instead of static learning on “field trips”, demonstrate the natural variability and ambiguity inherent in field-based science, in addition to providing context for diagrams, graphs, and images used in lectures. The practice of mapping requires close inspection coupled with integration into a larger scale map. In these ways, students may learn the context for the material and become more intentional in their approach, knowing that they are building skills for their career. Realizing that they will be working twice as long as they have been alive (at 20-25 years old) can provide profound context for the importance of learning.

Peer Mentoring

Courses in Analytical Techniques and Field Methods, research experiences for undergraduates (REUs), and elective courses all build an environment of exploration/research in which students learn the expectations of academic excellence from those that went before. Upper class students are used as peer mentors in many of the classes, not only serving as ad hoc Teaching Assistants, but also offering anecdotal and practical experience from their own research (and mistakes!). Here a student demonstrates a Standard Operating Procedure for the Raman Microscope.

Figure 1. Analytical expertise is best developed in the lab, examining issues of contamination, proper sample preparation, calibration, precision and accuracy, and data interpretation. Senior majors serve as peer mentors, not only explaining instrumentation and Standard Operating Procedures, but giving context from their own research (and mistakes!). Here a student demonstrates a Standard Operating Procedure for the Raman Microscope.
Course Connections

Students commonly ask how best to study myriad geologic topics and how to master the essentials of geology. Our experience is that to truly learn anything you have to see, read or hear about a given topic but to obtain “content ownership” a student really has to do some geology. Students are advised to seek out courses offered by faculty who themselves have professionally practiced geology beyond the academy. Look for professors offering courses that include as many exercises, labs or field trips as possible because this is a packaged deal for students who are intentional about learning as much geology as possible by doing it. Another piece of advice is to learn how to study. We suggest starting out with a blank sheet and writing down bulleted items you have mastered from each of your classes – this will take some thinking. Then the big challenge comes next – try to see linkages between each of your bulleted sheets.

Exhortation to Students to Intentionally Seek Connections of Material

We earnestly advise and encourage students to challenge themselves to take their core and elective courses in geology and review important principles, laws, theories, or Standard Operating Procedures (SOPs) to see how certain items reappear in various sub-disciplines of geology. Take for example that students commonly learn about Stokes’ Law, Bragg’s Law, and Snell’s Law but it should be recognized that the introduction of these laws in a given sub-discipline does not inherently mean that there is only one application of the law or procedure. Stoke’s Law can be used in classic hydrometer analysis for determining fine-grained sizes in soil or sediment samples and it can also be applied to phenocrysts moving in cooling magma chambers. The principle is the same but the modifications make it applicable in different scenarios! Bragg’s Law, which states that an incident X-ray has a corresponding and predictable diffracted X-ray in a crystal, is akin to a similar phenomenon recognized in Snell’s law which helps us understand seismic wave travel pathways that are refracted along variable stratigraphic interfaces. In short, each student should think of the possible multiple applications of a given law or principle.

Make Connections to Math, Physics, Chemistry, Biology, GIS and Writing Courses

Students need to be aware of the importance of not ‘putting off’ allied science classes because they are foundational for geology, permitting a better understanding of topics such as the chemical interaction between water and rocks, how seismic energy is propagated, how we use seismic surveys to find hydrocarbons, how we use geophysics to delineate hazardous waste sites, and how we use GIS to manage data such as stratigraphic tops, mineral trends, and the progress of aquifer and soil remediation.

Calculus, physics, and chemistry can be learned in a “just-in-time” fashion for a course (e.g., chemistry as a co-requisite for mineralogy), but provide foundational material for geology coursework, and should be taken sooner rather than later. Students are also encouraged to look at journal articles noting that papers are commonly the communication vehicle for practicing geologists. This also takes effort on the part of the student but limiting yourself to mere textbook learning does not provide an avenue of understanding communication between scientists and how to write a journal article or necessarily how to do science. Use of journal articles in classes not only augments a given text required for a lecture class, but journal reading permits a student to get familiar with technical jargon, see how to focus a research topic, define the scope of work, and state project significance. This exercise also forces students to see that it is not possible to study all aspects of a given topic as published papers are limited by the stated hypothesis or problem statement.

Learning by Doing

Faculty are generally quite conscientious about preparing material for lectures to prepare students for success. As a professor it is always interesting to deliver important material, material you know the students will absolutely need, and watch as they sit passively waiting to be told it will be on an exam. Realize that your professors are intentional about what they are trying to teach. They know the connections between the different courses in the major. They use these connections in their research and projects all the time. Make one of your intentions as a student to seek connections inherent in a multi-disciplinary science such as geology and to do the science first hand.

Select Courses in Which to Do Geology

The Geology Program at WKU has modified its program to provide select courses characterized by immersive experiences: Analytical Techniques

Science, and most importantly earth science, is usually treated descriptively in secondary education. There are big concepts (geologic time, plate tectonics, volcanoes and earthquakes, stratigraphy, etc.) that are difficult to explain by numbers. However, university and industry science is more quantitative. To that end, WKU initiated a course in Analytical Techniques offered after the introductory geology course, but prior to most of the core geology courses. This course is an intensive introduction to basic analytical/research techniques, which are then used to model research in later courses. Students make thin sections and are trained in polarized light microscopy (PLM), magnetic and heavy liquid separations, x-ray diffraction (XRD), x-ray fluorescence (XRF), Raman microscopy, scanning electron microscopy (SEM), and other techniques. The students in turn can use these techniques during mineralogy to independently identify unknown minerals. They may generate their own geochemical data sets during igneous petrology, sieve and analyze sediments they collected during sedimentology-stratigraphy, identify ore minerals in economic geology, and do field work for their own research, starting their sophomore year!

Exploration of these techniques is done either independently and as teams, supervised by faculty and peer mentors. Students compose a generalized research flow chart over the course of the semester, and then write a research proposal based on their flow chart, employing techniques learned during the course. These can be submitted for internal funding, or external funding from scientific societies. Each must keep a daily lab notebook, including ALL notes, ideas and speculations, procedures, results, and even mistakes as they learn about chain of custody, and the reality that their notes may be
subpoenaed as legal documents! Clear, concise, and illustrated Standard Operating Procedures (SOPs) are created for each technique. Students use the SOPs throughout their academic career — and commonly email after graduation that they find these SOPs indispensable in their jobs. In short, we advise that students get immersed early in active, hands-on learning projects. There is no need to wait for graduate school. If your institution doesn’t offer such a course, you may still prepare your own SOPs and explore the possibility of getting training in instrumentation available to you.

Field Methods

Based on our faculty experience from their alma maters and investigation of curricula in Kentucky and the region it is not that common in undergraduate education for students to have had numerous hours of field study prior to field camp with the latter generally being the capstone experience for students. Field camp is the last item on their list to graduate or as they transition to graduate school. At WKU, students are immersed in field situations relatively early in their academic careers. Most of these hours spent in the field (3 hours per week for at least 11 weeks in the semester plus a long day or full week field trip) provide students with extended periods of structured learning. Toward the end of the semester, students conduct independent research within small groups of two or three, and this is when more formal peer teaching and interaction occurs. Students then present their research before the class and they are evaluated by not only faculty but by their peers as well. (Figure 2) Students make advances in developing organizational and presentation skills by the end of Field Methods class.

Focused Undergraduate Research

In addition to intentional opportunities for research and practical training embedded in courses, WKU Geology has developed a number of ways whereby students can get focused, practical training by actively applying field and analytical techniques to research topics. A good example of this is students engaging in topics associated with the extractive minerals industry including examples of metallic ore mining and oil and gas (most via Geology 399 — independent research for undergraduates). Students dealing with economic geology topics obtain a suite of samples from a mine, and model typical tasks of a mine geologist in characterizing the ore. Many of these samples were donated by alumni in the mining/minerals industry. Students analyze samples using powder XRD and Raman microscopy to establish the equilibrium mineral assemblage (paragenesis) for the ore. When possible, cuttings and Raman microscopy to establish the equilibrium mineral assemblage (paragenesis) for the ore. When possible, cuttings or core are characterized as a proxy for logging done on site. Models of ore genesis are discussed and students prepare and deliver presentations on their research at conferences. In this way, students are executing research while learning firsthand about styles of mineralization and how to investigate mineral assemblages. Two students recently obtained grants from WKU to go further in their investigations of gold mineralization in Nevada and South Dakota. The program has recently developed a computing facility with site licenses for various industry software used in the mining and petroleum industry, including Vulcan® and Petra®. Experience in modeling ore deposits and mines, and oil and gas reservoirs, using industry software provides training that is less common in academic environments. Students will graduate with classroom knowledge, but more importantly, with practical experience in the methods required to work as a mining or petroleum geologist.
In another example, several undergraduates approached faculty asking “how will we look better than all those other Geology majors?” Get practical expertise in industry practices was one of the answers. These students found a local driller who agreed to provide training, and they worked during the summer to get familiar with an air rotary drill rig, best practices, and procedures. After meeting with faculty, they developed an SOP for the rig, which is now available for all future undergraduates, and for faculty to use in the classroom. They then drafted a research proposal using their new knowledge of the rig to drill at least two holes through five stratigraphic units at one of the university field sites. They will obtain gamma ray logs by combining down-hole measurements with outcrop measurements several hundred meters away as a comparison. As part of the learning process, they developed grant submissions for internal WKU grants, AAPG, and even solicited support from industry-based WKU alumni to cover costs associated with drilling the holes. These students volunteered to make a presentation of their project to representatives of an energy company who were recruiting for internships in the department. The students saw this as an opportunity to stand out from the crowd. The recruiters saw undergraduates who were very intentionally preparing for successful careers in oil and gas exploration by making opportunities for training. All these activities made these students much better prepared for careers in industry, and demonstrated their commitment to excellence. It’s no surprise that students were asked to provide CVs to the company.

importance of professional meetings

Scientific conferences are where research is disseminated, contacts are made, and synergies are developed leading to the creation of new ideas. It is important to not just attend but to actively participate in conferences in order to gain context for how professionals deal with each other and present their research. At WKU, we have developed courses specific to annual meetings in order to train undergraduates. Students identify specific oral technical sessions that they will attend. They are required to read all abstracts for the two chosen oral sessions, and develop and submit to faculty a number of questions that they might ask presenters at the sessions. While at the conference, students must participate in their chosen sessions and document their participation in at least one more meeting-related activity. These could include a faculty led field trip, other sessions, a sponsored mentoring session, or interviews at graduate program tables. They are required to send follow-up emails to each graduate program, and to each presenter with whom they speak. After they return from the conference, students must submit a summary of their active participation in the conferences. This intentional approach to participating in conferences is considered appropriate training for a successful career. Practices such as the timely (and articulate) response to emails, the careful nurturing of professional contacts and the intentional approach to participation in a conference are all training for successful professionals.

Scientific advances depend upon dissemination of research results to the scientific community for peer review and discussion. Active participation includes consideration of the broad range of research presented, the validity of data sets, analytical techniques, and being witness to the discourse common among peers. When membership in professional societies is considered a strong “resume-builder,” it is because of the assumption that the student is now more familiar with professional vernacular, activities, behavior, and priorities. These come from the active participation in a professional society, and not just membership. In the same fashion, a student’s GPA is a fairly accurate index of their commitment to academic success, even though many students don’t think that they accurately reflect a student’s “smarts.”

Summary

Intentionally taking charge of your education and training as an undergraduate student prepares you for a successful career that will last the rest of your life. But it is difficult to know What to do, How to do it, and even Why is this important? Geology departments have developed curricula that offer solid training in core material, and many go well beyond to offer opportunities for research and training in more specific aspects of career preparation. To take full advantage, students need to not just attend, but intentionally seek connections between courses, between coursework and research, and between research and professional behavior. Learning by doing should include how to maximize participation at professional meetings and writing thoughtful and timely communications, in addition to developing expertise in analytical and field methods. Understand the differences between the academic and commercial worlds, and develop a sense of how you can contribute to a corporate vision. Take some control over your preparation, and you’ll be prepared when the opportunities come!

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Andrew H. Wulff is an Associate Professor of Geology at Western Kentucky University where he has been since 2002 teaching primarily mineralogy, petrology, analytical techniques, and structural geology. Prior to coming to WKU, he had worked with the Maryland Geological Survey and in mining exploration, and was on the faculty at Whittier College and University of Iowa. He earned a B.A. from Oberlin College, M.S. from University of Maryland-College Park, and Ph.D. from University of Massachusetts. He can be contacted at andrew.wulff@wku.edu.

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Wine and Dine ArcGIS®:
Tips From the Self Taught User to the Beginner

Michael A. DeVasto, MEM-2281

In an ever-growing digital era, students are experiencing increasing pressure to learn the programs they have available to them, including ArcGIS®. Some students may learn by themselves while others may take a class or two, mainly sticking to theory or (maybe worse) the cookie cutter tutorials for adding, subtracting, joining, relating, and all miscellaneous manipulation to maps in “Arc.” Though by no means a user’s guide, this article outlines some of the more helpful tips, hints, and tricks that I, as a self-taught Arc-user, struggled to pick up. I’ll work from some basics into some things a bit more advanced. As I matured in using Arc, I needed to push the boundaries of what the program could do from just my humble experience. I hope this article can help other students in similar scenarios have a smoother experience with Arc, inducing those “ah-ha!” moments and preventing those “I never want to use this program again” moments. Really, Arc is a wonderful program, but, like many things, there is a learning curve – here are some tested tips that will help you beat that curve.

Free Data are Difficult to Come By

Before you can really get started, some of us may be wondering, “Where do I even get data to play with?” This has been a struggle for me, but I’ve found Canada’s Division of Natural Resources has true geological data, free for use – it’s a beautiful thing. USGS also provides some mapping files from different types of mapping projects. Tutorial CDs also have many map sets with a wide variety of data and is a good resource to begin experimenting with.

Write everything down.

With more functions and tools than ever thought imaginable, it’s more than likely you’re going to get very, very lost. This is why it becomes crucial to write your “moves” down; make notes on the tools you used, the outcomes, where you clicked to get to a certain menu, and even where you’ve been storing some of your files. I would go as far as even writing a summary of your session so that when you come back in a day, or week, or likely even a month later you know just where you left off. A helpful outline of what happened, where you stored your files, what you were trying to do or any other relevant facts will help very much in the long run. Plus, as sort of an added bonus, you’ll quickly learn from writing things down what works and what doesn’t, preventing repetition.

Functions and Tools Can Be Found By Using the “Search” Tab

Now that you have some data to work with, how do you use it? Well, Arc has a wonderful function; instead of poking through all of the toolboxes (there are way too many), you can simply search for a tool you may be looking for. This is even its own tab in ArcMap® 10. Just like using a search engine, type the words for what you think you want to do, and Arc will give you a list of all the tools that match those keywords. Even smoother, when you hover over the tool, Arc will give you a quick description, a link to the full description, and a link to use the tool – all without opening the toolbox. That is really helpful when you’re not sure precisely what tool you want to use but have a vague notion of what you’re trying to do. Note that Arc won’t save these searches, so if you find a useful tool, write it down!

Be Proactive with Digital Architecture.

Once you get the feel for adding data, opening maps, using the toolbox and you have started to generate your own data it’s time to learn to be disciplined in your digital architecture. Where you store your files, what you named them, and how you store them really do matter in Arc, in contrast to other programs where a word file is just a word file. ArcMap® will default and place everything into its default database, which is fine for some things. However, in a month when you want to resume your experiment or research, sifting through the default database with all your generated data can be exhausting (for instance, just executing a single tool can create more than 5 or even 10 “intermittent” files). Of course, there are an infinite amount of ways anyone can structure their files and folders, but here are a few tips to smooth things over with Arc:

- Create a single folder that holds your entire Arc-related activities. This has a twofold purpose – first, you can build that folder to your liking with subfolders and personal geodatabases. Second, if you are going to use different machines then you can “connect” to this working folder and never worry about leaving important files on another computer.

- Don’t move your data! Arc creates supplementary data with anything you build. These are files you don’t typically see in Windows Explorer, or even ArcCatalog, but if you move a folder or file, or simply change a name, the file will become corrupt.
File names are important! Arc will allow a certain amount of characters for different file types, doesn’t use spaces, and sometimes will even neglect case sensitivity. I typically want the file to reflect the type of data it holds and include the sample name. But this is always too long, so I had to be creative and careful with naming and storing.

Saving doesn’t necessarily mean you’re saving. What this means is that a traditional save (from the “File” menu) doesn’t always save the data that you may be working with. For instance, if you have a lot of layers in your table of contents, saving this as a .dxm-file will maintain all of your layers. However, if working with certain functions (like geo-referencing), you can easily rectify if working with certain functions (e.g. Feature class vs. Raster). Different functions for slightly different purposes can bog down the new user. It’s a lot of troubleshooting.

When you want to test your model, run the model within ModelBuilder®. This gives you a visual of how the model is running. Literally, Arc shows you what tool is running and precisely what the problem is.

Streamline Your Arc Experience with ArcCatalog® and ModelBuilder®.

Finally, when you’re starting to feel confident, have a set goal you want to accomplish, and really want to start to impress those “non-users,” I’d like to note the wonder that is ArcCatalog® and ModelBuilder®. These are more advanced tools within the Arc universe, but if you continue down this road they will become essentials. ArcCatalog® acts as a “filing cabinet” for all of your Arc related on-goings. In fact, I still don’t know everything this tool can do but even a limited familiarity with it can help things go smoother and quicker. For instance, in Catalog, you can access all of your file’s attributes right then and there and even get a visual preview of the file! This alleviates the need to open multiple files, wait on loading, and move through their respected tables within ArcMap®. Also, Catalog lets you accomplish something called “Batch” processing. Batching is running a single tool or model for multiple files. This can be a huge time saver if, for instance, you need to run a Join table for 20 or so raster files.

ModelBuilder® is a function that allows you to build custom tools and execute complex actions. I started to teach myself ModelBuilder® once I realized I was going to need to run a lot of repetitive functions. I took the time to go through some tutorials and really didn’t get much out of it until I started from scratch and tried to work my way up to more complicated functions. I recommend starting small, figuring out how to get model builder to find a file, then adding a simple tool like a “select by attribute”; keep adding when you find things that work. ModelBuilder® is a fully customizable, color coded flow chart, where you can add and subtract tools, move them around, and create a network of tools and functions; it’s essentially made to be loved by visual and kinesthetic learners. Once more, if you use the search menu (mentioned above) and find a tool you want to explore, you can drag and drop that tool right into ModelBuilder®! Things to be aware of in ModelBuilder®:

- You can accumulate a lot of “intermittent” data if you don’t select the option “Delete intermittent data” from the file menu.

More than two ways exist to get what you want out of ModelBuilder®. For instance, a multitude of options can be employed just too simply add a particular file type (e.g. Feature class vs. Raster). Different functions for slightly different purposes can bog down the new user. It’s a lot of troubleshooting.

When you want to test your model, run the model within ModelBuilder®. This gives you a visual of how the model is running. Literally, Arc shows you what tool is running and precisely what the problem is.

Arguably, one of the most important but transparent facts about ArcGIS® is that is it a Geographical Information system, not a Geological one. Arc was originally developed and heavily used by geographers. Like many things in Geology, we tend to “borrow” from the other sciences and apply them to what we do in Earth Studies (I hope this is no secret, or I just let the cat out of the bag). Using Arc is no exception. There are specific applications where geologists are trying to use a GIS, and there are a few hitches. We geologists need to accommodate those tiny differences. But this is not without hope — there is an entire online network of geologists furthering the use of GIS in the geological sciences. So don’t be discouraged if you can’t find what you want to do — just invent it!

Currently, Mike works as a Mine Geologist for Coeur d’Alene Mining Corporation in Alaska. He received his BS in Geology at the State University of New York (SUNY) Oneonta and his MS at University of Wisconsin, Milwaukee. Over the course of his time in school Mike used ArcGIS® for several independent projects and his Master’s degree; employing Arc to assist in petrographic analysis of shear zones. Mike’s work with Arc was recently published in the journal Computers & Geoscience.

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High Commodity Prices Do Not Translate into Exploration Bliss

James Hersch, CPG-06511

Geological exploration and development of natural resources are based on observations. Creativity is, or was, one of the founding premises that defined successful explorationists. I suggest that the present high commodity prices should make all geoscientists elated. High salaries, excellent benefits, freedom of movement, numerous job opportunities, bonus plans, a historically large number of drilling rigs making test holes – in the words of Alfred E. Neuman, “What, me worry?”

I contend that the geosciences community is not happy. The industry is known for being cyclical. Hiring trends have had many peaks and valleys. I started my geological career in the pre-boom years of the mid-1970’s, weathered the downturns of the 1980’s, and currently enjoy the prevailing economic “party” of resource exploration and development. Numerous authors have pointed out the bimodal demographic distribution of geoscientists now in the work force. One might expect the entire population of geoscientists, at both ends of the career spectrum, to be giddy concerning their job duties. I challenge this concept and contend that many of my associates may be disenfranchised. The reasons for this enigma are complex.

The culprit in this puzzle is rarely financial. I suggest the lack of empowerment and the role of scientific specialization may be surpassing creativity. The farming out of every task to an “expert” and the rise of peer reviews and quality control teams may be having the opposite effect of original good intentions. Is the law of unintended consequences at work? Organizations have strived to streamline themselves and decrease the residence time for prospect development and new business opportunities. This corporate desire for structural flattening to increase efficiency may be an illusion. Prospect creation and new business concepts may be taking longer to generate as creativity drifts out of the equation.

Although a corporate team may be entrusted to develop a new play or business strategy, individual members may not really be empowered. Possible causes may include a lack of spending authority, and prerequisite “buy-in” of concepts from diverse groups of experts. A rigid systems approach or a gate-keeping process may be a warning sign. Such well-intended methods may depress creativity and allow “Nintendo” or process-driven applications to become more significant to a project’s survival than the actual geology.

Process driven “idea” programs and the misapplication of technology may also have an unintended side effect. High technology has no chance to improve performance if the low-tech work is done incorrectly or ignored. The original roots of successful exploration were developed from direct observations. Design of the appropriate technical path on which to proceed should be based on sound geologic, engineering, and geophysical ground-truths, which also define the risk. The boundary conditions of the experiment must be determined before a potential solution can be found.

A common signpost of process-driven exploration and development is the “Moses Syndrome,” whereby all prospects must meet prescriptive, corporate commandments. All prospects and new business opportunities are not the same. A North American business model for property acquisition or an individual prospect may not be applicable in the international arena. The world has indeed gotten smaller with the geologic playing field changing rapidly. The competition by national oil companies is not limited to their country of origin. The old days of state oil companies “competing” behind the scenes, within national boundaries, are over. Today, national oil companies readily compete for business opportunities outside of their country of origin. The super majors, national oil companies, large independents both domestic and foreign, start-ups, investment houses, and utility companies are all joining the party. Competition has never been more intense.

The general lack of quality prospects in mature producing areas or new frontier areas has also heightened the competition. Creativity may be even more important than it was in the past. The ability to define risk and devise an appropriate business plan is critical to obtain new acreage and create a successful play. The brave new world in which we find ourselves may require a new paradigm. Purchasing reserves at 15 $US per barrel is now commonplace. A few years ago 8-10 $US for proven reserves was considered unacceptable. The full cycle economics for many companies were anchored on the concept of finding reserves at a cost below ten $US per barrel. At the same time that this economic shift has occurred, I wonder if geoscience thought and the way we view geoscientists may also need to undergo change.

The industry axiom is that a shortage of geologists is a major contributor to the stagnation of generating a significant number of new business opportunities. I suggest that the shortage of exploration and development staff may be a minor part of the problem. Is a more significant culprit the corporate “silo” effect – a stack of data confined to an individual discipline, a linear chain of command within disciplines, poor communication among technical groups, and lack of interdepartmental support? The rise of highly specialized technical groups may inhibit the desired team approach and promote the silo effect. Group A only does stratigraphy, Group B does geochemistry, Group C does modeling, and Group D generates cash flow models. A concerted company effort must ensure...
communication between all groups, and avoidance of a team that simply consists of individual silos, rather than a cohesive, focused technical force.

The domestic oil and gas industry has moved towards resource plays and away from conventional exploration. Statistical plays which are proven may not require the same technical personality types as frontier exploration plays, and may not require as many geoscientists. A possible employment model to service a statistical play might use geoscience technicians, with empowered geologic supervision, to free-up manpower for other business applications. I contend for the industry to remain healthy we must stop falling back on the manpower shortage issue and develop new business acumens to address the most exciting business in the world. Passion, drive, integrity, persistence, curiosity - these traits are our friends, and individuals possessing said traits have a bright future as we work in the world’s greatest industry. We as geoscientists must not forget our roots.

James Hersch holds a MS in Geology from the University of Tennessee (1978). Mr. Hersch has worked extensively in the majority of the world's hydrocarbon provinces. Jim began his career with Exxon and held technical positions at Anadarko Petroleum for 25 years. Mr. Hersch is currently the Exploration Manager for W@T Offshore, a NYSE listed company.

Winter’s Last Blast

You may be dreaming of spring, but don’t forget the cold, hard facts: Old Man Winter still has plenty of time to deliver a deadly blizzard or ice storm. Follow these tips if you lose power in your home or are stranded in your car.

At Home

• Replenish dwindling emergency supplies, including food, water and batteries.
• Stock plenty of dry logs for your fireplace.
• If you lose electricity that powers your thermostats and furnace, wear warm clothes and keep extra blankets nearby. NEVER turn on a gas oven to supply heat.
• Instead of candles, use flashlights and battery-powered lanterns to provide light.

In Your Vehicle

• Stay inside, but if it’s safe to do so, hang a colored cloth on your antenna or lay flares on the road to indicate distress.
• Run the heater for 10 minutes every hour with the engine on so you don’t drain your battery.
• Crack a window for fresh air.
• Put on extra layers of clothing or wrap yourself in a blanket.
• Try to stay awake if you’re alone or alternate taking naps with your passengers.
• If water is unavailable, melt snow before you eat it; otherwise it will lower your body temperature.

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AIPG HISTORY

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MARCH, 1973

APPROVED BUDGET 1973

ESTIMATED INCOME:

1. Dues from 2205 Active Members. $66,150.00
   Less expected delinquent accounts. 9,900.00
   2. Transfer from reserve dues account:
      45 applications pending 1-1-73 1,350.00
      45 approved before 7-1-73
      New applications received in 1973
      (due to reserve account)
      100 @ $30.00... ($3,000.00)
      40 approved
      in 1973 ....... $1,200.00
      60 in suspense
      to 1974 ...... ($1,800.00)
   3. Processing fees:
      100 @ $5.00 500.00
   4. Interest 750.00
   5. Contributions 2,500.00
   6. Sale of insignia material 50.00

   $62,600.00

ESTIMATED EXPENDITURES:

A. Administrative $24,130.00
   B. Operations GHQ 13,160.00
   C. Membership Services 14,410.00
   D. Special Projects 10,900.00

   $62,600.00

(continued next column)

A. Administrative
1. Salaries $20,160.00
2. Payroll taxes 970.00
3. Insurance & Bonds 300.00
4. Travel expenses 1,500.00
5. Retirement fund 1,200.00

   $24,130.00

B. Operations GHQ
1. Rent 2,760.00
2. Office supplies 1,400.00
3. Microfilming 100.00
4. Addressograph 120.00
5. Printing
   Applicant lists $420.00
   Form letters, dues 500.00
   Certificates 250.00

   1,170.00

6. Postage-general 2,200.00
7. Telephone 1,200.00
8. Depreciation 310.00
9. Xerox 1,100.00
10. Accounting 2,500.00
11. Annual Contribution to legal reserve 300.00

   13,160.00

C. Membership Services
1. The Professional Geologist 2,000.00
2. Proceedings Issue TPG 2,500.00
3. 1973 Membership Directory 3,250.00
4. Procedures Manual 500.00
5. Communicator 2,160.00
6. AGI Dues 4,000.00

   14,410.00

D. Special Projects
1. Public Relations Program 5,000.00
2. Committee support 5,900.00

   10,900.00

   $62,600.00
The AIPG Foundation Thanks Donors

Several generous members have provided very generous donations to the AIPG Foundation and a note of thanks is appropriate. Donations from 12/18/2012 thru 2/18/2013.

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Future Donors May Assist Now

The AIPG Foundation is undergoing change. We are looking to support the needs of the near term and the future, and the Foundation recognizes that funding the Foundation is not the goal. Funding the needs is the goal. The new thinking of the Foundation is that the AIPG Foundation exists to support activities of AIPG.

Parking Lot Safety

Parking lots—they can be as open as the plains of the Midwest or as bumper-to-bumper as a city street during rush hour. Although they may not be the most hazardous places to drive, parking lots can be more unpredictable than anywhere else you travel.

Drivers seem to suspend their good judgment when looking for a parking space. Some consider the Stop and Yield signs as optional because parking lots are on private property and not subject to traffic laws; others ignore the traffic lanes to cut diagonally across the lot.

So it’s not surprising that parking lots are home to frequent accidents. Although most mishaps cause fender benders or minor dings, if collisions occur at higher speeds or involve small children, more serious consequences could ensue.

To help keep you and others safe while driving in parking lots, we’ve got some tips for you and, especially, any teen drivers in your family:

• Be aware: Don’t distract yourself as you exit the parking space. Make sure that all bags and packages are secure, children are in car seats, seat belts are on, and that lights or windshield wipers are operating before you shift into gear.
• Back out gradually: Give oncoming drivers enough time to see you. If possible, pull into a space so that you can exit moving forward or park in areas with fewer cars.
• Drive slowly: Give yourself plenty of time to react to any possible hazard. Check your rearview mirrors constantly, as a car could be coming from any direction at any time.
• Look out for children: They could suddenly run in front of you from behind a row of parked vehicles.
• Give pedestrians in crosswalks the right of way: It’s not just a courtesy, it’s the law.

Dennis Goebel, Vice President, Liberty Mutual Insurance Company.

If you are in a car accident, Liberty Mutual offers quality auto coverage and 24-Hour Claims Assistance to help you get your life back on track as quickly as possible. As a member of AIPG, you are also eligible to receive exclusive group savings.

U.S. Female Geoscience Enrollment and Degree Rate is Mixed in 2011-2012

Alexandria, VA - Geoscience Currents #69 explores how female geoscience enrollments and degrees changed in the 2011-2012 academic year. New data collected shows that female geoscience enrollments and degrees in the U.S. dropped sharply at both the Bachelor’s and Master’s levels, but increased slightly at the Doctoral level. The percentage of women enrolled in undergraduate geoscience programs were at the lowest levels since the 1990s, and Master’s participation rates fell below 40% for the first time since 2001. Alternatively, women’s participation in geoscience Doctorate programs continued its steady growth, rising to 45% in 2012. Although specific causes for the decline are unknown, Geoscience Currents #69 poses potential theories for drivers for these changes, including the possible end of programs that engage female participants in STEM fields, or perhaps the recent growth in the energy sector is attracting substantially more men than women to the field.

A copy of Geoscience Currents 69 can be found on page 46 of this TPG or online at http://www.agiweb.org/workforce/currents.html.

Geoscience Currents are quick snapshots of data released by AGI on the status of the geoscience workforce. The Currents represent data collaborations with other societies, employers, and professionals. Topics for these reports are inspired by inquiries from geoscience community leaders. Interested in participating in AGI’s Geoscience Currents? Visit http://www.agiweb.org/workforce/currents.html and register to receive free email updates containing the latest Geoscience Currents.
As AIPG prepares to celebrate the 50th anniversary of our organization, we have asked the AIPG sections to prepare a history of their sections. Below is the history submission for the California section.

The California Section has supplied many important national leaders to AIPG, including the first AIPG President, Martin Van Couvener (1963-1965), Henry H. Neel (1970), Arthur O. Spaulding (1975), Richard Proctor (1989), and Stephen Testa (1998). In addition, the California Section is proud to have sponsored several meetings including the 5th Annual meeting in San Francisco in 1968, chaired by Daniel J. Pickrell, the 19th Annual meeting in Pasadena in 1982, chaired by Bruce Barron, and the 27th Annual meeting in Long Beach in 1990 chaired by Stephen M. Testa.

Current long-time California Section members with CPG numbers less than 5,000 include: Joseph Wargo, CPG-00054; Howard Pincus, CPG-00065; David Martin, CPG-00271; Robert Long, CPG-00338; Willard Classen, CPG-00524; John Troster, CPG-00596; J. Thompson, CPG-00763; Richard Faggioli, CPG-00808; Robert Hinde, CPG-00837; Wayne Estill, CPG-00917; Nancy Stehle, CPG-01749; Roy Shlemon, CPG-01766; George Witter, CPG-02188; Edward Nahuer, CPG-02808; Thomas Wright, CPG-02812; Ronald Heck, CPG-03100; John Parrish, CPG-03326; Robert Stollar, CPG-03497; John Moran, CPG-03625; Dan Eberhart, CPG-0366; Robert Lynn, CPG-03669; Raul Deju, CPG-04025; James Noble, CPG-04079; William Elliott, CPG-04194; Jonovegreen, CPG-04379; Robert Sydnor, CPG-04496; Wallace Jensky, CPG-04724; Donald Fife, CPG-04755; Arturo Nisperos, CPG-0480; and C. Clayton, CPG-04955.

The AIPG California Section is well represented in state government. The current California State Geologist is John Parrish who was the former Executive Officer of the State Mining and Geology Board, and prior to that, the Executive Officer of the Board for the Registration of Geologists and Geophysicists. Since 2005, Stephen M. Testa, also an AIPG member, has held the Executive Officer position at the State Mining and Geology Board.

California was one of the first states to license geologists. Registration in California had its basis in the very heavy rainfall in the winter of 1951-1952 which caused numerous landslides and mudslides in Southern California. Most of those slides occurred within the City of Los Angeles. Many of the landslides were precipitated by extensive excavation that had been completed by housing developments in hilly areas during the post World War II housing boom. The City of Los Angeles wrote an ordinance aimed at regulation of these practices of excavation and grading. The ordinance required that a geologic opinion was required in the event that the City Building & Safety Department believed that the area presented a geologic hazard. An Engineering Geologists Qualification Board was established by the City of Los Angeles in 1957. The purpose of the board was to review the qualifications of those geologists practicing engineering geology in the City of Los Angeles and to establish a list of those whose reports would be accepted. The County of Los Angeles, followed the lead of the City of Los Angeles and established its own grading ordinance and Geologist Qualification Board in 1959. Over the next several years, about 20 more local geologist qualification boards were established in California. By early fall 1966, the City and County of Los Angeles, requested that the state assume the responsibility of registering, qualifying, or certifying geologists in the field. Many worked on the process, including Martin Van Couvinger, as well as Henry “Hank” Neel. The Geologists Act was passed in 1968, effective in 1969. Licensure for geophysicists (early 1970s) and the title acts for specialty licensure for certified engineering geologists (in the original act) and certified hydrogeologist (mid 1990s) also occurred. A Board for the Registration of Geologists (later the Board for Registration for Geologists and Geophysicists) was formed under the Department of Consumer Affairs to license Registered Geologists. At some point it was noted that dogs and sex offenders were also registered in California, so the designation of Registered Geologist was retired in favor of the more socially acceptable Professional Geologist title.

Over the years, the California Section of AIPG has lobbied to protect the Board of Geologists and Geophysicists many times over the past two decades as board sunset hearings occurred. In a last minute act in 2009, legislation was passed that eliminated the Board for Geologists and Geophysicists and transferred all of the duties, powers, purposes, responsibilities, and jurisdiction to regulate the practices of geology and geophysics to the Board for Professional Engineers and Land Surveyors. Effective January 1, 2011, the name of the Board was changed to the Board for Professional Engineers, Land Surveyors, and Geologists.

For lobbying, since about 1995, AIPG was instrumental with other organizations in California to form the California Council of Geoscience Organizations (CCGO). AIPG California Section members active in the CCGO founding included James Jacobs, David Sadoff and Stephen M. Testa. James Jacobs has since been the California Section representative for CCGO, serving as CCGO president of the organization for five years. The CCGO has arranged the annual Sacramento Drive-Ins in the spring legislative sessions since about 2000, and the California Section of AIPG has played a major role in the annual Sacramento Drive-Ins as part of the state legislative outreach.

The California Section has had meetings, and hosted co-field trips over the years. For the past 13 years, the California Section has participated in providing judges and prizes for the California State Science Fair, held every year in Los Angeles. David Sadoff was the primary judge with help from James Jacobs, Mehmet Pehlivan, and Mark Rogers. State officers over the past two decades include James Jacobs (president and vice president), David Sadoff (president and vice president), Mehmet Pehlivan (vice president), Karel Detterman (treasurer) and Mark Rogers (secretary). Earlier, Stephen M. Testa, Rob Larson and Chris Sexton served as section president for a series of years and Chris Sexton was a newsletter editor.

In 2010, UC Davis Student Section was founded with Professor Robert Zierenberg as advisor and James Jacobs as sponsor. Since then, monthly meetings and field trips have occurred opened to AIPG members and student members. Speakers included Rob Sydnor, John Parrish, David Sadoff, James Jacobs and others.

April 4-5, 2013
Come visit the AIPG booth at the GSA South-Central Section’s 47th Annual Meeting in Austin, Texas.

Booth Volunteers Needed. If interested contact Vickie Hill at vlh@ aipg.org.
Employee Health and Safety – Now and Then

Robert A. Stewart, CPG-08332

The Prospectors and Developers Association of Canada (PDAC) annual convention is among the world’s premier events for the minerals industry. The convention is held in the Metro Toronto Convention Center, and in 2012 hosted over 30,000 delegates, with over 7,000 of those from 125 countries. This year I attended while on vacation to visit relatives in Toronto. The convention includes technical sessions, a trade show, an investor’s exchange, the Core Shack, and unparalleled networking opportunities, especially for students. The PDAC organizes a series of student events including guided tours of the 1,000+ companies present at the convention, a networking luncheon, and annual membership at a nominal cost.

The PDAC has come a long way since my graduate school days over 30 years ago. As it was known then, the PDA was a Canadian event, and held in the Royal York Hotel, across the street from the convention center. The focus was the industry, and networking for students was definitely self-implementing unless you had the advantage of a faculty member or alumni to make an introduction. The late 70s and early 80s were a period of peak employment for geologists in the minerals industry, as well as petroleum. By the mid- to late 1980s, exploration and development had crashed, geologists were laid off wholesale, and mineral exploration programs were laid off wholesale, and mineral exploration programs were laid off wholesale, and mineral exploration programs were laid off wholesale, and mineral exploration programs were laid off wholesale. By the mid- to late 1980s, exploration and development had crashed, geologists were laid off wholesale, and mineral exploration programs were laid off wholesale, and mineral exploration programs were laid off wholesale. By the mid- to late 1980s, exploration and development had crashed, geologists were laid off wholesale, and mineral exploration programs were laid off wholesale. By the mid- to late 1980s, exploration and development had crashed, geologists were laid off wholesale, and mineral exploration programs were laid off wholesale.

The 80s to 90s saw not only a hiring depression for geoscientists, but diminished enrollments in colleges and university geology programs. The subsequent rebound of commodity prices led to our present circumstances of a bimodal age distribution for geologists. None of this is news, but the trend is manifested in a few somewhat unexpected ways. In January 2012 I attended the 4th International Professional Geologists’ Conference in Vancouver, British Columbia, which was held concurrently with the Association for Mineral Exploration British Columbia (AME-BC). One of the first exhibits after the registration desk at AME-BC advertised screening for prostate and colorectal cancer. This struck me as a nod to the many silverbacks in attendance, although obviously cancer has no respect for age or gender. The presence of the booth generated its share of laughs – who hasn’t heard or seen a gag dealing with a prostate exam or colonoscopy? This didn’t bother the booth volunteers a bit, and they were happy to go along with the humor, which encouraged the participants to stop and ask questions. The PDAC convention included an information booth for the Canadian Cancer Society, and such representation is increasingly common at industry events.

Perhaps more to the point at the PDAC, AME-BC and related events is the heightened overall concern with workplace health and safety, which, 30 years ago, was not the integral component of field work that it is now within the mineral exploration industry. Historically there were formal programs at actual mine sites, principally in response to regulatory authorities such as MSHA and OSHA. For mineral exploration, however, health and safety programs were at a very basic level – some rudimentary firearms training if bears were a concern, proper behavior around helicopters, PFDs in watercraft, and so forth. Nowadays, a formal health and safety plan is the norm, including standard operating procedures (SOPs) and Job Safety Analyses (JSA) for the expected tasks – core drilling, overburden drilling, soil and rock sampling, use of outdoor tools – you name it.

Employee health and safety is, and should be, a moral imperative. In the industry parlance, a loss or near loss (LNL) is rarely an Act of God or some sort of force majeure; there is usually a root cause, that is, a particular behavior that is correctable. Following a LNL event the root cause analysis is the key to understanding how such a future event could be prevented. The health and safety record of individual employers can be quantified and compared through the Total Recordable Incident Rate (TRIR) and other metrics. Unsurprisingly, the TRIR is used to assess the performance of consultants engaged by industry, and a poor TRIR can be sufficient grounds to dismiss a consultant or prevent a consultant from bidding on work.

This level of care and analysis wasn’t a formal component of exploration work when I started my career as a geologist. I’ve often contemplated previous LNL events, generally as stories with friends and family, although some of them still make me shudder. When my kids were young, Helen Oxenbury’s We’re Going on a Bear Hunt was a favorite at bedtime. Inevitably, I was asked, “Dad, have you ever seen a bear?” Up close and personal? Once, while working on an old mine site near Matachewan, Ontario. I was slowly making my way through the thickets of an alder swamp, and spotted some dry ground and possibly an outcrop in a clearing maybe 20 feet ahead of me. After a few more steps, a black bear suddenly sat up in the clearing, took one look at me, and bolted in the opposite direction. The encounter was over before I had time to think about a thoughtful response. I suspect I’d awoken the bear from a morning nap. In retrospect, the alders were probably too thick for the bear to charge, and the noise I made was the best deterrent at the time.
1) This extrusive igneous rock cools from magma with low silica content. The typical mineralogy includes feldspathoids (such as nepheline, sodalite, analcite and leucite), alkali feldspars (such as sanidine, anorthoclase and orthoclase), as well as pyroxenes and sodium-rich amphiboles. Rock texture may range from aphanitic to porphyritic:
   a) Phonolite
   b) Dunite
   c) Dacite

2) An irregular coastline with abundant estuaries, headlands and bays, sea cliffs, wave-cut terraces, sea caves, sea arches and sea stacks is most likely:
   a) A submergence coastline
   b) An emergence coastline
   c) An unappealing coastline

3) The average composition of our domestic mid-continent natural gas is about 88% methane, 5% ethane, 2% propane and 1% butane. Which of the following formulae identifies “propane”?
   a) CH₄
   b) C₃H₈
   c) C₄H₁₀

4) Consider two horizontally-stacked layers where layer 1 starts at the Earth’s surface and layer 2 lies at 650 meters (vertical depth) underneath layer 1. A seismic survey is being conducted. Think of a single source and receiver separated by a distance of 25 kilometers. The average velocity of the rocks in layer 1 is 3.25 kilometers per second, whereas for layer 2, a velocity of 6.73 kilometers per second applies. After computing the critical angle that would give rise to the “head wave”, please determine its travel time (tₘₜ) between the source and the receiver.
   a) tₘₜ = 1.53 seconds.
   b) tₘₜ = 3.01 seconds.
   c) tₘₜ = 4.08 seconds.
Volunteering

Ronald J. Wallace, CPG-08153 ronald.wallace@dnr.state.ga.us

As a young kid growing up I wanted everything completed by the end of the year. If one of my model planes or boats had something broken, I was determined to have it fixed by New Year’s Eve. I’m still that way, and today on New Year’s Eve 2012 I was on the roof of my house blowing the leaves and cleaning the gutters. I got all of my laundry done, had my wife’s car serviced, got my hair cut, and cleaned the yard. At work, I reviewed my last few reports, set up files for next year, and threw out papers that keep piling up. So, you may be asking yourself what does this have to do with volunteering? Well, I believe that for most of us, the end of the year is more about getting things done than reflection. As I write this in the waning hours of 2012, I can’t help but reflect on what AIPG has done for me and what I have done for AIPG. The environmental field was contracting in the 1990s, and consequently, I changed companies a number of times. I knew there was something better out there for me and I knew I wanted to make a difference. Fortunately, I soon began volunteering with AIPG and now find myself president of this great organization.

People in the U.S. are known for their generosity in supporting all types of non-profit organizations. There are literally thousands of organizations out there that you can help. I was a volunteer firefighter for a number of different fire departments as I moved around the country. My wife and I volunteered in an organization where we took our trained dogs to nursing homes, senior centers, and children hospitals. We also fostered schnauzers for a number of years. While generosity comes in many forms, I personally think that volunteering your time is the most generous of all.

All of these different organizations have been personally very rewarding to me but the one organization where I have had the biggest reward has been with AIPG. You can easily start out as a committee member with your local section. Your total commitment time may be just a few hours per month. If you show some ambition one of the officers may ask you to head a committee, or better yet, take the initiative to speak with the section president for additional responsibilities. The great thing about AIPG is that if you demonstrate your desire to help the organization and are willing to give your time, possibilities are endless. You do not have to be a manager with your company or own your own business. All you need is initiative. We have a very small staff at AIPG National and while they do a super job, most of AIPG’s accomplishments come from the hard work of volunteers.

For several years I have told people that one of the things that make AIPG a special organization is the diverse professional backgrounds and areas of expertise of our members. On two separate occasions I was involved in situations where volunteers were needed at the national level. I chaired an energy committee in 2009 where a small but dedicated group produced an energy statement. It was such a great experience. Earlier last year I asked for volunteers to attend the GSA conference in Charlotte to introduce students to wide array of careers in the geosciences. It was such a huge success that we had to cut a few talks because we exceeded our allotted time limits. Its volunteers like this that make AIPG strong and demonstrates how we can make a positive difference as an organization.

So as you reflect in early 2013 and wonder how you can spend some of your limited extra time, think about AIPG and consider helping the organization. We have a number of sections that are inactive, so that is where volunteers are most needed. Volunteers attempting to re-energize inactive sections should consider the numerous opportunities enjoyed by active sections: field trips, professional development, and outreach with local universities. Even where sections are active and growing, volunteers are always welcome. Do not forget that we also have fifteen student chapters that always need a few extra hands. For you young student members, reach out to section officers to see how you can become more involved. After all, the person you ask may be a future reference or a boss. For all members, I encourage all of you to step up and offer a little of your time. I think if you try it, you will like the experience.

AIPG History
1973 President
Adolf U. Honkala

When AIPG was founded, the inspirational leaders, whose names are honored by two other awards, were Martin Van Couvering and Ben Parker. Ad Honkala participated in the organizing committee that met in Oklahoma City in the summer of 1963 to outline the need for AIPG. When AIPG was formed in November 1963, Ad became a member of the first Executive Committee on which he served until 1965. His contributions, which you will never hear about from this most modest of men, were recognized by his Charter Membership as CPG-7.
Answers:

1. The answer is choice “a” or “phonolite”. Dacite is intermediate in composition between andesite and rhyolite as end members. The rock is usually aphanitic or porphyritic in texture. It consists mostly of plagioclase feldspar (oligoclase, andesine or labradorite) with biotite, hornblende, and pyroxenes such as augite or enstatite. Quartz may occur as rounded, corroded phenocrysts, or as part of the ground-mass (along with plagioclase). Dunite is an ultramafic, plutonic igneous rock composed mainly of olivine.

2. The answer is choice “a” or “a submergence coastline”. As described in our example, it constitutes a submergence coastline exhibiting a variety of erosional features. "Emergence coastlines" generally tend to be straighter (less irregular) than those of submergence. Depositional features, such as barrier bars (and associated lagoons) and possible deltas may be prominent.

3. The answer is choice “b” or “C₃H₈” or “propane”, where three atoms of carbon are surrounded by eight atoms of hydrogen. Choice “a” represents “methane” or “CH₄.” Choice “c” defines “butane” or “C₄H₁₀”. All three of these hydrocarbons are part of the “paraffin” family.

4. The answer to our problems is choice “c” or \( t_{hw} = 4.08 \) seconds (with a critical angle of 28.875 or 28.9 degrees): The proof follows:

Consider the figure above. Remember Snell’s Law:

For reflected rays, the angle of incidence (\( \Theta_1 \)) equals the angle of reflection. (Also recall that in the seismic reflection method, the information comes from the midpoint between source and receiver).

For refracted rays:
\[
\sin \Theta_1 / \sin \Theta_2 = v_1 / v_2 \quad (eq. 1)
\]

Velocity is distance over time or:
\[
V = s/t \quad (eq. 2)
\]

Thus, time is distance over velocity:
\[
t = s/V \quad (eq. 3)
\]

Now, let \( \Theta_c \) = critical angle of incidence where the head wave is propagated. Remember that \( \Theta_c \) is defined as the angle of incidence for which the refracted wave travels along and thus parallel to the interface between the two rock layers of velocities \( v_1 \) and \( v_2 \).

Equation 1 becomes:
\[
\sin \Theta_c / \sin 90^\circ = v_1 / v_2 \quad (eq. 4)
\]
\[
\sin \Theta_c = \sin 90^\circ (v_1/v_2) \quad (eq. 5)
\]

Since \( \sin 90^\circ = 1 \), then (eq.5 ) becomes:
\[
\sin \Theta_c = \sin i_c = v_1/v_2 \text{ or } i_c = \sin^{-1} (v_1/v_2) \quad (eq. 6)
\]
Now consider the figure describing our problem:

![Figure showing the problem setup](image)

From the above:

The distance traveled by the head wave is the sum of $s_1$ plus $s_2$ plus $s_3$. Now:

$\cos i_c = h/s_1$ or $s_1 = h/\cos i_c = s_3$  
(eq. 7)

$s_2 = X - (AC + DB)$, but since $AC = DB$, then $s_2 = X - 2AC$  
(eq. 8)

$\tan i_c = AC/h$ or $AC = h \tan i_c$  
(eq. 9)

$s_2 = X - 2h \tan i_c$  
(eq. 10)

The travel time of the head wave is:

$t_{(head\ wave)} = t_{hw} = t_1 + t_2 + t_3$  
(eq. 11)

Then, from equations (3), (7) and (10):

$t_1 = s_1/v_1 = (h/\cos i_c)/v_1$  
(eq. 12)

$t_2 = s_2/v_2 = (X - 2h \tan i_c)/v_2$  
(eq. 13)

$t_3 = t_1 = (h/\cos i_c)/v_1$  
(eq. 14)

Substituting equations (12), (13) and (14) into equation (11):

$t_{hw} = (h/v_1 \cos i_c) + (X - 2h \tan i_c)/v_2) + (h/v_1 \cos i_c)$  
(eq. 15)

Simplifying:

$t_{hw} = (X/v_2) + 2h[(1/v_1 \cos i_c) - \tan i_c/v_2]$  
(eq. 16)

$t_{hw} = (X/v_2) + 2h[(1/v_1 \cos i_c) - \tan i_c/v_2]$  
(eq. 17)

Equation (17) can be used to solve our specific example problem.

In our problem:

$v_1 = 3.25 \text{ km/sec}; v_2 = 6.73 \text{ km/sec}; X = 25 \text{ kilometers}; H = 650 \text{ meters} = 0.650 \text{ kilometers}$

From equation (6) $\sin \theta_c = v_1/v_2$ or $\theta_c = \sin^{-1} (v_1/v_2) = \sin^{-1} (3.25/6.73) = 28.875$ or 28.9 degrees.

$\theta_c = 28.9^o; \cos \theta_c = 0.875$ or 0.88; $\tan \theta_c = 0.55$

Substituting the above values into equation (17):

$t_{hw} = (X/v_2) + 2h[(1/v_1 \cos i_c) - \tan i_c/v_2]$  
(eq. 17)

$t_{hw} = (25/6.73) + 2(0.65)[(1/(3.25))(0.88)] - (0.55)/6.73]$  

$t_{hw} = 4.08 \text{ seconds}$  
(eq. 18).

Equation (18) corresponds to our choices “c” in our problem and is the answer to our question.
Things You May Not Have Been Taught at University

William J. Siok, CPG-04773

Recently (while enjoying the final day of the annual and spectacular Tucson Gem and Mineral Show) I had the pleasure of running into a number of AIPG members, one of whom was friend and colleague Steve Maslansky. Steve and I discussed a few unrelated topics while viewing the impressive array of beautiful minerals and displays, including his personal display with specimens from his fluorite collection.

One part of our discussion centered on various courses which Steve has taught and his ideas for future offerings. An aspect of one of his hydrogeology courses was a segment with hands-on training regarding aspects of actual, field-oriented, data gathering. Students who are versed in the use of groundwater flow assessment were exposed to actual drilling and the physical and logistical issues associated with such data acquisition. The students were introduced to the reality and difficulty of observation, measurement, and in-field data gathering. Theoretical training normally doesn’t include field training, and in fact teaches elements which are usually learned only after the student begins working post-graduation.

This discussion led me to identifying some skills which I and other colleagues have developed as a consequence and requirement of job responsibilities post-graduation. These are skills which are generally not taught as part of traditional undergraduate or graduate training, but which are fundamental to professional career success.

So much of today’s geoscience work is, naturally, computer based. The very first and one of the most essential skills for a geoscientist is to be able to relate physical rock appearance and visual characteristics to the mathematical formulations used in every facet of resource development and environmental control. This may seem fundamental to many practitioners, but many colleagues are completing degrees without benefit of even fundamental field training.

This discussion led me to identifying some skills which I and other colleagues have developed as a consequence and requirement of job responsibilities post-graduation. These are skills which are generally not taught as part of traditional undergraduate or graduate training, but which are fundamental to professional career success.

Drilling technology for resource development or environmental management. When you are sent out on your first drilling assignment, will you know the fundamental differences between drilling rigs and technologies? Will you be equipped to collect and field-classify the sediments and other physical samples retrieved? Certainly, much of your initial training will be provided by your employer, but you will be better prepared for your new responsibilities if you have some fundamental first-hand knowledge upon entering the workforce. You’ll have an advantage if you demonstrate an ability to relate physical observation to theoretical learning.

Project management. This category covers a wide range of necessary skills, such as the ability to negotiate contacts; an understanding of finance to facilitate budget development; familiarity with technical specifications and regulations; an ability to develop detailed project scopes; a willingness to collect accounts payable (money due); an aptitude and willingness to accept responsibility for the supervision of others. There are many other challenges falling under the category of project management, but you may appreciate the essentially non-technical nature within its definition.

This minor list of expectations beyond formal education provides only a glimpse of the rather broad spectrum of extracurricular learning opportunities and requirements. As you prepared to enter the workforce, take advantage of every opportunity to enhance your skills and increase your appeal to prospective employers.

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AIPG members will be able to update their copy of this CD by regularly downloading the pe&p index.xls file from the www.aipg.org under “Ethics” and by downloading the electronic version of The Professional Geologist from the members only area of the AIPG website. The cost of the CD is $25 for members, $35 for non-members, $15 for student members and $18 for non-member students, plus shipping and handling. To order go to www.aipg.org.

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Best Practices(?)

A colleague, David Armstrong, of the Mining Engineering Department at Montana Tech, sent me this picture of toilet paper rolls that he uses to introduce a discussion of “best practices,” the great controversy on “over” or “under.” Armstrong notes that discussion of the controversy is spirited. There are strongly held opinions and reasons for them on both sides of the debate over the proper practice. However, the over or under debate assumes that there is sufficient toilet paper available when needed. When this isn’t the case, one’s preference for over or under is irrelevant.

There is a “best practice” for many geoscience tasks and failure to follow the “best practice” can subject one to severe criticism. But the problem is that there exceptions to general rules and “best practices” are general rules. I’ve published two articles on this subject, “Best practices, a dangerous term” (TPG, Nov ’03) and “Are scientific honesty and ‘best practices’ in conflict?” (TPG, Jul-Aug ’05). The critical and generally missing discussion of any “best practice” is a discussion of the assumed conditions that are required for the practice to perform as expected. If the conditions aren’t met, then the practice is inapplicable and modification or use of some other practice is required. If there is no toilet paper, what do you do?

If you ever deviate from a suggested “best practice,” include a discussion of why the “best practice” was inappropriate and why you did what you did. A client of mine had an independent review conducted of its reserve estimation practices. The independent review highlighted several deviations from a “best practice.” My response to the independent review pointed out why the cited “best practice” was inapplicable in this case and demonstrated the lack of understanding of the deposit type by the independent reviewers.

Getting a Job—Social Networking Check and Other Tips

The article, “Getting a Job—Resumes, Networking, and Interviews,” in the Jan/Feb ’13 TPG has been sent as a separate file to all AIPG student members. Copies are available on the AIPG website, www.aipg.org.

Ron Wallace, CPG-8153, noted that the article should have included a section on cleaning up your social media postings, including those of unflattering photos of you taken and posted by friends. Potential employers are checking Facebook, Twitter, and other social networking sites as part of their hiring due diligence. Some reportedly are asking for your account’s passwords. Social networks are a fun way to let your friends know what you are or have been doing. But do you want a potential employer to see everything that’s been posted? If you would rather a potential employer not see something, don’t post it in the first place or delete it as soon as you can.

Fleetwood Koutz, CPG-10839, wrote with the following tips: “Make sure you show up with pen/pencil, some paper/notebook to write on, extra copies of resume/references, possibly some report/map examples (list) of your work (mentioned), turn your cell phone- iPhone off, including while waiting and bring a hand lens to the interview if it has anything to do with a rocks/minerals based job. I do not know how many times I’ve seen an interviewer pull a weird rock/mineral specimen off a shelf and ask the interviewee to talk about it. I’ve even seen HR people do this at mines. Having a few basic tools shows you are prepared.”

Dealing with Creationism

David R. Montgomery’s article, “The evolution of creationism,” in the November 2012 issue of GSA Today (v. 22, no. 11) provides an interesting summary of the evolution of creationism, particularly of the “young-Earth” creationists who insist that the Earth is no more than 6,000 years old. Montgomery notes in his concluding paragraph that, “Geologists assess theories by how well they fit data, and creationists evaluate facts by how well they fit their theories. This simple distinction frames an unbridgeable intellectual rift.” As Montgomery observed earlier in his article, young-Earth creationists “read the Bible to determine geologic history and looked for scientific support for their views—and dismissed or ignored contradictory evidence. … Their view of earth history [is] based on a literal reading of Genesis.” Montgomery concludes,
“Given the ongoing conflict over what to teach in science classrooms, perhaps teaching the historical evolution of creationism offers a fresh way for students to learn about the history of geology, and thereby our knowledge of the world and how it works.”

While Montgomery’s suggestion may have some merit, it ignores the fact that young-Earth creationists start from the position that the Bible is literally true and that any deviations therefrom must be in error. In particular, creationists focus on the literal reading of Genesis 1:1 through 2:3, the well-known seven day progression ending in a day of rest.1 Man is not created until after the animals on the sixth day. However, of Genesis 1:1 through 2:3 is the first of two creation stories. The second creation story in Genesis begins immediately after the first with verse 2:4 and has a different chronology of events from the first creation story along with the creation of the Garden of Eden. Man is created first to till the earth and thereafter animals are created as his companions and finally woman is made from the man’s rib. I suggest that in starting to refute the young-Earth creationists, comparison of the literal words of the two creation stories in the first two chapters of Genesis is a good place to start. Both cannot be literally true. Deciding that one creation story is better than the other requires a selection of what one believes, a selection of “facts.” In using this approach, we reach over the unbridgeable rift by asking how can two conflicting stories be literally true. In pointing out that by selecting one over the other, we can begin an intellectual acceptance of the scientific method’s approach of selecting facts or observations that best fit an explanation of what happened in the past.

I published a review of The Bible, rocks and time: geological evidence for the age of the Earth by Davis A. Young and Ralph F. Stearley in the TPG in July 2010. Young and Stearley's book should be among the references those following Montgomery’s suggestion should have at hand. While is an excellent treatment of the subject, it primarily approaches the question of the Earth’s age from a scientific perspective. While this evidence is convincing for those who accept the scientific approach, it is not convincing to those who want to literally interpret the first creation story in Genesis. Convincing such people that they must deal with the contradictions in the two creation stories in Genesis is the point of beginning.

Having It All or What is Success in Life?

In column 142 (Nov/Dec ’12) I discussed several aspects of achieving a successful life as did Stephanie Jarvis, SA-1495, in her “Student Voice” column in the same issue. I listed the following characteristics of a successful life:

- Enjoyment, achievement, and fulfillment from your life and career.
- Achieving over time a personally satisfying balance among work, play, family, and other chosen pursuits.
- Achievement of recognition and respect from one’s peers and one’s self in the various activities you pursue.
- Sufficient family income to comfortably feed one’s family and educate one’s offspring.
- Clarifying your personal definition of success is the first step in achieving it.

Nowhere in column 142 was the word “happy” or one of its derivatives used. Yet “the pursuit of happiness” is one of our national aspirations for each individual courtesy of Thomas Jefferson. In January 2013 The Atlantic Monthly published “There’s More to Life than Being Happy” by Emily Esfahani Smith. Smith’s article focused on Viktor Frankl, a prominent Jewish psychiatrist and neurologist in Vienna in 1942 when he was arrested along with his wife and parents and sent to a Nazi concentration camp. In 1946 Frankl published Man’s Search for Meaning, a bestselling book in which Frankl concluded that a major difference between those who lived and who died in the camps came down to whether one had a real sense of meaning in life, “the last of the human freedoms—to choose one’s attitude in any given set of circumstances, to choose one’s own way.”

Living a meaningful life may or may not be viewed as a successful life by others. But if one believes that one’s life is meaningful and acts in ways that are consistent with that belief, whatever the circumstances, perhaps enduring the horrors of a concentration camp in order to continue with one’s meaningful pursuit(s) thereafter, then life has been successful for that person.

Meaningfulness and purpose can come from a variety of activities: being professionally successful, raising or nurturing children in some way, contributing to one’s community, etc. For many, religious belief and practice may be part of living a meaningful life. Some geoscientists are active religious believers, others are not. What gives your life meaning? What do you do to give your life meaning? What will you do to live a more meaningful life? These are very personal and individual questions but they are worth pondering periodically throughout your life.

1. Judaism’s greatest gift to civilization, the idea that we need at least a day of rest every week.

Geoscience Online Learning Initiative (GOLI) - AGI/AIPG

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A $200 stipend and 10% share of registration fees are provided to the presenters (details on presenters guide).

If you are interested please read the GOLI - AGI/AIPG Presenters Guide and Guidelines and Suggestions for Webinar Presentations on the AIPG National website (www.aipg.org).

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1. Judaism’s greatest gift to civilization, the idea that we need at least a day of rest every week.
How To Not Hire The Low-Bid Driller

William J. Stone, MEM-2164

Ground-water recharge investigations using natural environmental tracers begin with collecting core of the unsaturated zone by hollow-stem-auger methods. The driller used can make or break the project. To hire a driller, the policy of the state agency where I once worked was to obtain three bids and select from among them. I was also told it was expected that I’d hire the low bidder and it was nearly impossible not to.

The first time I did this, I got bids from the state highway department and two private companies (one local, one out-of-state). The highway department was least desirable: they were not only high bidder but provided a crew of four: a driller and three helpers. On an auger rig? I’d have to trip someone to get at the core! The local contractor was the mid-range bidder. His bid got points as he used a crew of only two: a driller and a helper (the norm). The out-of-state company was the low bidder. Guess they forgot the mobilization charges. Of course I hired the low bidder, as instructed.

The project was at a coal strip mine. After the required safety training, I led the way to the first drill site. While they were rigging up, I got my sampling gear organized. That’s probably why I never noticed that there was something funny about their set-up. I’d done this kind of sampling before and was often both geologist and driller’s helper. So I knew what a hollow-stem auger outfit ought to look like. This was just wrong. They were set-up to drive a core! They raised and dropped a hammer by means of a rope (not cable). That worked fine, through the blow-sand at the surface. Then they hit the coal measures (sandstone, siltstone, shale, coal). No matter how hard or fast they hammered, they made no progress. The rope started smoking and finally broke under the strain. The driller was embarrassed but said he had a new one in the truck. I told him that wouldn’t be necessary and we should go to the mine office and call his boss.

I was told that they’d used that method all over Arizona (sure, in soil). Also, they didn’t have any other equipment. I pointed out that the call for bids specified hollow-stem auger coring of coal measures. I was allowed to replace them with the local mid-range bidder and it was a good experience.

Next time I had a project like that, I invited bids from the same three sources. Again, the highway department was high bidder and the Arizona company was low bidder (this time they enclosed a photo of their new hollow-stem core equipment). My successful defense for hiring the mid-range bidder was that I’d run the low bidder off the last job. No one ever questioned why, in that case, I’d even sent them a call for bids. Answer: they had wasted my time; why not waste theirs? This scheme worked just fine. I didn’t have to hire the low bidder. TIP: In going out for drilling bids, include one ridiculous source, the one you want and the one you fired last time.

Dr. Stone has more than 30 years of experience in Hydroscience and is the author of numerous professional papers as well as the book, Hydrogeology in Practice – a Guide to Characterizing Ground-Water Systems (Prentice Hall). Feel free to argue or agree with him by email at wstone04@gmail.com.

May 1-3, 2013

Visit the AIPG booth at the GSA North-Central section’s 47th annual meeting, in Kalamazoo, Michigan.

See you there!!
Whenever friends and family ask about how I like Carbondale, I usually cite the good music scene, my awesome roommate and her dogs, and the many outdoory opportunities that abound around the town. When talking to people that have lived here a while, though, I am always reminded of how little I’ve actually explored. Despite living down the road from Panther’s Den Wilderness Area for a while, I only made it there once, when a friend who had been on me a while about all the cool places I needed to see was about to leave town for the Southwest and finally caught me on a morning that I didn’t have too much “stuff” to do. Giant City State Park, conveniently located just outside of town, has some short trails (perfect for a quick afternoon hike) as well as some decent bouldering. However, I think I’ve biked through it more than hiked in it. Taing, research, and a couple good friends have gotten me sporadically to some places (the Cache River, Jackson Falls, Bell Smith Springs, Fountain Bluff, Little Grand Canyon, Ferne Clyffe State Park…), but I have yet to make it to some Shawnee Forest-must-see places like Lusk Creek and Garden of the Gods. More importantly, I don’t have those old haunts that I’ve had in other places I’ve lived—the places I keep an eye on year-round and that get to feeling like old friends, ones I make sure to catch up with when I visit after I’ve moved away. Most of those places have made their way into my columns over the years. In Wooster, it was Spangler Park, the post-glacial valley, Fern Valley, the research station with the newly formed oxbow and beautiful glacial clay, and the stream at Christmas Run Park, desperately trying to fight efforts to stagnate its banks. At home, it’s the creek behind my parents’ house, lined by Ordovician brachiopods, and the ones that I cross on my runs, more muddy from runoff.

It was this missing sense of place-knowledge that I was reflecting on when my boyfriend, in town for the holidays, and I went on a hike just before New Year’s. I’ve recently moved to a place surrounded by the Crab Orchard Wildlife Refuge with trails all over, including the River-to-River, a ~160 mile trail through the Shawnee National Forest. Actually, I’ve lived here for about two months now and have yet to explore any of them, despite my roommate’s almost daily excursions to run her dogs. My boyfriend’s well-founded frustration with me about not appreciating the gem I’m surrounded by, as well as the recent, unusually heavy, snowfall, prompted us to stick close to home when we decided we needed an adventure. So, we donned our snow pants and walked down the road, I in my grandpa’s winter hat, the wool kind with the snipping bill and fold-out earflaps that prompted my dad to start calling my Fievel, and he in his trademark orange and red beanie, the one that hardly leaves his head from fall to spring. It was a beautiful, sunny day, the snow delicately and thickly balanced on tree branches and brush, falling down around us in small clumps as it was warmed by the sun. Though there were footprints on some of the trails, the only people we saw were a few hunters wearing snow camo as we were finishing.

I’m not one for New Year’s resolutions, and by the time this is published most peoples’ will probably be long-forgotten. Instead, I tend to find myself constantly reassessing where I am and what I need to do. Resolutions to read more for fun, to get my bike out more, to stop worrying about my next step, to get my resume and applications together to figure out my next step, to have a better attitude about my thesis, to take evenings for myself and constrain work to during the day, to buckle down and be more self-disciplined about getting my research done, to save up what money I can for yoga classes, to be better about keeping in touch with good friends, to be more creative, to be more timely (yes, I’m writing this 3 days after it was due…), etc. come in a constant stream, usually clustered during particularly busy times of the semester when I feel like I’m missing something amidst all the work that is seeming less and less worthwhile. My most recent resolution was to stop thinking and talking about things I need to do (i.e., all the things mentioned above). Considering that this past semester was one of the worst I’ve had in terms of general self-content, however, I need to change something. Of course, there’s a long list of things I want to do, lovingly classified my by wonderful father as the “not-my-thesis” course catalogue (woodworking, horseback riding, piano…). And I know the source of a lot of my discontent—that whole figuring out what I’m supposed to do next thing, the long-distance relationship (a common plight for students, especially those doing post-grad work), and the thesis that doesn’t seem to be getting off the ground all contribute. But most of it is my mindset, and I know that my mindset is very dependent on balance, not so much work/play as inside/outside. So, I’m making a resolution. A single one that I think will have a trickle-down effect to all the other ones that I should make but am not going to because I’m tired of talking about what I need to do. I’m going to watch the snow melt. I’m going to watch the transformation of snow-covered tricky rocks to a cascading stream, the thick mat of leaves lining the stream at the bottom of the bluff mobilize and provide food for leaffcutters, and the waters of the lakes, low from the drought, swell with melt water. I’m going to note the smell of the mud as it’s uncovered from a winter blanket, the blooms of the early spring flowers, the leaves emerge as the woods awake. I’m going to get to know this place.

And, hopefully, finish a thesis.
Dr. John C. Gries, CPG-4199
Professor of Geology at Wichita State University for over 40 years passed away last Friday following a short illness. A teacher known to thousands of general studies students and many of WSU’s finest athletes through his popular Introductory Geology 300 class on Energy, Resources, and the Environment; he will be particularly remembered by the many Geology majors he mentored and encouraged in their careers. John was born and raised in Rapid City, South Dakota where his father, Paul Gries, was a long-time, highly-regarded professor of geology at the South Dakota School of Mines. He was introduced to well site geology at the age of five and accompanied many of his dad’s field classes. Dr. Gries’s education included a BS in Engineering and a Master’s degree in Geology from the University of Wyoming and a Ph.D. from the University of Texas. His dissertation centered on mapping portions of the northern Mexico region near Ojinaga which still ranks as the definitive map of that area, perhaps in part due to the fact that drug cartels and smugglers have prevented access to any other geologists. Summers at UT provided a diversity of experience working for US Geological Survey (including a bit of mule skinning in Idaho) and surface mapping for Humble Oil. He joined the faculty at Wichita State in August 1971. At WSU he taught in a variety of fields, with specialties in Structural Geology, Ground Water Management and Geotectonics; but virtually all WSU Geology grads will best remember their five weeks at Field Camp based in Colorado which he led for most all of that 40 years. Known for his expertise with a Dutch oven and his seemingly unlimited delicious menus produced over the campfire - come snow, rain, or dark of night, he also got to know field camp students on a personal level not usually found in the University environment. He receives regular up-dates from former students throughout the world-and downtown Wichita. He served multiple terms as Department Chairman. His teaching and research have been recognized by numerous awards including George Lewis Teaching award, selection for the two-year Berg fellowship to support his fracture studies in the Silverton caldera, and the recent 2013 Teacher of the Year award from the Kansas Geological Society.

Michael A. Measures, CPG-11200
Mike Measures passed away suddenly on December 17th, 2012, at the age of 45, while vacationing in Zanzibar before visiting his parents for the Christmas Holidays.

Mike had been working in Tanzania for Africa Barrick Gold for over three years, first at the Bulyanhulu mine, then as Senior Project Geologist for exploration. Prior to that Mike worked for Barrick Gold in the Osgood Mountains area. He also worked for Mexivada in the U.S. and Mexico. Mike performed geotechnical work for Black Eagle Consulting and Stantec Engineering in the western U.S. He also worked for Homestake Mining Company for several years where he did regional exploration work throughout Nevada, and also project work at Tonkin Springs, and Ruby Hill. Mike also did a stint with Cornucopia-Mineral Ridge at the Mary-Drinkwater Mine in Silver Peak.

Mike was also a very dedicated geologist and always pushed a high level of professionalism in his work.

IN MEMORY
John C. Gries
CPG-04199
Member Since 1978
January 18, 2013
Wichita, Kansas

Charles J. Mankin
CPG-01415
Member Since 1966
November 13, 2012
Norman, Oklahoma

Michael A. Measures
CPG-11200
Member Since 2007
December 17, 2012
Newcastle, California

A.C. Spreng
CPG-00154
Emeritus
Member Since 1964
October 19, 2012
Rolla, Missouri


Martin Van Couvering, CPG No.1, receives Past-President award. Left to right: Harrison Schmitt, Martin, President Honkala, Jerry Newby, Mrs. James Boyd, Frank Conselman. Photo from the tenth anniversary banquet held at the Bourbon Orleans Ramada, in New Orleans, Louisiana.
Basic Map Mishmash

Michael J. Urban, MEM-1910

It is perhaps infrequently that we, as geology instructors, introduce much mathematics in our introductory courses. This is more often left for our advanced classes. We do, however, recognize that many of our students need a little practice applying the number skills they should have learned in high school. In fact, too many of our students seem to suffer from unfortunate lapses in memory when it comes to using the requisite mathematics skills they ought to possess. General numerical literacy, or numeracy, is a proficiency everyone should acquire as it is applicable and relevant in most professions (and certainly in the sciences) as well as everyday life. Consequently, instructors of liberal education courses at many 2- and 4-year colleges and universities are encouraged to include some basic mathematics applications within their coursework.

Recently, I decided to introduce a “mathematics refresher” into an introductory planetary sciences course I teach. I distributed a set of 5 problems to the students. As a part of this set of basic mathematical activities, I incorporated and focused on two primary items: 1) the nautical mile (where it comes from), and 2) the convergence of lines of longitude from the equator to a single point at the poles. Both of these topics relate very easily to discussions of latitude and longitude, understanding maps on a spherical Earth, and the true shape of the Earth. See below for two starter problems:

1. Verify that there are 6076 feet in one nautical mile. [Average circumference of Earth = 24,859.81 statute miles.]

2. On the Earth, lines of longitude that are separate at the equator (i.e., 0° and 15°) converge to the same point at the poles. Using trigonometry we can determine the distance between lines of longitude at specific latitudes. [Circumference of Earth at the equator is about 24,901.55 statute miles.]

   a. At the equator, the distance between 0° W longitude and 15° W longitude would be how many miles?

   b. At 65° N latitude, the distance between 0° W longitude and 15° W longitude would be how many miles?

   The careful reader will note a difference between Earth’s equatorial circumference and its polar circumference. This fact is accounted for by Earth’s axial rotation and the so-called centrifugal force outward perpendicular to the axis of rotation, which results in a flattening of the Earth (pole to pole) from a true sphere to an oblate spheroid (Figure 1). The first problem considers the nautical mile, defined to be 1 minute of latitude, and used by mariners for ease of charting and navigating. It is easier than using statute miles at sea because 1 degree of latitude equals 60 nautical miles, since there are 60 minutes of arc in 1 degree. After allowing students a little time to think about the problem and try to work through it on their own, I went through it with them. [Solution: 24,859.82 miles divided 360 degrees equals 60.05 miles/degree. There are 60 minutes in a degree2, so 69.05 divided by 60 equals 1.1509 statute miles in one minute of latitude. So, 1.1509 x 5280 equals 6076.75.]

   For the second problem, I reminded students of some general trigonometry, and specifically, the memory device “sohcahtoa” (whereby, when referring to right triangles, we can easily recall that sine is equal to opposite over [divided by] hypotenuse; cosine equals adjacent over [divided by] hypotenuse; and, tangent equals opposite over [divided by] adjacent). Again, I provided a little time to think about the problem, and then went through the explanation. This description could be as involved as the instructor wants (Figure 2).

   Essentially we need to know, at constant latitude, the ratio of the radius of a circle at 65° N latitude compared to

---

1. For simplicity, this value is the average of the polar circumference and the equatorial circumference and is used here to show specifically how one could arrive at the accepted value for the International Nautical Mile. In actuality, polar circumference as determined for Earth’s polar diameter by satellite is 24,818.06 statute miles, resulting in 1 minute of latitude equaling about 6066 feet; equatorial circumference is 24,901.55 and corresponds to 1 minute of longitude being about 6087 feet. The average between the two values results in about 6076 feet.

2. An aside I share with students related to this is how we arrive at our typical 7.5 minute maps. One degree is 60 minutes; half of that is 30 minutes; half of that is 15 minutes; and, half of that is 7.5 minutes. So, our 7.5 minute quadrangles are 1/8 of a square degree.
the radius of a circle at the equator (0° latitude). For example, from the "cah" in "sohcahtoa" we know that the cosine of an angle is equal to the adjacent side divided by the hypotenuse (radius of Earth, in this case). By referring to Figure 2 and rearranging the formula we find:

$$\cos (\theta) = \frac{adj}{hyp}$$

adjacent = \cos (\theta) \times (R_E)

A) a = \cos (65°) \times (R_E)

B) b = (R_E)

thus a = \cos (65°) \times b

and, this process will work for the radius of any circle at constant latitude. It will also work for any angular separation or distance along the equator relative to a corresponding distance at some latitude3. Therefore, we can write a more generalized version of the equation:

Length of 1° of longitude = cosine (latitude) x length of 1 degree at the equator

[The solutions to the two parts of problem 2 are as follows: a) At the equator, the distance between 0° and 15° longitude is equal to 15 degrees. We can use the approximation of 1° of longitude, at the equator, is equal to 60 nautical miles and therefore, 15 degrees times 60 nautical miles equals 900 nautical miles. b) At 65° latitude, we would multiply 900 nautical miles by the cosine of 65°, which equals 380.4 nautical miles.]

Illustrating and using applied mathematics in introductory geoscience courses is useful for helping students recall concepts they may have already learned (in many cases). Quantitative analysis is essential to science for a variety of reasons, and our students should be encouraged to use math once in a while to retain, or polish, their existing skills. Whether or not the specific problems shared in this article are appropriate for every introductory course may be debatable, however, problem-solving is always useful and should be encouraged whenever reasonable.

**Featured Resource:**


For those who are unaware of this resource, it provides free access to digital GeoPDFs of topographic maps. Locate “Find my Map!” near the bottom of the screen and select “Historical Topographic Map Collection search.” You can conduct searches by entering the names of specific quadrangles you wish to locate, or conduct general searches by state or scale. This is an indispensable resource for geologists and geoscience instructors.

**References for more information:**


3. The length of 1° of longitude is \(\frac{1}{360}\)th of the circumference, and for the Earth at the equator, this is computed by \((2\pi R_E)/(360°)\). The length of 1° at a given latitude is \(2\pi a/(360°)\), where \(a = \cos (\theta_{Lat})(R_E)\), and so \((2\pi \cos (\theta_{Lat}) R_E)/(360°)\). The 2\(\pi\) and 360° cancel and the generalized equation remains.

---

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Space can be increased vertically by doubling or tripling the size and also the rate.

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---

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**ATTESTATION:** I attest that I meet the requirements for AIPG Student Adjunct (currently enrolled in a geological science degree program) and agree to abide by AIPG Bylaws and Code of Ethics.

<table>
<thead>
<tr>
<th>Applicant Signature:</th>
<th>Date:</th>
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Rcvd:  
Mbr #:
Applicants for certification must meet AIPG's standards as set forth in its Bylaws on education, experience, competence, and personal integrity. If any Member or board has any factual information as to any applicant's qualifications in regard to these standards, whether that information might be positive or negative, please mail that information to Headquarters within thirty (30) days. This information will be circulated only so far as necessary to process and make decisions on the applications. Negative information regarding an applicant's qualifications must be specific and supportable; persons who provide information that leads to an applicant's rejection may be called as a witness in any resulting appeal action.

**Applicants for Certified Professional Geologists**

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<th>State</th>
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<td>AK</td>
<td>Jesse Grady</td>
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<td>AK</td>
<td>James Jacobsen</td>
<td>MEM-2297</td>
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<td>Daniel Sellers</td>
<td>MEM-0028</td>
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<td>John Cox</td>
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<td>James Edwards</td>
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<td>Julie Carpenter</td>
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<td>Anka Basu</td>
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<td>WV</td>
<td>Kevin Andrews</td>
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<td>WV</td>
<td>Tammy Bellman</td>
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**Applicants Upgrading to CPG**

| AK    | Keri Nutter       | MEM-1847          |
| AZ    | David Hawkins     | MEM-2297          |
| CO    | Alexander Garhart | MEM-1985          |
| CO    | Vincent Matthews  | MEM-0013          |
| ID    | Kelly Lippoth     | MEM-2319          |
| MA    | Christopher Mabbert | MEM-0028   |
| MN    | Jenny Holmes      | MEM-2085          |
| OH    | Michael Akins     | MEM-1258          |

**New Professional Members**

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<td>MEM-2327</td>
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<td>William Gray</td>
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**New Associate Members**

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<tr>
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**New Young Professional Members**

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<td>Jennifer McNeil</td>
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**New Student Adjuncts**

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**AIPG Membership Totals**

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**Canada** Derek Kinakin CPG-11558

**China**  Hin Yuen Tsang CPG-11561

**New Certified Professional Geologists**

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**New Student Adjuncts**

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NEW APPLICANTS AND MEMBERS (12/18/2012-02/05/2013)

IN  Samantha McBride  SA-4289
KY  Michael Priddy  SA-4138
KY  Chelsea Bulen  SA-4173
KY  Kevin Malone  SA-4304
MA  Katherine Lowe  SA-4102
MA  Sarah Brisson  SA-4112
MA  Khara Gomez  SA-4113
MA  Drew Fuchs  SA-4179
MA  Alison Denn  SA-4191
MA  Richard Le Mon  SA-4245
ME  Morgan Monz  SA-4118
MI  Meredith Beukelman  SA-4126
MI  Laura Donker  SA-4150
MI  K. Braunschneider  SA-4214
MI  Zackery Remtema  SA-4215
MI  Jordan Koster  SA-4272
MI  Nathaniel Shuff  SA-4273
MI  Karl Campbell  SA-4288
MI  Chris Goeddeke  SA-4290
MI  Kynt Olejniczak  SA-4311
MN  Bennett Steen  SA-3998
MN  Patrick Johnson  SA-4210
MN  Andrew Essington  SA-4251
MN  Patrick Quillin  SA-4266
MN  Elizabeth Roepeke  SA-3987
MO  Fang Ren  SA-4159
MO  Jennifer Kissel  SA-4171
MO  Rachel Schulta  SA-4174
MO  Emily Bunse  SA-4174
MO  Vanna Carr  SA-4258
MO  Howard Loftis  SA-4286
MO  Daniel Johnson  SA-3992
MS  Cay Lindley  SA-4146
MS  Calista Guthrie  SA-4160
MS  Valerie Cruz  SA-4189
MS  Dakota Kolb  SA-4241
MS  Amanda Couch  SA-4260
NC  Phillip Goodling  SA-4106
NC  Abigail Bullard  SA-4129
NC  Katlin Howard  SA-4154
NC  Jason Snyder  SA-4183
NC  Jonathan Simms  SA-4184
NC  Brandon Jones  SA-4193
NC  China Tickle  SA-4206
NC  Kristopher Ashton  SA-4256
NC  Holly Hawks  SA-4274
NC  Charles Harris  SA-4278
NC  Alesia Griesmyr  SA-4293
ND  Emily Delaney  SA-4237
NE  Bailey Lathrop  SA-4225
NE  Jason Yull  SA-4295
NJ  Nina Astillero  SA-4140
NJ  Peter Lordan  SA-4147
NJ  Beverley Chiu  SA-4248
NM  Ryan Vise  SA-4228
NM  Jaime Campo  SA-4315
NY  Anthony Pivarunas  SA-4131
NY  Steven Janet  SA-4148
NY  Sara Kozmerr  SA-4161
NY  Anna Jaworski  SA-4168
NY  Mohammed Rahmen  SA-4177
NY  Sophie Kolankowski  SA-4180
NY  Ahmed Nayel  SA-4181
NY  Karan Dada  SA-4199
NY  Chelsea Lyle  SA-4208
NY  Ezaul Haque  SA-4263
NY  Caitlin King  SA-3993
OH  Genevieve Cavalia  SA-4109
OH  April Menedez  SA-4119
OH  Joshua Fowler  SA-4210
OH  Michael Norton  SA-4211
OH  Ann Parkin  SA-4125
OH  Angelina Catena  SA-4149
VA  Catherine Patterson  SA-4182
VA  Adam Szyikowski  SA-4213
VA  James Freeman  SA-4240
VA  Africa Norris  SA-4253
VA  Miles Costello  SA-4268
VA  Lisa Whalen  SA-4275
VT  Annika Silverman  SA-4236
WA  Danika Globoksr  SA-4197
WA  Emily Jenkins  SA-4298
WI  Amber Brett  SA-4127
WI  Scott Wipperthur  SA-4247
WI  Miles Harbury  SA-4267
WI  Tony Seefeldt  SA-4301
WI  Nicole Fitzgerald  SA-4314
WI  Kyle VanderVest  SA-3988
WI  April Marrara  SA-4194
WI  John Tudek  SA-4203
WI  John Zupanic  SA-4220
WI  Emily Sundell  SA-4249
Gr Britain  Joseph Thorpe  SA-4166
Tunisia  Mohamed Lamouchi  SA-4136

AIPG History

1966
Second President
Ben H. Parker

Our second president, Ben H. Parker, CPG 5, was a highly respected geologist in Colorado and beyond.

The qualities that made him so outstanding were sagacity, generosity, strength of character, and self-control. There was plenty of turbulence, but Ben kept his composure.

He spearheaded the move to register the title “Certified Professional Geologist.” When our house publication, “The Professional Geologist” came into being, Ben Parker designed its attractive format.

The first AIPG award was devised in 1969, in honor of Ben H. Parker. Fittingly, it was awarded to our first President Martin Van Couvering. Shortly after the death of Ben Parker in late July, President Russell, at the suggestion of Executive Director Art Brunton, proposed to the Executive Committee the establishment of a medal to be awarded by AIPG in Ben’s honor, for outstanding service to the Institute and the profession.

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Charles J. Mankin, CPG-1415, 1932–2012

The American Institute of Professional Geologists (AIPG), the geologic community, and the State of Oklahoma lost a gentleman, a true friend, and an advocate with the death of Dr. Charles J. “Charlie” Mankin on November 13, 2012. He died peacefully at his home in Norman after 80 years of a fulfilling life. He is survived by his wife, Betty Bellis Mankin; his three daughters, Sally Geyer, Helen Volak, and Laura Veal; Betty’s children, Doug Bellis and Karen Powers (both are geologists); and six grandchildren.

Charlie was born in Dallas, Texas, on January 15, 1932. His parents, Green and Myla Mankin, moved to Stony, Texas, about 40 miles north of Fort Worth, where he attended grades 1–3 in a two-room school house. His parents then purchased and moved to the family ranch near Ozona, in West Texas, where he learned the lessons and benefits of hard work. He often spoke fondly of digging post holes in rocky ground and stringing 22 miles of three-strand barbed wire along with the ranch hands. Maybe his living in “Stony,” and his early digging into rocks near Ozona, helped guide him into the field of geology?

He attended the University of New Mexico (UNM), earning a starting position on the basketball team as a “walk-on.” But an injury caused him to drop basketball, leave UNM, and enroll at the University of Texas (UT) in Austin. Charlie had some excellent mentors: at UNM, Sherman Wengard sparked his interest and got him “turned on” to the study of geology, and at UT-Austin he studied under Robert Folk, Ronald DeFord, and Bill Muehlerberger, among others. He received his B.S., M.A., and Ph.D. in Geology at UT-Austin, in 1954, 1955, and 1958, respectively, and then did a Post-Doctoral Fellowship at California Institute of Technology in 1958–59. While at Caltech he was privileged to attend lectures and luncheons at the famed Athenaeum Round Table with the likes of Linus Pauling (Nobel Prize in Chemistry, 1954, and Nobel Peace Prize, 1962) and other outstanding people.

In spite of all this growing up and education in Texas, Charlie ventured north of Red River and ended up at The University of Oklahoma (OU) in Norman. He arrived as an Assistant Professor in 1959, and quickly rose through the ranks: he became Associate Professor and Director of the School of Geology and Geophysics in 1963 (Director until 1977); became full Professor in 1964; and was appointed Director of the Oklahoma Geological Survey (OGS) at OU in 1967, a position he held until he retired from OU in 2007. He had an excellent academic and administrative career, even if that was all that he had accomplished. As a Professor at OU, he directed the research of about 40 M.S. and Ph.D. students, all of whom went on to productive careers in geology or related fields. Charlie’s continuing dedication to the future of geology was his long service to Sigma Gamma Epsilon (SGE), the national student honorary earth-sciences society.

AIPG and professionalism were especially important to Charlie, as shown by his activities on behalf of AIPG and in his attempts to establish registration of geologists in Oklahoma. Of course, he was professional in all his actions, and he was very active in AIPG. He served as Vice President and President of AIPG in 1984 and 1987, respectively, and received a number of the Institute’s top awards: the Martin van Couvering Memorial Award, 1988; Honorary Life Member, 1995; and the Ben H. Parker Memorial Medal, 1999. In receiving both the van Couvering Award and the Parker Medal, Charlie was the first and only recipient of the highest awards granted by AIPG. In addition, Charlie was one of the founders of the AIPG Foundation, and served as a Trustee of the Foundation for nearly 25 years. In 1979, he served on the AIPG Employment Survey Committee and chaired the Search and Screen Committee for Executive Director of AIPG, and in 1982–83 he chaired the AIPG Public Relations Committee. Charlie was a major factor in the history of AIPG.

Charlie was a member of 20 societies, associations, and institutes, at the local and national level, and served terms as president of American Institute of Professional Geologists (AIPG), American Geological Institute (AGI), Association of American State Geologists (AASG), Midcontinent Section of the Society of Economic Paleontologists and Mineralogists (SEPM), and the Oklahoma Academy of Science (OAS). The National Academy of Sciences (NAS) called upon Charlie’s expertise many times. One of Charlie’s signature AASG achievements, which benefited all state geological surveys, the U. S. Geological Survey (USGS), and the Nation as a whole, was his championing the passage of the National Geologic Mapping Act by the U. S. Congress. Most recently, in 2012 the AASG established the Dr. Charles J. Mankin Annual Award for the best State Geologic Map proposal submitted for the National Cooperative Geologic Mapping Act Grant. “Service to the public” was Charlie’s creed. When he said “We’re from the government, and we’re here to help you,” he really meant it.

Kenneth S. Johnson, CPG 2266
Norman, Oklahoma

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Carbon Sequestration Potential In Simulated Saline Lake Waters

Scott N. Yurman, SA-3000 and Daniel M. Deocampo

Abstract
Recent studies have examined different applications of established geologic formations as potential reservoirs for sequestering anthropogenic CO2. This investigation tested simulated saline lake waters as mineralization sites for sequestering anthropogenic CO2. Four saline lakes were simulated in the laboratory – Lake 1 (Na-Mg-Cl-SO4 type), Lake 2 (Mg-Na-Ca-Cl type), Lake 3 (Mg-Na-K-Cl type) and Lake 4 (Ca-Mg-Cl type). Two sets of experiments were conducted by diffusing CO2 through each simulated lake over 30 days. The first set tested the carbonate system response to elevated CO2. The second set of experiments replicated the same process but used ammonium hydroxide to elevate pH. Water samples were collected daily to test for cation loss via mineralization. Rapid mineralization occurred with the pH enhancer and cation activity was greatly reduced by as much as 38,000 mg/L Ca due to precipitation. This resulted in a mass of 100,000 mg/L of CO2 being mineralized via Ca and Mg-carbonate precipitation. Under proper geochemical conditions, saline lake environments may therefore potentially serve a purpose in sequestering CO2.

Analyses are now underway using X-ray diffraction and scanning electron microscopy to characterize the newly precipitated carbonate minerals.

Introduction
Environmental concerns involving rising levels of atmospheric CO2 have begun to grow at an alarming rate in recent years. Due to this dilemma, finding ways to permanently store CO2 has become an important issue. Established geologic formations have been thought of as a potential solution in sequestering CO2, also known as carbon sequestration. Geologic formations such as depleted oil and gas reservoirs, deep-sea basalts, and deeply-buried shale and sandstones have all been considered as possible alternatives (Kaldi et al., 2010). This study will introduce a different type of geologic setting as a possible scenario. The purpose of this study is to determine if saline lake environments can sequester CO2 by carbonate mineralization. Through previous research, saline lake environments have not been studied thus far as being a possible geologic setting for carbon sequestration.

Methods
Four saline lakes were simulated in the laboratory – Lake 1 (Na-Mg-Cl-SO4 type), Lake 2 (Mg-Na-Ca-Cl type), Lake 3 (Mg-Na-K-Cl type) and Lake 4 (Ca-Mg-Cl type). A related example for each lake type is listed below:
Lake 1 – Na-Mg-Cl-SO4 (Great Salt Lake, Utah, USA)
Lake 2 – Mg-Na-Ca-Cl (Dead Sea, Israel)
Lake 3 – Mg-Na-K-Cl (Dabusun Lake, Qaidam Basin, China)
Lake 4 – Ca-Mg-Cl (Donglin Lake, Qaidam Basin, China)
The chemical composition of each simulated lake was obtained through previously published literature to match that of the related examples above. The chemistries from Lake 1 and Lake 2 were acquired from Jones and Deocampo (2003). The chemical composition of Lake 3 and Lake 4 were obtained through Spencer et al. (1990). The hydrochemistry for each lake is expressed as individual ion concentrations. The major ions included Na, K, Ca, Mg, SO4, Cl and HCO3+CO3, and are listed below in Table 1.

<table>
<thead>
<tr>
<th>Lake Type</th>
<th>Na</th>
<th>K</th>
<th>Ca</th>
<th>Mg</th>
<th>SO4</th>
<th>Cl</th>
<th>HCO3+CO3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake 1</td>
<td>85,700</td>
<td>4,550</td>
<td>319</td>
<td>8,050</td>
<td>17,400</td>
<td>147,000</td>
<td>327</td>
</tr>
<tr>
<td>Lake 2</td>
<td>39,330</td>
<td>6,500</td>
<td>17,750</td>
<td>40,450</td>
<td>760</td>
<td>212,600</td>
<td>290</td>
</tr>
<tr>
<td>Lake 3</td>
<td>20,300</td>
<td>18,063</td>
<td>882</td>
<td>79,161</td>
<td>5,764</td>
<td>264,869</td>
<td>2,502</td>
</tr>
<tr>
<td>Lake 4</td>
<td>1,890</td>
<td>23</td>
<td>60,518</td>
<td>110,101</td>
<td>19</td>
<td>426,145</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 1. Hydrochemistry of Model Lakes. All Results in mg/L.

The four simulated saline lakes were created by mixing deionized water and a combination of different salts. Each experimental lake was created to equal approximately 1000 mL of solution in a 2000 mL glass beaker. The lakes were then placed on a stir plate for 24 hours to ensure that all solids were dissolved. Two sets of experiments were conducted by diffusing gaseous CO2 through each simulated lake. An atomic 55 mm CO2 diffuser was secured to the bottom of each beaker with small rubber suction cups. Plastic tubing was used to attach the diffuser to a 50 lb steel CO2 tank. A pressure of 30 psi was used on each experimental lake throughout both the first and second experiments.

The first set of experiments tested the carbonate system response to elevated CO2 for approximately 30 days. After the 30 day period, the CO2 was stopped and each model lake solution was allowed to equilibrate for approximately two weeks. This was done to see if pH levels would rise high enough for carbonate mineralization to occur. The second set of experiments replicated the same process but used ammonium hydroxide (4% ammonium hydroxide, 96% water) to elevate pH levels to an optimum range of 8.5 to 9.5. Water samples were collected daily to test for cation loss via mineralization.
Beginning pH levels for each simulated lake ranged from approximately 6.5 to 8.5.

Lake samples were collected through a disposable polyethylene pipette and then transferred to a 5 mL plastic vial. Flame atomic absorption spectroscopy was used to analyze all samples collected for cation loss. Calcium and magnesium were the two cations that were to be analyzed. Parameters of pH, temp °C, date and time were recorded with each sample. Analyses are currently underway using X-ray diffraction (XRD) to characterize the newly precipitated carbonate minerals from each simulated lake. So far, XRD analysis has only been completed on newly formed minerals in the Lake 3 model lake.

**Discussion**

With the addition of CO₂, each experimental lake reached its maximum acidic level within 24 hours, displaying a pH of approximately 4.0. This indicated that each simulated lake was fully saturated with dissolved CO₂ at this point, leading to the formation of carbonic acid (H₂CO₃). The equation for this reaction is as follows:

\[
\text{CO}_2 + \text{H}_2\text{O} = \text{H}_2\text{CO}_3
\]

As long as the CO₂ was being diffused into each experimental lake, the pH remained acidic as the solution was fully saturated with dissolved CO₂ or H₂CO₃. This concept follows Henry’s Law for a dissolved gas concentration being proportional to its pressure (Drever, 1997). Once the CO₂ was stopped, pH levels began to increase naturally as the diffusion of CO₂ decreased.

As the carbonate system progresses, the importance of the transition to bicarbonate (HCO₃⁻) and carbonate (CO₃²⁻) will depend on the pH of the solution (Andrews et al., 2004). At a pH of 6.4, carbonic acid (H₂CO₃) will dissociate to form bicarbonate (HCO₃⁻). At a pH of 10.3, bicarbonate (HCO₃⁻) will dissociate to form carbonate (CO₃²⁻). These pH levels are known values within the carbonate system and are referred to as the first and second dissociation constants (K₁ and K₂). This can be seen within the diagram known as the Bjerrum plot displayed below (Drever, 1997). This plot displays the activities of the different species in the carbonate system as a function of pH.

For carbonate mineralization to occur, pH levels will have to rise high enough for carbonate ions to be present within the simulated lakes’ solution. Once this happens, cations such as Ca and Mg will begin to bond with the CO₃²⁻ anions to form Ca and Mg-carbonates. This progression within the carbonate system, as well as the control and importance of pH was seen in each of the experiments.

**Results**

All four simulated lake types displayed similar results during the second set of experiments displaying a reduction in cations activity. The detailed analytical results from Lake 3 will be used as the example within this section. Results of cation loss from Lake 3 with the addition of the pH enhancer are listed below. Calcium and magnesium were the cations of interest, and were analyzed using flame absorption spectroscopy. As shown in the graphs below, a reduction in Ca and Mg was seen within seconds of the addition of the ammonium hydroxide solution. Lake samples were collected more frequently at this point to observe the cation reduction and ion interaction within the reaction. The graphical results are displayed in Figures 1 and 2.

The simulated lakes were allowed to equilibrate for another seven days to observe any additional ion interaction. The calcium and magnesium concentrations began to increase after the 7th day which resulted from a decrease in pH within the lake solution. This decrease in pH levels caused the newly formed carbonate minerals to dissociate, therefore elevating cation concentrations. After approximately 24 hours of the addition of ammonium hydroxide, pH levels in each of the
simulated lakes began to slowly decrease and continued as time went on.

Total cation loss from each simulated lake with the addition of the pH enhancer is summarized in Table 3.

<table>
<thead>
<tr>
<th>Lake Type</th>
<th>Ca loss (ppm)</th>
<th>Mg loss (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake 1</td>
<td>380</td>
<td>2,300</td>
</tr>
<tr>
<td>Lake 2</td>
<td>7,800</td>
<td>5,000</td>
</tr>
<tr>
<td>Lake 3</td>
<td>1,200</td>
<td>11,000</td>
</tr>
<tr>
<td>Lake 4</td>
<td>38,000</td>
<td>32,000</td>
</tr>
</tbody>
</table>

Table 3. Cation loss in each model lake.

XRD analysis has been conducted on the Lake 3 solids to characterize the newly precipitated minerals. XRD analysis is currently underway to help characterize the newly precipitated minerals from Lakes 1, 2 and 4. The diffractogram for precipitated minerals in Lake 3 is shown in Figure 4.

C = Calcite (CaCO₃)
N = Nahcolite (NaHCO₃)
H = Halite (NaCl)

XRD analysis of the newly precipitated minerals from Lake 3 indicates the precipitation of two carbonate minerals, calcite and nahcolite. Halite was present in Lake 3 solids as well and was also the dominant mineral in each of the experimental lakes.

Conclusion

The result of just diffusing CO₂ throughout each of the simulated lakes did not show any evidence of ion interaction. Once the CO₂ was stopped, pH levels did slightly rise but not high enough for carbonate mineralization to occur. The second set of experiments replicated the same process but used ammonium hydroxide to elevate pH. Within seconds, mineralization occurred and cation activity was greatly reduced by as much as 38,000 mg/L Ca due to precipitation. This resulted in a mass of 100,000 mg/L of CO₂ being mineralized via Ca and Mg-carbonate precipitation. Carbonate mineralization continued to occur for approximately 5 to 7 hours in each of the simulated lakes until a cease in ion interaction was observed. Under proper geochemical conditions, saline lake environments may therefore potentially serve a purpose in sequestering CO₂.

References


Scott Yurman received a BS in Geology from the University of West Georgia in 2005. He then worked as an environmental geologist before pursuing an MS in Geology from Georgia State University. After graduating in 2012, he began an exciting career at BHP Billiton in Houston, TX as a graduate geologist.

Daniel Deocampo is Associate Professor of Geosciences at Georgia State University and Director of the Environmental Research Laboratory. He is a sedimentary mineralogist and geochemist, and his work has been supported by the National Science Foundation, the Petroleum Research Fund, the U.S. Geological Survey, the National Institutes of Health, and others. He is a licensed Professional Geologist in the States of California and Georgia.
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U.S. Female Geoscience Enrollment and Degree Rate is Mixed in 2011-2012,
Bachelor and Master’s at Decadal Lows, Doctorates Hit New Highs

In 2011-2012, the percentage of U.S. geoscience students and graduates who were women dropped sharply at both the Bachelor’s and Master’s level, but grew slightly at the Doctorate level. At the undergraduate level, female participation rates are at their lowest since the late 1990’s, while Master’s participation rates fell sharply to below 40% for the first time since 2001. Doctorate levels continued their steady climb, rising to 45% in 2012.

These numbers stand in contrast to the 57% of all U.S. undergraduates and 58% of all U.S. graduate students that are female.

The specific causes of the declines are unknown, but it does appear that a cohort of high-female participation is moving through the system, with Bachelor’s peaking at 49% in 2004, Master’s at 47% in 2006, and likely the Doctoral level nearing a possible peak of 45% in 2012. The next two years should indicate if this mid-2000’s surge was simply a unique cohort and if this is a new systemic problem for the geosciences.

A couple potential issues can be speculated for the change in female participation. First, the steady rise of participation may have been a result of systematic programs that encourage women to enter STEM fields terminating in the mid-2000’s. We are unaware of specific programs that fit this behavior, but AGI is investigating the possibility. In addition, the sharp drop in female

Master’s participation in 2011-2012 is commensurate with the 44% increase in new Master’s awarded during the year, and based on the regional distribution, is likely related to the strong growth in the energy industry in the United States. It is clearly possible that these career paths are more attractive to men than to women as an incentive to enter a geoscience graduate program for a Master’s degree.

- Christopher Keane and Carolyn Wilson

www.agiweb.org/workforce/
Evaluating Anomalous Surface Water Lead Results Associated With the TVA Kingston Ash Recovery Project

Joseph P. Kraycik, MEM-0113, Stephen D. Brower, Rock J. Vitale, and William J. Rogers

Keywords: Coal ash, quality assurance, release, environmental monitoring

Abstract

A 2008 coal fly ash spill at Tennessee Valley Authority’s (TVA’s) Kingston Fossil Plant (KIF) allowed a large amount of fly ash to escape into the Emory River. In response to the containment area discharge event, TVA immediately initiated comprehensive measures to assess, contain, and remediate the fly ash spill.

As part of quality assurance (QA) oversight for the TVA KIF Ash Recovery Project, the project QA Team was requested to perform an investigation to identify the cause of elevated total and dissolved (field-filtered) lead concentrations associated with surface water monitoring samples collected between early February and April 2009. Samples were collected at various depths using a peristaltic pump. The laboratory-reported lead results were sufficiently unusual (e.g., dissolved lead results an order of magnitude greater than the associated total results, including samples collected at upstream/background monitoring locations) to prompt a QA investigation to forensically identify the cause and institute corrective action.

In fairly short order, laboratory contamination was ruled out as the source of the suspicious total and dissolved lead results. A review of field sampling practices identified three potential sources of contamination - the fabricated tubing weights, the pump tubing, and the 0.45-µm filters used in the field for dissolved metals analysis. In order to evaluate each of the potential sources of lead, a study design was executed whereby a series of equipment blanks were collected for laboratory analysis. Based on the analytical results associated with the equipment blanks, it was determined that the fabricated tubing weights were the source of the anomalous lead results. As a result of the equipment blank study, the fabricated sampling weights were removed from use and replaced with dense polymer weights.

Introduction

On December 22, 2008, a coal fly ash release occurred at the Tennessee Valley Authority’s (TVA’s) Kingston Fossil Plant (KIF), allowing a large amount of fly ash to escape into the adjacent waters of the Emory River. The plant is located in Roane County, Tennessee, near the town of Kingston. Ash produced by the combustion of coal for power generation is stored in containment areas on-site including a former dredge cell. KIF generates 10 billion kilowatts of electricity per year - enough to supply electricity to approximately 670,000 homes. There are nine coal-fired generating units in operation at KIF and the plant consumes an average of 14,000 tons (12,698 metric tons) of coal per day (Figure 1).

A dike associated with the former dredge cell failed, resulting in a release of approximately 5.4 million cubic yards (4.1 million cubic meters) of coal ash that covered about 300 acres (121 hectares) and affected about 40 area homes.
EVALUATING ANOMALOUS SURFACE WATER LEAD RESULTS

(TVA, 2010). Coal ash filled Swan Pond Embayment to the north of the KIF property adjacent to the former dredge cell. In addition, a section of the Emory River channel was blocked by released ash (Figures 2 and 3).

On January 12, 2009, the Tennessee Department of Environment and Conservation (TDEC) issued a Commissioner’s Order requiring action be taken as necessary to respond to the emergency under Tennessee Code Annotated §69-3-109(b)(1), the Water Quality Control Act (TDEC, 2009). The TDEC Order required a plan for the comprehensive assessment of soil, surface water, and groundwater; remediation of impacted media; and restoration of all natural resources damaged as a result of the coal ash release. On May 11, 2009, an Administrative Order and Agreement on Consent was signed between US EPA and TVA providing the regulatory framework for the restoration efforts (US EPA, 2009). US EPA’s Administrative Order directed the restoration work to be conducted under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).

In response to the containment area discharge event, TVA initiated comprehensive measures to assess, contain, and remediate the fly ash spill. Initial environmental monitoring included an immediate assessment of the surface water quality and an assessment of the extent of ash deposits that entered the adjacent river system. Over time, the monitoring scope was expanded to include air monitoring, ash and sediment sampling, waste disposal characterization, and aquatic and terrestrial biota monitoring.

A quality assurance (QA) program was developed to ensure the generation of high-quality, defensible data for use in decision-making and regulatory compliance. The data generated from the project sampling and monitoring activities are being used for operational decision-making, risk assessment and human health evaluations, delineation of the extent of contamination, and demonstration of achievement of cleanup objectives.

The project QA Team was requested to perform an investigation to identify the cause of elevated total (unfiltered water sample collected into a pre-acidified container) and dissolved (water sample filtered through a 0.45 micron filter into a pre-acidified container) lead results associated with surface water monitoring samples collected between early February 2009 and April 2009. Samples were collected at various depths using a peristaltic pump. The observed lead results were sufficiently unusual (e.g., dissolved lead results an order of magnitude greater than the associated total results, including in samples collected at a background monitoring location 12 miles upstream from KIF) to prompt a QA investigation to forensically identify the cause and institute corrective action. A summary of the QA investigation and conclusions are presented below.

Background

In late January 2009, members of the QA Team observed routine surface water sampling activities performed by TVA personnel. Sampling locations were established at multiple locations in the three surface water bodies comprising the adjacent river system - Emory River; Clinch River; and Tennessee River (Figure 4). Samples are identified by the river mile location; for example, a sample collected at Emory River Mile 12.2 is identified as ERM12.2. Surface water sampling was conducted using a peristaltic pump; at each sampling location, a weight was used to hold the sample collection tubing at the appropriate depths in the water column during sample collection. At the time of the observation, the weights in use were metallic and neither the weight nor tubing was dedicated to each specific sampling location. As such, the QA Team recommended that the sampling team replace the metal weights with dedicated weights constructed from an inert material to prevent potential sample contamination. In addition, the QA Team recommended that dedicated tubing be used at each sampling location.

In response to the QA Team’s recommendation, TVA personnel fabricated weights consisting of hollow PVC tubes sealed at each end using PVC solvent. To achieve the desired weight, each tube contained metal shot encased in an
inner sealed compartment (Figure 5). According to the fabricator, the metal shot was purchased commercially and was comprised of bismuth alloy (bismuth is not a target analyte for the TVA KIF Ash Recovery Project). The metal shot was believed to be completely sealed inside the weights. These fabricated weights, which were attached to the dedicated tubing with polyethylene zip-ties, were put into use on February 2, 2009.

**Issue**

Total lead and/or dissolved lead were detected at a frequency of approximately 8% of surface water samples collected between the ash spill incident on December 22, 2008, and early February 2009. With few exceptions, laboratory-reported results were less than 50 μg/L. Shortly following the implementation of the fabricated weights on February 2, 2009, the incidence of total and dissolved lead detected above the laboratory reporting limit increased dramatically. Total and/or dissolved lead were observed at a frequency of approximately 30% in surface water samples collected after February 2, 2009; in several instances, the observed lead results were sufficiently high to appear as outliers to the data set (e.g., greater than 500 μg/L). In addition, several dissolved lead results were observed to be significantly greater than the associated total lead results. The frequency of these detections became apparent during reasonability evaluation and data verification performed as part of QA oversight and prompted QA personnel to initiate an investigation and to initiate corrective action.

**Investigation and Results**

The first phase of the investigation focused on potential laboratory contamination as the source of the highly anomalous lead results. During an audit of the analytical laboratory that performed the analysis, several samples that yielded the highest total and dissolved lead results were examined. It was noted that the sample bottleware originated at different laboratories. In addition, the analytical laboratory was requested to (informally) reanalyze the subject samples during the audit and it was noted that dissolved samples analyzed directly from the sample bottle (without digestion) confirmed the reported results for dissolved lead in the 600 - 700 μg/L range. These observations eliminated the laboratory as the potential cause of the anomalous lead results.

Once laboratory contamination was ruled out as the source of the suspicious total and dissolved lead results, QA review of field sampling practices identified three potential sources of contamination: the fabricated weights, the pump intake tubing, and the 0.45-μm filters used to field-filter samples for dissolved metals analysis. On April 9, 2009, the QA Team collected a series of equipment blanks as described below to evaluate each of the potential lead sources.

- Equipment blanks were collected from the dedicated sampling weights from locations ERM12.2, ERM0.1, ERM2.1, ERM4.0, CRM0.0, CRM5.5, and TRM568.5. The sampling weights were soaked in laboratory-provided deionized water (contained within laboratory-provided, certified-clean glass bottles) for 10 minutes. The deionized water was then transferred into 1-liter plastic bottles preserved with nitric acid.
- Two equipment blanks associated with the dedicated pump intake tubing were collected. The first tubing blank was collected by pumping deionized water through the dedicated tubing configuration from the ERM12.2 location. The second tubing blank was collected by pumping a sample of 2% nitric acid...
acid and deionized water through the ERM12.2 dedicated tubing. The tubing blanks were transferred into 1-liter plastic bottles preserved with nitric acid.

• Two equipment blanks associated with the filter and tubing were collected. The first filter and tubing blank was collected by pumping deionized water through the dedicated tubing setup from ERM12.2 and a disposable filter. The second filter and tubing blank was collected by pumping a sample of 2% nitric acid and deionized water through the ERM12.2 dedicated tubing and a disposable filter. The filter/tubing blanks were transferred into 1-liter plastic bottles preserved with nitric acid.

The equipment blanks were submitted to the analytical laboratory for metals analysis using the same methodology as the routine surface water samples. The reported results for lead associated with each of the equipment blanks described above are presented on Table 1.

In addition to the lead results presented on Table 1, positive results were observed for cobalt (2.35 μg/L) in the ERM12.2 dedicated sampling weight equipment blank; for iron (116 μg/L) in the CRM5.5 dedicated sampling weight equipment blank; and for antimony (12.0 μg/L) in the TRM568.5 dedicated sampling weight equipment blank.

**Conclusions and Corrective Action**

Based on the laboratory-reported lead results associated with the equipment blank study, it was determined that the fabricated sampling weights were the source of the significant lead contamination for the routine surface water sampling conducted following implementation of these weights on February 2, 2009. Although analysis of the bismuth alloy shot was not conducted and a study to identify the specific mechanism by which the shot resulted in contamination of the water samples was not undertaken, it is believed that dissolved lead was introduced into the surface water samples in the following manner:

• Repeated, daily submersion of the sampling weights into the river system at depths of up to 25 feet (resulting in significant hydraulic head) coupled with sometimes strong current resulted in river water entering the weights through sealed fittings.

• Once the water entered the weights and came into contact with the bismuth alloy shot, lead contained in the shot dissolved into the water.

• Water remained inside the weights between sampling events and lead continued to dissolve into this water.

• During subsequent sampling events, the lead-containing water inside the weights would leak out of the apparatus into the surrounding river water where it was collected as part of the river water sample.

As a result of the equipment blank study, the fabricated sampling weights were identified as the source of contamination and immediately removed from use and replaced with weights constructed from solid PVC. All fabricated weights were replaced at the routine surface water sampling locations prior to the April 20, 2009, sampling event.

In order to fully evaluate the impact of contamination introduced by the fabricated weights, the results for routine surface water samples collected on and after April 20, 2009, were used to document “return to control.” The QA Team identified data that were affected and qualified the data appropriately. The positive results for total and dissolved lead in river surface water samples collected between February 2, 2009, and April 20, 2009, were considered unreliable based upon the results of the QA investigation.

**References**


Joseph Kraycik is a Professional Geologist with more than 15 years of progressive experience in the environmental consulting industry and has served in a quality oversight role on various projects including the TVA Ash Recovery project, the New Bedford Harbor Superfund Site, and the Rocky Mountain Arsenal.

Stephen Brower Manages the Geosciences Dept. at Environmental Standards, Inc. and has more than 20 years of experience as an environmental geologist. Mr. Brower is registered as a Professional Geologist in PA, VA, NC, and KY.

Rock J. Vitale, CEAC is the Technical Director of Chemistry/Principal of Environmental Standards, Inc. Mr. Vitale has over 30 years of experience in the environmental field and has authored and peer-reviewed numerous published manuscripts relating to data validation, laboratory auditing, and analytical methodologies.

Dr. William Rogers has worked for the Tennessee Valley Authority since 1979 as a chemist specializing in laboratory quality assurance.
**Colorado Section**

**2012 Annual Meeting and Awards Banquet** - The 2012 Colorado Section AIPG Annual Meeting and Awards Banquet on December 11 at the Golden Hotel was a well-attended, fun evening. The festivities began with a social hour, and was followed by a delightful dinner. The 2012 Colorado Section AIPG Executive Committee officers and advisors were honored and recognized by outgoing President Steve Sonnenberg, who presented each member a momento, and thanked them for serving on his board. The Section awarded Tom Cavanaugh with its Distinguished Service Award. For the first time, the Section gave its newest and highest award, the Honorary Membership Award, to Bill Siok, the AIPG National Executive Director, recognizing his work for the National AIPG and their support and involvement with the Colorado Section.

After the awards ceremony, John H. Wright captured everyone’s fascination with his incredible presentation, “Blazing Ice – Pioneering the Twenty-first Century’s Road to the South Pole”, which is detailed in his book of the same title. John’s 13-year career in service to the United States Antarctic Program culminated in accomplishing the historic project of pioneering a 1,000-mile haul route over snow linking the United States coastal station at McMurdo to the Pole, executing the first ever round trip between those two points, and in the process delivering 220,000 pounds of cargo to Amundsen-Scott South Pole Station. This was a four year project, and Blazing Ice tells the story of the team of Americans who made it happen in first-person, non-fiction narrative. John was the project manager and field team leader on that job.

**Steve Sonnenberg, CPG-6201, receives a plaque for his service as Section President.**

**Michigan Section**

**2012 Michigan Section Annual Meeting** - On November 29, 2012 the Michigan Section held its annual meeting at Cleary University in Howell. Joyce Dunkin was the featured speaker who presented “Offshore Coring Feasibility Studies – Geotechnical Investigations to Support a Potential Large Water Intake.” This topic was a bit different than many recent presentations, but was well received by those in attendance.

The Michigan Section has officially announced that a new student chapter of AIPG has been formed at Wayne State University. The Executive Committee extends its congratulations to the students at Wayne State University, and encourages them to attend AIPG events.

The winner of the annual student poster contest was David Trudeau of Grand Valley State University; he submitted a poster titled “Weathering Rates for Exposed Sedimentary Lithologies in West Michigan Based on Gravestones.” David was awarded $500 to put toward his education. Congratulations David!

**Adam Heft, Michigan Section Editor**

**Georgia Section**

The first month flew by but we have been busy planning activities for our Georgia Section. Eric and I participated in Sciencepalooza at McClure Middle School in Cobb County. We talked about the Grand Canyon and I was really surprised of the small number that had visited out west. A few were ready to go after seeing the pictures of Eric’s hiking trip to the north rim and back. I was also recently a judge for the science fair in Fulton County.

We have our six students for 2013 that will receive a membership plaque and our section scholarship. We hope to have a few career nights at different universities. If you would like to participant let Eric or I know. We hope to have activities in the Atlanta area, Carrollton, Athens, Columbus, and maybe Statesboro.

Student Scholarship Winners-Albert Killingsworth, SA-4345 – Georgia Southern; Rebecca Pickering, SA-3260 – Georgia State; Jeannie Patrick, SA-3772 – Columbus State; Scott Reyher, SA-3382 – Georgia Southwestern State; Rachel Sellers, SA-3432 – University of Georgia; Troy Mosac, SA-4209 – West Georgia.

**Ron Wallace, Georgia Section President**
AGI Releases Faces of Earth Series in HD on YouTube

Alexandria, VA - The American Geosciences Institute is pleased to announce that it has released its award-winning Faces of Earth series on YouTube in full High Definition (http://www.youtube.com/user/AmericanGeosciences).

“As part of our mission to promote awareness of the geosciences, AGI is moving aggressively into the areas where the general public is, especially students. We hope this will also enable wider use of these assets in both university and K-12 classrooms around the world,” says AGI Executive Director, Dr. P. Patrick Leahy.

Delve into the Faces of Earth and rediscover the wonders behind our dynamic planet. From the resounding cacophony that bore Earth 4.6 billion years ago, to the steady and resolute changes that affect our surroundings even today, the Faces of Earth series explores the vibrant, forceful, and ever-changing facets of planet Earth.

Conveniently packaged into four informative and energetic videos, the Faces of Earth series seamlessly flows from an exciting introduction to the geosciences, to a deeper understanding of what fuels our planet for a more advanced audience.

Experience spectacular imagery, exclusive interviews, and captivating commentary from distinguished geoscientists as you explore this compelling collection of videos.

Building the Planet (http://youtu.be/y-cc8fs3xYY), episode one in the four-part series, travels back in time and strips away the layers of Earth to witness the explosion that formed the planet. Earthquakes rumble, volcanoes explode, and lands transform as we explore the science behind plate tectonics in Shaping the Planet (http://youtu.be/yWezU1P6dM0), the second episode in the series. In Assembling America (http://youtu.be/1iTUAUmF-N4), the third installment in the Faces of Earth series, viewers travel with geoscientists and explore how time and the forces of nature have shaped the continent and influence the United States even today. Finally, discover the delicate balance between Earth and its inhabitants in the fourth and final video, A Human World (http://youtu.be/FkrsKCUQ7-s). In this video, viewers learn how Earth has shaped human evolution, and how humans, in turn, are now shaping the evolution of Earth through geologic, climatic and other changes.

Use these dynamic videos as an engaging learning tool for students of all ages! Whether it’s for an exciting introduction or an in-depth look at a particular topic, the Faces of Earth series is a fascinating and powerful way to engage audiences about the importance of geoscience throughout society.

Coming Soon!!

TPG Annual Meeting Issue

Get all of the details and highlights of the AIPG 50th Annual Meeting.
NEW Rapid Dry Sport Shirt by Port Authority
Fabric/Style: 5.6-ounce, 60/40 cotton/poly baby pique, Rapid Dry™; hemmed sleeves, double-needle stitched, side vents. Features 3-button placket with pearlized buttons. Available Colors: Burgundy, Charcoal, ClassicNavy, CourtGreen, Dandelion, DarkGreen, JetBlack, LightBlue, Papaya, Red, Royal, Seafoam, White. Sizes: Small-6XL
Price: $33.50 (2XL-6XL extra charge)

AIPG Expandable Briefcase has the AIPG pick and gavel logo, durable 600 denier polyester fabric and a large main zippered compartment. Created with several pockets and pouches for optimum organization. Dimensions: 15.75”w x 11.75”h x 6”d (expanded), cubic inches: 1,100 (expanded). Available Colors: Black, Hunter, Navy, Red, Royal.
Price: $30.00


NEW Pen and Pencil Sets!-Custom engraved pen and pencil. Mechanical pencil for precision writing. Hi-gloss finish and stylish, silver accents. Patented lathe lines around each barrel. Sapphire Blue. Price: $14.00

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