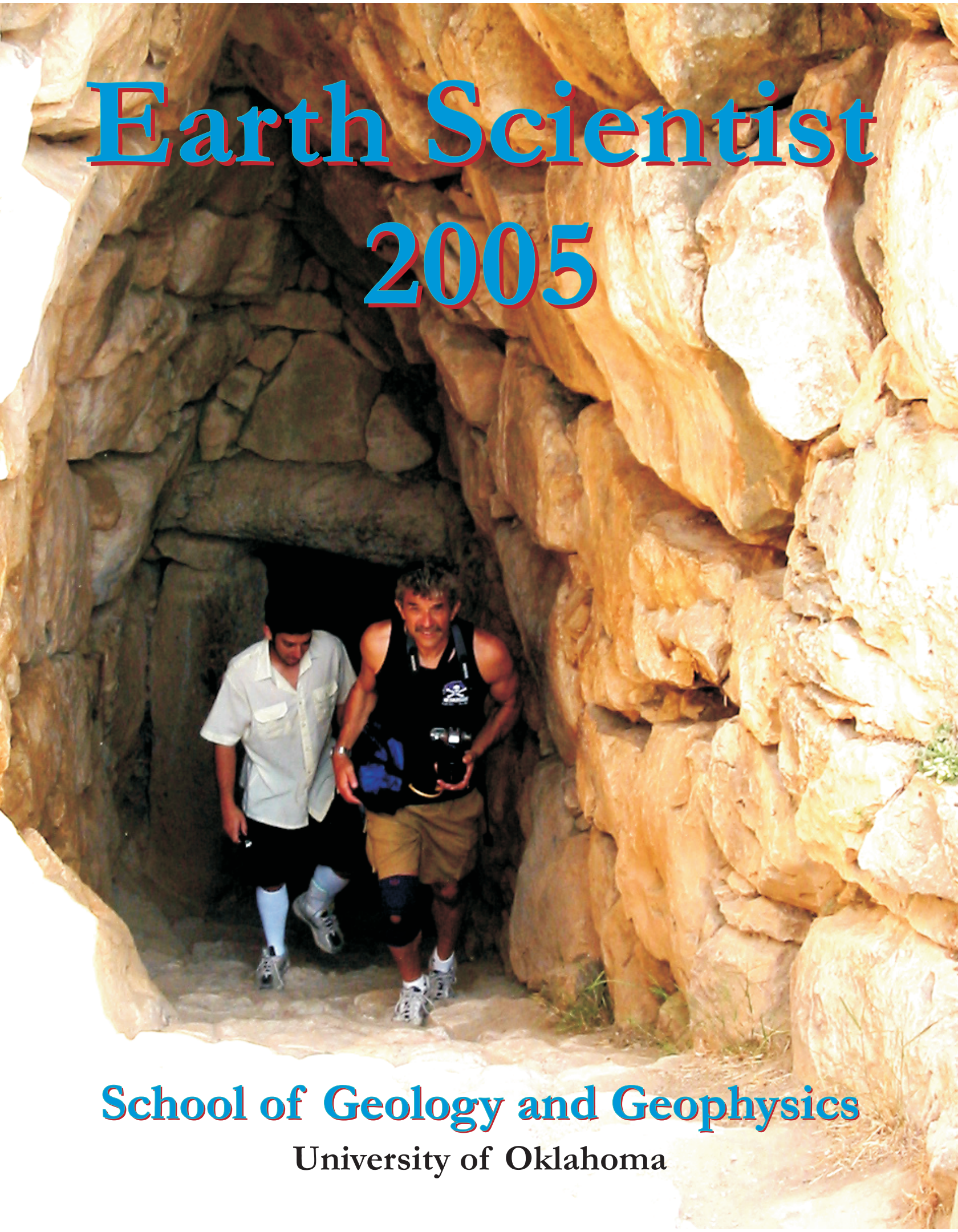
Earth Scientist 2005



School of Geology and Geophysics

University of Oklahoma

SGG Vision Statement

The School of Geology and Geophysics shall be a preeminent center of excellence for study and research in geology and geophysics with emphasis in applied areas such as energy. Students shall be provided with a high quality education that stresses the fundamentals of science within a creative, interdisciplinary environment, and that prepares them for success in their professional careers by instilling knowledge, skills, confidence, pride, principled leadership and the ability to contribute to the wise stewardship of the earth and its resources.

University of Oklahoma
School of Geology and Geophysics
Earth Scientist
2005

Director of the School
Roger M. Slatt

Editor
Carol Drayton

Layout
Greenlight Technologies
A subsidiary of Eric Geosciences

The Earth Scientist is published annually, reporting on research, activities and programs related to the OU School of Geology and Geophysics. It is prepared and distributed with private funds at no cost to the taxpayers of the State of Oklahoma. Please address all inquiries and changes of address to the Editor, Earth Scientist, School of Geology and Geophysics, 100 East Boyd St., Ste. 810, Norman, OK 73019-0628.

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Acknowledgments

The editor would like to acknowledge the help of the many SGG students who unselfishly gave of their time and resources to help produce this magazine; particularly Kerry Moreland and Sara Kaplan. Many thanks as well to Dr. Slatt, the alumni, faculty, staff and friends who contributed articles, pictures, information and encouragement.

On the Cover: Dr. Alan Witten and son Ben on their visit to an ancient Mycenae cistern in Greece in July 2003. Dr. Witten died February 13, 2005, and will be sorely missed.

EARTH SCIENTIST 2004

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From the Director's Desk



Roger M. Slatt
Director

The 2004-2005 academic year was perhaps the most dramatic and diverse year in recent history for the School of Geology and Geophysics. The highs and lows were comparable to and as frequent as oil and gas price spikes.

Of course, the most devastating happening of the year was the loss of Dr. Alan Witten to a heart attack February 13, 2005. I personally witnessed the shock of our graduate students, as well as the 100 undergraduate students in his ever-popular, "Adventures in Geophysics" general education class when I broke the sad news to them. Their expressions of grief spoke volumes about Alan's popularity among students. I will not dwell on this subject here because there is ample testimony to his character and achievements elsewhere in this memorial issue of the Earth Scientist. However, I will here offer thanks to Ph.D. student Jaime Rich, Dr. Ray Brown and Dr. Jud Ahern for quickly volunteering to assume the responsibilities for the three courses Alan was teaching this Spring.

The loss of Dr. John Castagna was another low point for the School. John assumed the prestigious Robert E. Sheriff Chair in Geophysics at the University of Houston. At any given time in John's eight plus years at the School, he had a full plate of eager, enthusiastic, and intelligent graduate students, all of whom have now moved into what will ultimately be successful careers in the petroleum industry. He has a unique teaching style that fosters scientific curiosity and motivation as well as a gift for recognizing which research tracks are most important to pursue. In addition to his academic achievements, John has been able to spin off a growing entrepreneurial company with offices in Houston, Dallas and Norman. Our loss is certainly Houston's gain! Another difficulty for the School this year was our inability to reach a consensus on a candidate to fill the our vacant Structural Geology faculty position.

There were many high points during the year, some of which are listed below:

- In Spring and Summer, we will have had the largest graduating class since the late 1980s, with 19 undergraduates and 20 graduate students receiving diplomas. Three of our students graduated summa cum laude and one graduated cum laude.
- Comparative statistics with numerous other Earth Science departments in the U.S. place the School in the upper 10-15% in both undergraduate and graduate student enrollment and a relatively high student/faculty ratio.
- Our undergraduate enrollment continues its five-year upward growth, even though for the first time in 10 years there is a slight drop in graduate student enrollment. Part of this drop is clearly attributable to the loss of John Castagna, who attracted very bright geophysics students.
- The Geophysics Ph.D. program was formally approved by the State Board of Regents and our first Ph.D. in Geophysics graduated in May.
- In the area of gender, over the past three years, the number of male graduate students has decreased (currently 56% of total) while the number of women graduate students has increased (44%). In contrast, the number of male undergraduate students increased to its current 77%, while the number of female undergraduate students decreased to 23%.
- In the area of demographics, we enjoy equal proportions of U.S. citizens and international graduate students, and an 80:20 ratio of U.S./international undergraduate students. This past year, we had representative students from 16 countries, in addition to the U.S.
- Field camp enrollment, which is a barometer of undergraduate interest, continues its annual climb to 16 this summer.
- In the Fall, 16 major and mid-size petroleum companies formally interviewed on campus, double the number that interviewed in 2000 (when there were many more major companies than there are today). During that recruiting season, there was a mini feeding-frenzy for our students, with many receiving multiple employment offers, sometimes on the same day as the interview. Virtually all of our graduate students who sought either full-time or internship appointments in the petroleum industry were hired. I was particularly heartened to see that companies are now more willing than in past years to sponsor employment for our excellent international graduate students.

From the Director's Desk continued...

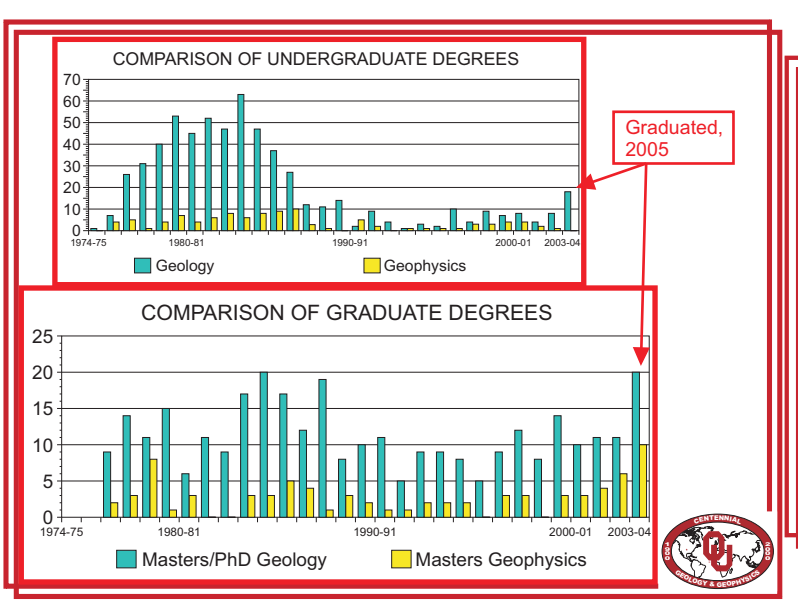
- The AAPG/SEG Spring Student Expo seems to now have taken solid root. In March, the School was host to a record 166 students from 42 colleges and universities in 22 states (from California to Florida). Also, a record 68 scientific student posters were presented. Twenty-one petroleum companies were present, of which 14 held formal interviews. Several matches were made and students received employment and internship offers. Thirty-two companies and individuals financially supported the event (special thanks go to alumnus Chuck Noll, who committed a 10-year pledge to support the Expo). Not only is the Spring Expo an excellent way to showcase the School and Sarkeys Energy Center, but it is one of the very few opportunities that students from universities where companies do not recruit have to pursue career opportunities in oil and gas. The Expo serves an important national purpose. The AAPG Expo committee has formally designated our event the "Spring Break Student Expo" for coming years.
- The School received a new Professorship this year, the Norman R. Gelphman Professorship. In addition, $513,000 in corporate and personal gifts were received, $185,000 of which is in the form of endowments.

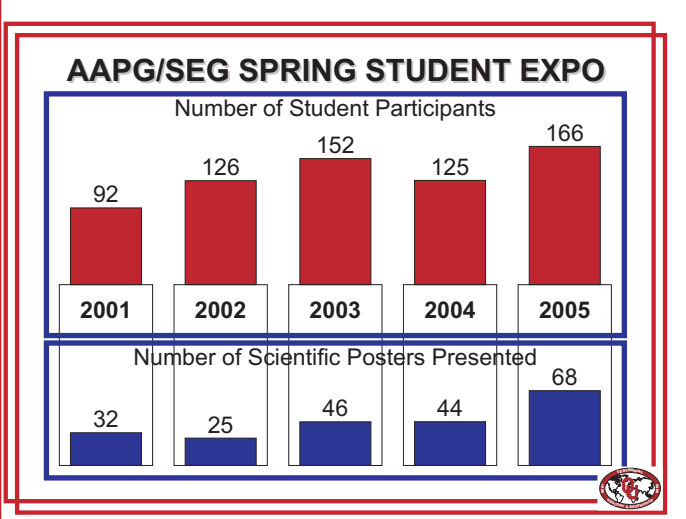
So, the School is currently financially healthy. However, we have now received our final annual installment of the President's five-year alumni match. These funds are used mainly in support of graduate student fellowships and student/faculty educational activities such as field trips and travel to conventions. The end of the match translates into the potential for a much decreased graduate student program unless a new funding source is identified.

Finally, the highlight of the year for many people was the formal announcement in May by President Boren of the formation of a new college emphasizing energy education and research. The college, to be named by faculty committee, will be composed of the School of Geology and Geophysics, the Mewbourne School of Petroleum and Geological Engineering, Sarkeys Energy Center and the Oklahoma Geological Survey. A transition team, which I am part of, has been formed to ensure a smooth and orderly transition to the projected January 1, 2006 opening of the School. Among the many short-term challenges are:

- Selecting an appropriate name that transmits to the world the intent of OU to expand upon its historical reputation in energy education and research while ensuring that non-energy faculty are not considered second-class citizens;
- No disruption to students in their current degree programs;
- Expanding upon current interdisciplinary petroleum geoscience and engineering teaching, including new degree options such as a M.S. in Integrated Reservoir Characterization (proposed at the Fall 2004 joint alumni council meeting);
- Developing adequate external funding sources for both the educational and research components of the College;
- And most importantly in my opinion, ensuring that energy education and research have a very strong international component in addition to its traditional Oklahoma emphasis. There is a solid, growing global market for petroleum education and research, and several universities are currently capitalizing, or planning to capitalize, on this potential. Outreach opportunities include online education (virtually unlimited growth potential) and in-country teaching, both for OU academic credits, in addition to, or in combination with, the traditional education of students on the OU campus.

Indeed, the coming academic year will be filled with many challenges and opportunities. Hopefully, next year's Earth Scientist will highlight early successes in this innovative OU mission. ■





The Dean's Corner



John T. Snow
Dean of the College of Geoscienences

Dear Alumni and Friends: As I write these words on April 27, 2005, spring has come to Oklahoma and all the faculty staff, and students are looking ahead to Commencement and the start of summer. It has been a busy year for all with many successes and some sadness. Probably the greatest shock of the year was the sudden, unexpected passing of Dr. Alan Witten earlier this spring. Alan was an outstanding teacher, exceptional researcher, valued colleague and friend to all. At the time of his death, Alan was leading our efforts to establish a new doctoral degree in Geophysics. He will be missed.

My main project at present, the construction of the National Weather Center, is on track, with substantial completion scheduled for mid-February 2006 and move-in beginning in late April 2006. We are planning for the School of Meteorology to offer its first classes in the new facility in August 2006. If you would like to see the progress first hand, go to http://nwc.ou.edu and try your hand with one of the steerable web cameras. We have a National Weather Center enhancement fund-raising effort just getting under way, with the College Board of Visitors and several donors providing important lead gifts. If you would like to explore the possibility of a gift to help enhance the furnishings and equipment in the student facilities in the NWC, please contact Mr. John Ritz at 405-325-3101.

This will be my last message to you as the Dean responsible for the School of Geology and Geophysics. Last Thursday, 21 April 2005, OU President David Boren announced that the Mewbourne School of Petroleum and Geological Engineering and the School of Geology and Geophysics will form the core of a new college to be housed in the Sarkeys Energy Center. I applaud and enthusiastically support the president's decision. This new college – yet to be named – will fulfill the vision of the Sarkeys Energy founders of 25 years ago and position the University to be very competitive in attracting the best students and more research funds from the energy sector.

The President's decision follows his receipt in late March of the recommendations of the Presidential Task Force on Energy Education and Research. In brief, the president has decided that there will be 1) a new college combining all the energy-related science and engineering programs and 2) a reorganized College of Geosciences (which may have a new name). A high-level transition team has been appointed by the president to assist in the organization of the new energy college. President Boren will be bringing in an outstanding academic consultant to lead the transition planning for the new college. I will be working as necessary with that consultant to ensure a smooth, orderly transition to the new energy college. The president hopes to have the search for a dean to lead this new college under way by July 1, 2005. Further, I have been charged with working with the Director of the School of Meteorology and the Chair of Geography to develop a plan for the reorganized College of Geosciences. The goal is to have these new arrangements in place by the end of the year, and paramount is minimizing impact on students at all levels.

For the remainder of this calendar year, Provost Nancy Mergler has directed that there will be no changes in administrative or academic processes. Thus on a routine working level, no changes in the way we do business will be made until the new energy college and the reorganized College of Geosciences come into existence on January 1, 2006.

So this is my last message to you in this venue. While I look forward to the challenges of re-organizing Geosciences, working with a new colleague to ensure the success of the new energy college, and moving all the weather programs to the National Weather Center, I will also miss working with the School of Geology and Geophysics and its many alumni and friends. Let me close by expressing my strongest appreciation for the warm fellowship you all have extended to Janet and me over the last 11 years. From that first dinner in February 1974 at the Petroleum Club in Dallas to the recent College Board of Visitors meeting, you have always provided good advice, wise counsel and outstanding support. You are truly an exceptional group of people. ■

John T. Snow
Dean, College of Geosciences

Alumni Advisory Council Update



Jon R. Withrow
Chair, Alumni Advisory Council

Greetings from the Alumni Advisory Council (AAC) of the School of Geology and Geophysics (SGG). The AAC has been presented with many challenges during the 2004-2005 period. Significant progress has been made in addressing these challenges.

November 2004 AAC Meeting Report: Fifteen members were present for the Executive Council Meeting of Nov. 11, 2004, to review the state of the School. Bob Allen thanked Dean Snow and Dr. Mankin for the new million-box sample library and complimented Dr. Slatt and Carol Drayton for the 2004 Earth Scientist publication.

Dr. Slatt presented a detailed review of the progress of the SGG. The year ending Dec. 31, 2005, will be the last year of Dr. Slatt's five year term and funding of the SGG President's Matching Funds. The School will lose $200,000 from the presidential match beginning in 2005. Funding will have to be replaced in order to maintain graduate enrollment. The status of Chairs and Professorships as well as Faculty positions was presented and the five-year CDRP was reviewed.

Hugh Peace reported on fund raising. The primary needs are for five-year salary funding for a Chair, graduate student support, a full-time recruiter and endowment for summer field camp.

In the full council meeting the following day, Dr. Slatt again reported on the status of the School. He discussed the Geophysics Ph.D. program and the summer field camp situation. It was recommended that the School offer in-state tuition to out-of-state students to increase enrollment. Dr. Slatt reported that the graduate student enrollment has decreased because 1) Dr. John Castagna left the School, 2) the petroleum faculty can handle only a limited number of graduate students and 3) fewer international students are applying because of visa restrictions. The starting salaries for graduate students in petroleum are $65,000 to $70,000.

Plans for the spring 2005 AAPG Student Expo were discussed. Chuck Noll offered $2,500 per year for the next 10 years to co-sponsor the Expo.

Dr. Lynn Soreghan gave a presentation on Paleoclimate Research at OU.

Ben Hare reported on the President's Advisory Committee for Energy Education. Three SGG AAC members are on the committee.

Kelvin Cates reported on membership. Nominations for the Executive Committee and the Full Council were made and accepted. Joseph Dischinger and Jenni Kessler were nominated for Executive Committee membership. David Fleming, Robert Lord and Eric Kubera were nominated for General Council.

May 2005 AAC Meeting Report: The council heard reports from Dr. Slatt and Dean John Snow, which are included with their articles. The membership committee reported that Robert Lord, David Fleming and Eric Kubera were to be voted on in the full council. Gene Van Dyke, Kelvin Cates and Emmit Lockhart were nominated to fill the posts of Chair, vice chair and secretary respectively. Jennie Kessler and Joseph Dischinger were elected to the Executive Council.

The main item of discussion in both the executive and full council, however, was the formation of a new college to include the School of Geology and Geophysics, Petroleum Engineering and the Sarkeys Energy Center. Since the new college, which is apparently supposed to be in place by January 1, 2006, will have its own AAC, the fate of the SGG AAC was discussed. The alumni were concerned that the SGG AAC (which has been in place since 1964 and was the first alumni board in OU history) not be disbanded. Ultimately, President Boren told John Ritz that the SGG AAC will maintain its position, but the College Board will be the voice of both Schools. This was agreeable to the alumni, who recommended that the board draft a letter to President Boren pledging support for the new college and affirming their desire to remain an active alumni board for the School of Geology and Geophysics.

The full council elected Robert Lord, David Fleming, Brian Biddy and Eric Kubera to membership, elected Jenni Kessler and Joseph Dischinger to the Executive Council and approved the slate of officers.

It was reported that Terry Brady is retiring to pursue her education. She plans to finish her degree in history and add a Classical Culture major and possibly two minors. She has served the alumni devotedly for 7 ½ years, for which the AAC is deeply appreciative.

As Chair, I would like to express my appreciation as well to Dr. Slatt and the staff for their help during my tenure. ■

Alumni Advisory Council Update - Pictures



Students honored at the AAC luncheon. L-R: Kristen Marra, Colt Nickel, Chris Harms, Aaron Bell, Brian Harms, Kathryn Gardner and Amir Allam.



Chair Jon Withrow enjoys the luncheon with new Executive Council member Joseph Dischinger



Kathy Sokolic and Jerry Medina



Now, I don't know about you, but I think somebody ought to find out just what was going on at this table. Rodger (Tim) Denison, Dr. Tom Rowland, Mike Pollok and Chuck Noll. Hmmmmm. They're having altogether too much fun.



Robert Richter, Hugh Peace, Pat Clare and Dr. Roger Young



Terry Brady, who has been coordinating alumni events for over 7 years, is retiring to pursue educational goals.



New Executive Board member Jenni Kessler, Dr. Lynn Soreghan and Dustin Sweet, geology Ph.D. student.



Dave Campbell (I think that smile is permanent), Lee Sargent, Bill Reed and G. Carl Hale

Development Update

Development Opportunities for the School of Geology and Geophysics



John W. Ritz,
Assistant Dean for External Relations

The College of Geosciences and the School of Geology and Geophysics are privileged to have some of the most successful and generous alumni at the University of Oklahoma.

The School of Geology and Geophysics will be combined with the Mewbourne School of Petroleum and Geological Engineering, the Sarkeys Energy Center's seven research institutes and the Oklahoma Geological Survey in January 2006 into a "NEW COLLEGE". This is a rare opportunity for our alumni to be proactive in supporting the combined energy entities. We will need to provide resources to develop and assist Dr. Slatt with the School's current programs. However, we still need to provide resources for continuing support to the School of Geology and Geophysics for FY 2006.

Annual giving can be used immediately to meet the School's most pressing needs. Undesignated annual gifts allow the School to solve problems as they arise and seize unexpected opportunities. Annual gifts are used for student projects, scholarships and graduate fellowships, teaching and research laboratories, and classroom renovations. The ability to meet the changing needs and priorities of students and faculty by utilizing unrestricted funds to specific areas or programs is valuable for continuity.

Annual giving is available through direct gifts to the School or through the President's Associates Program. The President's Associates Program at the University of Oklahoma is the single most successful private support program in the history of OU. Since its beginning in 1979, the President's Associates Program has been integral to the success of the University of Oklahoma in areas ranging from the National Scholars Program to the Center for Analysis and Prediction of Storms. All gifts received through this program are used entirely for academic purposes and enable the University to address critical needs and to explore new opportunities. While OU Associates may make their gift entirely unrestricted to the University of Oklahoma, we encourage you to designate one half of the gift to the School of Geology and Geophysics. All gifts are tax deductible and corporate matching gifts may be included as part of the annual contribution by including a matching gift form.

Endowed gifts are created for student scholarships, graduate fellowships, faculty enrichment and for the use of the Director of the School of Geology and Geophysics to meet the School's strategic directives.

Planned gifts take many forms including planned or deferred gifts, bequests made through a will or living trust, charitable remainder unitrusts or charitable remainder annuity trusts, life insurance or retained life estates. ■

Additional information for annual giving, the President's Associate Program, endowed gifts or planned gifts is available by contacting:

John W. Ritz, Assistant Dean for External Relations
(405) 325-3101 or e-mail: jwritz@ou.edu

Snapshots of the life of

Dr. Alan Joel Witten

This section is devoted to the memory of Dr. Witten, who died February 13, 2005. His students, colleagues and friends have been invited to contribute their memories of Dr. Witten.

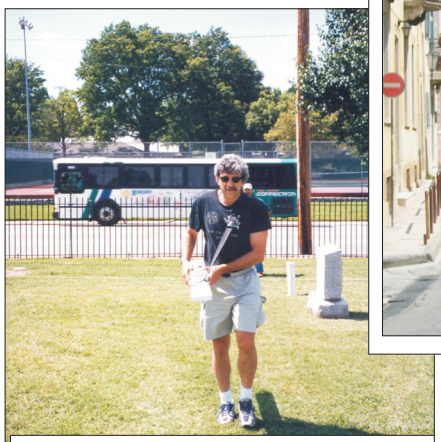




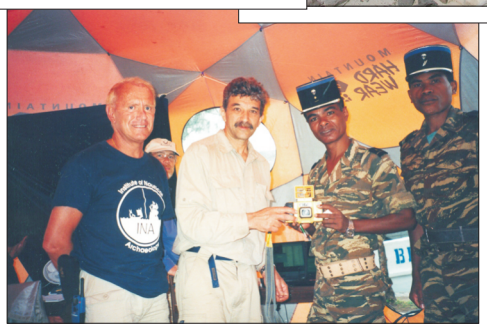


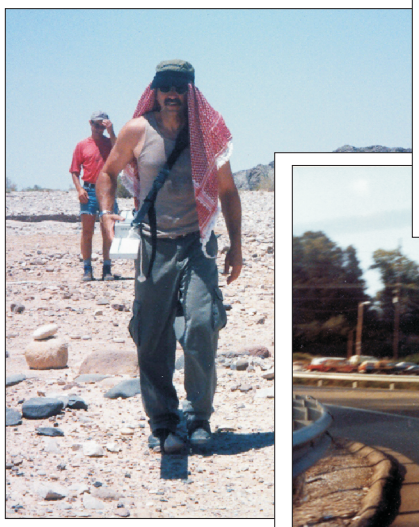


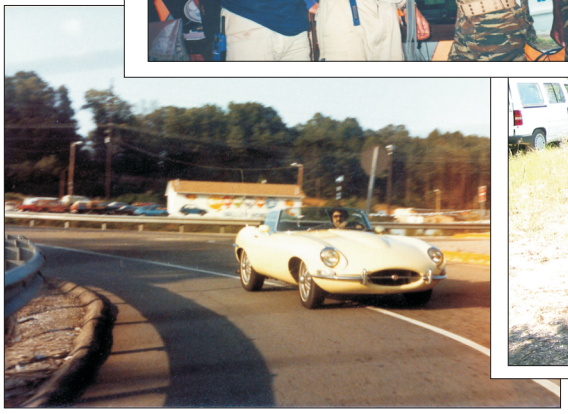














In Memory of Alan Witten



Tribute to Alan Witten
Delivered February 14, 2005 at a Memorial Service in Norman Oklahoma
by **Roger M. Slatt**, Director, School of Geology and Geophysics, University of Oklahoma

Tonight I want to represent Alan's other family—his professional family at the University of Oklahoma—and talk a bit about his accomplishments. For me, it was truly an honor and privilege to know Alan as a friend and colleague. He was a remarkably talented, creative—and most important—caring individual.

As you all know, Alan was almost fanatical about good health, which makes his loss all the more tragic. The only real vice that I knew Alan had was his love of desserts. Anyone who ever watched Alan eat chocolate cake knows how forcefully he could stab that fork into the cake, devour it without shame and with intense gusto.

Thinking of the word 'gusto', it is not used much anymore and I would bet there are people here who do not know what it means. The dictionary defines gusto as "Keen enjoyment; relish; zest; great vigor or fervor." That word 'gusto' really describes Alan's approach to life.

As an educator, he was always available to talk with students. His enthusiasm for the subjects he taught routinely spilled out into the audience. He truly lived up to the title of his freshman course "Adventures in Geophysics" by taking his students on real adventures, from searching for burial plots in Norman to imaging buried cities in Jordan and Greece. He always wanted students to share in his adventures. His approach to students was sometimes unconventional, but always effective. For example, instead of giving routine exams in his classes, he would have students meet individually in his office for their final exam, ask them what they had learned, and grade them accordingly. Whenever an opportunity arose for him to go out and conduct some geophysical research, his first question was: "Can I take students along"? In his spare time, he taught geophysics at Norman High School on a volunteer basis.

He also approached scientific endeavors with great gusto. Alan called his research "high-visibility geophysics," not only because it involved precise three-dimensional imaging of shallow-subsurface features, but also because his work garnered considerable respect and attention in the scientific and non-scientific communities. He developed and applied imaging techniques such as high resolution seismic reflection, ground penetrating radar, electromagnetic induction, diffraction tomography, and most recently, resistivity imaging. As an indication of his diversity, his credits include exploring a 6,500-year-old civilization in what is now Israel, imaging an ancient copper mining village in Jordan, investigating a mass grave from the 1921 Tulsa race riot, finding Captain Kidd's sunken treasure ship off Madagascar, mapping high- and low-level underground contaminants and waste, exploring Jesse James hideout caves near Atoka, and locating the longest dinosaur ever found, which was appropriately named Seismosaurus. This dinosaur formed the model for dinosaurs used in the movie Jurassic Park. Just two weeks ago Alan was in Florida imaging sinkholes for a homeowners association, and a month before that, he was in North Dakota imaging concretions in coal deposits for a strip-mining firm. His abilities also extended to working with military and criminal agencies. On many occasions Alan would disappear for a week or two, and we knew he was up to some top secret activity, ranging from locating tunnels near border crossings, to developing techniques for imaging caves. A plaque from the Homeland Security office thanking him for some unknown activity even hangs in his office.

Alan has received considerable acclaim for his accomplishments. He has been on the History Channel on more than one occasion, appears in the local newspapers regularly for some "adventure in geophysics," has published numerous articles from archaeology to petroleum geology applications, holds several patents, and his new book, titled Handbook of Geophysics and Archaeology, is scheduled to be released this month.

Finally, I want to mention that Alan's greatest enthusiasm and joy came from conducting scientific field studies with his two sons, Ben and Seth. On several occasions I had the opportunity to witness the pride he had in working with them. His sons' names appear as co-authors on some of Alan's publications. Ben and Seth are well versed in Alan's geophysical techniques, are real contributors to his research activities, and sometimes would even grow inpatient with him in the field and say, "Dad, give it here and let me do it, I can do it better." Alan was always very proud of that.

So, what else can be said? Alan's loss extends far beyond the reaches of OU and Norman. He has truly left his mark on society far and wide and has guided many, many people to success. Helping others succeed was always his greatest goal. We will all miss him. ■

Dr. Alan Witten – A Friend Remembered

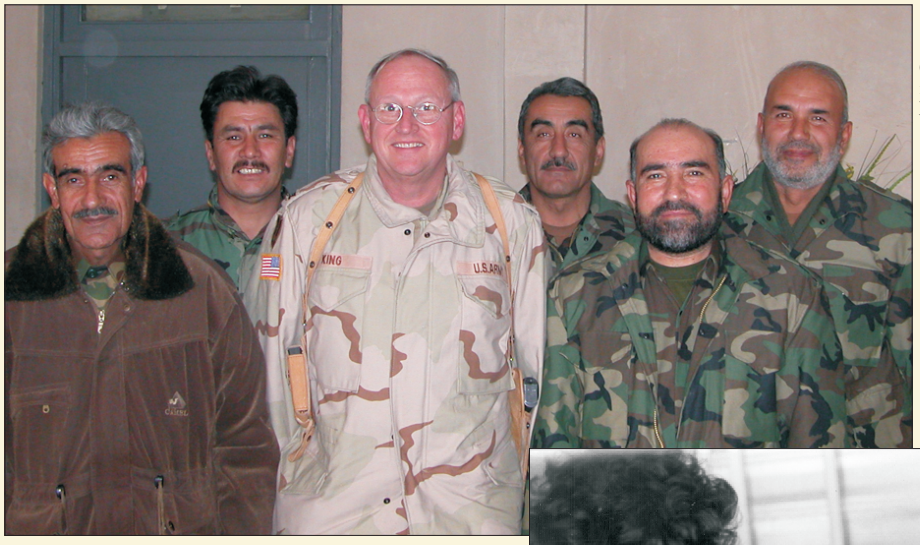
Colonel W. Chris King, Ph.D., P.E.
United States Army, Professor and Head, Department of Geography and Environmental Engineering

I am writing this article from Kabul, Afghanistan, the place I was serving at the time I received the horrible news that my friend Alan had died. Living in a place of war and utter devastation where almost every day brings you face to face with some surreal experience, even ones involving death, Alan's untimely death struck very hard. To me, there are many tragic ironies in this story. First, I am in a war zone where we live with the reality that we are targets to our enemies and where death comes too often and too early. It just shouldn't be that I learn that my best friend, who has sent me all the notes about being careful and getting home safe, should die while riding his bicycle.

The second irony comes from the thought of this tragedy striking Alan Witten. Alan and I have worked together, trained together and been friends for over 20 years. Even for an Army officer who lives in a culture where people are physically fit, Alan Witten was one of the best conditioned, healthiest people I have ever known; a person whom age didn't seem to be able to grab and pull down. It reminds us of our frailty and that we don't know how much time we have. I think my main point in writing about my friend Alan is that we need to use his life as an example of how to live our lives well – fully, richly and with a love for people; that is what I want to share with you.

I met Alan as an Army major while I was working on a project to safely dispose of chemical munitions for the Army. I was introduced to this young genius at Oak Ridge National Laboratory who was working on new technology for finding buried wastes, something called geophysical diffraction tomography. Our mutual friends felt what Alan was doing might be of interest to the Army, particularly for finding land mines and unexploded ordnance. I was also preparing to return to school as a Ph.D. student in environmental engineering so it was thought I might be interested in the research area as a dissertation topic. Alan had completed the basic theoretical work and was convinced that it was possible to image buried objects by probing the subsurface with wave energy, collecting the propagating wave signals at different locations, and then using complex mathematical systems to build two-dimensional images of the subsurface environment. As an environmental engineer, the theory was exciting because it would allow the non-intrusive detection of buried wastes, which could make hazardous site cleanup safer and less expensive. The only trivial details left were to design a field data collection system, figure out how actual data could be input into the theoretical mathematical algorithms, develop imaging software, and a few dozen other practical considerations on the pathway to an actual imaging system. This brings us to another important point about my friend Alan; he possessed an infectious enthusiasm for everything in life that was fatally attractive to everyone around him. And I caught it; Alan convinced me that there was a Ph.D. dissertation within the project somewhere and we would figure it out as we went, if I would join him on the project. I swallowed the whole thing hook, line and sinker, one of the best decisions I have ever made in my professional career.

Any sane person would have looked objectively at all that had to come together to make this geophysical diffraction tomography a



Colonel W. Chris King with the faculty of the new National Military field system, 1986.



Alan operating the first geophysical diffraction tomography. Academy of Afghanistan, Kabul, Afghanistan, 1986.

Dr. Alan Witten--A Friend Remembered continued...

reality and recognized how foolhardy it would be to hang your Ph.D. research on such an impossible task. But I had caught the fever, and I had never been that sane anyway; remember that I came to work with Alan from a job that entailed playing around with chemical weapons. The intangible that I could not see as I started down this road was the power of the mind and the positive energy that Alan possessed. There was no way Alan was going to fail, with or without me. I was just the lucky person that got to go along for the ride.

We began the development of the field technique for geophysical diffraction tomography (GDT) imaging in early 1986. The tasks at hand included developing a data acquisition system, designing a software system to take collected real world data and make it fit into the GDT, adjusting the imaging software to accept the real world data, and developing image production software – no canned software in the good old days. After all of this was done, a field experiment would need to be completed to collect the data needed to produce the first GDT image. I took on a couple of obscure parts of the project and Alan did the rest. By my best accounting, Alan, at one time or another, served as our lead electrical, mechanical, and instrumentation engineers; physicist; applied and theoretical mathematician; and computer programmer, just to highlight his primary efforts. There are other people who did come and go in support of this project and I am in no way slighting their contributions, particularly in building the data acquisition system and helping with other tasks.But it was Alan and his energy that made the impossible happen, routinely. In today's world it would take a team of scientists, millions of dollars and years and years to (maybe) produce the results Alan achieved. This story shows what one man can achieve when he tries. Two and one-half years after we started, the first GDT image from an actual field experiment was produced. I would never suggest that all of us could do what Alan was able to accomplish; few have the gifts that Alan possessed. But even fewer have the zest for discovery and learning that Alan showed us and that is the lesson that we all can apply.

My final point in describing my friend Alan is about the man, the human side. I want you to think about the challenges in the project described above- the hard problems that had to be solved, pressures to meet schedules and find money and the wear and tear from the many long hours. If you have seen these kinds of pressures in your work, you realize how they can add stress and at times, misery to the work. Let me summarize the impact of these stressors first—we had a total blast. Alan just didn't let there be pressure because he knew we would solve the problems, no matter how hard. If he wasn't worrying about the little stuff, no one else should. As the project progressed, more people became participants, primarily attracted by atmosphere that Alan established. I am sure we violated about every standard of decorum for pure scientific research. Alan was way over the top in creating laughter, completely irresponsible in failing to worry enough, and treated colleagues way too nicely, even when he didn't want something from them. The list goes on and on. There were definitely several lessons learned in the right way to do research in this story.

It is awful that we all have lost such a talented scientist and superb friend. I cannot express the grief I feel for Cathy, Seth and Ben. There was never a better or a more proud father in the world than Alan Witten. I struggle with my faith to understand why bad things happen to really good people and families. I have come to know that even people as smart as Alan, and he remains the smartest person I have ever known, are not able to understand everything in the world. There is a Being more knowing than any human. I do know that if you look at the sum total of his life, Alan got about 120 years worth of work, family and friendship done in the time he was here. He left a legacy in science that will be a foundation for many who follow. He did more as a human being and particularly as a dad than most will achieve in a full lifetime. Alan, God bless and keep you, from all who were honored and enriched by your presence in our lives. ■



Witten's Treasure

by **John W. Lane**, Chief, USGS Office of Ground Water, Branch of Geophysics

I learned of the tragic, unbelievable death of my good friend Alan Witten while in Sri Lanka, participating in a tsunami relief effort to bring freshwater to the victims. Alan was the last person I spoke with before I left. He called me the night before my departure to wish me a safe journey and to discuss a plan to bring OU students to Sri Lanka in order to geophysically map the effects of the tsunami on aquifer salinization. When I first heard the news, Alan was still with us, and like everyone, I prayed for a miracle. Physically fit like few people I know, if anyone had a chance of recovery it was Alan. But it was not to be; Alan was taken from us—his family, friends and colleagues. In the weeks since, I have struggled, like many others, to understand how this could have happened. I don't think I ever will, yet my struggles to do so have given me a chance to reflect on Alan's life and work and the good fortune I had to be a small part of it.

I first met Alan in the early 1990s, through our mutual involvement in the Environmental and Engineering Geophysical Society (EEGS). At that time, EEGS was a small but rapidly growing fraternity of near-surface geophysicists. As editor of the society's journal, Alan was always stumping for contributors and reviewers and I am happy to say that I soon found myself in his stable. In those days, Alan was not only the editor, but also a major contributor. Occasionally, he would send early drafts of his articles to me for comment. I remember one article in particular that dealt with the properties of evanescent waves. The article sent me scurrying through texts in a vain attempt to penetrate his math. In the end, a short time on the phone with a patient Alan improved my understanding and, at the same time, left me with an indelible impression of Alan's capabilities as a researcher and teacher.

Alan and I were among a group of instructors assembled to teach a geophysics short-course to the EPA in the summer of 1995. That experience solidified our friendship and planted seeds for a decade of collaborative research. We shared research interests in the areas of radar tomography, resistivity imaging, seismic reflection and archaeological geophysics. A common thread that permeated our work was the desire to provide geophysical results that were meaningful to non-geophysicists. Alan believed, wherever possible, in providing results that could be viewed as 'images' of some subsurface physical property. To accomplish this, Alan developed and published visualization codes capable of presenting geophysical data in two, three and even four dimensions.

Another aspect of our work dealt with reducing the cost of geophysics. Seismic reflection methods employed by the petroleum industry are far too expensive for routine application in the environmental and engineering industry. In 1995, Alan showed me a simple plane-wave seismic reflection imaging approach during the EPA geophysics short-course. Skeptical but intrigued, I encouraged Alan at every opportunity to continue development of the idea. By the late summer of 2004, Alan had worked out the theoretical and practical aspects of plane-wave seismic reflection imaging and had

Witten's Treasure continued...

already applied it to identify buried wastes at a DOE site in Idaho; explore archeological ruins in Greece; examine sedimentary structure in Wyoming and Oklahoma; and investigate near-surface coal mining problems in the Dakotas. Although time and further research is needed before the plane-wave seismic imaging method will be accepted by the purists in our industry, as a low-cost seismic reflection reconnaissance tool, Alan's method has the potential to revolutionize and revitalize the use of seismic reflection methods for water-resource, environmental and engineering investigations.

Development of the plane-wave seismic imaging method is but one example of Alan's inventive ingenuity. Other contributions to our science and industry include innovative seismic, electromagnetic induction, and radar processing and visualization algorithms, development of geophysical equipment for surface-to-borehole and cross-borehole diffraction tomography, as well as development of geophysical forward modeling software for gravity, magnetics, seismic and radar applications.

It was through our mutual involvement in archeological geophysics that I first observed another dimension of Alan Witten – his extraordinary dedication to his students. In the summer of 2002, I accompanied Alan on a trip to Jordan with a group of OU graduate and undergraduate students. Among the group of students was Seth Witten, Alan and Cathy's eldest son (fig.1). The objective of our trip was to conduct electromagnetic conductivity surveys over the ruins of an ancient copper smelting facility at a site near Wadi Fidan. Many of the students had never left the U.S. Some had never been on a plane. Alan managed to shepherd the students out of the country, across Jordan and back again. His genuine concern for the students and their welfare was apparent at all times. Along the way, Alan successfully mixed the science of geophysics with the culture, geography and history of Jordan. A persuasive mentor, I watched as Alan, extolling the virtues of a career in geophysics, managed to convince more than one student during the trip to either change their major or pursue graduate work in geophysics.

As dedicated as Alan was to his students, I took special note of his dedication to his family and marveled at how the Witten family managed to juggle their personal and professional lives. During visits to OU for guest lectures and colloquiums, Alan and Cathy's home was always open to the wandering geophysicist. Over the years I grew accustomed to seeing Alan's sons, Seth and Ben, included in groups of students on field trips, operating geophysical equipment, or processing data at the end of a long field day. In a world where getting a family together for dinner is an achievement, it is a tribute to the Witten family that they not only found the time, but also had the desire to work so closely together.

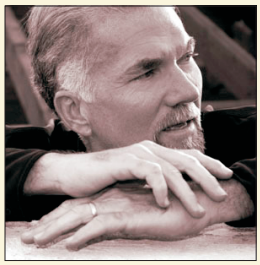
Alan always took the time to listen. Although immensely busy, his calls never seemed rushed. As interested in my family as he was in our research, Alan gave gentle advice, generally buried within a story or an anecdote from his own life, which counseled the importance of balancing the two. When Alan learned I was to be deployed to Iraq in February 2003, he did more than wish me well. He put me in contact with his Army colleagues, volunteered geophysical equipment he thought might be useful to my unit, and above all, he wrote. In the chaos of that time and place, letters and e-mails from home meant so much. As the months dragged on, Alan's periodic notes kept coming, providing a sorely needed glimpse of normalcy and the technical career I had left behind. He kept me abreast of our projects and his other research, and even managed to get a Leading Edge paper we were working on published while I was away. When I returned to the U.S. for a short leave in January 2004, Alan somehow found out that I was home. He called to welcome me back, see how I was doing, and discuss what we would do when I returned home for good. When I was finally released from duty in the summer of 2004, Alan was there. He had a list of papers to finish, new projects to start, talks to give, classes to teach, and, oh yes, a couple of students he thought I should meet. It was like I had never left, and I think that was his message.

Alan Witten had great adventures. All geophysicists are treasure hunters and Alan found his share. He worked in biblical lands and the south pacific. He used geophysics to find massive dinosaurs and sunken ships; the tunnels of smugglers, and those with more nefarious purposes. I have a shard of pottery Alan gave me, a relic recovered from the lost ship of Captain Kidd. That small piece of colored ceramic is a tangible link to an intricate web of human history. It is also a link to Alan, and I will treasure it forever.

Alan Witten was a brilliant scientist, exceptional teacher, loving husband and father, and a great friend. Many will tell you he led a full life; that he had done more than many of us will ever do. But I'd have you know that Alan was just getting started. He is sorely missed. ■



Alan and Seth Witten, among the ruins of an ancient copper smelting site at Wadi Fidan, Jordan, June 2002.



The Man With X-Ray Vision

by **Paul Perry**, author and filmmaker

We were on the distant and exotic island of Isle Sainte Marie off the coast of Madagascar when we heard that Alan Witten and his "tech team" were coming to give us a hand.

This tiny island was where pirate captain William Kidd had left his worm-eaten flagship, the Adventure Galley, and stolen another ship to make his infamous return to Boston. Now Barry Clifford, the noted undersea explorer, was looking for Kidd's ship for a Discovery Channel program and the executives at that network decided that he needed some technological help. That was when they sent Witten. He had a device that could "see underground," they said. It would help us "see" sunken ships that were under the harbor mud without having to dive with shovels. Avoiding that kind of work made us all happy and gave Witten the reputation of being a superman. We called him "the man with X-ray vision."

When Alan arrived, we decided to give him the creeps about the island's transportation. Dr. John de Bry, our archaeologist, decided that the two of us should pick him up at the island's one-horse airport in a cart pulled by two zebu, Madagascar's favorite beast of burden as well as its most popular meal. The cart had no shock absorbers to lessen the jolts that came up through the potholed road. This was magnified by the failure of the two zebus to get into a rhythm with one another and pull as one. By the time we got to the airport, John and I were a wreck. We did our best to convince Alan that this uncomfortable conveyance was the island version of a limousine, but he saw right through us. The man with X-ray vision had arrived.

Over the course of the next several days, Alan and his crew of technicians from Witten Technologies put their technology to work. Using sound waves that were beamed into the harbor's muddy bottom and captured in a computer, they were able to map objects that had become engulfed in the sludge and were no longer visible to the naked eye.

Barry Clifford and his crew loved Alan's software, which he called a "mathematical lense." Not only did it save a tremendous amount of physical labor, it also prevented an area from becoming ecologically damaged in the course of an archaeological dig. In less time than it would take Howard Carter to assemble a shovel team at the site of King Tut's tomb, Alan's equipment could emit sound waves into the ground and give you a good idea if further searching was necessary.

While Witten's crew was mapping the sub-surface of the harbor, Clifford came up with an idea. There was a small island within Isle Sainte Marie -Pirate Island- that was believed to be laced with pirate tunnels. The tunnels, said the locals, contained pirate gold put there as a means of hiding it from any British patrol boat that might visit the island. Perhaps, suggested Clifford, Witten might want to search for the buried treasure.

That afternoon, several of us broke away from the harbor site and took Witten to Pirate Island. He brought a long case with an electromagnetic sensor in it that he slung over his shoulder like a rifle. The purpose of this device, said Witten, was to broadcast radio waves into the earth to map its density. By doing that he could solve the legend of the tunnels.

Witten had covered the tiny island within two hours, collecting a subterranean view using radio waves. That night we were able to see the tunnels that laced the island as they showed up on Witten's computer.

The screen showed us two shafts connected by two tunnels, one on top of another. What we saw filled us with speculation that this was indeed a bank of sorts, one that may still contain pirate gold.

Although we wanted to dig into the tunnels to see what was inside, we could not. Our permit only allowed us to examine the harbor and no other sites. Besides, Alan Witten and his team had to leave the island and map other parts of the subterranean world.

In the years since then Witten and I spent a lot of time on the telephone talking about those islands. We both agreed that finding those tunnels indicated that there might truly be undiscovered pirate treasure in the world. We vowed to someday return to Isle Sainte Marie with our sons and search those tunnels for any sign that they were truly a pirate bank.

If I ever do that now, I'll make certain we call the effort "Witten's Expedition." It would be a fitting memorial to a scientist with an explorer's mind. ■



Alan with Dr. John de Bry, archaeologist for the Madagascar Expedition to find the pirate flagship of Capt. William Kidd.





On an island (Pirate Island) inside of an island (Isle St. Marie) searching for tunnels with his mathematical lens. We were having success at finding tunnels and success at having fun. Men were meant to look for lost pirate treasure and this is a photo taken in the heat of that search. We found a complex of tunnels and vowed to go back some day and start digging to see if there was pirate treasure in them. Someday I hope to do that, and if we find anything we'll call it "Witten's Gold".



Alan Witten: the Rochester Years and Beyond

John H. Thomas, Department of Mechanical Engineering, University of Rochester

Alan Witten and I came to the University of Rochester at the same time, in September of 1967 – he as a freshman undergraduate and I as a young assistant professor. Alan majored in mechanical engineering and I got to know him during his undergraduate days. Alan began graduate work in our department in fall 1971, immediately after receiving his B. S. degree. In the spring of 1972 he took his first course with me, a new graduate course I had developed in Geophysical Fluid Dynamics. This course sparked Alan's interest and he decided to do his Ph. D. research in this general area under my supervision.

At that time, one of the research projects I was working on was the study of wind-driven currents in large lakes, as part of a research program for the International Field Year for the Great Lakes (IFYGL). Professors Bill Diment and Graeme Bonham-Carter (in our Geology department) and I had a rather large NSF grant to support both observational and theoretical work on currents in Lake Ontario. Bill was leading the field program to measure currents in the Rochester embayment of Lake Ontario using a grid of buoyed current and temperature meters, while Graeme and I were collaborating on the theoretical modeling of these currents. This was an exciting project, with the prospect of interacting and sharing data with several other IFYGL groups at other universities and comparing our theoretical models with good observations. Alan joined the project to do his Ph.D. research on the theory of wind-driven lake currents with support from our NSF grant. We had quite a lively group, which included a postdoc and graduate students in both Geology and Mechanical Engineering.

The deployment and maintenance of the current meters was a big job, so all of us associated with the Rochester IFYGL project, including the theoreticians, pitched in. Alan and I both spent several pleasant (and a few not so pleasant) days on the lake tending buoys from our 16-foot Boston Whaler. Bill Diment left the university before the end of the project, so Graeme and I inherited responsibility for finishing up the field program. Fortunately, Alan cheerfully agreed to direct the recovery of the current meters. During the successful recovery, Alan did much of the required scuba diving and then helped analyze the data. His enthusiastic involvement in the field work along with his theoretical work was to become a hallmark of Alan's entire career.

During Alan's third year of graduate school, the academic year 1973-74, I was away on sabbatical leave in Munich, Germany. The absence of a research advisor can be a serious setback for many graduate students, but I was confident that Alan would not languish. He was well launched on his research project and strongly self-motivated. In my absence, Alan was guided by Graeme Bonham-Carter and Professor Alfred Clark in ME, an expert in fluid dynamics and a fine mentor.

Alan's Ph. D. dissertation, entitled "Wind-driven circulation in large lakes with spatially-variable eddy viscosity," was submitted in the spring of 1975. In it he developed a new formulation of the hydrodynamics of circulation in a large lake (including the effects of the Coriolis force), in which the eddy viscosity (the usual parameterization of turbulent momentum transport) is allowed to vary spatially in a realistic manner. He applied his formulation to the idealized problem of a pure drift current in an infinite body of water of uniform depth in order to make comparisons with other formulations of the turbulent transport. He also did detailed computations of wind-driven circulation in Lake Ontario and showed how the structure of the coastal jets depends on the assumed spatial dependence of the eddy viscosity. In particular, his model predicted a strong local downwelling in the Rochester embayment that was absent from the flows computed using the traditional constant eddy viscosity, but clearly present in the field data. The results of his dissertation were published in two papers, one in the Journal of Physical Oceanography and the other in the Journal of Great Lakes Research.

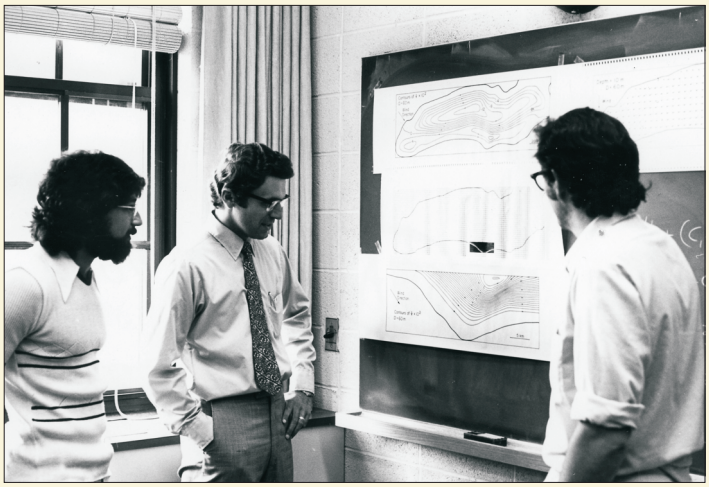
Alan defended his dissertation in spring 1975, completing his Ph.D. program in less than four years. He had offers of a postdoctoral fellowship in NASA's oceanography group and a research position at the Great Lakes Laboratory in Ann Arbor, but he decided to accept the opportunity to start a new research group in lake dynamics at Oak Ridge National Laboratory, where they were interested in problems of thermal pollution of lakes. Alan put together an active group of researchers and under his leadership they worked on a number of interesting fluid dynamical problems. Several of us at Rochester visited Alan's group at Oak Ridge during his tenure there, including Professor John Molyneux, who spent an entire sabbatical year there and began his long-term collaboration with Alan on problems involving applied mathematics.

After a few years of doing mostly fluid dynamics, Alan was presented with the intriguing problem of locating buried barrels of hazardous waste at the Oak Ridge site.

No accurate record of the location of these buried barrels had been kept and there was new concern about them leaking toxic waste into the groundwater. Alan took on this problem with his usual enthusiasm and this new work was soon to change the course of his career. He approached the problem with great ingenuity and developed a new technique for high-resolution, shallow seismic imaging, with which he succeeded in locating the barrels. He later developed other techniques for probing shallow geological structures using ground-penetrating radar and magnetometry, and he applied all these various techniques to a fascinating range of problems, including locating bedrock to support construction, imaging the fossil remains of the largest dinosaur ever discovered, and mapping out buried archeological sites. In all of this work, Alan demonstrated his extraordinary aptitude for both practical field work and sophisticated mathematical analysis.

I was delighted when Alan moved to the University of Oklahoma as Schultz Professor of Geophysics. I knew that this would allow him the freedom to explore new areas of application of the novel techniques he was developing, and I was confident that he would be an inspiring teacher. I know that some of Alan's colleagues will describe his career at Oklahoma in this publication, and I look forward to reading their accounts. Throughout his career, Alan was extraordinarily independent, creative and productive, and he was involved in a fascinating array of scientific activities. Who knows what new adventures he would have embarked on if he hadn't been struck down at the peak of his powers. ■

John H. Thomas is Professor of Mechanical and Aerospace Sciences and Professor of Astronomy at the University of Rochester. He has been at Rochester since 1967, and from 1983 to 1991 he was University Dean of Graduate Studies. His research interests have been in several areas of geophysical and astrophysical fluid dynamics, especially in solar magnetohydrodynamics. He was Alan Witten's Ph.D. supervisor at Rochester.



(Left to right) Alan Witten, Jack Thomas and Graeme Bonham-Carter discussing their numerical computations of wind-driven circulation in Lake Ontario in 1973. Their work was sponsored by the NSF as part of the International Field Year for the Great Lakes.



Alan Witten: Friend and Colleague

by **Tony Devaney**

The first time I met Alan, he kicked me in the stomach and knocked me down. This was the beginning of a friendship that lasted for over 30 years; a friendship that began in a martial arts class at the University of Rochester and ended, sadly, in Alan's death last month. Although Alan is gone, he left behind both personal and professional legacies and wonderful memories of his time spent here with his family, friends and professional associates. I fondly remember Alan's wedding to Cathy, Bar Mitzvahs of his two sons, Seth and Ben, and, very sadly, the death of Alan and Cathy's daughter, Jill. I remember Alan and I working out in the university gym and sitting in my apartment in Rochester watching the (at that time brand new) TV series *Kung Fu* and afterwards going to the student center for a few beers. I remember going on field trips with Alan to image the drug tunnel between Mexico and Douglas, Arizona using ground penetrating radar (GPR); to Albuquerque, New Mexico to image dinosaur bones; and to Idaho Falls, Idaho to image contaminated nuclear dump sites, both of the latter using acoustic tomography. However, I won't write about all these personal memories here. Rather I will write about Alan and my professional collaboration. For besides being my best friend for these past 30 plus years, Alan was also my closest and most important professional colleague.

The Development of a GDT System

After we left Rochester in the mid '70s Alan and I continued to correspond: he from Tennessee, where he was a scientist at the Oak Ridge National Labs (ORNL) and I as a scientist at Schlumberger Doll Research in Connecticut. In the early 80s I had developed an imaging scheme called ``diffraction tomography'' (DT) that accounted for the scattering and other wave-like properties of acoustic and electromagnetic waves when probing geological and other material structures. Although Schlumberger was interested in this possibly new technology I couldn't get anyone at the lab to actually build a "DT imaging system" to perform even laboratory experiments to exploit this new, potentially important imaging modality. Along came Alan.

During a telephone conversation in 1982 I complained to him about the situation and he promised to look into the theory and see if he might come up with some ideas of potential uses of diffraction tomography to problems of interest to the ORNL. It should be pointed out that, at this time, this new "technology" of DT was nothing more than a "reconstruction algorithm" that used hypothetical scattered field data to generate a quantitative image of a hypothetical body being interrogated in hypothetical experiments by acoustic or electromagnetic waves: it was mathematics pure and simple with no actual physical system to perform the experiments and generate the data required by the algorithm.

A few weeks after talking to Alan he called with the exciting news that he had the DT algorithm all coded and tested in computer simulations of subsurface acoustic imaging of low level nuclear waste sites. The next step he announced was to actually build an acoustic DT system to be used in field tests. Needless to say, I was flabbergasted. Not only had Alan mastered the details and intricacies of the theory underlying what he and I would later christen Geophysical Diffraction Tomography (GDT for short), but he had also coded the GDT algorithm in Fortran and performed extensive computer simulations for an important application of interest to ORNL as well as to many other government research establishments. But this is what made Alan one of the premier geophysicists of his time: he could take a highly mathematical and abstract theory and reduce it to practice. He also improved upon the basic theory and extended it in directions that few, if any, are capable of.

Alan's GDT System

At this point I should describe in broad and non-mathematical terms exactly what GDT is and how Alan's GDT system worked. The basic idea is to use an array of sources of sound (transmitters) deployed along the surface of the earth and an array of receivers

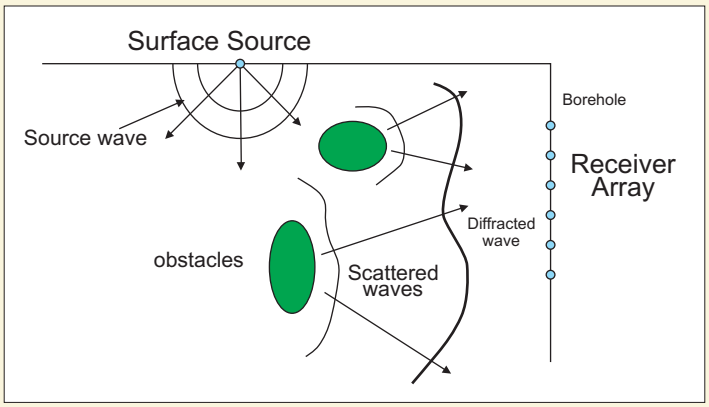


Figure 1. In GDT a surface source generates a sound wave that scatters off of obstacles thus producing a diffracted wave that is measured by the receiver array. The GDT reconstruction algorithm can generate an image of the acoustic properties of the obstacles from the measured diffracted waves generated from such data collected for many source locations.

(basically microphones that can detect and record these source signals) strung out down a nearby water filled borehole as illustrated in figure 1. Alan used a single source that was moved from point to point on the earth's surface as the source array and an array of 32 specially designed microphones as the borehole receivers. At each source location a pulse of sound is generated that then propagates outward and through any obstacles, such as waste containers, that lie in the path of the propagating sound wave. The situation is similar to what occurs in medical X-ray tomography where the sound waves play the role of the X-rays and the obstacles play the role of the tumors that are to be imaged by the X-ray CAT (standing for computer aided tomography) scanner. Unlike X-rays, however, sound waves do not propagate in straight lines but rather suffer scattering and diffraction as they propagate from source to receiver array. Although the situation is much more complicated than that of X-ray CAT it is still possible, using the well-known laws underlying wave propagation and scattering, to derive a reconstruction algorithm that generates an image of the acoustic properties of the obstacles for this more general type of tomography and this is the algorithm that formed the basis for Alan's GDT system.

In his initial experiments Alan used a shot gun that was fired into pre-dug and water filled holes at various surface locations as his surface sound source. You are probably familiar with this source, called a Betsy, from the opening scenes of the first Jurassic Park movie This scene was motivated by Alan's discovery of Seismosaurus, the longest dinosaur every discovered, using GDT, a discovery that won Alan considerable fame due to articles that appeared in The Wall Street Journal and The New York Times, as well as an appearance on the PBS special series *The Dinosaurs*!



Figure 2. Alan and his graduate student Greg Calvert at the Cold Test Pit in Idaho Falls in 2000. The receiver array that Alan built in the 1980's, and that is still in use, is shown extending out of one of the plastic cased boreholes.

Alan Witten: Friend and Colleague continued...

In later work Alan replaced the Betsy with a simple steel plate that was hit with a heavy hammer. I show in figure 2 a picture taken of Alan in 2000 with one of his former OU graduate students, Greg Calvert, who is poised to slam the hammer onto the steel plate at the Cold Test Pit in Idaho Falls, Idaho. This picture shows a number of plastic cased boreholes and Alan's specially designed and built receiver array sticking out of the borehole to the rear of Alan. Notice that Alan is directing the operation and not swinging the hammer.

The Intervening Years

After the initial testing of his GDT system Alan was off and running. In short order his name was known by virtually every dinosaur enthusiast in the country due to his discovery of Seismosaurus using GDT. The New York Times referred to him as the Dynobuster, a name that he was kidded with for many years after the article appeared. I remember my older daughter Liz calling me excitedly from Virginia Tech, where she was a student, with the news that Alan was on TV on the PBS special series *The Dinosaurs*. All of this notoriety never went to Alan's head. If you mentioned it to him he would give that little laugh that he had and brush it off as unimportant or irrelevant.

In late 1989, just before he left ORNL to take a Professorship at OU, Alan suggested that we submit a joint proposal to the Department of Energy (DOE) for fundamental studies in GDT. We received the grant, which required us to perform a number of field studies in Arizona, New Mexico and elsewhere, and which led to a number of fundamental advances of GDT theory. Since that time we collaborated on a continuous basis until Alan's untimely death. There are many memories from these years but I will include only one that stands out in my memory as the most amazing display of real world data processing that I have ever witnessed.

Imaging Pit 9 at Idaho Falls

In the late '90s Alan and I were awarded a new grant from the DOE to employ GDT to image buried nuclear waste sites at the Department of Energy's nuclear waste facility, located in Idaho Falls, Idaho. The job required extensive field tests using acoustic GDT to identify the location and condition of buried nuclear waste containers in Pit 9, a notorious dumping site that was purported to contain numerous canisters of nuclear waste that had been dumped throughout the '50s and '60s without regard for the potential disastrous effects. The grant was one of the key projects of Northeastern University's NSF funded Center for Subsurface Sensing and Imaging Systems (CENSSIS), of which both Alan and I were members.

In 2001 we conducted a crucial field test to validate the basic utility of GDT for imaging Pit 9. The problem was that no one knew what the pit actually contained, so how could we convince the DOE that the images that we were generating were meaningful or representative of what was in the Pit? I will never forget a meeting that Alan, Mike Silevitch, the director of CENSSIS, myself, and Dr. Sean Lehman, one of the team members from the Lawrence Livermore National Laboratories, had in my hotel room on the morning that we arrived in Idaho Falls. The meeting's purpose was to process the latest Pit 9 data in preparation for a two-hour presentation to be given the following day to the project's sponsors. We had three laptops simultaneously computing three-dimensional images of the Pit 9 subsurface that we were trying to correlate and interpret via visual inspection. We were getting nowhere fast since we had no idea what to look for and soon desperation set in. Mike, visualizing the termination of one of CENSSIS's key projects, was wringing his hands and urging us on, begging us that we come up with something, anything, that would show that GDT actually generated sensible images of the Pit. At this point a light came into Alan's eyes and he took his laptop and went off to his room promising to be back in short order with solid "proof" that the GDT images were meaningful. How he was to accomplish this no one had a clue but he was our only and last hope and we all breathed a sign of relief: Alan will come through – he has to.

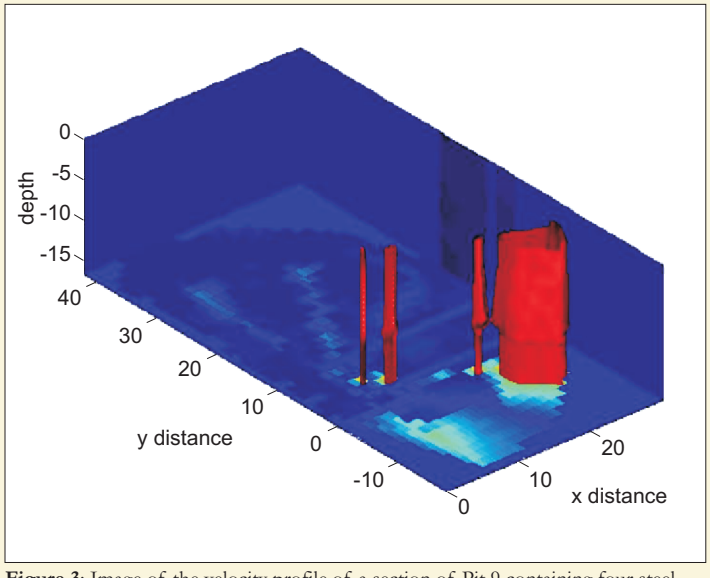


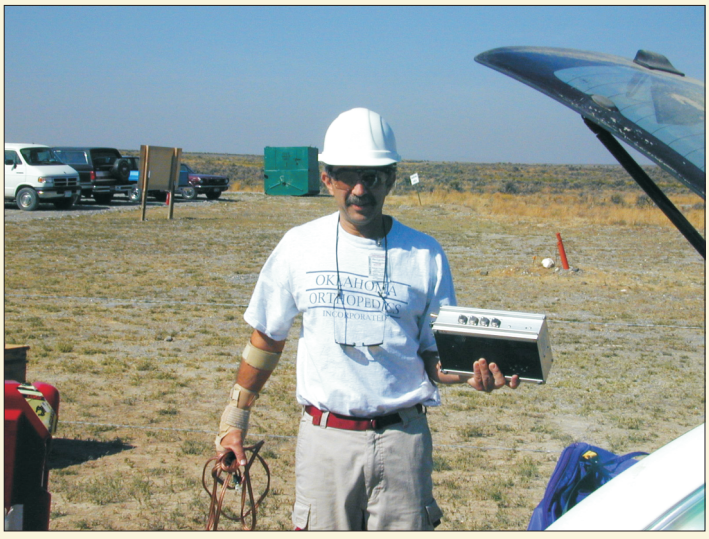
Figure 3: Image of the velocity profile of a section of Pit 9 containing four steel boreholes obtained using GDT. The image was obtained by thresholding the raw GDT image to display only very high acoustic velocity details and clearly shows the four boreholes. The distorted character of one of the bore holes is due to limited scattered field data acquired from that particular borehole.

About an hour later Alan returned with a big grin on his face and with his laptop in hand. On the screen were beautiful images of the only structures within Pit 9 that we absolutely knew were there. They were images of the steel boreholes that were used to house the GDT receiver arrays used in the data collection and that were clearly and unequivocally shown on the Pit 9 drawings. Alan had adjusted the threshold in the images generated by the GDT algorithm so that only the objects with the highest acoustic velocity were visible and these were the known Steel boreholes. It was an absolutely beautiful and unequivocal demonstration of the power of GDT imaging and, needless to say, saved the day. The DOE went on funding the project for three years during which time Alan generated a number of images of Pit 9 and other waste pits within the Idaho Falls complex that have since been verified by independent tests using GPR and other imaging modalities.

The Future

It is ironic that the last time Alan and I talked was on the phone on the afternoon of his heart attack when he invited me to come to OU to give a colloquium on April 7. During my visit we planned to go on a long bike trip (Alan had a number of bikes) and work on a paper that we had started a few years ago and never got to finish. I will always remember that last conversation since it summed up Alan to a tee: bike ride and work on a research paper.

Although Alan is gone, his memory and work survive. His research has had a pronounced effect on the field of subsurface geophysical imaging. I was delighted to hear that his younger son Ben plans to continue in Alan's footsteps. He is entering Stanford University this coming Fall to pursue a Ph.D. in geophysics. ■





Alan Witten and Archaeology in the Middle East

Thomas E. Levy, Professor, Department of Anthropology, University of California, San Diego

Over the past 16 years I had the good fortune of working closely with Alan Witten on a series of archaeology projects in Israel and Jordan. During this period of time Alan developed a passion for applying his knowledge of geophysics to the interdisciplinary goals of archaeology. By the time of his tragic death, Alan had a major book in press entitled *Handbook of Geophysics and Archaeology* that will be published this year by Equinox in London. Alan's far-ranging talents carried him to the Middle East where he unleashed his intellect to become one of the leading advocates, innovators and leaders in the field of geophysics and archaeology.

Over the years, we spent more time together in the field than we did back in the USA. In fact, our inter-continental collaboration was solely based on field work that translated into a number of published papers. These evolved from the use of snail mail, faxes and Fed Ex to the internet. It is ironic that Alan, so gifted a physicist, didn't really like to use e-mail but preferred the telephone. He liked the personal touch. Alan wanted to talk – not just about business but to find out how you and your family were really doing.

Our relationship started when Alan was working at Oak Ridge in Tennessee and I was the assistant director of the Nelson Glueck School of Biblical Archaeology (NGSBA) at the Hebrew Union College in Jerusalem, Israel. Back in 1989, Avraham Biran, the noted Biblical archaeologist and director of the NGSBA, handed me a series of letters from Alan regarding his interest in doing some geophysics at archaeology sites in Israel. Biran, in his 80s at the time and from the old school archaeology, didn't appreciate what geophysics could do for archaeology so he let me deal with the letters. One of the letters included a copy of some newspaper articles from The New York Times and The Wall Street Journal explaining how Alan, using geophysics, had discovered the largest dinosaur skeleton in the world which he called Siesmosaurus. Alan used a geophysical tool that he helped pioneer called Geophysical Diffraction Tomography "GTD", and if you saw the beginning of the Spielberg movie "Jurassic Park" – the geophysics portrayed there are based on Alan's work. Always one to take a gamble on high-tech and archaeology, Alan Witten sounded like my kind of researcher.

Alan flew out to Israel in 1990 with a mountain of geophysics equipment and some colleagues to help him in the field. At the time, I was digging an unusual ancient settlement from the Chalcolithic (ca. 4500-3600 BC) period – a time when metal working was first discovered, fruit growing developed, the earliest temples emerged and the first institutionalized social inequalities (chiefdoms) were formed. At the ancient village of Shiqmim located in Israel's northern Negev desert (and in the middle of an Israeli army firing zone), we had found evidence of over 20 underground rooms and tunnels that represented a kind of troglodyte community. The question was just what were they for and how extensive were these subterranean complexes. Alan had brought three different geophysical tools with him to the field, but GTD worked the best. Even before he got on the plane, Alan had to improvise. Standard GTD, as practiced at the time in the USA with large research budgets, had the luxury of using truck-based drilling rigs and small explosive devices to produce the much needed sound source for subterranean imaging. We simply didn't have the funds to hire a truck in Israel; and try getting an eight gauge chassis mounted shot-gun through Israeli customs! Instead, Alan brought a hand auger, a metal sound plate and a sledge hammer for us to use. Studying his lap-top computer in the field, we immediately saw significant results—a long underground tunnel leading somewhere. However, time had run out as the Army needed our area for their exercises.

Alan returned to Israel in 1993 to join me as part of a UCSD expedition to Shiqmim. I had just joined the faculty at UCSD as an assistant professor. Alan set up his equipment in an area over 300 meters from our main excavations to test just how extensive the underground architecture was at the site. That year, Alan borrowed a large SiliconGraphics computer unit from the company in Tel Aviv and operated it out of the rented minibus that he drove out to our desert site. As the data started to appear on the computer screen, we were amazed to see that the entire hill was catacombed with underground rooms. We did ground-truth tests by digging in those areas that Alan imaged and proved that his work was correct. These data were instrumental in proving the existence of a huge underground storage system that was central to the rise of chiefs in this ancient society. Our published results gained a lot of scholarly and popular attention.

While Alan loved the deserts of the Middle East, he was also partial to a clean bed and a healthy Israeli or Jordanian breakfast served at the best available hotels in our research areas. In all the years we worked together, Alan never slept under tent canvas. But Alan was no prima dona – he simply liked to ensure that he had a good night's sleep to maximize his performance in the field. Unlike many specialists who work with archaeologists, Alan always brought his own funding to our projects, making him a unique independent scholar and true partner.

On becoming a professor in the Department of Geology and Geophysics at the University of Oklahoma in the 1990s, Alan held the Schultz Chair in Geophysics. After many years at Oak Ridge, Alan was prepared to take the chance of leaving the security of his work with the government for a new life in academia. During this period, he joined me in a series of new archaeological projects in Jordan. Although we spoke over the years, the last time I saw Alan was when he came to the field in 2002 to help us by using geophysics to explore one of the largest Iron Age (ca. 1200 – 500 BC) copper metal factories in the ancient Near East. The results of that work will be published in coordination with Alan's remarkable young sons, Seth and Ben. Seth had joined his father on that last expedition to Jordan. As a university professor, Alan's gifts as a teacher and communicator grew every year. He could make the most complex physics concepts understandable for the 'science challenged.'

I deeply miss Alan as research and field colleague. We had many years of fruitful, good fun, meaningful collaborations and friendship. ■



Alan Witten teaching about the day's geophysics results at the UCSD Archaeology Field School in Jordan, 2002.



Alan Witten (left) and Tom Levy (right) at the Iron Age (ca. 1200 – 900 BC) metal production site of Khirbat al-Jariyeh, Jordan in 2002.



Memories of Alan Witten

Delivered February 14, 2005 at a Memorial Service in Norman, Oklahoma
by **Marty Lichtman**

Scientist, researcher, pioneer, innovator, mystery hunter, teacher, colleague, son, brother, husband, father. Just some of the words that describe the man we come together today to remember: Alan Joel Witten.

For my family, he was our friend. A friendship of two families who came to Norman, Oklahoma from opposite directions, with the hope of enjoying a new life in a new place. A friendship exemplified by his recent offer to help me by coming onto the board of directors of the university's Hillel in order to try to fulfill our shared dream of mentoring young adults.

Alan was a friend to all of you. Your outpouring of concern and support for Cathy, Ben and Seth over the last few days has shown this to me. And I am sure that it is in return for the kind, compassionate man that Alan was to each of you. Quiet and thoughtful, caring and concerned, I don't ever remember seeing Alan angry or upset. And if there was something that bothered him, he worked through it with the same even temper and laid back personality that defined him. A personality that made him a wonderful husband to Cathy and a doting father to his sons, Ben and Seth, and his daughter Jill of blessed memory.

He loved his family. Most of us are there for our children, but I am not sure we could hold a candle to Alan and his dedication to his sons' successes. Teaching, guiding, supporting, working with, ready to run to their side at a moment's notice. Alan was a pretty special dad. And he wasn't just that for his own children. More than once did my children call Alan for help with a physics problem that their own father was not smart enough to understand. More than once did Alan take in my children for a day or weekend so that Mom and Dad could get away on business or just have some time alone. More than once did Alan give something to my kids who needed or wanted an item, just because he had a spare. Alan was a pretty special dad.

Even as he left us, Alan touched the lives of a new group of children. Collapsing on his bike in front of Roosevelt Elementary School, those still around at that hour rushed to his aid. The next day, a little bear with a get-well card, hand made and signed by the children in the fifth grade, arrived at the hospital. And after his passing yesterday, the school asked if they could dedicate their "Jump for the Heart" Valentine's Day fund-raiser today in Alan's memory.

I heard Cathy say that she did not regret one decision that they made in their life together. So I say we should not be here to mourn Alan, but to celebrate his impact on our lives. Lives that were made better because of his presence and his friendship. Lives that were made better because of who he was. Lives that were made better because he cared about each of us. ■

Dr. Alan Witten: The Real Indiana Jones

by **Ceci Gillespie**

When Alan enters your life the adventure begins!

My sister Jo Anne and I owned 600 acres of 80 foot cliffs, rocks, trees and the ruins of the headquarters for the Confederacy in Oklahoma. While we were in the process of activating a dimensional limestone quarry on this land, we were inundated by historians and treasure hunters touting the same tale….Jesse James….Knights of the Golden Circle….Confederate Depository…..millions in gold, silver and jewels. They caught our attention. We tried metal detectors, but they only go so deep. Digging through the clay and rocks was heavy work and didn't get us anywhere. We seemed to be standing on serious treasure with no way to get at it.

Helping us at the time was Dr. Bob Faye with the Oklahoma Geological Survey, who led us to Dr. Alan Witten, the Schultz professor at the University of Oklahoma who had extensive experience in applying geophysics to archeology and paleontology. Alan's imaging of dinosaurs was featured in the movie *Jurassic Park*. He found a 3500 year old underground village in Jordan, discovered Captain Kidd's sunken pirate ship off the shores of Madagascar and sometimes disappeared for days working with the CIA on classified assignments.

Dr. Witten, became so intrigued with all the treasure information and the history of our land that he made our site a field trip for his "Adventures in Geophysics" class at the University of Oklahoma. The class was intended for students who might not otherwise know about geophysics. Our group would try to figure out what the carvings meant, and when we came up with a site Alan and his class would come with magnetometers, electromagnet induction and ground penetrating radar, and do three dimensional underground images. We now have a number of 100 square foot sites that we know have no buried treasure.

Alan was an extraordinary teacher. We so enjoyed watching him inspire his students. He would jump from rock to rock to show them carvings and caves. Jo Anne and I were fortunate to become friends with his wife Cathy and sons Seth and Ben. Alan's love for his family seemed to be the only thing stronger than his passion for teaching. ■







Alan Witten: A Personal Remembrance

by **John Molyneux**, Associate Dean for Academic Affairs, College of Engineering, Villanova

Alan Witten was a great friend and valued colleague for nearly 30 years. I met Alan when he was a student at the University of Rochester and I was a fairly new faculty member. Since that time we have worked on a wide variety of scientific problems of mutual interest. Our families have shared good times as our children matured. As I write this, I am recalling times that Alan and I ran together during lunch time in Oak Ridge, Tennessee. Although I, perhaps because of the decade and a half that separated our ages, have slowed down quite a bit, Alan never lost his vitality and enthusiasm. This, of course, is just one of the reasons that his loss is so difficult to accept for his family and all of his many friends.

In the next few paragraphs I will discuss some of the problems that Alan and I struggled with that led us to publish or present about 14 papers together. At the beginning of our professional collaboration, we were interested in modeling transport phenomena in which randomness or stochastic elements played an important role. Alan was working at ORNL (Oak Ridge National Laboratory), and was involved in the assessment of environmental impacts of power plants and other construction projects.

I visited ORNL on a sabbatical leave (1979-80), and we presented a number of joint papers on topics such as "Accidental Release of Pollutants," "A Stochastic Model for Pollutant Transport" and "A Stochastic Method for Predicting the Dispersion of Thermal Effluents in the Environment." In addition, we coauthored papers on "Diffusion of a Passive Scalar with Random Advection," and "A Stochastic Method for Predicting the Dispersion of Thermal Effluents in the Environment." My family lived in Oak Ridge while the Wittens were in Knoxville, however, we spent many happy hours together. I remember, in particular, our Fourth of July party at Alan's place. I had purchased a variety of fireworks (legal in Tennessee) and while setting them off in Alan's driveway managed to send a rocket into the side of Alan's house. Fortunately, no one was injured and a hose was handy to prevent real damage, but it's a Fourth I won't ever forget.

Our next period of lengthy collaboration dealt with a completely different set of problems. Alan was still at ORNL, but his interests had shifted to the fields of tomographic imaging and, in particular, of geophysical image inversion in which Alan is recognized as an extremely innovative and important contributor. Again, I visited Oak Ridge on a sabbatical leave (1990-91). However, this time we rented a place in Knoxville near Alan and Cathy so that we could car pool and, of course, I refrained from further purchase of fireworks. Alan and I began looking at problems involved with tomographic imaging using very low frequency (essentially static) electric and magnetic fields and this collaboration led to papers "Impedance Tomography: Imaging Algorithms for Geophysical Applications" and "Imaging Algorithms for Geophysical Applications of Impedance Tomography," "Numerical Impedance Tomography" and "Imaging Algorithms for Geophysical Applications of Impedance Tomography." The term impedance in these papers refers to the usual electric circuit concept of the ratio of voltage to current. The aim of impedance tomographic imaging is to apply voltages (currents) to the surface of a body to be investigated and to measure the resulting current (voltages). Using the data so obtained the tomographic algorithm then determines the electrical properties of the body, i.e., the conductivity and permittivity. Of course, there were a number of practical applications that motivated this work. In particular, as I recall, the location of buried hazardous waste was of primary importance to ORNL, but there are also applications to medical imaging, nondestructive testing and process monitoring.

One of Alan's strengths was his ability to develop novel and interesting solutions to problems of great practical interest. Alan saw the advantage of dealing with broadband imaging algorithms using such tools as seismic waves and ground penetrating radar. Here the underlying theory may be described as diffraction tomography which provides a method of producing images of the internal structures (e.g., refractive index variations) of a solid object, such as the human body or the earth, by the observation and analysis of the distortion of energetic waves that are directed at the body. Our work together led to a number of papers including "Ground Penetrating Radar Tomography: Algorithms and Case Studies," "Diffraction Tomography Imaging in a Monostatic Measurement Geometry," "Geophysical Diffraction Tomography: Validity and Implementation" and "Geophysical Imaging with Arbitrary Source Illumination."

A third sabbatical year (1998-99) provided another opportunity to collaborate with Alan. By this time he had been appointed to the Frank A. and Henrietta E. Schultz Chair at the University of Oklahoma's School of Geology and Geophysics, and was recognized as one of the leading researchers in the area of radar tomography and in particular, its use in geophysical exploration. One of Alan's visions at this time was to develop radar tomographic software for field use with a personal computer. In addition, he was involved in the development of a portable radar antenna array for use in detecting underground utilities. I joined the effort to create a user-friendly software package that would be capable of reading radar data from an array of colocated source receiver pairs and process it using tomographic algorithms based on Alan's work. As a bonus, I traveled a good deal with Alan, including a trip to Mala, Sweden (near the Arctic Circle) to investigate radar antennas.

In subsequent years, Alan and I kept in close touch even though our geographical locations have remained considerably separate. Most recently, I reviewed an important paper by Alan in which he developed a technique for separately reconstructing images of complex scattering attributes from limited view measurements. On a more personal note, I had invited Alan to give an invited lecture describing his work as part of the celebration of the 100th anniversary of the founding of our College of Engineering at Villanova University. I shall not now have the pleasure of hearing this lecture, but I know it would have been memorable. I should like to close by recalling the breadth of Alan's accomplishments as a teacher, scholar, mentor, friend and family man. He will be sorely missed by all who knew him. ■



Dr. Witten

by **Ellen Gilliland**, School of Geology and undergraduate

I first met Dr. Witten as a junior in high school when he taught an enrichment course in geophysics at my school over the lunch hour. Going into the first meeting, I knew nothing about the field of geophysics; by the last, I had decided to base my career in it. Geophysics is a broad subject, but it was Dr. Witten's specific work in near-field studies that I found so interesting.

A year later I enrolled at OU, majoring in geophysics. Eager to start classes and get more exposure to geophysics, I was disappointed that I wasn't scheduled for any geophysics classes until late in my junior year. Frustrated, I met with Dr. Witten, hoping for an early start in geophysics. His response was much more than I expected. He offered to let me into one of his own courses the next semester, and, when no one else enrolled for the course, he taught it for me anyway and changed the time to one that worked best for me.

Since then, I've taken at least one of his courses each semester, even though on his part it often meant opening new sections just for me or a few other students or getting departmental approval for me to take them. This kind of effort for students was typical of Dr. Witten. In addition to helping me get a head start on coursework, he made sure that I and his other students always knew about any upcoming field opportunities and invited us to dinner with guest lecturers he brought in. As I write this, I'm studying abroad in Scotland. When I told Dr. Witten that I was considering studying abroad and asked if he knew any good schools for geophysics, he grabbed the phone and started calling his colleagues for suggestions instead of referring me to other people or getting back to me later. He always let me know in advance which of his classes I could take, and before I left for Scotland he was already telling me options for my undergraduate and Master's thesis.

One of my favorite memories of Dr. Witten was on a trip to Idaho in the fall of 2003 doing field work for Idaho National Engineering and Environmental Laboratory (INEEL). The other students drove vans to Idaho over a weekend, but, because I had a wedding to attend, I flew out a day later with Dr. Witten. The project finished early and the other students drove back. Unable to change our flight, Dr. Witten and I were left with an extra day in Idaho. I expected to spend the day bored in the hotel while Dr. Witten continued work at the lab with his colleagues. Instead, Dr. Witten invited me along to the lab that morning where he explained to me the imaging software being used on our data. In the afternoon we went to a sporting goods store, where he showed me all the field gear he had found helpful in his work, and later that afternoon he spent hours giving me advice on internships, graduate schools, and careers in geophysics, and then took me to dinner with his colleagues. I am grateful for all the experience I gained from that day, but the advice Dr. Witten shared especially meant a lot. I had asked him for advice on many things before, but I didn't ask for any that day; everything he told me he shared simply because he wanted me to know and cared about my success as a student. I still remember how enthusiastically he spoke about my own future. As I've continued in school, that conversation has become more meaningful each time I've thought about it and how important it was for me.

Dr. Witten's concern for his students showed in the extra efforts he took for them and in the way he taught. He pushed his students and expected them to work hard because he had confidence in them, and, in turn, his students respected him and wanted to deserve his confidence. He gave carefully organized lectures that made difficult material manageable and clear. One semester he held an unorthodox final, asking each student in the class to meet with him individually to analyze data so that he could see how they had learned to apply the information he had taught. He was eager to help his students understand material and was visibly excited during class or any other time he got to teach people about the work he loved so much.

When he was teaching, it was easy to forget that behind the teacher was an accomplished scientist and mathematician. Even though I knew this, I was still somewhat surprised anytime I learned that a technique we were discussing or algorithm we were using was one he developed. His work was exciting and important. It aided counterterrorism efforts, uncovered ancient cities, detected buried landmines and found treasure on sunken ships. He truly enjoyed it and made many contributions to his field. One of the last times I talked to him, we discussed his upcoming projects and I know that he had other important contributions yet to make.

Although Dr. Witten was always professional in the way he taught and conducted work he enjoyed socializing with his students and colleagues as well. On field trips, he would set work aside and talk with us about books, music, backpack brands, or how best to cook a steak. He had a quick wit and loved sharing anecdotes and bragging about his sons to his colleagues. He drank more coffee than water and looked forward to his family vacations more than any of his adventures in distant countries.

His passing is a great loss to the scientific community and to the university. It is a deeply felt loss for those fortunate to have worked with him or known him well. For me, it is the loss of a mentor. I have sat through his lectures, worked with him in the field, listened to his stories and taken his advice for five years. Perhaps most importantly, he has been an example for me of someone who used his time and life the best he could—doing important work that he loved, teaching others about that work, helping his students succeed every way possible and enjoying his family. Everyone who knew Dr. Witten will remember him in his or her own way, but this example is one he left for all of us. He was a great scientist, teacher and person and will continue to be missed for a long time. ■



Dr. Witten in the field with Nicole Baylor and Ellen (in red), showing them how to collect seismic data using a mallet, aluminum plate, and geophones (sensors).





Memories of a Witten Advisee

Jamie Rich, Doctoral Candidate, School of Geology and Geophysics

Coming to the University of Oklahoma to work with Alan Witten was probably one of the best decisions I've ever made. The opportunities he afforded me far exceeded any opportunities I could have had anywhere else. In less than four years he gave me so many memorable experiences: working on archaeological sites in three different countries; surveying various sites of historical and geological significance; assisting with various projects for law enforcement ranging from local municipalities to the Department of Homeland Security. In discussions with students from other schools I found that they consider themselves lucky to be able to go out to the field to work on just one or two projects. By that standard I do consider myself blessed to have studied under Alan, and I feel very sorry for the future students that will not have the opportunity to experience his enthusiasm for sharing research with them. For those that didn't know him, I would like to share what I believe to be two of Alan's greatest qualities—his drive and determination to finish whatever he set his sights on and his desire to share his experiences with students of all levels.

As an example of his determination, I'm reminded of an opportunity I had to go cycling with him. Cycling is a passion that we both shared, and it would often be the primary topic of conversation while traveling together. Unfortunately, I only had the opportunity to ride with him on one occasion. Prior to one of our trips to do research at Idaho National Engineering Lab, he suggested we take along our bikes. I enthusiastically agreed to the idea. What other advisor would not only permit, but suggest, taking bicycles along for a little recreation while working in the field? We got back from the field early one windy afternoon and pulled out the bikes. We knew that we shouldn't head out with the tailwind, but regardless we headed that way because it was the simplest route out of town. As we rode, we discussed the fact that we were probably going too far and the ride back into a headwind would be tough, but flying out a country road in Idaho with a 20 mph tailwind is hard to turn away from. When we finally turned around to head back, we became immediately aware of our mistake. An easy 25 mph ride turned into a 15 mph struggle. Alan never let up fighting that headwind. I tried to slow our pace a little because I was worried he might be pushing himself too hard, but he refused to slow down and gave it every bit of energy he had the whole way back. That's how Alan attacked everything he did. When he started a project he would give it everything he had and not slow down until it was finished.

The other quality I found most admirable in Alan was his desire to share his experiences and knowledge with his students. He would never hesitate to take students of all levels with him on research trips. Whether the students were Geophysics graduate students or Finance undergraduates, if they showed an interest, Alan would do his best to bring them along so they could share in his adventures. These trips served as great educational experiences that significantly broadened the horizons of the students. Some who had never left Oklahoma became world travelers with Alan. His experiences traveling also gave him great stories to use as an aid to teaching in the classroom.

Alan's great ability to make complex material easy to understand was his best tool for sharing his knowledge inside the classroom setting. In his Adventures in Geophysics class, he was able to teach unsuspecting non-science majors more physics than they ever expected to learn and all without showing a single equation. For anybody who's ever tried that, it's very hard. Anyone who understands the math can derive equations on a board, but to take that material and present it in such a way that it is understood and appreciated without the math, was a skill of Alan's that I do truly admire.

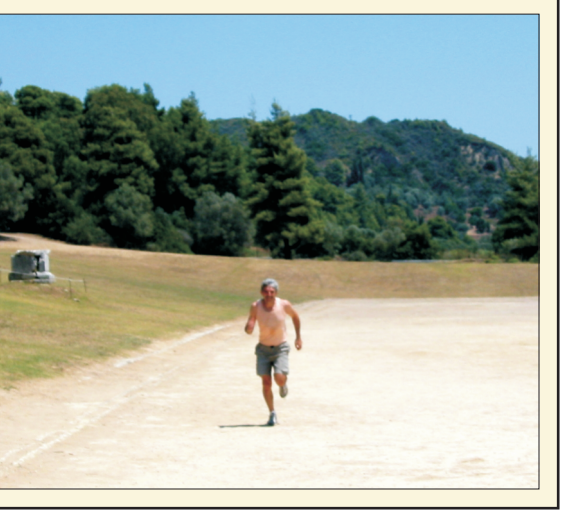
I don't want to mourn for Alan, but would prefer to celebrate everything he did for his students. Alan lived more in his 55 years than most live in 80. His last conscious moments were riding his bike, something I know he loved. We shouldn't mourn, but should be envious. How many people get to do everything Alan did and then spend their last conscious moments participating in an activity they love? I only hope I can be as lucky. Alan, you will be deeply missed by both those who knew you, and even though they may not know it, by those who never had the opportunity to meet you. ■



Seismic at Helike, Greece, 2003

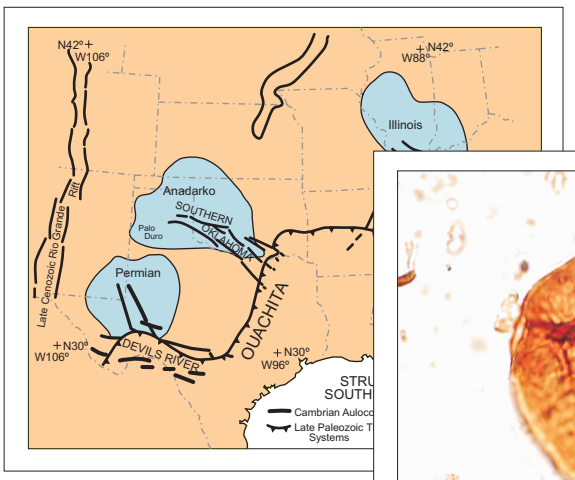


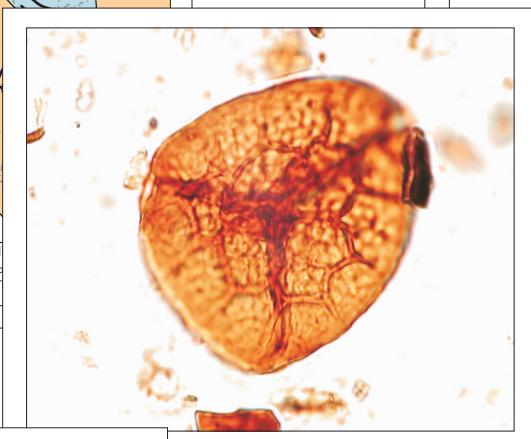
Jamie Rich, Alan and Seth, discussing travel plans with a Jordanian official at a hotel on the Dead Sea Fall 2002

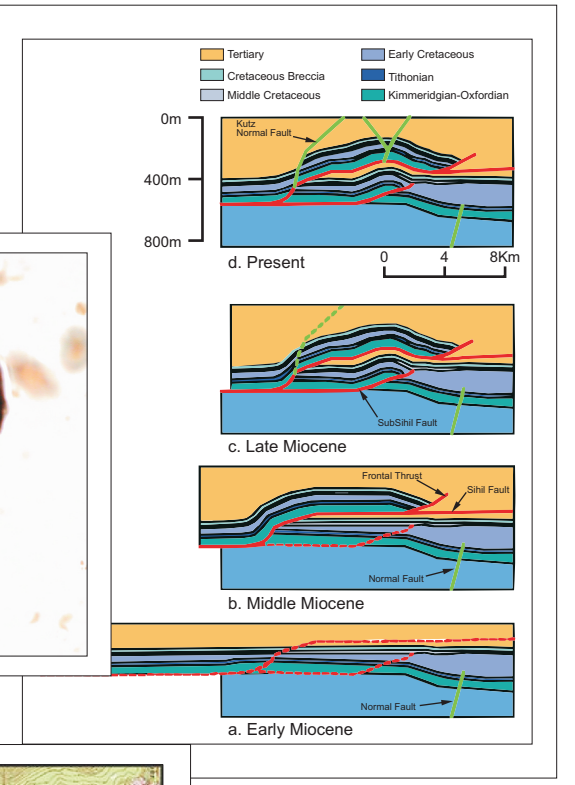


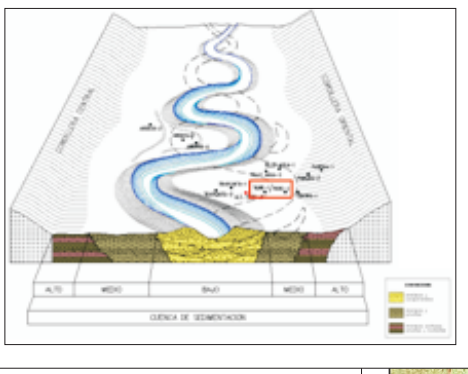
Alan running at Olympia.

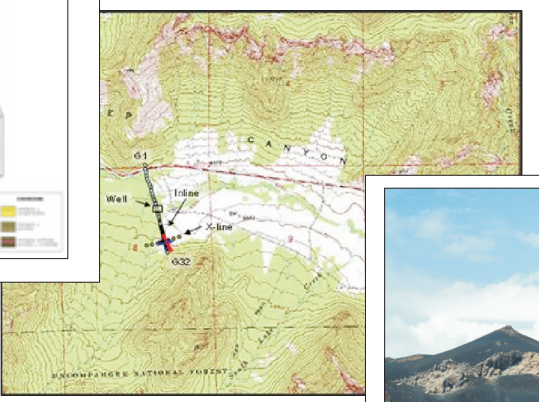
Faculty and Student Abstracts and Articles



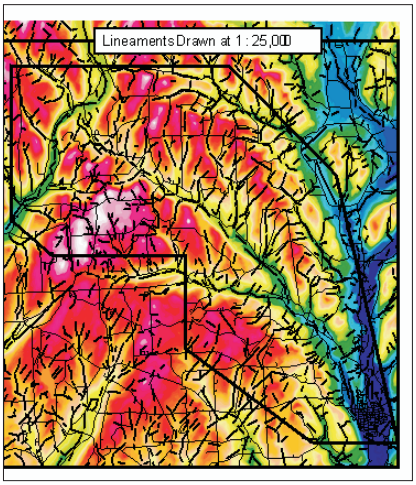


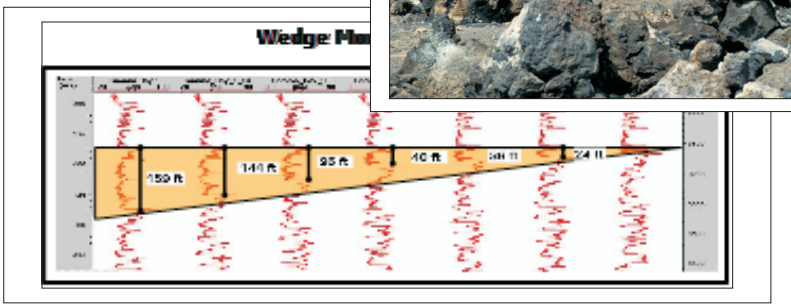












Faculty Abstracts

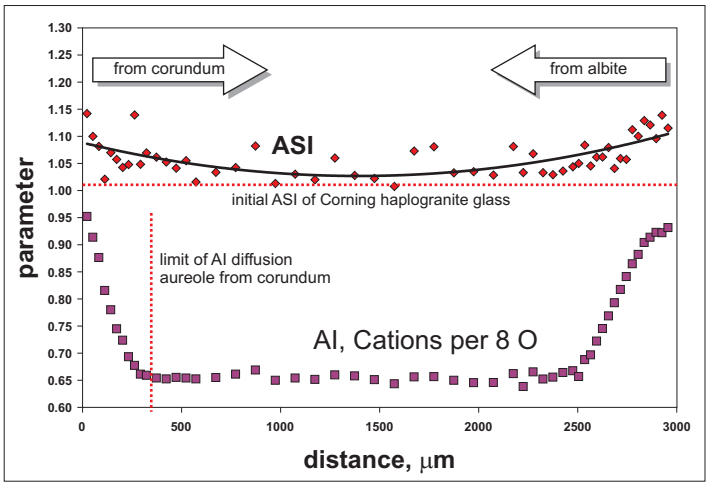


Alkali fractionation and feldspar zonation in granitic pegmatites.

Geological Society of America Abstracts with Programs, 36, 46.

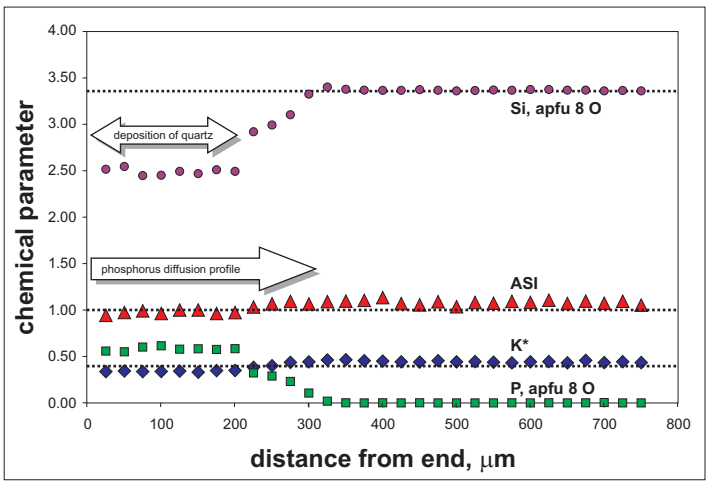
London, D., Morgan, G.B. VI, and **Acosta-Vigil, A.** (2004)

Spatial zonation of alkali feldspars is a fundamental characteristic of granitic pegmatites. Zonation at the scale of the pegmatite body gives rise to Na-rich margins and K-rich centers, to K-rich upper and Na-rich lower portions, and to sequential alterations of albitic and potassic feldspars. Previous models hinged on flux-rich, low viscosity melts to enhance elemental diffusion throughout the entire melt volume and buoyant ascent of aqueous vapor through melt to fractionate K from Na. The high viscosities of hydrous granitic melts at liquidus temperatures (~ 10^5 Pa•s, the viscosity of window putty, at 680°C, 200 MPa H_2O) or below (e.g., ~ 10^8 Pa•s, the viscosity of cold asphalt, at 400°C, 200 MPa H_2O) were thought to work against long-range diffusion, but also would impede the buoyant separation of an aqueous phase. Petrologic experiments have simulated the zonation of feldspars in pegmatites via substantial liquidus undercooling (by ~ 200°C) of high-viscosity granitic melts. Recent experiments have demonstrated that the diffusion and fractionation of alkalis occur rapidly throughout the melt, even in viscous, simple granitic liquids. When chemical potential gradients of the components H_2O, B, P, F, and Al exist in the melt, Na diffuses toward and associates with these components, whereas K diffuses (with or opposed to Na) so as to maintain charge balance on ^{IV}Al. Such gradients are created when fractionated melt boundary layers form at the margins of crystallization fronts, where the accumulation of excluded components such as H_2O, B, P, F draw Na for local charge balance, creating a distal melt enriched in K. Chemical potential gradients also are created by sequential feldspar growth: hypersolvus Na-rich plagioclase tends to be the first-formed feldspar in natural granitic compositions, and its crystallization at one location in an experiment can (re)move sufficient Na to induce K-feldspar crystallization at the opposite end of the (diffusive distance in the) melt volume. The experiments and natural pegmatites, spanning variations of ~ 10^6 in diffusion length, are similar because they originate from the same process: when sidewall crystallization advances inward from the margins, diffusion and fractionation of alkalis is scaled to the size of the body, independent of distance, volume, and time. ■



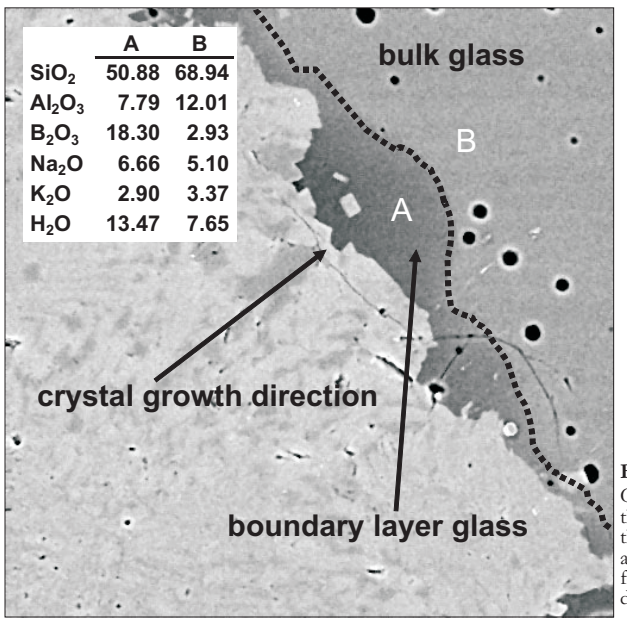
Diffusion of Na and K in Melt

The alkalis diffuse quickly in response to chemical gradients in the pegmatite-forming melt. Here, Acosta-Vigil et al. (2005a) dissolved corundum and albite into a hydrous granitic melt. Even though the Al from corundum diffused < 400 μm into the melt, the ASI value (Aluminum Saturation Index, molar $Al_2O_3/[Na_2O + K_2O + CaO]$) increased also where albite (ASI = 1.00) dissolved into the melt. The explanation of this behavior is that the Na introduced by the dissolution of albite diffused through the entire melt column toward corundum, showing that the diffusion of alkalis takes place rapidly and affects the entire volume of melt.



Melt Speciation Reactions with Phosphorus

London et al. have discovered that the alkalis, Na and K, can be fractionated when concentration gradients of other components exist in the pegmatite-forming granitic melt. In this case, a gradient of phosphorus in melt (green squares) causes Na to diffuse toward phosphorus, whereas K does not move. The variable K* (blue diamonds), molar K/(K+Na), decreases toward the phosphorus diffusion profile. The ASI (red triangles), molar Al (K+Na), shows that the melt becomes more alkaline in the P-rich regions. Phosphorus takes the place of Si in the melt (purple circles) causing Si to be precipitated as quartz. Dotted lines are initial values in the melt before addition of phosphorus.



Boundary Layer Effect

Compositional gradients sufficient to fractionate the alkalis can be developed when components that are excluded from growing crystals accumulate in what are termed liquid "boundary layers" at the interface between crystals and the bulk melt. The sodic fractionation trend was documented in a boron-rich experiment that captured a boundary layer of melt in advance of a quartz – alkali feldspar crystallization front. K* falls from 0.3 in the bulk melt to 0.2 in the boundary layer. ASI drops from 1.00 in the bulk melt to 0.55 in the boundary layer.



Ascension Island, South Atlantic: Deep Plume or Shallow Melting Anomaly?

Barry Weaver, Geology and Geophysics, University of Oklahoma

Ascension Island (7° 56' S, 14° 22' W) is the subaerial manifestation of a broad region of anomalous volcanism on, and adjacent to, the South Atlantic MAR between the Ascension Fracture Zone (AFZ; approx. 7° S) and the Bode Verde Fracture Zone (BVFC; approx. 11.5° S). Zero age MORB from the MAR in this region have Pb isotope compositions more radiogenic than N-MORB and which plot significantly above (positive Δ 8/4) the Northern Hemisphere Reference Line (NHRL), and have LaN/SmN higher and Zr/Nb lower than N-MORB. The enriched character of the MORB volcanism has been suggested to be the product of a plume located near Circe Seamount, at approx. 9° S, 11.7° W, or of a plume located beneath two large on-axis seamounts at 9° 50' S on the MAR.

The volcanic rocks of Ascension Island comprise a diverse basalt – hawaiite – mugearite – benmoreite – trachyte suite. There is significant chemical heterogeneity in the mafic lavas, with high Zr/Nb, intermediate Zr/Nb, low Zr/Nb, and Dark Slope Crater lava types reflecting significant source heterogeneity, as indicated by trace element and Sr-Nd-Pb isotope systematics. Data for samples from shallow boreholes and one deep borehole suggest that high Zr/Nb lavas dominate in the subsurface and that there has been a temporal trend toward eruption of increasingly enriched, and more diverse, lava compositions with growth of the volcanic edifice. Ascension Island volcanic rocks have Pb isotope compositions which plot significantly below (negative Δ 8/4) the NHRL and trend toward St. Helena HIMU compositions.

In addition to Ascension Island, there are numerous seamounts (Circe, Grattan, Stvor, etc.) both on and off the MAR axis between the AFZ and the BVFZ. The locations of the seamounts are closely associated with fracture zones and do not reflect the directions of absolute motion of the South American and African plates (for example, the two large seamounts to the west of Ascension Island are on a flow line parallel to the AFZ). The nature of the distribution of Ascension Island and seamounts between the AFZ and BVFZ does not conform to the classic deep plume model. The geochemistry of Ascension Island and MORB lavas is best explained as the result of melting of shallow chemically heterogeneous mantle, with bursts of excess magmatism when 'pods' of enriched (HIMU-type component) mantle pass into the sub-axial MAR melting zone. ■



Ascension Island: Scoria cones in background (Sisters Peak is the highest cone in this view) with mafic cinders 'draping' the 818 ka trachyte of Daly's Crags, and a guano-spattered aa lava flow in the foreground. [This photo was used in the commemorative edition (OUP, 2003) of Rachel Carson's classic book The Sea Around Us.]



Ascension Island is 98 km2 of spectacular exposure of mafic (basalt to benmoreite) scoria cones and lava flows, and of trachyte and rhyolite lava flows and domes and pyroclastic deposits. [Satellite image courtesy of Space Imaging.]



Mathematical Modeling The Physical Parameters Of Porous Fractured Reservoirs

Evgeni M. Chesnokov, School of Geology and Geophysics, Sarkeys Energy Center, University of Oklahoma

Most reservoir structures can be described in terms of porous fractured anisotropic media models. It follows that an understanding of the elastic and transport (especially permeability) parameters of such media is essential in order to:

- Separate the presence of oil and gas in the reservoir structure
- Estimate the reservoir structure in terms of petrophysical characteristics (crack density, their orientation, size and aspect ratio)
- Estimate in situ stress tensor
- Predict some unmeasured parameters (permeability) using well measured characteristics (P and S -wave velocities, amplitude characteristics -attenuation, scattering, reflection and refraction coefficients).

A number of approaches already exist relating these microscopic parameters to the bulk effective properties of the rock directly probed by large scale seismic measurements. Almost all of these approaches rely on spatial averaging to accomplish upscaling. A major drawback of such methods is that they neglect any effects arising from correlations (statistical order) between the microscopic elements. But this problem becomes difficult to solve when fluctuation of physical parameters are large. It is impossible to use the standard approaches widely applied at present (Mavko, et.al.,1998). From here the necessity of developing a mathematical approach which can be applied for taking into account fluctuations and can allow one to consider any interactions between different structural elements of media appears. These goals can be reached by applications of the Dyson equation (Chesnokov, et.al., 1995,1996,1998 a,b).

Since the problem of determination of effective physical characteristics of media with inclusions is the "many body" problem and can't be solved analytically, an elegant formalism has been developed to describe the effective media properties for complex models. The formalism requires solving the static and dynamic (frequency dependence) problem. An approach presented here uses the Green function for medium which requires the solution of the integral equation (Dyson equation). The kernel of this equation is the operator of physical properties (OPP) which depends on a frequency (in the dynamic case) and can be expressed in a form of diagram series over exact Green functions. In local approximation this operator coincides with effective complex tensor of elastic constants (or transport constants). In order to determine OPP, two approximations are used to simplify the solution and allow us to consider the elastic constants, transport constants and density fluctuations. These approximations are the Correlation Approximation (CA) and General Singular Approximation (GSA).

In the Correlation Approximation tensor of elastic (transport) constants can be presented as a sum of two terms, one of which is averaged over volume tensor of elastic (transport) constants, and the other is the correlation term which reflects the pair interaction between different elements of studied medium.

General Singular Approximation (GSA) allows us to take into account all types of multiple interactions, but in order to do this we have to have some assumptions:

1. elastic or transport field in inclusions should be homogeneous;
2. we consider just the singular part of the second derivative of the zero Green function.

These two assumptions allows us to summarize the Dyson series and to get the rather powerful method for calculation of elastic and transport characteristics of porous cracked anisotropic media (Shermergor, 1977, Chesnokov et.al, 1998, Bayuk,Chesnokov,1998).

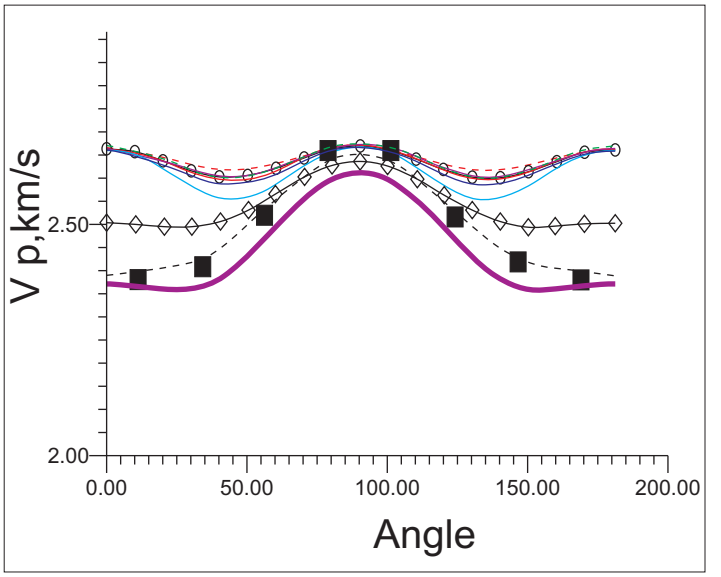


Fig. 1-A. The Vp behavior in an anisotropic medium generated by void elliptical inclusions.

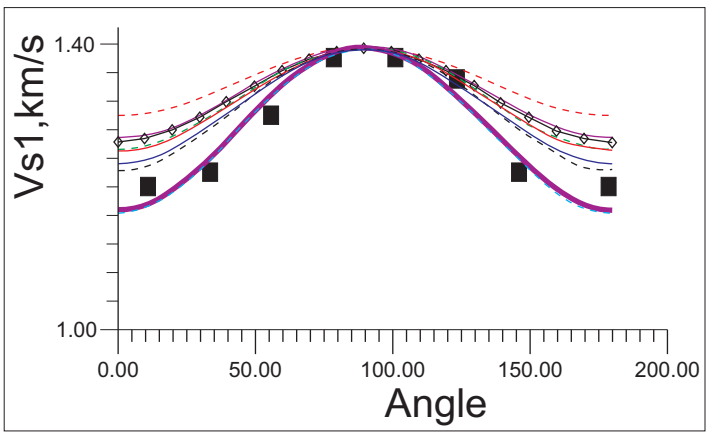


Fig. 1-B. The behavior of Vs1 for the same model.

Mathematical Modeling, continued...

As can be shown (Chesnokov et all.,1995, Bayuk, Chesnokov, 1998) the tensor elastic constants C* is the function of six groups of the parameters, which define the structure of the studied medium, namely:

$$C^*_{ijkl} = F(\Omega_i, R_i, X_i, a_i, x_i, M) \quad (2)$$

where:

Ω_i is the distribution function (DF) of inclusions over angles; R_i is the distribution function (DF) of inclusions over crystallographic axes (in a case of anisotropic inclusions); X_i is the DF of inclusions over aspect ratio in the case of elliptical types of inclusions; a_i is the DF of inclusions over size; x_i is the DF of centers of inclusions over coordinate (space statistics); **M** reflects the existance of liquid, gas and brine inclusions simultaneously in studied medium.

The comparison of results of calculations of C^*_{ijkl} with the measured ones for synthetic rock samples (Rathorn, et.al,1995) shows complete agreement between theory and experiments.

Separation of oil and gas inclusions.

Using the GSA method we can find the parameters sensitive to the type of fluid in inclusions. **Fig. 2** shows the possibility of separating oil and gas inclusions in anisotropic media. We are using a clay matrix with cracks which are modeled as aligned ellipsoids with an aspect ratio of 0.03, being typical of clay reservoirs. This figure reflects the important fact that **inclusions (gas or oil)** produce anisotropic media. The observed singularity is explained by the fact that differently polarised shear waves intersect at a certain angle value.

Prediction permeability using body wave velocity measurements.

Taking into account that we can calculate elastic and transport characteristics for the studied model simultaneously , we can find the correlation between them and estimate values of permeability using body velocities measurement (**Fig. 3**).

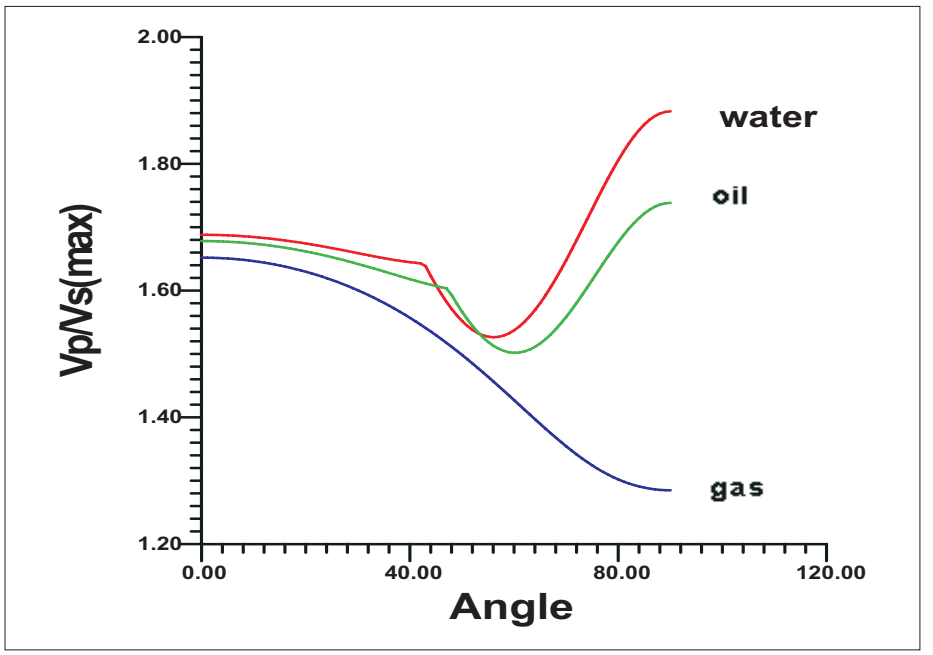


Fig. 2. Ratio of Vp and Vs Velocities for a clay reservoir model for a wave propagation in the plane normal to a fracture plane.

Conclusions

The developed approach exhibited in this paper allows us:

1. To solve the problem of construction of macroscopic equations and obtain the exact expressions of effective tensor of elastic modules for various distribution functions of fractures, including size, aspect ratio, space statistics and etc.
2. To find the features that distinguish gas and oil saturated fractures.
3. To calculate the Green function (operator of physical properties in dynamic case) that leads to determination of dynamic elastic constants which allows us to estimate the frequency dependence of multiscale fractured media.
4. To investigate the stress dependence of elastic and transport characteristic of fractured media. ■

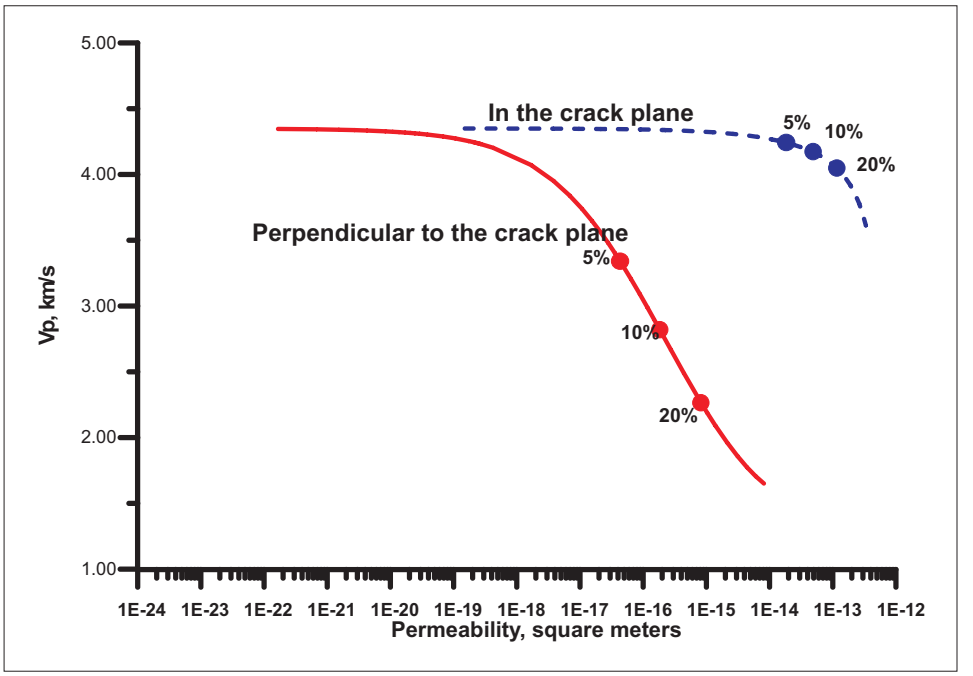


Fig. 3. Calculations of the relationship between Vp velocity and permeability for anisotropic medium of the hexagonal type of symmetry.



Vertical zonation of alkalis in mineralized granites and pegmatites.

Invited keynote lecture for special session on Rare-Element Geochemistry of Ore Deposits (R. Linnen, convener).
Geological and Mineralogical Association of Canada, Abstracts Volume, 29, 197.

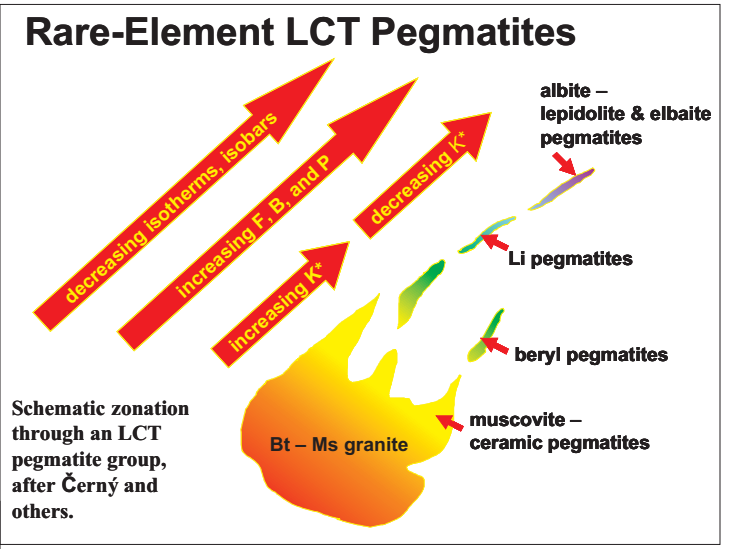
Dr. David London

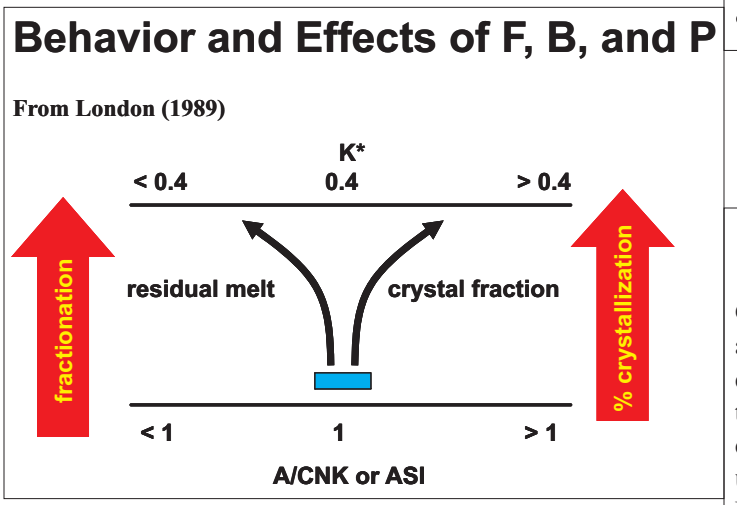
Vertical zonation of Na and K in mineralized granite stocks and pegmatites can be generalized as follows. In Cu-Mo-W porphyries, deeper portions of stocks are "granitic", but K* (= K/[Na+K]) increases upward. In F-rich "apogranites", K* decreases upward. Within individual pegmatites, K* increases upward, but throughout a pegmatite group, K* decreases as pegmatites evolve to the albite-lepidolite subtype. Though whole-rock data to substantiate these generalizations are sparse, the question remains, "what drives alkali zonation within each of these systems?"

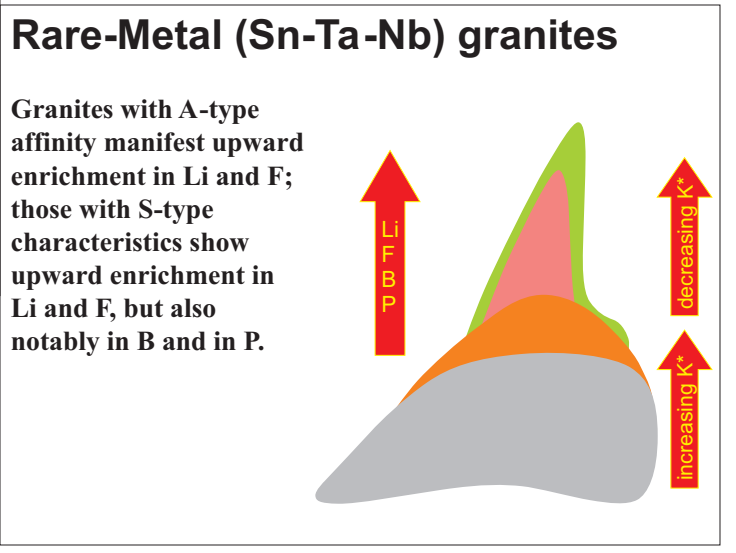
In base-metal porphyries, the vertical increase in K* is attributed to a redistribution of alkalis between coexisting feldspars via saline (Cl) aqueous fluid in a thermal gradient that decreases roofward. Exsolution of an aqueous chloride solution also slightly increases K* of a coexisting granitic melt, so vesiculation and vapor loss through apical portions of the magma bodies should promote the same trends seen in K* of the whole rocks.

The upward decrease of K* in "apogranites" is attributed to hydrothermal "albitization", which has been linked qualitatively to the F-rich nature of these granites. Recent experimentation confirms that K* of granitic melt decreases when B, P and F increase via the crystallization of quartz-feldspar assemblages. Melts become increasingly sodic and alkaline as the crystallizing assemblage becomes more siliceous (quartz-rich), aluminous, and potassic (micas, tourmaline, topaz become abundant); thus, there is marked divergence in the composition of fluxed melt and coexisting crystalline assemblage. Miscibility between fluxed melt and H2O also increases, so that complete miscibility may exist at pressures relevant to pegmatites and shallow granites. Whether the magmatic-hydrothermal transition is continuous or not, the resultant "aqueous" fluid composition is similar to and inherited from that of the fluxed melt.

For pegmatites, increasing concentrations of B, P and F also account for the fractionation trend toward late-stage albitic (cleavelandite and quartz-poor) units within individual bodies, and as separate dikes of the albite-lepidolite subtype. Within individual bodies, the Jahns-Burnham model attributed the vertical increase in K* to exsolution and buoyant ascent of vapor from melt, but experimentation shows just the opposite trend in K*. New experimental work on diffusion in melt and the crystallization sequence with liquidus undercooling provide alternative mechanisms to explain the marked fractionation of Na and K seen within pegmatites. ■









Comments on Rifting and Continental Crust

M. Charles Gilbert, School of Geology & Geophysics, University of Oklahoma

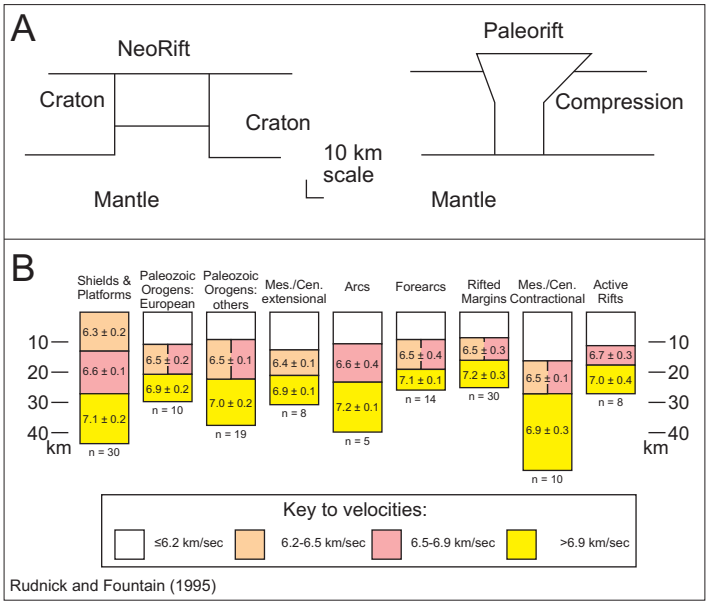
Continental plates are dismembered by rifting processes. These processes distort and thin preexisting lithosphere and its crust. Rifts that do not result in complete dismemberment of the continental plate and formation of oceanic lithosphere and crust are sometimes called "failed" rifts. Most of the presently recognized on-going continental rifts, e.g., Rio Grande, East African, are in stages where the final result is not yet known. The geologic record has many examples of no-longer active rifts that are integral parts of a continental plate, e.g. in North America, the Cambrian Southern Oklahoma Aulacogen (SOA), and the Proterozoic Mid-Continent Rift (MCR). Studies of crustal structure of active rifts (neo-rifts) and of shield and platform areas, as summarized and reviewed by Rudnick and Fountain (1995), present data that, on reflection, illustrate a fundamental problem deserving discussion. That problem is that crustal thickness of shields and platforms average about 43 km and of neo-rifts about 28 km, a difference of 15 km. Yet the shield and platform areas are partly composed of paleo-rifts whose crustal thickness appears consistent with that of the surrounding non-rifted crust. If paleo-rifts once had structure like neo-rifts, then how do we effectively thicken the crust, i.e., deepen the crust-mantle boundary by ~15 km, after the time of rifting, to end up with shield/platform type crust?

To put this in terms of end member situations, it would seem that either 1) new lower crust material must be added below the once existing lower rift crust, or 2) what was lower rift crust has to be shortened and deformed into thicker lower crust. The first end member itself has two possibilities: that later, non-rift-related magmatism (i.e., a type of underplating) installed 15 km of new lower crust, or that sub-rift mantle (i.e., eclogite) was later transformed into lower crust material (i.e., gabbro). The second end member would require later tectonism to do the shortening and deformation. One of these end members is primarily a chemical/phase equilibrium solution and the other is primarily mechanical. Each of these end member situations, to have operated, would generate consequences for ensuing geologic history. The paleo-rift, the SOA, has a geologic history well enough known to place useful constraints on possible scenarios.

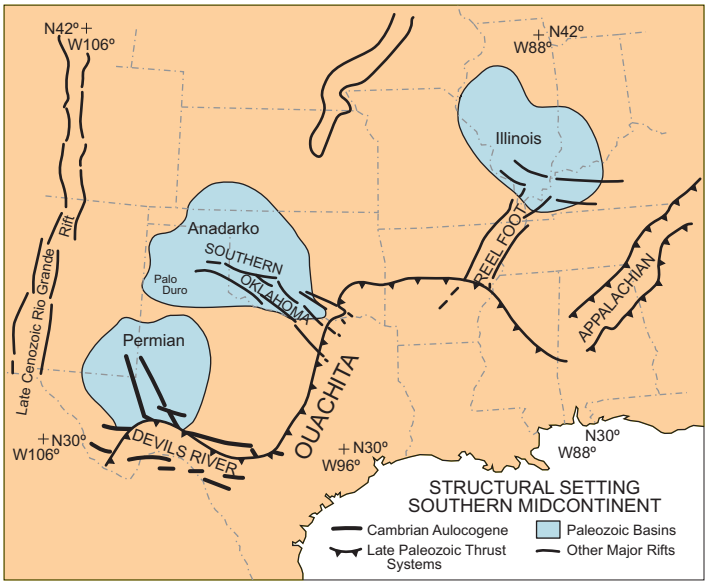
Underplating the SOA after the time of rifting would have presumably caused significant uplift at the time of underplating. Significant uplift did occur in the Pennsylvanian but with associated compressional tectonism and no surface magmatic signal, not a situation suggestive of underplating. In fact, the record shows no strong thermal signals after the time of rifting in the Early Cambrian. Then, for a phase change argument to work, the sub-rift mantle would have to have been eclogitic, not peridotitic. To have transformed the sub-rift mantle lithosphere from eclogite to gabbro would also have required a significant change in the thermal gradient, from a lower one to a higher one, because of the positive slope of the gabbro to eclogite transition on a P-T diagram. Again, no thermal anomalies of the magnitude that this would have entailed are recorded in the upper crust. Thus, chemical/phase equilibrium solutions do not seem viable.

We are left with some kind of mechanical solution. The nearby collisional zone of the Ouachitas does represent a profound compressional event. The Pennsylvanian Wichita-Amarillo (SOR) crustal block uplift is also part of the Ancestral Rockies problem and so the source of the uplifting is debatable. Whatever the source, compressional features are large and significant. For the SOA, a mechanical solution works better in achieving a larger crustal thickness. Whether this thickening is due to a ~2X compression of the lower ductile crust, or some kind of whole crust thrust faulting is not yet resolved. A model of thrust faulting and "extension" for the upper brittle crust, and tremendous "squeezing" (compression) for the lower ductile crust might work.

Could a mechanical/structural solution be the general solution for thickening the crust of paleo-rifts? Perhaps not when considering the MCR, although a significant fraction of its geologic history is missing. Comparison of several paleo-rifts and of some neo-rifts further highlights the problem under discussion. ■



Rudnick and Fountain (1995)



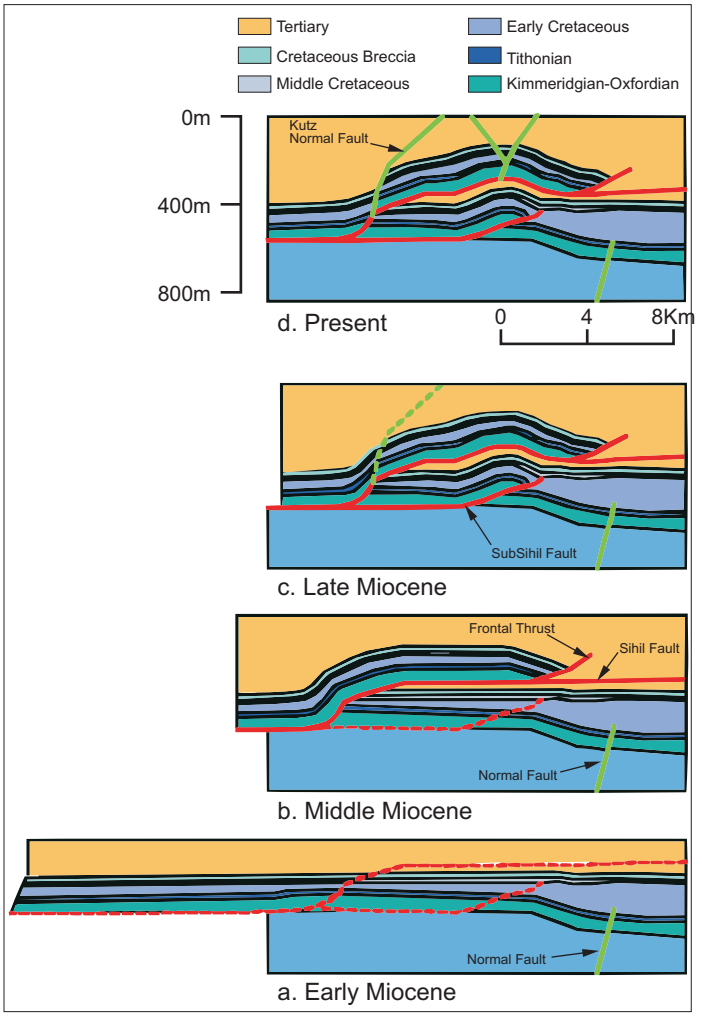


Three-Dimensional Structural Model Of The Cantarell And Sihil Structures, Campeche Bay, Mexico

Shankar Mitra, School of Geology and Geophysics, University of Oklahoma;
Gerardo Figueroa Correa, **Jesus Hernandez Garcia**, **Antonio Murillo Alvarado**, Petroleos Mexicanos, Cd. del Carmen, Campeche, Mexico

The Cantarell and Sihil fields are located within a complex system of compressive structures in the offshore Campeche Bay province in Mexico. The geometry of the Cantarell-Sihil structure varies along trend from a simple fault-related structure in the south, to a duplex consisting of the Cantarell and Sihil structures in the central part, to a more complex system consisting of compressive blocks separated by Tertiary normal faults in the north. The Cantarell–Sihil structures formed during three main episodes of deformation: (1) Jurassic to early Cretaceous extension, resulting in the formation of normal faults which displace Tithonian, Kimmeridgian, and lower Cretaceous units; (2) Miocene compression, during which the Cantarell-Sihil thrust system was formed; and (3) Pliocene to Recent extension, during which a number of the pre-existing Jurassic normal faults were reactivated.

The Cantarell field produces out of three separate fault-bounded allochthonous blocks: the Akal, Nohoch, and and Kutz blocks. The main field is located in the Akal structure. Secondary fields in the allochthonous block include Kutz, formed on the crest of a downthrown fault block, and Nohoch, formed above a west-vergent back thrust. The recently discovered Sihil field is located in a subthurst compressive structure, and consists of two structural lobes formed above the sub-Sihil fault. The Chac structure is formed at the updip edge of a tilted fault block in the autochthonous block. The detailed three-dimensional structural model is being used for future production of remaining reserves in the Cantarell field as well as for delineation of the Sihil field. ■



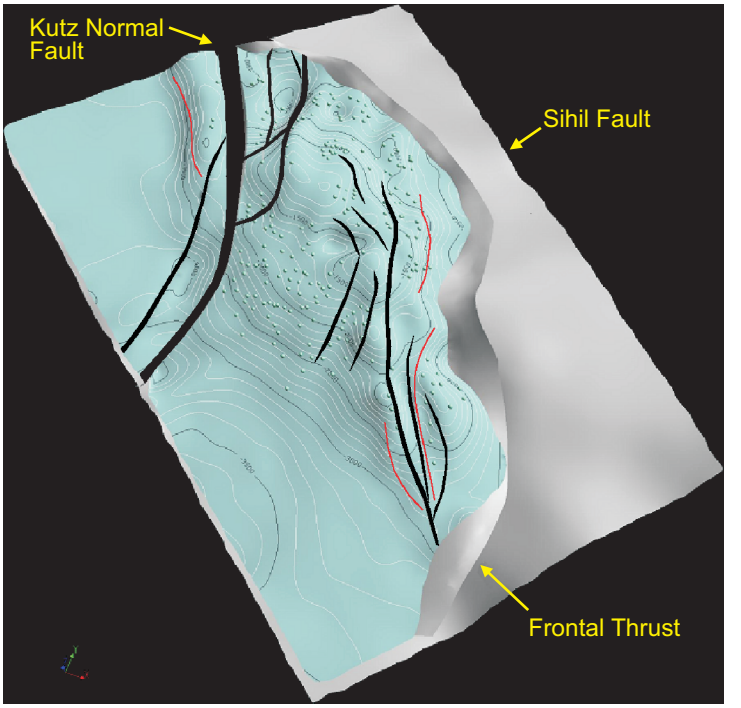


Figure 2. Three-dimensional modal for the top of the Cretacous breccia in the Cantarell structure, and the Sihil and frontal thrusts. Normal fault to the northwest separates the Kutz and Akal structures. West-verging back thrust in the southeast defines the Nohoch structure. Secondary Tertiary normal faults are also shown. Green spheres are well markers for the top of the upper Cretaceous breccia.

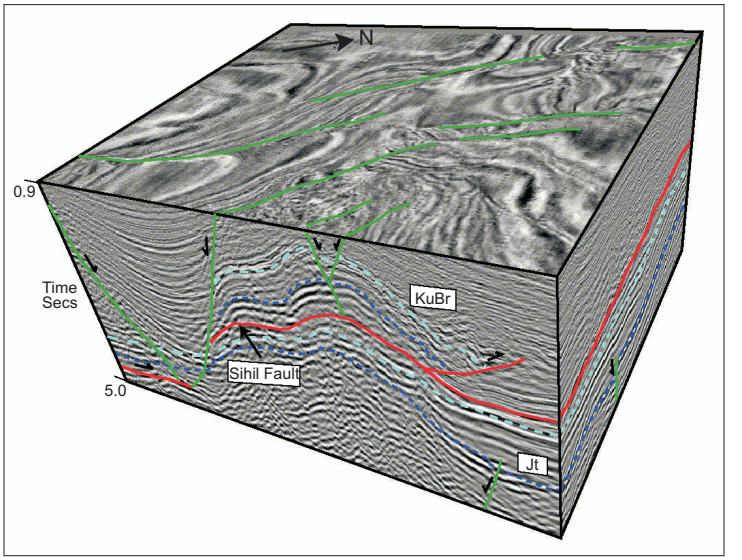


Figure 1. 3-D seismic cube showing the seismic expression of the structural geometry in the northern part of the Cantarell-Sihil structures. Normal faults are shown in green and thrust faults are shown in red. The Tertiary normal faults have an approximate north-south trend whereas the compressive structures trend approximately northwest-southeast, or parallel to the sides of the cube. KuBr = top of upper Cretaceous breccia; Jt = top of Jurassic Tithonian.




Building a natural immersive visualization "theater" in a quarry to teach geologic constraints on fluid flow in shallow aquifers or deeper hydrocarbon reservoirs

J. Camilo Goyeneche, **Roger M. Slatt**, Alan Witten, and Roger Young

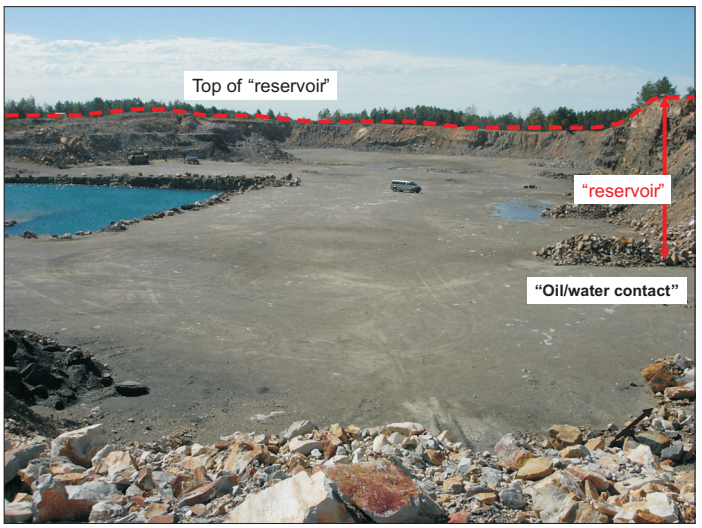
This research formed a M.S. thesis by the senior author. This paper is modified from a paper to be published in an upcoming AAPG book on turbidite outcrops of the world. The thesis expanded upon research conducted over a several year period (Slatt et al., 1994; Slatt et al., 2000). A natural laboratory has now been completed in a quarry in Arkansas which can be used to teach of the geologic constraints on fluid flow in shallow (for water) to deep (for hydrocarbons) strata. The research was designed to build a geological model of a 3D outcrop for fluid flow simulation that addressed the effects of small-scale ('subseismic') interwell heterogeneities on potential production problems in analog oil and gas reservoirs. The principles are also applicable to shallow aquifers.

Hollywood Quarry, Arkansas, is 380x250x40m in dimension. It exposes the upper Pennsylvanian Jackfork Group turbidites, which are often used as an outcrop analog for deepwater reservoirs in the Gulf of Mexico and elsewhere. A variety of strata are present: lenticular, channelized sandstones, pebbly sandstones, and conglomerates within shale; laterally continuous, interbedded thin sandstones and shales; and thicker, laterally continuous sandstones and shales. Sandstone and shale beds are cut by strike-slip faults with a vertical component; some faults contain a thick gouge zone. One side of the quarry exposes an asymmetric anticline. These combinations of structural and stratigraphic features have resulted in a horizontally and vertically, highly compartmentalized, stratigraphic interval, and divide the quarry into the following "reservoir" types: Fractured Reservoir; Asymmetric Anticline Reservoir; Complex stratigraphy: Massive sands, shale barrier, layered sand/shale; Faulted Reservoir (gouge zones).

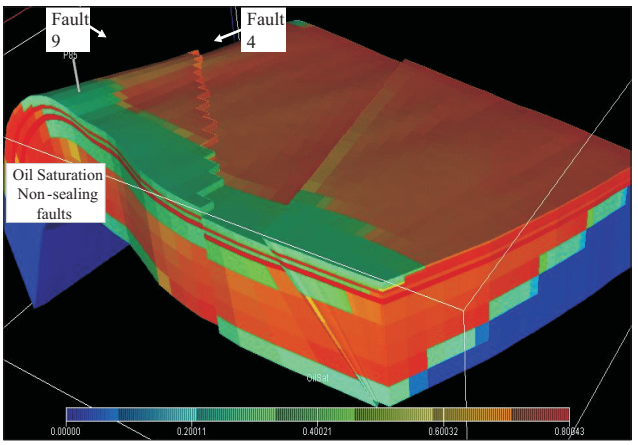
Techniques used to characterize the quarry have included: behind-outcrop coring, outcrop gamma-ray logging (GR), measured stratigraphic sections, sequential photography of quarry walls, Digital Orthophoto-Quadrangle mapping (DOQ), Ground Penetrating Radar (GPR), high resolution shallow seismic (hammer as source), Global Positioning System (GPS), and GPS laser gun positioning of geologic features in 3D space.

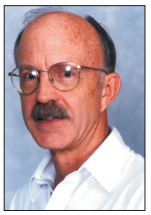
The west wall has been quarried back within 90cm of the first inline of a previous 3D GPR survey (Pedersen, 1998). The strata imaged along inline #1 are now exposed at the quarry wall. Core and photomosaic descriptions superimposed on inline #1 show good bed correlations and reveal small scale faults and their orientation.

Outcrop walls, faults, measured sections, GR logs and photomosaic locations have been georeferenced with GPS to create a spatially correct, GoCad 3D geological model. The 3D geological model has been input into Eclipse™ for reservoir fluid flow simulation under a variety of structural and stratigraphic combinations, coupled with different well spacing, orientations and type (horizontal, vertical, slant). Over 100 simulation runs have been completed which illustrate the effect of these various structural and stratigraphic features on subsurface fluid flow. It is now possible to stand within the quarry, show the various geologic features exposed, and quantify their effect on fluid flow and "reservoir" performance. In essence, the quarry is a natural immersive visualization theater. ■







Spectral decomposition of 3-D ground penetrating radar data from the Norman landfill

Isabel C. Geerdes and **Roger A. Young**, School of Geology and Geophysics, University of Oklahoma

Summary

The application of spectral decomposition analysis to seismic data is quickly gaining momentum in the oil industry. Encouraged by this momentum, and taking advantage of the fact that seismic algorithms are widely used for ground-penetrating radar (GPR), we applied spectral decomposition to our GPR data. The object of this research was to integrate the spectral decomposition results with complex attributes, sediment core data and conductivity logs in order to make a more robust interpretation.

Introduction

The study area is located on the northern bank of the Canadian River, south of the city of Norman, Oklahoma, and consists of unconsolidated alluvium deposits. The alluvium has a range of thicknesses of about 10 to 15 meters (Marston et al., 2001), and is mostly composed of sand, with varying amounts of silt and clay. Underlying the alluvium is the Hennessey Shale (Marston et al., 2001).

The data set consists of twenty-nine, common-offset, single-channel profiles, each separated by two feet. The offset of the transmitter and receiver was four feet and the trace spacing was one foot. The tight trace spacing and line spacing of the data provided a relatively high spatial resolution, while the nominal frequency of 100 Hz and sampling rate of 800 ps gives high temporal resolution.

In most geological situations, the electrical properties of the subsurface are the dominant factor controlling GPR response; thus, reflections are generated by changes in the electrical impedance (Annan, 1998). Although the behaviors of electromagnetic and elastic wave propagations are different, the kinematic behaviors are similar so long as the GPR frequency is such that displacement currents are dominant (Fisher et al., 1992). These kinematic similarities allow seismic algorithms to be applied to radar data (Fisher et al., 1992). Following this trend, spectral decomposition methods were applied to GPR data.

Spectral decomposition has proven to be a very valuable tool in oil exploration, particularly in the problem of imaging and mapping bed thicknesses and geologic discontinuities (Partyka, Gridley and Lopez, 1999). In addition, the spectral analysis method has been successfully used in the detection of hydrocarbons in the presence of anomalous attenuation effects (Castagna, Sun and Siegfried, 2003).

The proposition tested was that spectral decomposition would help to identify the anomalously high attenuation associated with clay layers and highlight other effects, such as preferential illumination of specific features due to tuning effects and amplitude changes due to differences in electric impedance. The goal was to integrate the spectral decomposition results with the other data available (cores with grain size analysis and conductivity data) and draw some observations from the application of this analysis tool to GPR data.

Conclusions

The final ISA results helped to identify the anomalously high attenuation associated with clay layers and indicated other effects, such as preferential illumination of thin-bed interference and the clay onset. The spectral decomposition results were integrated with the other available data to produce a more robust interpretation.

Thin bed interference events were preferentially illuminated at 80MHz, however, the use of complex attributes allowed the discrimination between fully tuned and not fully tuned. The clay onset spectral response was preferentially illuminated at 80MHz, but it was localized, coinciding with where the envelope response was high. The instantaneous frequency response for the onset was not anomalous. Multiple diffraction energy showed up as anomalous in the spectral analysis, with a low preferential illumination frequency.

Spectral decomposition provides an effective method of seeing high-frequency shallow reflections masked by the air wave. No determinations could be made with respect to attenuation caused by water saturation because there were no reflections above the water table to compare with the reflections below (with the exception of the airwave).

Acknowledgements

The authors would like to thank the University of Oklahoma for financial support during this research and the USGS for borehole data. Also Isabel Geerdes would like to thank ChevronTexaco for allowing the time to present this work. Also, the authors would like to thank the following companies for providing software and support: Parallel Geoscience Corporation (SPW), Sensors and Software (WinEkko Pro), Fusion Geophysical (InspectTM, SpecManTM), SeismicMicroTechnology (Kingdom Suite). ■

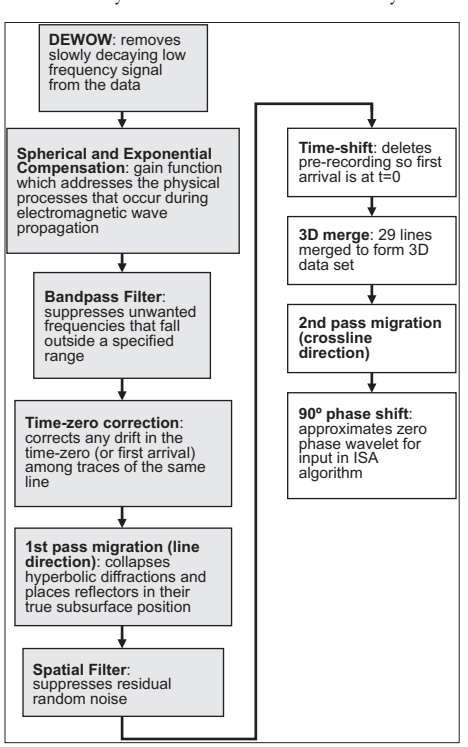


Figure 1: Processing flow applied to GPR data.

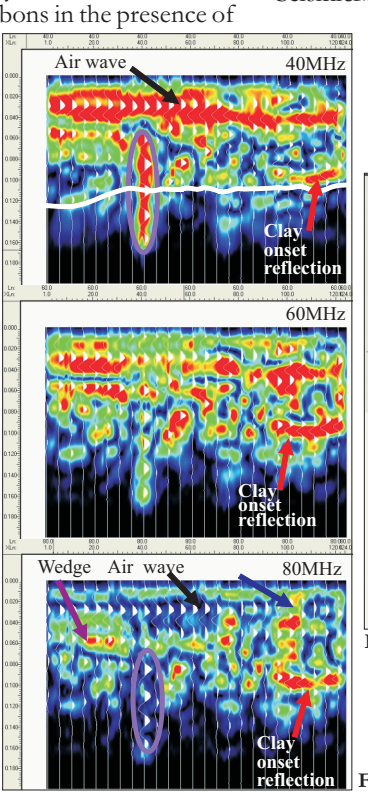


Figure 2: Spectral decomposition results (40, 60, 80MHz).

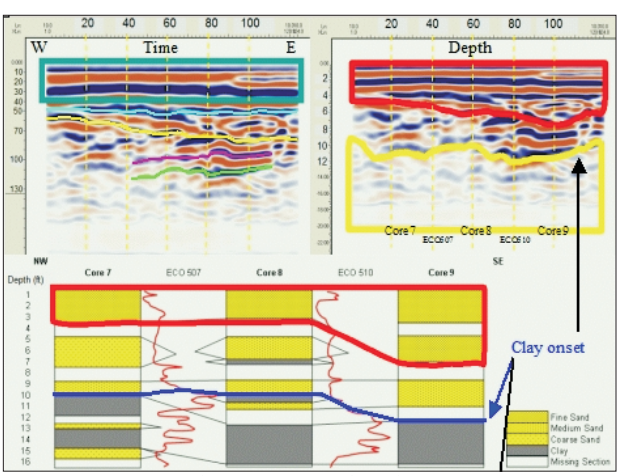


Figure 3: Tie of GPR data with cores and conductivity logs.



Multi-Scale characterization of fine-grained, sinuous leveed/channel outcrops-subcrops: problems methods and analogs

Roger M. Slatt, Director, School of Geology and Geophysics, University of Oklahoma

This paper was a keynote, invited presentation in June, 2005 at the "Meandering Turbidite Channels" conference at the National Oceanography Centre, Southampton, U.K. Conventional techniques for characterizing hydrocarbon reservoirs are scale-limited. For example: (a) conventional 2D/3D seismic provides aerial reservoir coverage, but insufficient vertical resolution to image small-scale features that might affect reservoir performance; (b) well logs record continuous vertical rock/fluid properties, but also with limited bed resolution (except borehole image logs); (c) cores provide continuous vertical resolution of properties, but often with incomplete reservoir coverage; (d) well tests provide interwell-scale connectivity and continuity information, but these are indirect measurements; (e) geostatistical/geocellular models allow multiple iterations of reservoir properties distribution, but are most useful (for fast-tracking reservoir development) when there are relatively few wells which provide the property measurements.

Outcrops which are laterally and vertically extensive, which have shallow-dipping beds, and/or which offer faces with different orientations provide the best means of documenting bed- to sequence-scale continuity and connectivity for building 3D geologic models. Standard outcrop data include measured stratigraphic sections and photomosaics. To document the 3rd dimension, the following techniques can be employed to image the shallow-subsurface (subcrop) extension of the dipping outcrops: (a) 2D/3D high-resolution, shallow seismic reflection; (b) 3D electromagnetic induction; (c) 2D/3D ground penetrating radar ; (d) shallow- and deeper- borehole logging and coring. Both surface and shallow subsurface data are spatially positioned with a global positioning system.



Figure 2: Deanne Browning shooting a shallow 2D seismic line using a sledge hammer and metal plate as a source of wave energy. This work was done under the guidance of Drs. Witten and Slatt during the final week of the 2004 Summer Field Camp.

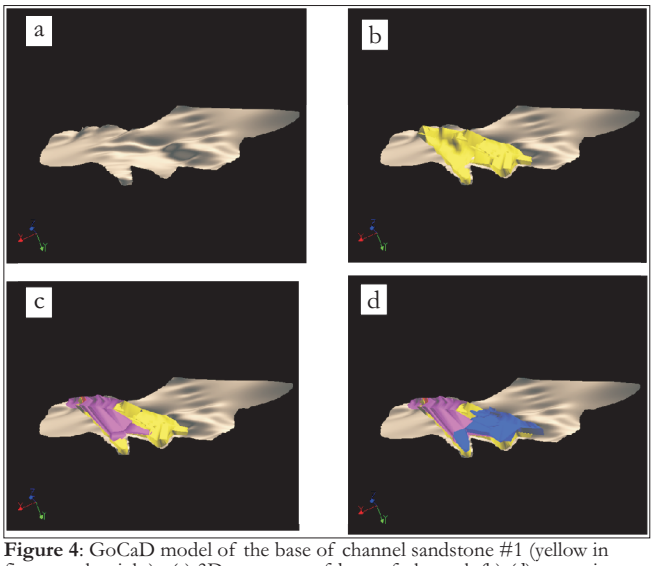


Figure 4: GoCaD model of the base of channel sandstone #1 (yellow in figure to the right). (a) 3D geometry of base of channel. (b)-(d) are various facies that fill that channel, mapped from a combination of outcrop measured sections, shallow boreholes, ground penetrating radar and electro-magnetic induction.

Two examples are provided of the application of these techniques to build 3D outcrop-subcrop geologic models of leveed-channel deposits. Comparable features in analog, subsurface hydrocarbon reservoirs are also presented.

The first example is an outcrop of the Cretaceous Dad Sandstone in Wyoming. The outcrop is composed of a 67m thick, approximately 300m wide set of nine stacked, channel sandstones (57% net sand) and associated thin-bedded levee/overbank strata (variable net sand) nestled within a master channel with adjacent levee wedges. Characterization was accomplished by integrating the results of all of the measurement techniques described above. One result is the spatially correct, 3D image of the geometry and trend (in GoCaD™) of the largest channel and its complex fill.

The second example is the Miocene Mt. Messenger Formation, New Zealand. Previously published study (Browne and Slatt, 2004) integrated outcrop measured sections and photomosaics with two behind-outcrop, cored and logged (including borehole image logs) shallow boreholes and a 150Hz, 2D seismic line oriented oblique to depositional strike. That work is here augmented by a new seismic inversion processing technique (called ThinMAN™) applied to the line. The technique effectively removes the seismic wavelet by using spectral decomposition processing, thus providing additional seismic details of bed boundaries. The resulting image shows a complex stratigraphy of stacked levee sets and channel-fills.

These examples provide a workflow for 3D characterization of outcrops-subcrops with this combination of geophysical and geological techniques. The addition of LIDAR imaging would provide additional, continuous detail of outcrop faces. ■

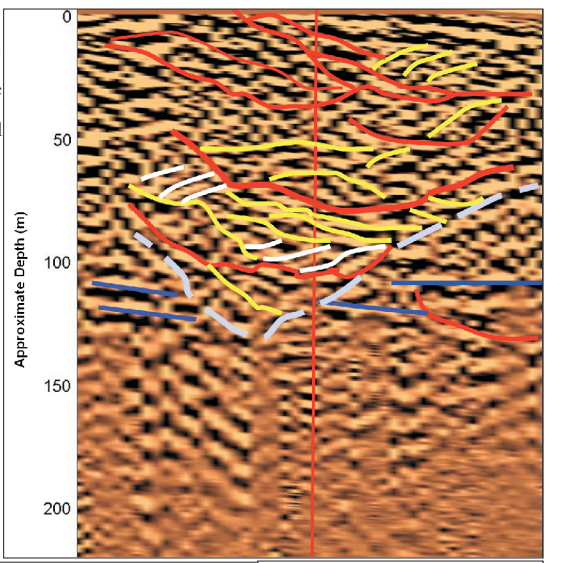


Figure 3: Seismic line shot across the top of the ridge shown in the figure below, showing the interpreted channel sandstones seen in outcrop. A master channel is shown by the gray dashed lines. Red lines are bases of individual channel sands nestled within the master channel. Blue lines are truncated sheet sandstones. Yellow and White lines are lateral acrrection packages.

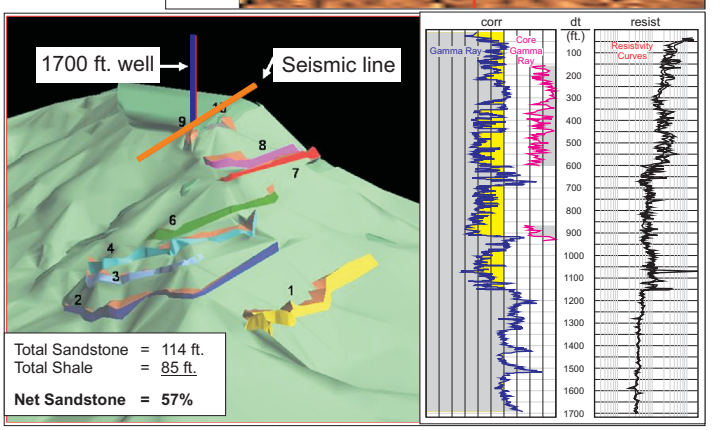


Figure 1: Digital eleveation model of ridge of Dad Sandstone (Lewis Shale of Wyoming) showing the spatially correct (from GPS) positions of 10 outcrop channel sandstones. The Entire 199 ft. of stratigraphic section has a net sandstone of 57%. Right picture is the logs from a 1700ft. well drilled behind the outcrop.

School of Geology & Geophysics Faculty



Roger M. Slatt
Director, School of Geology and Geophsyics
Eberly Family Chair Professor
Research interests are in the petroleum geology of deepwater (turbidite) depositional systems and on applied reservoir characterization.



Judson L. Ahern (retired June 1, 2005)
Associate Professor
Research Interests are in Geomechanics; Gravity and Magnetics; Environmental Geophysics



John Castagna (Terminated employment with SGG May 15, 2005)
Edward Lamb McCollough Chair
Director, Institute of Exploration and Development Geophysics
Research interests are in well logging research; applied AVO analysis; use and abose of amplitude variation with offset; seismic frequency measurement of velocity and attenuation; elastic wave attenuation and dispersion, AVO studies, and field studies.



Richard Cifelli
Adjunct Professor
Zoology Professor, Curator, Vertebrate Paleontology, Sam Noble Oklahoma Museum of Natural History
Research interests are in the paleontology, systematics, and evolution of mammals.



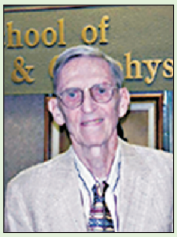
Tom Dewers
Associate Professor
Research interests include experimental and theoretical studies of solution-transfer creep in the application of fault-zone healing and earthquake cyclicity, chemical aspects of formation and wellbore damage in petroleum reservoirs, comparison of laboratory-and field-based rates of mineral dissolution and precipitation, and redox reactions in contaminant plumes resulting from interplay of mineral surfaces and bacteria.



Charles Harper
Professor Emeritus
Research interests include paleontologic principles and methods, quantitative methods in paleontology and paleoecology, and the taxonomy of Paleozoic brachiopods.



Claren Kidd
Geology Librarian/Professor
Research interests include bibliographical reference books on Oklahoma geology, geological field trip guidebooks, redistribution of geological literature and the pricing of serials.



Robert DuBois
Professor Emeritus
Research interests are in paleomagnetism and archeomagnetism



R. Douglas Elmore
Associate Provost
Robert E. and Doris Klabzuba Professor
Research interests are focused on understanding the origin of remagnetizations in sedimentary rocks and testing/developing a paleomagnetic/geochemical approach for dating diagenetic events.



Michael H. Engel
Willard L. Miller Professor
Research interests include the application of stable isotopes to assess the diagenetic history of organic matter in fossils and sediments and to determine the origins of organic compounds in carbonaceous meteorites.



James M. Forgotson, Jr.
Kerr-McGee Centennial Professor
Research interests are in subsurface stratigraphy, basin analysis, petroleum geology, petroleum reservoir characterization, quantitative geological mapping and statistical analysis of geologic data.



M. Charles Gilbert
Professor
Research interests include: Stability relations of the rock-forming ferromagnesian minerals, especially amphiboles, pyroxenes, and micas; processes active in the evolution of igneous and metamorphic rock systems; and petrology and tectonic development of rifts, particularly as exemplified by the Southern Oklahoma Aulacogen.



David London
Professor

Research pertains to the origin and chemical evolution of felsic magmas that solidify as granites, pegmatites, and rhyolites, and to the properties of crystalline and melt phases that regulate the transfer of volatile and lithophile trace elements from deep to shallow crustal reservoirs.



Richard Lupia
Assistant Professor
Assistant Curator of Micropaleontology and Paleobotany
Sam Noble Oklahoma Museum of Natural History

Research integrates field collecting, laboratory research, including light and scanning electron microscopy, and literature surveys to examine and test paleoecological



Charles Mankin
Director, Sarkeys Energy Center
Director, Oklahoma Geological Survey
Professor

Focus on geoscience and public policy and Oklahoma/U.S. natural resources.



Shankar Mitra
Monnett Chair in Earth Resources
Monnett Professor of Energy Resources

Research interests: two main hydrocarbon exploration and production themes: 3D analysis and modeling of structures in sedimentary basins, and analysis of minor and microscopic-scale mechanisms of deformation including faulting, fracturing, cataclasis, and pressure solution.



R. Paul Philp
Joe and Robert Klabzuba Professor
George Lynn Cross Research Professor

Research interests are centered on the study of organic material as it is deposited in the sedimentary environment and undergoes a number of changes resulting from diagenesis, microbial degradation, and thermal maturation at higher temperatures in older sediments.



John Pigott
Associate Professor

Research interests focus on basin analysis and seismic stratigraphy to evaluate the tectonic evolution and hydrocarbon potential of sedimentary basins worldwide.



Gerilyn Soreghan
Associate Professor, Dupont Young Professor, Presidential Professor

Research interests focus on investigating the character of past climatic, eustatic and tectonic conditions using the sedimentary record; identifying the stratigraphic products of discrete processes; and to improve our understanding of climatic trends & transitions, tectonic behavior, and distributions of source, reservoir, and seal lithofacies critical to hydrocarbon exploration and exploitation.



David Stearns
Professor Emeritus

Research interests are in the application of rock mechanics principles (experimental and theoretical) to field problems in the structural geology of layered crustal rocks, including the classical mechanisms of faulting and folding as well as structural alteration of fluid in reservoirs, macroscopic flow laws, experimental modeling of natural structures, and stress and/or strain analysis of natural deformation features.



Barry Weaver
Associate Professor

Research interests include the application of x-ray fluorescence and instrument neutron activation techniques to the analysis of geological materials, and the interpretation of these data in terms of the origin and evolution of igneous and metamorphic rock suites.



Steve Westrop
Professor
Curator of Invertebrate Paleontology, Sam Noble Oklahoma Museum of Natural History

Resesarch interests lie at the intersection of paleontology, ecology and evolutionary biology, specifically patterns and processes of mass extinction, with special reference to Lower Paleozoic trilobite faunas of North America, and evolutionary radiations following mass extinctions in Paleozoic marine communities.



Alan Witten (died February 2005)
Frank and Henrietta Schultz Chair in Geophysics
Professor

Research is focused on near-field geophysics applied to the characterization of sites known or suspected to contain buried wastes, geotechnical engineering, paleontology and archaeology.



Roger Young
Associate Professor

Research interests are in applying reflection seismology and ground penetrating radar techniques to determine sedimentary structures and lithology at the outcrop scale and to the imaging of complex structures at the petroleum reservoir scale.



The Faculty of the School of Geology and Geophysics—Fall 2004

Left to Right: Roger Young, Shankar Mitra, Douglas Elmore, Gerilyn Soreghan, Michael Engel, Roger Slatt, Thomas Dewers, John Pigott, Richard Lupia, M. Charles Gilbert, Alan Witten, Barry Weaver, David London
Not pictured: James Forgotson

Student Abstracts

AAPG/SEG Spring Student Expo Poster Contest - GEOLOGY

1st Place Winner

Influence of deep-water lithologies and geometries on seismic indication of fluid saturation

Kathleen Baker-Colorado School of Mines

Indicators of pore fluid types and distributions are seeing increased use in exploration and reservoir monitoring. Geologic complexities can strongly influence fluid distributions in a reservoir and impact the seismic signature in a way that may lead to false fluid indicators. Studies of deep-water outcrops in West Texas and Wyoming have contributed to better understanding of the architectural elements that comprise deep marine basins. Turbidite sequences in deep water outcrops contain numerous related but distinct stratigraphic bodies that can have contorted inter-fingered boundaries, gradational contacts and abrupt changes in properties at scales well below seismic resolution. These include inter-bedded sands and silts and channel forms with stratigraphic pinch-outs. The continuity and connectivity of the sand bodies that make up the channel forms have a strong impact on fluid migration in hydrocarbon reservoirs. Deep water outcrops are used as analogues to Gulf of Mexico deepwater environments. By combining information from outcrop observations, well log data, core measurements and seismic data we can model geologic lithologies and geometries that control fluid distribution within the reservoir.

It is clear that these deep-water lithologies and geometries have a significant impact on the seismic response which could result in an incorrect interpretation of the presence of hydrocarbons. By developing realistic models of these deepwater settings we can better predict their impact on the seismic and down-hole response by using these for seismic modeling. This will be useful in developing DHI technology. ■

3rd Place Winner

Natural Brine Pump In The Tallgrass Prairie Preserve

Sophia Rodriguez-University of Tulsa

Faculty Mentors: Dr. Bryan Tapp and Dr. Winton Cornell, Dept. of Geosciences, Univ. of Tulsa

Co-authors: Nathan Buchanan, Cailean Carlberg, Juliana Gendron, Kathleen McKee, Emily Starke, Dept. of Geosciences, Univ. of Tulsa

Surface and subsurface contamination by produced oilfield brines is an ongoing problem within the Tallgrass Prairie Preserve. In summer 2004, Geosciences Summer Undergraduate Research Program (GSURP) students evaluated one of the oldest spills in Tall Grass, circa 1920, Site 3. We found evidence of permanent scarring due to the original surface spill at the site. We first characterized the site attempting to understand the lack of auto-remediation, and then we proposed a remediation plan. The study included developing a stratigraphic cross-section, surface mapping (using DGPS), a field electrical-conductivity survey, and soil sampling for pH, x-ray diffraction, SEM, and IC (dissolved solids) analyses. During the investigation it became apparent that another source of brine contamination existed in conjunction with the original spill.

Field mapping indicates plant-kill zones corresponds to the base of sands and limes in the Upper Pennsylvanian strata. Conductivity mapping verifies the main subsurface transport for brine runs along fractures and sand/shale contacts. From the evidence, we conclude a continuous supply of brine runs along fractures in the subsurface with the original well as the source. The diffusion process functions as a "natural brine pump". The brine pump models a simple one-dimensional diffusion equation; the "brine pump" hypothesis fits existing data in the Preserve, and explains a perched brine layer in the area. We propose further modeling and field-testing of the hypothesis to determine whether bridge plugs in older wells might attenuate contamination and allow remediation of older scars and of near-surface brine contamination in the Preserve. ■

2nd Place Winner

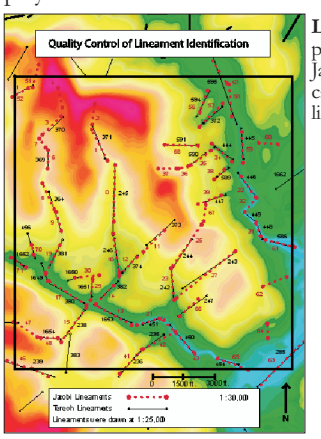
Fracture Patterns, Lineaments and Seismic Reflection Data: Integration for Fault Mapping in the Appalachian Basin of East-Central New York State

Nicholas Terech, Robert D. Jacobi,
UB Rock Fracture Group, Geology Dept., 876 NSC, University at Buffalo, Buffalo, NY 14260

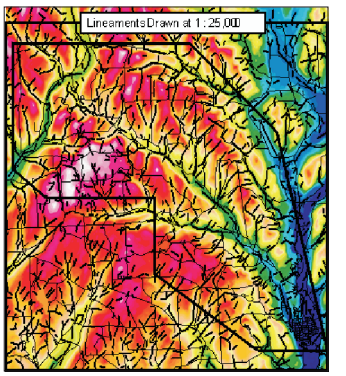
This study integrates surface structure data with faults observed in 2-D seismic reflection profiles and lineaments in order to map probable fault patterns. The study area is located in the Middle to Upper Devonian Catskill Delta Complex in the Appalachian Basin in central New York State. This previously unmapped study area is significant because of active oil and gas exploration in the region.

Several characteristics of surface bedrock fractures were collected within the study area. Fracture characteristics include orientation, dip, spacing, fracture abutting relationships and fracture geometry. Fracture characteristics are displayed using modified rose diagrams to illustrate trends in orientation, frequency and fracture relationships. Three regional fracture orientations are common in the area. Fracture Intensification Domains (FIDs) are characterized by relatively closely spaced fractures; FIDs indicate areas where faulting is probable. Each of the three regional fracture orientations have zones of closely spaced fractures. FIDs recognized at the surface correlate spatially with thrust and high angle faults observed in 2-D seismic and with lineaments.

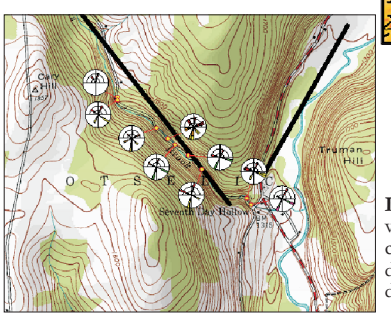
Lineaments identified from satellite imagery, digital elevation maps and aeromagnetic gradients are combined with exposed bedrock fracture data and seismic reflection data. NNW-striking and NE-striking lineaments are coincident with aeromagnetic gradients in the field area. NNE-striking and N60°E-striking lineaments are also coincident with fractures and FID orientations. The integration of these data promote mapping of FIDs in order to define areas with a higher probability of faults. This fault map will point to exploring areas that should be high-graded in the exploration for fracture-plays. ■



Left: Shows lineaments drawn by two different people individually (my advisor, Dr. Robert Jacobi and myself) and then were compared by calculating difference of lineament angle and lineament length.



Above: These lineaments were drawn using a DEM at 1:25,000 scale and were then compared with 2-D seismic reflection data, LandSat lineaments, aeromagnetics and surface structure data.



Left: Black DEM lineaments correlate very well with surface fracture data collected in the field. The fracture data are displayed using modified rose diagrams.

AAPG/SEG Spring Student Expo Poster Contest - GEOPHYSICS

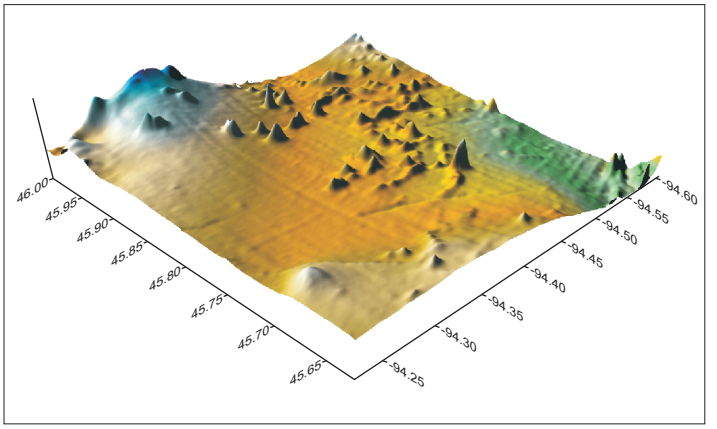


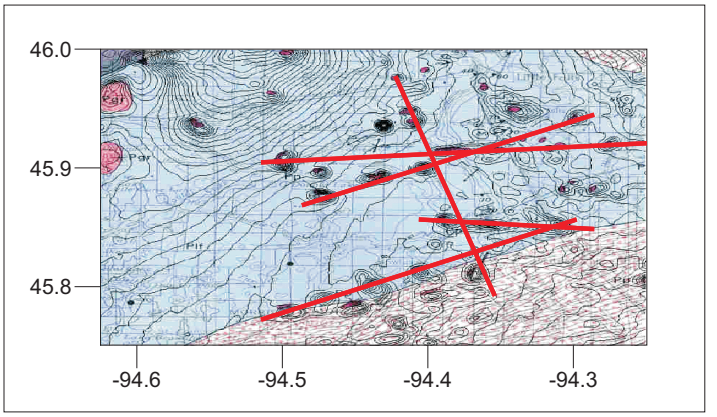
1st Place Winner

Geophysical Exploration: Its Not Just Seismic You Know? Investigation of a central Minnesota mafic dike swarm.

Aaron C. Rothfolk, M.S. student, University of Oklahoma

Kimberlites are defined as an ultramafic igneous rock with porphyritic texture hosting a mineralogy that resembles an alkaline peridotite. They are intrusive features that are propelled to the surface with the aid of volatile gases. The resulting geometry is a carrot shaped pipe commonly referred to as a diatreme. If the surrounding host rock is magnetically "quiet" these diatremes can be easily imaged using aeromagnetic flight surveys. The aeromagnetic data, assuming tight enough flight lines, will result in a circular to comet shape high of the magnetic contours (or low depending on magnetic orientation) that is very diagnostic of a kimberlite pipe. Although this is a great tool for kimberlite exploration, generally exploration is initiated by tracing kimberlite indicator minerals (pyrope garnet, chrome diopside and Mg-ilmenite) and geochemical sample, then followed by the aeromagnetic surveys when there is reasonable suspicion a pipe is nearby. However, in the case of this study a very dense aeromagnetic survey had been completed in entirety across the state of Minnesota to properly locate the expanse of the iron range deposits. In the process of doing this several small sub circular aeromagnetic anomalies emerged in Central Minnesota with mafic to ultra mafic compositions begging the question, are there kimberlites in Minnesota? This investigation set out to answer this and in the process uncovered some useful applications of the aeromagnetic anomalies relating to the large scale basement geology of Central Minnesota.■







2nd Place Winner

Imaging Fractures Created from Micro-earthquakes in the Barnett Shale, Newark East Field; Wise County, Texas

Tomieka Searcy, M.S. student (1), **Sergey Abaseyev** (1), **Mike Ammerman** (2) and **Evgeni Chesnokov** (1)
(1)University of Oklahoma, Norman, OK
(2) Devon Energy Inc., Oklahoma City, OK

Fractured shales have been a key gas reservoir since the early 19th century. Obtaining a commercial gas production rate is the major risk in drilling in shale reservoirs. This requires the presence of micro-porosity which is one mechanism of free gas storage.

Currently, the Institute of Theoretical Geophysics at the University of Oklahoma is developing imaging fractures tools to improve exploration for oil and gas within anisotropic layers as shale reservoirs. The two Fortran programs for imaging fractures are "Frac_Detect" and "SW_View." The Institute is studying micro-earthquake events generated by water injection.

Three component data are analyzed with the help of the 'Frac Detect" program, which contains the subprogram "SWPolar." This subprogram automatically determines the fracture orientations considering all micro-earthquake data. The "SW_View" program allows manual investigation of shear wave splitting using polarization diagrams. Manual investigation is found to be a more precise method because the user identifies the good seismograms with little background noise to determine the body waves' arrival times. The programs determine the arrival times of the two shear waves and calculate the horizontal direction of preference for the first shear wave.

From the calculated results, the locations of the fractures are plotted according to their preferential horizontal direction and time delay between the fast and slow shear waves. The fractures plot a northeast to southwest trend. The results reveal that 88% of the imaged fractures occur in the Lower Barnett Shale.■

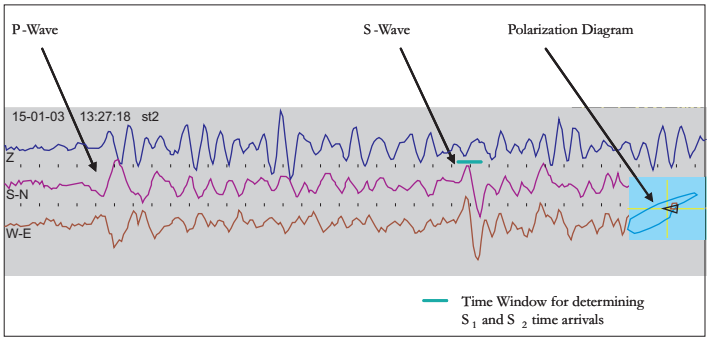


Figure 1: This figure is an example of the three component (3-C) data with recognizable arrivals of body waves. This step involves identifying the arrival times of P-, S1-, and S2- waves. The moving time window calls the image of the particle motion shown in the box on the right.

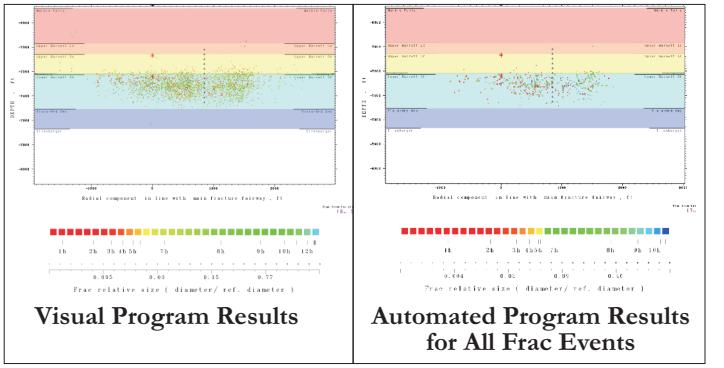


Figure 2: These plots show fracture location according to depth and time of creation during fracture job.

AAPG/SEG Spring Student Expo Poster Contest - GEOPHYSICS - 3rd Place Winner

Estimation of effective pressure and water saturation by viscoelastic inversion of synthetic time-lapse seismic data for a gas sandstone reservoir

Tiwari, Upendra K. and **McMechan, George A.**, University of Texas at Dallas, Richardson, TX

Inversion of synthetic seismic data for a viscoelastic reservoir model produces estimates of changes in effective pressure (Pe) and water saturation (Sw). Application is to analysis of time-lapse seismic data for a gas sandstone reservoir.

To generate synthetic time-lapse viscoelastic seismic data, reservoir properties [porosity (Φ), clay content, permeability (k), Pe and Sw] are used to define the corresponding viscoelastic seismic properties [compressional and shear velocities (Vp and Vs), density (ϱ) and compressional and shear quality factors (Qp and Qs)] using petro-seismic modeling. It is assumed that porosity, clay content and permeability do not change during production and are known. Full wavefield inversion is performed for different production scenarios, on synthetic viscoelastic time-lapse seismic data, using a grid search refined by a conjugate gradient solution.

Estimation of Pe and Sw from two independent data (such as Vp/Vs and Qs/Qp) is feasible, if the other reservoir properties are known. Sw and Pe are accurately estimated for noise free data. For the example shown, the average uncertainties associated with Sw and Pe are approximately +/- 1.5% and +/- 2.5 Mpa respectively based on the bounding values. Qs/Qp is independent of Pe but dependent on Sw. For the reservoir properties (Φ, clay content, k), and the dominant seismic frequency used in the example, ϱ and Qs/Qp are most sensitive to Sw, Vp is most sensitive to Pe, and Vs, Qp and Qs and Vp/Vs are sensitive to both Sw and Pe. Time-lapse changes are less sensitive to Pe changes than to Sw changes. Future work includes application to field data and mapping of real hydrocarbon depletion patterns. ■

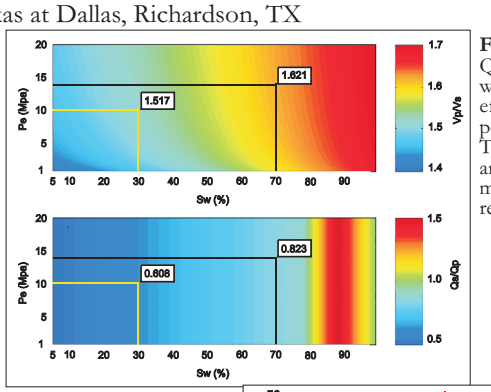


Figure 1: Vp/Vs and Qs/Qp as functions of water saturation and effective pressure for porous sandstone at 40 Hz. The yellow and black lines are for the reference and monitor survey, respectively.

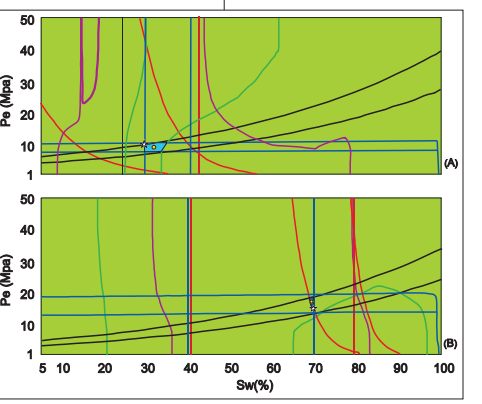


Figure 2: Bounds of all the seismic parameters in the Sw versus Pe plane for (A) the reference data and (B) the monitor data. The blue colored regions enclose the Pe and Sw values that are constrained with all the estimated seismic parameters. Compare with Figure 1.



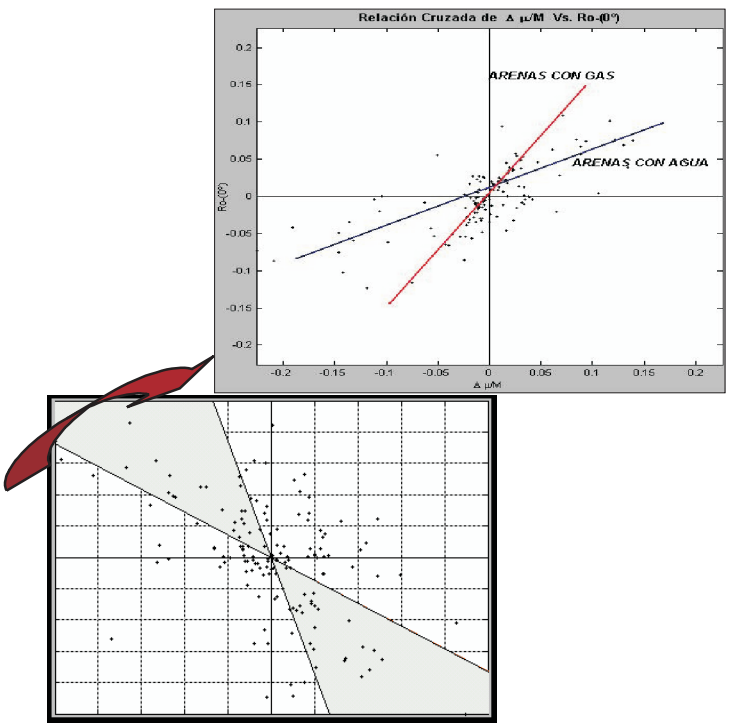
Matlab algorithms designed to calculate AVO instantaneous amplitude attribute.

Ramon Asuaje, M.S. student, University Simon Bolivar 2004

Several algorithms were designed to confirm the feasibility of a new technique for obtaining AVO attributes based on the contrast in the elastic parameter M and P. The values of Dm and Ds are obtained by inverting prestack seismic data, based on the linear approximation of Hilterman and the quadratic approximation of Gardner to the zoeppritz equations.

In the last few years several seismic data interpretation techniques have been proposed based on the correlation of attributes, most of which were obtained by inversion processes or approximation to the zoeppritz equations. The most effective techniques are those which analyze this parameter through crossplots, such as Gradient and Interceot (Verm&Hilterman 1985) where tendencies are interpreted as possible hydrocarbon indicators. In 1996 Regueiro et al. proposed using the angular deviation between the parameters Ro and ΔΣ in a crossplot, called Instantaneous Phase AVO, and the values of the vector from the origin to the point under analysis, called Instantaneous Amplitude Avo, as possible indicators of fluids or changes in lithology in the reservoir. In this project, software developed in matlab was used to confirm the feasibility of the former technique using real seismic data from the North of Paria, Venezuela. Looking at the tendency that particular lithologies follow (figure 1), the idea of capturing this tendency in an angle range was raised. This new attribute was named Instantaneous Phase AVO. Combining the attributes obtained from the approximation to the zoeppritz equation of Hilterman and Pan&Gardner in a crossplot, a phase angle was calculated which closed a particular tendency, and the vector which combined each point closed in this region until the center was named instantaneous Amplitude AVO (figure 2). Once the values of the Instantaneous Amplitude AVO were obtained, the seismic traces were built and the amplitude corresponded to each time in the trace was that obtained from the close region, in other words, if a determined time in the traces has a value different from zero, it is because that time corresponded to a point that belongs to the region closed by the Instantaneous Phase AVO.In the seismic data provided, a high amplitude is observed at approximately 2.3 seconds and by well log data, is confirmed that this event is a gas bed. The results obtained from the new attributes show perfectly the event at 2.3 seconds for a range angle from 92 to 134 degrees.

The new attributes clearly showed the event placed at 2.3 seconds and clear the rest of the section. This confirmed that the region closed by the Instantaneous Phase Amplitude AVO belonged to a particular tendency. The tendency closed in the region described the gas layer detected in the seismic record and the well log data. ■



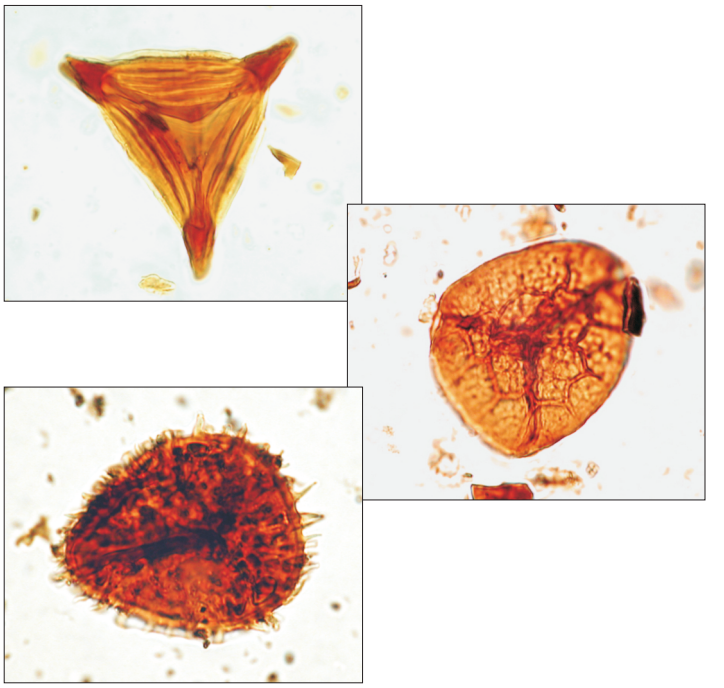


Paleoecological analysis of early mammal habitats: Cedar Mountain Fm. (Albian) of Utah

Tiffany Stephens, M.S. student, School of Geology and Geophysics, University of Oklahoma

During the Cretaceous, modern mammals began to evolve while flowering plants (angiosperms) underwent a dramatic taxonomic and ecological radiation (Lupia et al. 1999). Are changes in vertebrate faunas related to changes in vegetation? The Cedar Mountain Formation (Albian, 98 Ma, Cifelli et al. 1997), Utah, contains some of the earliest records of taxa that later dominate Late Cretaceous vertebrate faunas, as well as the first evidence of some modern mammals (Cifelli et al. 1997). To document the vegetation in which the animals actually lived (within the limits of taphonomic resolution), I examined the palynology (pollen and spores) of sediments from samples at or stratigraphically adjacent to six known vertebrate sites from volcaniclastic mudstones in the Cedar Mountain Formation. I counted 200 identifiable palynomorphs from each sample to document taxonomic diversity and ecological abundance of vegetational components.

Pteridophytes (e.g., ferns, lycopsids, mosses) were the most diverse vegetational component across this late Albian landscape, with about 55 species observed. Flowering plants were the second most diverse group, with approximately 20 identified species. Three species of conifers, one bennettitalean, one cycad and one gnetophyte were recovered. In contrast, pteridophytes were dominant in three of six samples (overall range 30-90%). Flowering plants were the most abundant at the other three sites, (range 0-60%). Conifers were less than 20% in all samples. These results suggest that the mammals, dinosaurs and crocodiles lived in and along a river system with sparse trees and abundant herbaceous, low-growing vegetation. ■



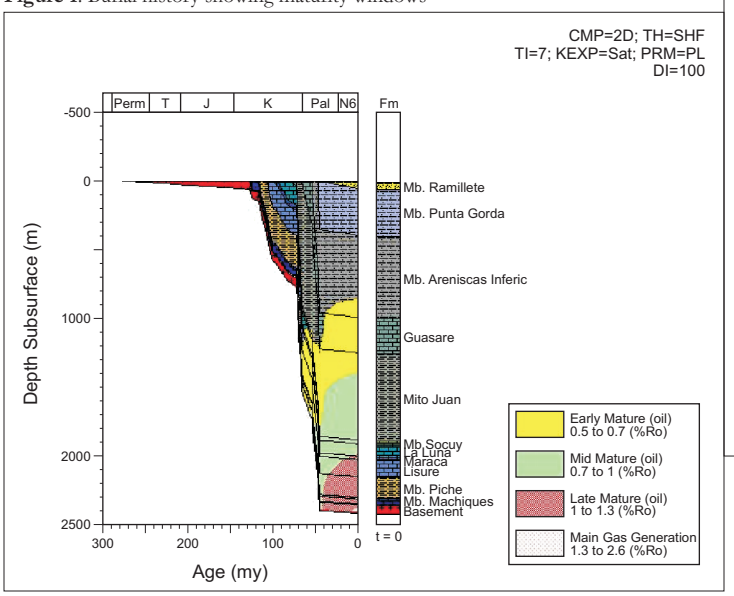


Basin Analysis of La Concepcion Field, Maracaibo Basin, Venezuela

Ngoc Hoang, M.S. student, School of Geology and Geophysics, University of Oklahoma

La Concepcion Field, which covers a surface of about 248 km^2, is located in the northwestern portion of the Maracaibo basin in the Zulia County. The field was discovered in 1924 by Shell. However, Shell only produced from the shallow Tertiary strata owing chiefly to ignoring the petroleum system (76 MMbbls) and in the mid 1990's sold the field to Perez Compac. Following new exploration, remaining recoverable reserves are estimated to be in excess of 25 MMbbls. In order to minimize exploration-development risk, this study analyzes well data and regional seismic lines in order to better understand its petroleum system. Preliminary basin modeling results suggest that principal source rocks include Type II Cretaceous (95 Ma) La Luna and Type III Tertiary (58 Ma) Misoa; reservoir rocks consist of carbonate (about 100+ Ma) Cretaceous Lisure and Apon, and siliciclastic Tertiary Misoa. Chief hydrocarbon oil phases matured around 60 Ma, cracked gas around 40 Ma, and Misoa gas around 42 Ma. Principal migration pathways were fault zones in the carbonates and along unconformities and through connecting reservoirs for the siliciclastics. With respect to charge, the field is overcharged and multiple additional undiscovered reservoirs are possible. Tectonic activities of La Concepcion Field in specific and Maracaibo basin in general provided four distinct phases of structuring and thermal perturbations which yielded two distinct petroleum systems. ■

Figure 1: Burial history showing maturity windows



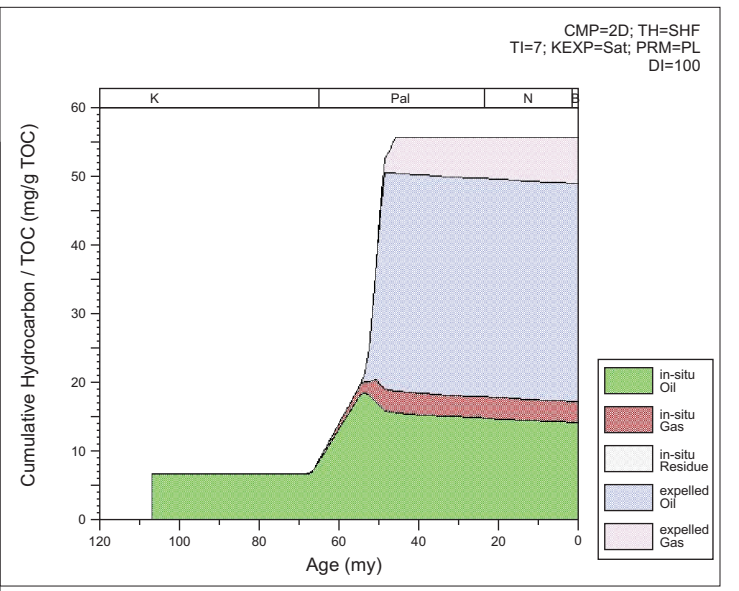


Figure 2: Cumulative hydrocarbon/TOC



The Integration of Geology and Engineering through the characterization and simulation of Aquifers of Gigante formation for Rio Ceibas Oil Field

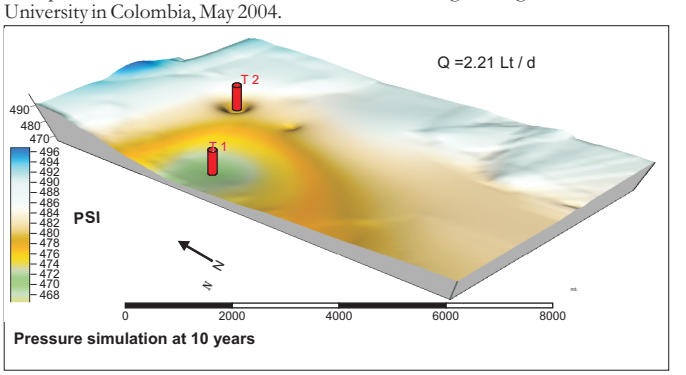
Carlos Bahamon, M.S. student, Geology, University of Oklahoma,
Rodrigo A. Guzman, Application Engineer, **Baker Hughes** Centrilift, Colombia

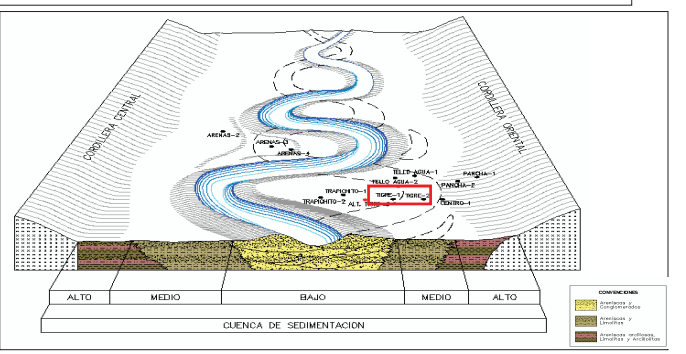
The enhanced recovery project of Rio Ceibas oil field depends on water production from Tigre 1 and Tigre 2 water wells that feed the injectors wells. The need for an understanding of the aquifers from which this project bases its success or failure calls for an integration of geology and petroleum engineering, which is the best possible approach in forecasting the performance of the aquifer.

The emphasis of this research was on the shallow water resource. This four year project (2000 – 2004) began with recognition of the regional and local hydrogeology, looking for aquifer formations inside the lease zone, acquiring multiple geoelectric surveys to prospect the best areas and depths to drill, logging, testing and completing the two Tigre wells. For studying the possible effects of superficial aquifers used by farmers close to the oil field, a shallow observation well net of four wells was also drilled. Interpretation of individual well tests and interference tests results were also done based on traditional hydrogeology methods like Theis and Jacob. The Tiab's Direct Synthesis Technique was evaluated as not a practical well test interpretation method for the aquifers. The aquifer is modeled with Visual Modflow of Waterloo Hydrogeologic, building a seven layer geological model with a 1600 grid size for simulation. The simulation results through time as well as measured results from wells tested, show that with the existing wells, and a proposed additional one, water production requirements of the injection program can be filled for the oilfield without affecting the superficial aquifers.

Future modeling and simulation runs need to be done during the life of the project as new production information and wells are gathered in order to update the reserves estimations, improve the understanding of the model and act as a base for accurate reservoir management decisions. The integration of geologists and engineers throughout the four-year study allowed the building of a more realistic model for the aquifer. The experience and knowledge of the regional geology of the geologists and the methodology of the engineers culminates in a better reserve evaluation and management of the groundwater as well as confirming that petroleum engineers contribute to improvements in hydrogeology. ■

¬This research was sponsored by Petrobras and Integrated Geological Services and has been presented as a Bachelor's Thesis in Petroleum Engineering at the Surcolombiana University in Colombia, May 2004.



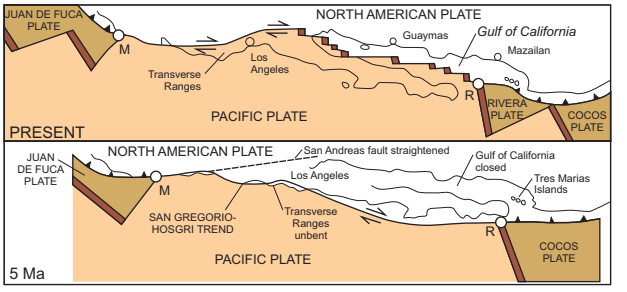




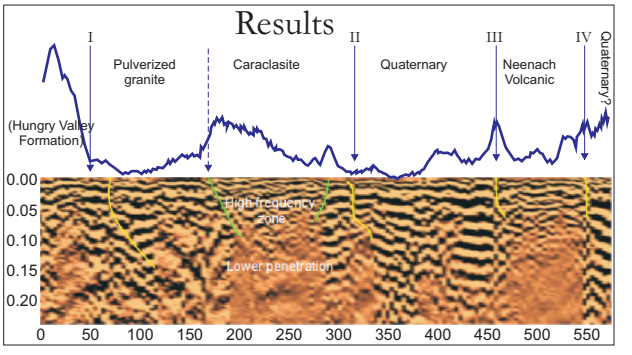
Characterization of the San Andreas Fault at Tejon Pass in Southern California Performed With Seismic Reflection and Electromagnetic Induction

Gabriel Borges, undergraduate student, University of Oklahoma

The San Andreas Fault has been characterized at Tejon Pass in Southern California, achieving an integrated geophysical study that combined Seismic Reflection and Electromagnetic Induction. Tejon Pass is located in what is called by geologists "The Big Bend" at the San Andreas Fault zone. It is a suitable area for this study, because it depicts a high uplift rate area that has risen two to five millimeters each year, disclosing exhumed features of the San Andreas Fault Zone that could reach four kilometers depth. Seismic reflection technique was performed along the Tejon Pass in order to visualize interesting geological structures. Electromagnetic induction was also accomplished in the area. The processing of the data contemplated a simple computational processing method introduced by A.Witten, B. Witten and R. Slatt, that attempts to synthesize the response to a plane wave that penetrates straight downward on a variable terrain, with a time-shifted sum over any data set. The profile displayed by the seismic matched pretty well with the EMI profile, depicting three sub-parallel segments separated by three faults according to our interpretation. These segments, found at the transect, overlapped one another, beginning at the southernmost segment known as the Hungry Valley Formation, where the first fault appeared separating this formation from the Tejon Lookout Granite. A cataclastic zone seen on the outcrops is distinguishable at the seismic profile as an abrupt increase in the frequencies compared to those shown by the Lookout Granite. Another fault that separates Quaternary sediments from the former block is identified on the profile, followed by a third fault set as the one that represents the separation of the Quaternary deposits and the Neenach Volcanic Formation. This formation is interrupted by another block with similar elastic properties to those at the Quaternary deposits, according to the frequencies depicted. The interruption is caused by an unexpected fault that follows the trend of a fault documented by the geologic reconnaissance, but thought to end farther southeast from the area of our study. ■



The collision between the plates generates a right lateral strike slip system defined as a convergent or restraining bend. (Wilson, 2004). The collision is going to produce a convergence and strike slip component because the plate motion is roughly 30 degrees oblique to the plate boundary along the continental transform of this junction.





Preliminary results from seismic imaging of the basement profile in western Unaweep Canyon, Colorado

Yoscel Suarez, M.S. student, **Roger Y. Young**, **Roy A. Johnson** and **Gerilyn S. Soreghan**
University of Oklahoma, and University of Arizona

The origin of Unaweep Canyon (western Colorado) remains debated. Some authors relate the genesis of the canyon with fluvial environments, presuming that either the Colorado or Gunnison river may have carved the Canyon in the Plio-Pleistocene. Others suggest that it was created due to glacial processes in either Pleistocene or the late Paleozoic. In order to be able to support any of these the shape and depth of the valley fill-crystalline basement contact needs to be determined.

To achieve this, a preliminary geophysical survey conducted within Unaweep Canyon in summer 2003 provided a first velocity model and an estimated depth for the top of the Precambrian basement of 195 feet. In summer 2004 a seismic survey and a gravity survey were acquired within western Unaweep Canyon. Seismic reflection data were collected in CMP mode along two lines: a NW-SE transverse profile (540 m long) across the canyon, and a longitudinal profile (150 m long) that crosses the transverse line.

The transverse refraction profile was supplemented by five shots at one end of the profile, producing reversed refraction profiles. Travel times from the refraction profiles indicate a velocity jump to approximately 1600 m/s at a depth of approximately 10 m. These values are in close agreement with earlier refraction results conducted nearby (2 km). The persistence of the refraction branch from this boundary at large distances from the shot indicates that there are no velocity increases to a depth >=100 m, and may indicate a thick section of heterogeneous conglomerate. The shallow refraction model will be used to correct the reflection profiles for variation in near-surface velocities. We are also integrating lithologic, petrophysical and depth data from a well drilled on the transverse profile to provide parameters for data processing and interpretation.

Ongoing analysis of these data will allow a more accurate assessment of the bedrock shape of Unaweep Canyon. If the true transverse profile of Unaweep Canyon is U-shaped, a glacial origin is likely, whereas a V-shape would be more consistent with a fluvial origin for the canyon. The seismic results will also enable analysis of the thickness and character of the canyon fill in regions beyond the well bore, which will contribute to our understanding of the possible age and genesis of Unaweep Canyon. ■

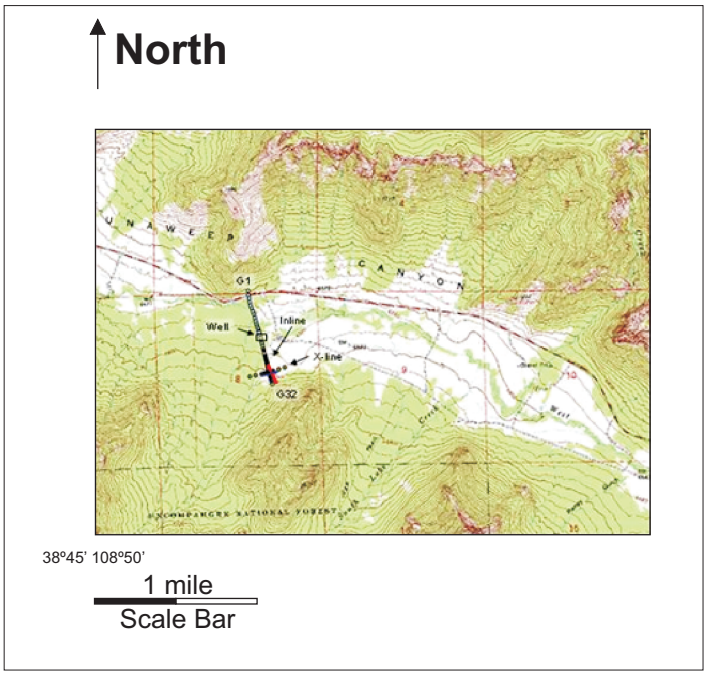


Figure 1. Map showing the location of the survey. The distance between the forward and reverse refraction profiles is about 240m (red line). Refraction analysis was also performed in the x-line direction covering a distance of about 120m (blue line).



Impacts in Carbonate Target Rocks: A Paleomagnetic Study of the Weaubleau-Osceola and Alamo Breccia Impact Structures.

S. A. Dulin, M.S. student, **R. D. Elmore** and **K. G. Gardner**, University of Oklahoma, School of Geology and Geophysics

There are many terrestrial craters that are associated with ancient bolide impacts in carbonate target rocks. The paleomagnetic study of these craters is useful to constrain the age of impact and can also provide insight on the sedimentary processes involved during deposition of bolide related beds.

The Weaubleau-Osceola structure is a 19km diameter circular structure that contains deformed Devonian Burlington-Keokuk limestones and a fall-back breccia. The age of the structure is stratigraphically constrained between deposition of the deformed Osagean limestones and the overlying undeformed Pennsylvanian (Desmoinesian) units. The deformed Burlington contains a magnetization residing in magnetite whose pole lies close to the Mississippian portion of the apparent polar wander path. Geochemical and petrographic analysis was also undertaken to help discern the origin(s) of the magnetization and link the impact to the remagnetized rocks.

The Alamo Breccia is a carbonate mega breccia located in southern Nevada that is commonly about 50m thick and covers an area of 10,000 km2. Features such as shocked quartz and carbonate spherules have led to the conclusion that the Alamo Breccia was deposited during an impact event on the shallow carbonate platform during the Late Devonian. The breccia consists of a graded bed that is interpreted as a tsunami deposit which formed after the impact. Sampling of the breccia will provide a test to determine if the unit contains a magnetization that coincides with the age of the deposit. If the results are positive, then the model can be applied to other tsunami deposits associated with impacts. ■

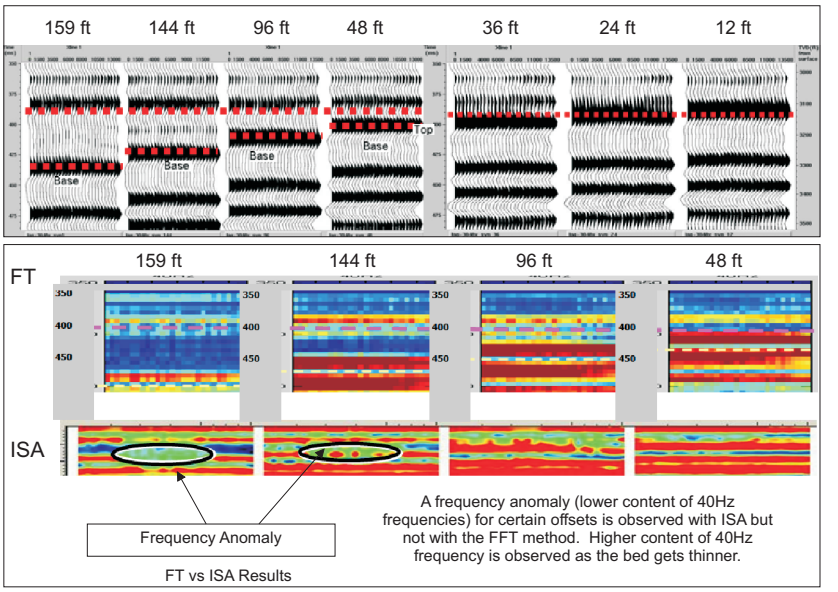


Tuning Effect Analysis On The Avo Response In The Frequency Domain: Comparison Of Fft And Isa

Carla C. Valerio, M.S. student, University of Oklahoma

This study demonstrates that the tuning effects can complicate and modify lithology and fluid type prediction based on an AVO analysis. In order to evaluate the tuning effect on the AVO analysis, a wedge model was generated for a gas reservoir located in the Maracaibo Basin-Venezuela. Then, an AVO modeling was performed for different thicknesses of the reservoir. The AVO response, which is represented by the intercept and gradient of the curve Amplitude versus Offset, varies depending on the thickness of the reservoir. Consequently, any lithology and fluid type prediction based on an AVO analysis could be altered by the thickness of the reservoir.

Additionally, a spectral decomposition was performed on the different AVO models for the wedge using FFT and ISA. Variations of frequency content with offset are better observed with ISA rather than with FFT. The frequency content varies with the tuning for the top and base of the reservoir. The original CDP data does not show anomalies observed in the frequency decomposed data. Therefore, the frequency dependent AVO response has additional information that could be used in future inversion projects. ■



FT vs ISA Results

Student Articles



Applications of Electron Microbeam Analysis to a Metapelitic Garnet-Mica Schist and Applied Geothermometry

Aaron S. Bell, undergraduate student, University of Oklahoma

*Special Acknowledgment of Dr. David London and Dr. George Morgan

Detailed electron beam microanalysis of metamorphic garnet solid solutions often reveals distinct compositional zoning and chemical heterogeneities within individual garnet porphyroblasts. This chemical zoning within the garnets is a direct reflection of the changing P and T conditions throughout the growth history of the garnet. A metepelitic garnet-mica schist sample from the Manzano Mountains, NM collected on a petrology field trip was utilized in this study. The primary aim of this study is the practical application of geothermometry and the comparison of the (presumably different) temperatures yielded by a variety of experimentally and empirically calibrated geothermometers. In this study all investigations into the chemical composition of the garnet porphyroblasts and the accompanying biotite and muscovite matrix phases have utilized both the qualitative and quantitative aspects of electron beam microanalysis. Multiple quantitative chemical point analyses of both the garnets and micas were obtained through the use of wavelength-dispersive x-ray spectrometry. Spatial and textural relationships between phases were also examined and documented using digitally acquired backscattered electron images. Point analyses of the garnet rims and the muscovite directly adjacent to the porphyroblasts were subsequently used in an empirically derived garnet/muscovite geothermometer of Wu et al. 2002. The "no ferric iron" model of the geothermometer was applied and a temperature of 534 C was obtained. The future of the project will involve the applications of several different calibrations of garnet-biotite geothermometers (both experimental and theoretical), an apatite-biotite geothermometer, and potentially a Ti in biotite geothermometer. Further electron beam microanalysis is planned to quantitatively examine the F and OH content of accessory apatite. Through the use of independently established temperatures and the strongly temperature dependent F/OH exchange reaction, chemical equilibrium between coexisting biotite and apatite might be assessed. The question regarding the implications of volatile species equilibrium in geothermometers utilizing biotite might then be able to be addressed through this study. The activities of the components of the metamorphic fluid may also soon be assessed through a thermodynamic approach. ■

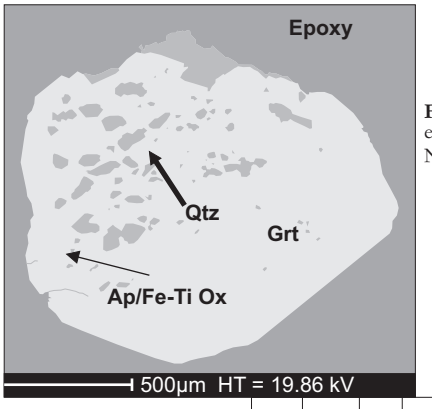


Figure 1. BSE Image of Garnet extracted from Matrix
Note: Ap=Apatite

	Weight Percent Oxides							
	SiO2	*TiO2*	*Al203*	*FeO*	*MnO*	*MgO*	*CaO*	*Total*
			Garnet 1					
G1-1	36.74	0.08	20.51	31.16	9.59	1.10	2.16	101.34
G1-2	36.62	0.06	20.41	31.22	9.47	1.07	2.20	101.07
G1-3	36.72	0.04	20.53	31.10	8.77	1.08	2.52	100.75
G1-4	36.69	0.06	20.70	32.07	7.44	1.17	3.05	101.18
G1-5	36.82	0.05	20.58	33.31	6.00	1.23	2.89	100.88
G1-6	36.80	0.05	20.67	34.07	5.20	1.38	2.71	100.88
G1-7	37.01	0.00	20.60	34.78	4.42	1.47	2.62	100.90
G1-8	36.91	0.05	20.78	36.50	2.75	1.71	2.37	101.07
G1-9	37.07	0.04	20.71	37.31	2.01	1.92	2.08	101.14
G1-10	37.08	0.01	20.70	37.93	1.87	1.90	1.53	101.02
Ave.	**36.85**	**0.04**	**22.62**	**33.95**	**5.75**	**1.40**	**2.41**	**101.02**
Std Dev.	**0.16**	**0.02**	**0.11**	**2.62**	**2.99**	**0.03**	**0.05**	**0.17**

Figure 2. Point analyses and averages of garnet compositions obtained by wavelength dispersive spectrometry WDS



Sequence-stratigraphic context of Cambrian extinctions: trilobite faunas, stratigraphy and sedimentary facies of the Eau Claire Formation and the Tunnel City Group, Upper Mississippi Valley.

Jennifer D. Eoff, Ph.D. student, School of Geology and Geophysics, University of Oklahoma
Advisor: Dr. Stephen R. Westrop

The Upper Mississippi Valley is a classic area for Cambrian stratigraphy in North America (Berg, 1953, 1954; Berg et al., 1956; Ludvigsen and Westrop, 1985). The Upper Cambrian (Marjuman-Sunwaptan) Eau Claire Formation and Tunnel City Group (Lone Rock and Mazomanie formations) exposed in central and western Wisconsin and southeastern Minnesota represent a shallow marine shelf dominated by clastic sedimentation and storm deposition during a time of exceptionally high sea level. The sandstones contain diverse assemblages of Late Cambrian trilobites from the Cedaria-Crepicephalus, Aphelaspis-Elvinia and Taenicephalus-Saukia zones, but their systematics have not been studied in detail since the early 1950s (Nelson, 1951; Bell et al., 1952; Berg, 1953). Further, the current depositional model (Runkel et al. 1998) is based on a sparsely fossiliferous part of the succession.

An exhaustive taxonomic revision and biostratigraphy are necessary in order to test how the presence and distribution of fossils are influenced by sequence stratigraphic architecture. That sequence architecture exerts a strong, often controlling influence, has been demonstrated in Cinncinnatian (Ordovician) sediments (Holland, 2000; Kidwell and Holland, 2002). Holland (1995, 1996, 2000) noted that extinctions occurring at sequence boundaries and flooding surfaces could be artifacts and those within TST and HST real. Boundaries of the Late Cambrian trilobite stages, in particular the Steptoean-Sunwaptan, correspond both to trilobite extinction events (Ludvigsen and Westrop, 1985) and probable sequence boundaries within the overall Sauk sequence (Palmer, 1981); thus, the trilobite patterns upon which the boundaries are defined must be tested against null models with sequence architecture as the predominant control to ensure that the faunal exchanges are not artificial (Holland, 1995, 2000; Kidwell and Holland, 2002). My study will include detailed analysis of the sequence stratigraphy and sedimentary facies of the Cambrian succession. The combination of new lithostratigraphic and sedimentological work with revised trilobite biostratigraphy and systematics will permit examination of potential forcing mechanisms behind the faunal turnover with changes in relative sea level the primary focus (Holland, 2000; Kidwell and Holland, 2002).■



Research Area: Outcrop belt of Upper Cambrian Eau Claire and Lone Rock formations in Wisconsin and Minnesota. Outcrop localities denoted by black dots.



"Cedaria" woosteri (Whitfield) cranidium from the Cedaria Zone, Eau Claire Formation, Strum, Wisconsin.



Hummocky cross-stratification, representing shallow subtidal storm deposition, Lone Rock Formation, Wheeler, Wisconsin.



Earthquakes and Tsunamis

Inyene Awakessien, Geology Undergraduate, School of Geology and Geophysics, University of Oklahoma

We often hear the word "tsunami" in today's news. What does it mean? What causes a tsunami? Is everyone on earth equally affected? What determines how destructive a tsunami will be? Is the United States at risk? By now you are probably wondering why I ask all of these questions. I ask because the devastating tsunami that hit South Asia on December 26, 2004 was an eye opener. You and I should be aware of this natural disaster – its causes and dangers.

Tsunami is a Japanese word meaning "harbor wave." It is a series of ocean waves with very long wave lengths generated in a body of water by a sudden disturbance which vertically displaces the water column (Figure 1). Most occur in the Pacific Ocean, which is surrounded by a highly active volcano and earthquake zone called the Ring of Fire. The ring circles the ocean from Alaska to the west coasts of North and South America and up along the east coast of Asia, taking in parts of China, Japan and Russia. For this reason, not everyone on earth is equally affected by tsunamis. They only cause damage in coastal regions and their existence is difficult to prove until they reach shallow water. Certain types of new predictive instruments are designed to check for the passage of a tsunami in the deep ocean.

Under normal conditions, the earth's oceans are still. Tsunamis are created when the flatness of the ocean's surface is suddenly disturbed, usually by some huge, underwater upheaval, often an earthquake, but sometimes by a landslide or volcanic eruption. When that happens, the ocean floor shifts upwards or downwards (Figure 1).

Not all earthquake types cause tsunamis. Subduction zone earthquakes are the most likely contributors (Figure 2). The lifting motion must be capable of displacing huge amounts of overlying water, thus causing gravity waves. A tsunami can travel at 600 mph—as fast as a jet flies. When this amount of speed and energy are focused into a shallow water environment the water begins to rise, warning that tsunami energy is present.

Hopefully, I'm not scaring you about the dangers of a tsunami. You are probably asking, what size earthquake strength is required to trigger a tsunami and how often do they occur? To cause a tsunami the right type of earthquake has to occur and have a magnitude of 6.5 or greater on the Richter scale. Earthquakes with an 8.0+ magnitude occur only every 100 to 1000years. The last time an earthquake/tsunami occurred in the United States was in 1700; it had a magnitude of 9.0. It hit Washington because of the Cascadia subduction zone shown in Figure 2. The United States may not be at as much risk as other coastal regions, but research finds that tsunamis tend to impact the same localities repeatedly. It's been over 300 years since the last earthquake/tsunami occurred in Washington.

The disastrous tsunami that hit South Asia on December 26, 2004 was caused by the largest earthquake that area has seen in 40years, with a 9.0 magnitude. It occurred where the Indian plate subducts beneath the overriding Burma plate and generated tsunamis in 11 countries bordering the Indian Ocean. The energy released was 20 * 10^17 Joules or equivalent of 23,000 Nagasaki bombs. More than 80,000 were reported dead, 45,000 in Indonesia alone. Three months later, on March 28, 2005, another earthquake of 8.7 magnitude hit Indonesia, killing about 2000 people.

But the tsunami generating process is more complex than a sudden displacement against the column of ocean water. The earthquake's magnitude and depth, water depth in the region of tsunami generation, the amount and velocity of vertical motion of the sea floor, whether there is instantaneous slumping of sediments and energy transfer efficiency from the earth's crust to ocean water are all part of the generation mechanism. Predicting tsunamis isn't an easy task. When they are produced by undersea collapses, all that can be reported with any surety is that a submarine region is relatively unstable and that there is a risk in the Pacific Ocean due to an earthquake, volcano or landslide. However, predictions can be made because tsunamis impact the same areas repeatedly under these conditions. On the other hand, if you ever hear that an earthquake of magnitude 6.5 or greater has hit your area ladies and gentlemen—RUN!--for a tsunami is a possibility. ■

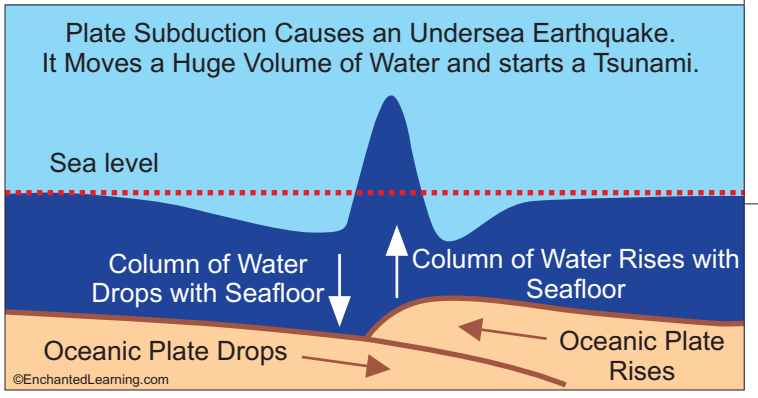


Figure 1. Illustration of how an earthquake lifts the water to cause a tsunami.

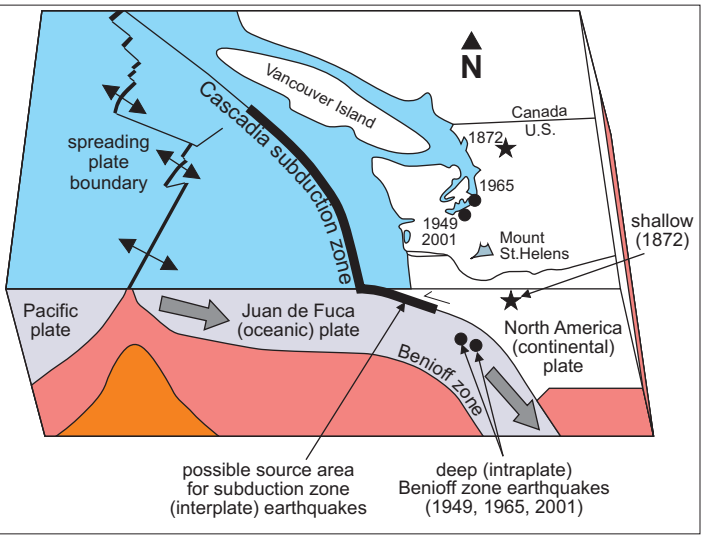


Figure 2. Typically subduction zones are locations for the type of Earthquakes that cause a tsunami. The subduction zone off the coast of Washington is a good example.

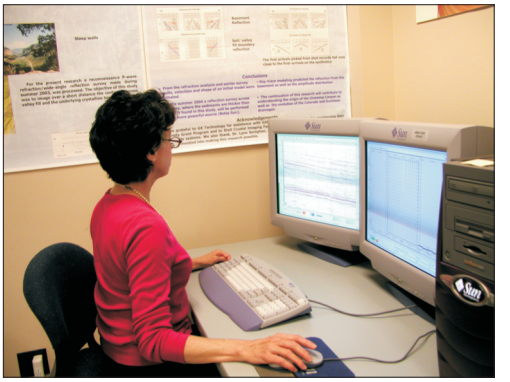
IN THE NEWS!!

























In The News - Faculty Award



Dr. Lynn Soreghan was honored in 2004 as a Fellow of the Geological Society of America. As published in GSA Today (July 2004), " Gerilyn Soreghan was elected for her vigorous research and superior teaching in the field of sedimentary geology and especially for her work in elucidating varied aspects of glacioeustatic cyclostratigraphy in Paleozoic strata."■

In The News - Student Awards

Once again our students earned many awards. Following are the honors we know about.

- **Brooke Wilborn** was awarded the Gretchen L. Blechschmidt Award for 2005 ($3200), awarded by the Geological Society of America
- **Jennifer Eoff** received two research grants: a student research grant from the Geological Society of America ($1500) and the Stephen J. Gould Student Grant from the Paleontological Society ($500)
- **Kate Moore** was awarded the Energy Cup Scholarship and the Kerr McGee Scholarship this year.
- **Tiffany Stephens** (a graduate student majoring in geology and law) won a law scholarship--Comfort Scholarship $3,500/semester (with B average or better) given based on LSAT score and undergrad GPA, and the Am Jur Academic Achievement Award in Energy Law (given to top grade in the class)
- **Kathryn Gardner** graduated summa cum laude with a 4.0 GPA. She was named Big Woman on Campus and elected to the Homecoming Royalty Court. Kathryn was named the College of Geosciences Outstanding Student, received the Charles N. Gould Outstanding Senior Award, a graduation stole for being a member of the 2004-05 PE-ET class (an honor society for the top ten seniors on the campus) and she was named to the Letzeiser Honor List.
- **Brian Harms** was named the David Stearns Outstanding Senior as well as being invited to join Phi Beta Kappa. He also received a Questar and a Jon Withrow Scholarship.
- **Chris Harms** received the Estwing Hammer Award, was also invited to join Phi Beta Kappa and received a Jon Withrow Scholarship.
- **Kristen Marra** received a David Stearns Outstanding Senior Award.

Dean's Honor Roll

Named to the Dean's Honor Roll for 2004 were:

For Geology:
Quinn Floch
Kathryn Gardner
Katie Gunderson
Brian Harms
Christopher Harms
Kevin Harris
Christopher McLaughlin
Breanne Minor
Matthew Totten, Jr.

For Geophysics:
Rika Hood
Jonathan Jarrett



Kathryn Gardner with her parents Ray and Claudia at the Campus Awards Program

Campus Awards Night

On Friday, April 8, 2005, the University of Oklahoma took time to recognize its outstanding students in an annual Campus Awards Program. In the ceremony, each college awarded their best and brightest students with plaques and certificates, while parents and family members watched proudly. In addition to awards given by each college, awards were also given from OU's Center for Leadership Development.

The School of Geology and Geophysics was overwhelmingly represented on the evening of April 8! Several SG&G students received awards from the College of Geosciences. Kathryn Gardner, the College of Geosciences Outstanding Senior, received the Charles N. Gould Outstanding Senior Award. In addition, Brian Harms and Kristen Marra both received the David Stearns Outstanding Senior Award. Last but not least, Chris Harms received the Estwing Hammer Award.

From the Center for Leadership Development, Kathryn Gardner also received a graduation stole for being a member of the 2004-2005 PE-ET class. PE-ET is an honor society for the top ten seniors on the OU campus. At the very end of the evening, Kathryn was also named to the Letzeiser Honor List. The Letzeiser Awards are the highest awards presented during the Campus Awards Program; the selections are based on leadership, scholarship and service to the university.

Congratulations to the School of Geology and Geophysics outstanding scholars!■

In The News - College of Geosciences Awards Night



Held in the Sam Noble Oklahoma Museum of Natural History, April 22, 2005, the Geosciences Awards Night was a great event.

Dr. Slatt welcomed everyone for the School of Geology and Geophysics and turned the time to Kathryn Gardner, who spoke on behalf of the School. Kathryn is from Broken Arrow, Oklahoma and is the Outstanding Senior for the College of Geosciences this year and receives the Trailblazer Scholarship associated with that. She was also named Big Woman on Campus and elected to the Homecoming Royalty Court. Following a six week geology field camp in Colorado this summer, she will graduate summa cum laude with a Bachelor of Science in Geology. She has a 4.0 grade point average. Kathryn will begin work on her doctoral degree in Planetary Science this fall at the University of Arizona. She has participated in several internship programs with NASA (see article in the "In The News" section) and plans to become an astronaut.

Dr. Slatt then acknowledged other SGG undergraduate students receiving awards as follows: Amir Allam, Henry Badra, Andrew Correa, Rika Hood, Melissa Orr, Garrett Reasnor, Aaron Siemers, Matthew Totten, Inyene Awakessien, Christopher Grimm, Daniel Beck, Paul Bowen, Aaron Bell, John Guess, Katie Gunderson, Jason Harms, Margaret Hayes, Katherine Moore, Colt Nickel and Miguel Sipuikinene. (Refer to "Student Scholarships, Fellowships and Support" later in this publication for details.)

Katherine Moore is graduating with distinction and she and Strethen Townsend are also the recipients of Energy Cup Scholarships (see brief article). Dr. Slatt then acknowledged Kathryn Gardner for further awards. She received three SGG scholarships (refer article above), as well as the Charles N. Gould Outstanding Senior Award for 2004-2005. Brian Harms, who has been invited to join Phi Beta Kappa, will be graduating with Special Distinction and, in addition to a Jon R. Withrow and a Questar scholarship, has been awarded the Dr. David Stearns Outstanding Senior Award for 2004-05, which was also presented to Kristen Marra—having two recipients was a first for this award. Christopher Harms also received a Jon R. Withrow Scholarship in addition to being selected for the Estwing Hammer Award. He will be graduating with a 4.0 grade point average and has been invited to join Phi Beta Kappa.

Dr. Slatt then acknowledged the graduate students receiving awards as follows: Kajari Ghosh, Subhotosh Banerjee, Devin Dennie, Jennifer Eoff, Jamie Rich, Olubukola Ojo, Olutunde Ademola Soyinka, Louise Totten, Satish Sinha, Kerry Moreland and Yoscel Suarez (refer to chart later in publication for details).

Each year the School of Geology and Geophysics staff contributes to a fund honoring the student who was the most cooperative and helpful to the School. The award is the "Geology and Geophysics Students ROCK! Award" and it was presented this year to Sabata Pereira.

Aaron Rothfolk, who was a ROCK! Award winner last year, received the Stan Cunningham Excellence in Teaching Award. ■



Alums Dave Campbell and Bob Thomas



Kerry Moreland and Aaron Rothfolk (without whom the School would not have functioned nearly as well this year).



Doctoral candidate Jamie Rich and family.



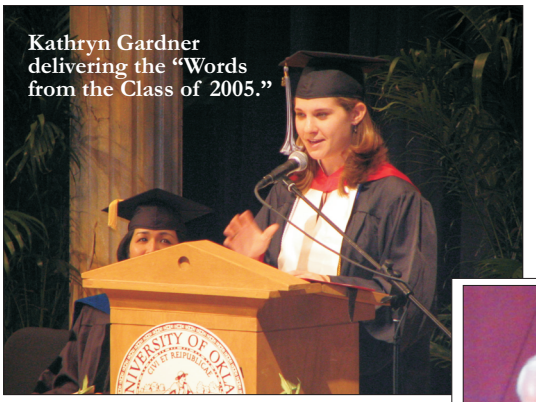
Dr. Roger Slatt with the Brothers Harms (Chris, Jason and Brian).



Kathryn Gardner and Kate Moore.

In The News - Graduation 2005

Commencement and Convocation



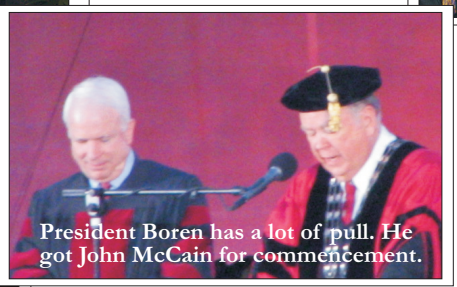
Kathryn Gardner delivering the "Words from the Class of 2005."



What would graduation be without parents, pipes and pageantry? It took some sweat, some fears and tears, but Graduation's finally here!!

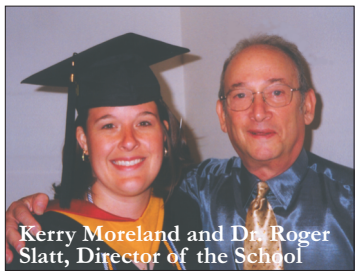


Back: Kerry Moreland, Abbie Negrey, Sonia Bradley, Sara Kaplan, Carlos Cabarcas
Front: Tomieka Searcy, Tiffany Stephens, Sabata Periera, Luz Lozano



President Boren has a lot of pull. He got John McCain for commencement.

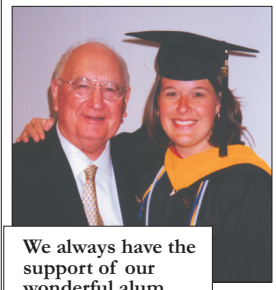




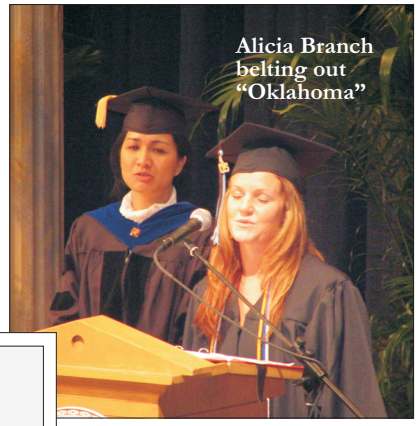
Kerry Moreland and Dr. Roger Slatt, Director of the School



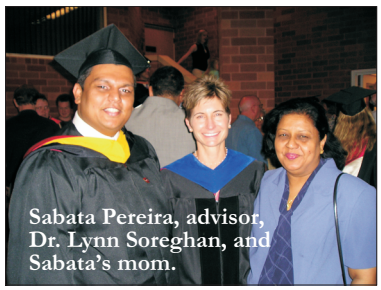
Now this is a truly international group. An Oklahoman, a Colombia and an East Indian. Sara Kaplan, Luz Lozano and Sabata Pereira



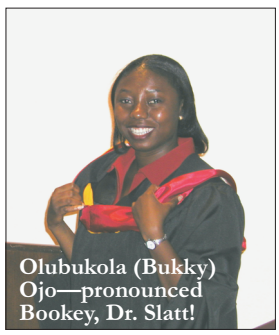
We always have the support of our wonderful alum, Dave Campbell



Alicia Branch belting out "Oklahoma"



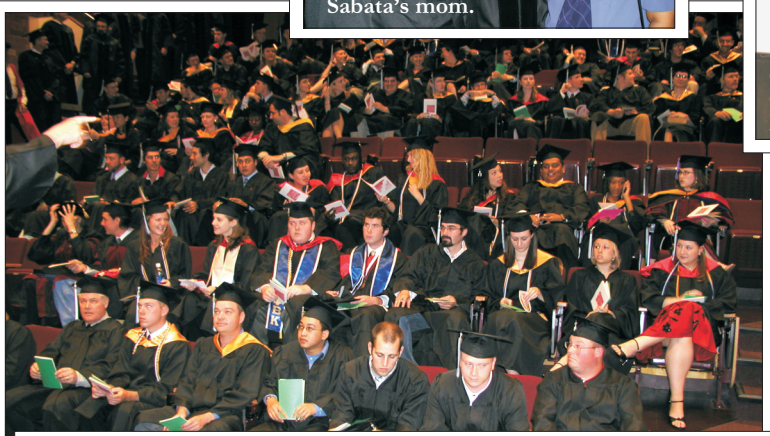
Sabata Pereira, advisor, Dr. Lynn Soreghan, and Sabata's mom.



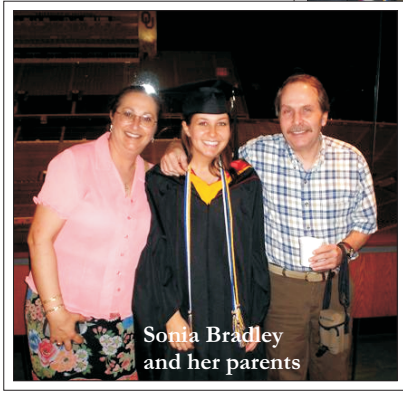
Olubukola (Bukky) Ojo—pronounced Bookey, Dr. Slatt!



Kerry and her parents



Second row r-l: Katherine Moore, Breanne Minor, Kristen Marra, Kurt Johnson, Chris Harms, Brian Harms, Kathryn Gardner, Alicia Branch, ?, ?
Third row r-l: Tiffany Stephens, Tomieka Searcy, Sabata Periera, Luz Lozano, Sara Kaplan, Walter Doyle, Sonia Bradley, Jose Villalobos, Aaron Siemers, Paul Richardson, Ronnie Pike
Fourth row r-l go way over past the middle: Marco Vignali, Bukky Ojo, Kerry Moreland and Ngoc Hoang



Sonia Bradley and her parents



In The News - Student Chapter Activities



AAPG Student Chapter

By **Aaron Rothfolk**, President

Is there a more perfect way to introduce new and returning AAPG student chapter members to each other than ice skating? The answer is no, and not only was it perfect it was entertaining watching people from the oil belts of the world attempt to stay vertical on ice. That activity in essence set the stage for what this chapter's year would be, enriching. We spent a majority of the first semester organizing the chapter and doing a little inventory reduction of cookbooks and plastic footballs that were long overdue for a new home. In the process of this fall cleaning we realized any fundraiser launched by this year's chapter must be of a higher quality and of a better use.

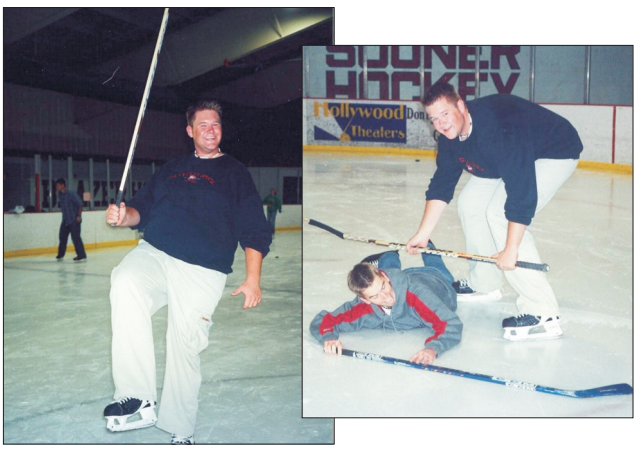
We accomplished this by designing and registering a simple embroidered logo that would be ours to use forever. We plastered this logo onto a crimson hat and began a solicitation campaign to the Alumni Advisory Council and the Council responded. The generosity of these alums was astonishing and more appreciated than they may ever know. Because of across the board budget cuts to all student groups, we needed their help so that this chapter could deliver on its biggest goal, a geology enrichment trip.

Thanks to the AAC donations and a chunk of change Shell Oil Company kicked in due to some strong arm tactics of this year's President, student chapter members went on a trip to Reef country almost free of charge. We saddled up for a grueling drive across the hellish landscape known as the Texas Panhandle on our way to the Guadalupe Mountains. It was there we got thrown into some amazing geology on the Permian Reef Trail and in Carlsbad Caverns; a great opportunity to sit back and fall in love with geology all over again.

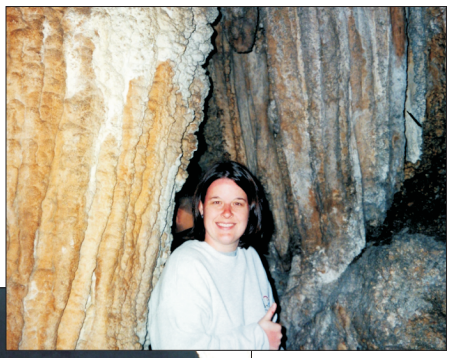
This field trip and the ice skating serve as the bookends to a year filled with enriching activities. Many of our members volunteered their time over and over again to youth groups, Girl Scouts, group homes for the mentally retarded, after school programs, Earth Day activities, health fair/blood drive and starting a new student chapter of AWG. But the most outstanding display of student support came during the Spring Student Expo. A worried group of AAPG officers posted numerous times slots that needed to be filled by volunteers in order for the Expo to have a chance of survival and success. Within a week of posting sign up sheets we had more volunteers than we needed in a display of student support that sent chills down our spines. It was our chance to give back to a department that has given us so much and in the end, this school and this chapter is full of better and more enriched people. That my friends, is all we can hope for any of us. ■



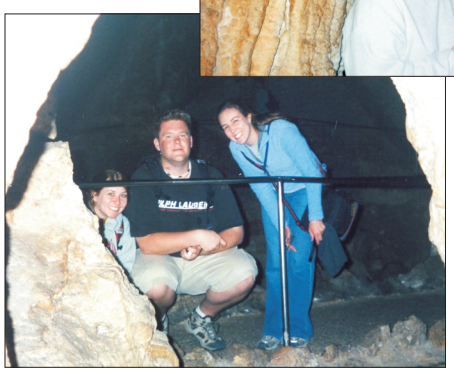
Back l-r: Fabricio Parra-Galvis, Ryan Miller, Veronica Caro Bayer, Carlos Cabarcas, Ramon Asuaje, Camilo Goyeneche, Caroline Goyeneche, Kerry Moreland,
Front: Yoscel Suarez, Sebastian Bayer, David Ramirez, Heidy Correa, Gloria Romero and Tomieka Searcy. Crazy guy sitting on the ice: Marco Vignali (who else)



Aaron Rothfolk and Adam Shear: Let a couple of Minnesotans show you how this is done.



Kerry Moreland



Sonia Bradley, Aaron Rothfolk and Vanessa O'Brien



Aaron Rothfolk and Adam Shear standing.
Sonia Bradley, Heidy Correa and David Ramirez (the two names always appear together) and Louise Totten

The Association for Women Geoscientists (AWG), Sooner Chapter

Sonia Bradley M.S. Student, **Sara Ann Kaplan** M.S. Student

The fall 2004 semester brought a new chapter of the Association for Women Geoscientists (AWG) to the University of Oklahoma – the first chapter in the state. Dr. Gerilyn (Lynn) Soreghan, Associate Professor in the School of Geology and Geophysics, is serving as faculty advisor. The 2004-2005 AWG Sooner Chapter officers, who brought AWG to OU, are: Sonia Bradley, Nicole Baylor, Tomieka Searcy and Sara Kaplan. All the officers are master's candidates in Geology, though Nicole is working on a joint degree in Environmental Science. Currently, AWG has members from geology, geophysics, environmental science and meteorology.

The AWG Sooner Chapter was very active during our inaugural year. In the fall 2004 semester, the chapter participated in Geosciences Week, in association with the Geosciences Student Leadership Council, to bring together the three Schools in the College of Geosciences and to promote Earth Sciences throughout the community. AWG sponsored "Pass the Word with Sweetness;" environment-saving tips and Earth awareness facts attached to pieces of candy and handed out to students at the Oklahoma Memorial Union during lunchtime (samples below). The message of "Pass the Word with Sweetness," was that small changes make big differences. In November AWG members printed purple Rape Awareness stickers as part of a campus wide effort to promote rape awareness.

In the Spring 2005 semester, the Sooner Chapter focused their efforts on hosting a two-day Women in Science and Engineering Conference (WiSE), March 4-5, 2005. It began with an etiquette dinner hosted by Martha Aughe, an etiquette and protocol consultant trained and certified by the Protocol School of Washington and the owner of The Etiquette Source and Tea Etiquette by Martha in Norman. During dinner, which was a "learn while you eat" event, members of the Sooner Chapter learned business dinner etiquette that will prove beneficial during next year's recruiting season and give us confidence for future professional settings. Following dinner, Dr. Soreghan spoke on balancing being a full time professor, wife and mother of three.

During the Saturday morning session of WiSE, guest speakers spoke on issues important to young women entering the job market. The first speaker was Jenni Kessler, a recent OU Masters graduate in Geology currently with St. Mary Land and Exploration in Tulsa. Her topic was the transition from college to professional life. Noel Osborn, a geologist for the Oklahoma Water Resources Board in Oklahoma City, spoke about the ups and downs of a career in the petroleum industry and shared her experiences. The WiSE Conference concluded on Saturday afternoon with a resume-writing workshop and interviewing tips. Included throughout the day were tips for living a healthier life. The WiSE Conference was funded in part by a Valentine's Day Bake Sale, which raised almost $300.

Next year, the Sooner Chapter plans to remain active in OU events and become more active in the community. We hope to increase membership to include other colleges and universities as well as professional women throughout the state. The Sooner Chapter has the possibility of bringing women in the geoscience community of Oklahoma together. For more information visit the website at www.awg.org. For Sooner Chapter information contact Lynn Soreghan at lsoreg@ou.edu or by phone at 405-325-3253. ■



Valentine's Day Bake Sale Fund Raiser
04-05 AWG Sooner Chapter Officers
From left to right: Sara Kaplan, Nicole Baylor, Sonia Bradley and Tomieka Searcy.



Invest in a reusable water bottle instead of buying bottled water at school.



Ride your bike or walk when making short trips.



Turn off lights and appliances right after you finish using them.



If we recycle 10% of all our newspaper, we can save 25 million trees each year.



When doing laundry, use cold water whenever possible. Clean the lint filter in your dryer every time. A clogged filter increases drying time.



The energy saved from recycling one aluminum can could keep your TV running for 3 hours.

SEG Student Chapter

by **Sabata Pereira**, President

It has been a great year for the Society of Exploration Geophysicists Student Chapter at the University of Oklahoma. We are proud to say that we have grown by leaps and bounds. Our current membership has risen from 35 members to over 75 members. This is due to the constant interest generated by various speakers the school invites for the Shell Oil Colloquium Series.

We started out the year by electing the new committee which consisted of Sabata Pereira (president), Yoscel Suarez (secretary) and Gloria Romero (treasurer).

Thanks to School support, SEG student chapter members were able to attend the SEG 74th annual exposition and meeting in Denver (pictures below). We sincerely appreciate Dr. Roger Slatt for making this possible. The students were able to participate in a lot of technical courses, were exposed to new technologies and networked with industry professionals. The students also helped set up and man the OU School of Geology and Geophysics booth. The School hosted an alumni reunion at the Denver Marriott that helped students network with alumni who are currently working in the industry. This event was wonderfully organized by Donna Mullins.

The SEG student chapter hosted the SEG Distinguished Lecturer Dr. Greg Partyka for the weekly Shell Oil Colloquium Series in Spring 2005. Dr. Partyka gave a talk on "Spectral Decomposition" and helped in understanding this technology with real and model case studies. The students later went out to dinner where they were able to discuss their research interests with him.

All good things must come to an end, but I hope the chapter continues and flourishes in the years to come. It was an honor to serve as the chapter president. ■



OU Students with Distinguished Lecturer Dr. Paul Weimer after attending his course Petroleum Systems of Deepwater Settings at the 2004 SEG Annual Meeting
Pictured from left to right: Marco Vignali, Gloria Romero, German Camargo, Carlos Cabarcas, Dileep Tiwary, Heidy Correa, Gabriel Borges, Yoscel Suarez, Juan Pablo Gomez, Dr. Paul Weimer, Ramon Asuaje, Felipe Gallego, Sabata Pereira, Carla Valerio, David Ramirez, Kerry Moreland and Ryan Miller



OU Alumni Banquet at the 2004 SEG Annual Meeting
Back row from left: Vance Hall, Donna Mullins, David Ramirez, Ryan Miller, Felipe Gallego, Gabriel Borges, Juan Pablo Gomez, Nick Gregg and Sabata Pereira
Girls in the front from left: Kerry Moreland, Heidy Correa, Gloria Romero and Yoscel Suarez



OU Students burning up the dance floor at the Student Reception during the 2004 SEG Annual Meeting
Pictured from left: David Ramirez, Heidy Correa, Ramon Asuaje, Felipe Gallego, Yoscel Suarez, Kerry Moreland, Ryan Miller, Juan Pablo and Sabata Pereira



OU Students enjoying a friendly game of Human Fusball at the Student Reception during the 2004 SEG Annual Meeting
Pictured from left to right are the following: Juan Pablo Gomez, Felipe Gallego, Ramon Asuaje, Sabata Pereira, Yoscel Suarez, Nick Gregg, Kerry Moreland, Carla Valerio, Ryan Miller, Heidy Correa, Gabriel Borges and David Ramirez

Sigma Gamma Epsilon Scholarship Ball

Kathryn Gardner

In the spring of 2003, the Gamma Chapter of Sigma Gamma Epsilon established an annual scholarship fundraiser called the SGE Scholarship Ball. The third annual SGE Scholarship Ball occurred on April 15, 2005, and it was a wonderful success! Through the evening, SGE raised over $1,000 for the scholarship fund. From that money, two scholarships can be given to two of the Gamma Chapter members. SGE was very excited to have received donations amounting to $900 from various donors from the College of Geosciences. The rest of the money raised came from a member clean-up at the Lloyd Noble Center and through ticket sales.

The ball this year occurred in Beaird Lounge of the Oklahoma Memorial Union on OU's campus. Members, non-members, donors and faculty danced the night away while eating cookies and cake. Hosty Duo, a Norman tradition, filled the room with music and geoscience jokes. As Hosty Duo put it, we all ate cake on "tectonic plates!" At the ball, the SGE officers also took a moment to thank those that donated money for the scholarship fund, especially John Withrow, who attended the ball with his wife, and Brian O'Brien, who donated $500, the largest donation ever received for the SGE Scholarship Fund! In addition, Sara Kaplan, the chair of the 2004 SGE Scholarship Committee, awarded graduate student Aaron Rothfolk and geography senior Johnathan Rush the two SGE Scholarship Ball scholarships from last year.

The evening was partially funded by the University of Oklahoma Student Association and the Union Programming Board. ■





In the School of Geology and Geophysics we have beautiful ladies (Sonia Bradley, Kathryn Gardner, Tomieka Searcy and Sara Ann Kaplan are just a sampling) and . . . handsome gentlemen (here we have Sabata Pereira, Matthew Boyce, Adam Shear and Ryan Miller).

Alumni Jon Withrow and his beautiful wife Kathy supported the SGE Ball. Geologists don't lose their looks as they age.







When you spend years working and studying together you can make some pretty great friends. Far left is Kerry Moreland and Aaron Rothfolk, and left is Dustin Sweet and Vanessa O'Brien



David Ramirez and Heidy Correa



Sonia Bradley and Adam Shear



Ryan Miller and Sarah Austin

But sometimes you make other connections. Some were already an item when they arrived at the School, (David and Heidy) and some met when they got here (Sonia and Adam, and Ryan and Sarah).

National Association of Black Geologists and Geophysicists

Tomieka Yvonne Searcy, M.S. Geology Student

During the spring of 2004, a group of students rejuvenated the National Association of Black Geologists and Geophysicists (NABGG) University of Oklahoma (OU) Chapter with Pamela Neal, Assistant Dean of the College of Geosciences as advisor. The chapter is affiliated with NABGG headquartered in Houston, Texas. The purpose of the organization is to: 1) inform students of career opportunities in geology and geophysics 2) inform students of scholarships, grants, loans and other financial aid available to minority students and 3) follow educational careers of scholarship recipients.

This year the chapter has been quite active. September 15 through18, 2004, chapter members attended the 23rd National Conference at UT Austin, which featured technical presentations on the petroleum industry, environmental issues and professionalism. Conference speakers included Dr. Patrice Mahob (OU Geophysics graduate), Dr. Jerry Harris (Stanford University), Dr. A. Wesley Ward (USGS), Scott Tinker (Bureau of Economic Geology, Jackson School of Geosciences), and Dr. Sandra K. Johnson (IBM - First African American Ph.D. for Electrical Engineering). H. Jerome Murphy (OU Geology graduate) won first place for the conference student presentations. The guest speaker at the final banquet was Dr. Edwin Dorn (Dean, Lyndon B. Johnson School of Public Affairs) and Tomieka Searcy (OU Geology graduate student/chapter president) spoke on the student's perspective of being a member of NABGG.

NABGG OU Chapter held a Canned Food and Kids' Supply Drive and a Health Fair as part of College Geosciences Week. The donation drive was quite successful and donations were made to the Center for Children & Family Inc. in Norman. Approximately 15 health services were invited to participate in the Health Fair, with topics such as sexually transmitted diseases, heart disease, cancer, physical fitness, immunizations and nutrition. At Christmas, members bought toys and clothes for a family suffering financial hardship.

The chapter continuously seeks opportunities to increase the number of minorities in the earth sciences. Meanwhile, the chapter has had social events to encourage its members to excel in their profession. NABGG OU Chapter has proven to be a positive organization for the School of Geology and Geophysics at the University of Oklahoma. ■



NABGG officers: Joni Verrett, Tomieka Searcy and Oludara Koleowo.



Left to right: Olubukola Ojo, Demola Soyinka, Dr. Sandra Johnson, Oludara Koleowo and Tomieka Searcy enjoying the first day of the NABGG Conference.



Left to right: Members - Tomieka Searcy, Sonia Bradley, Joni Verrett and Sara Kaplan are enjoying the SGG Christmas Party.





Left to right: Daniel Samake, Joni Verrett, Oludara Koleowo, Ozzie Ilaboya, Tomieka Searcy and Jason Wycoff working at the health fair during Geosciences Week.

Community Service Chair Joni Verrett drops off chapter donations to Children's Care Center.



Members and friends help VP Tomieka celebrate her 25th birthday.

Left to right: Dileep Tiwary, Tomieka Searcy, Jeremy Bryan, Joni Verrett, Jennifer Eoff and Satish Sinha

Geosciences Student Leadership Council

Sara Ann Kaplan, Geoscience Week Chair

Geoscience Week

During the week of October 11-16th, 2004, the Geosciences Student Leadership Council (GSLC) organized several activities in honor of National Geosciences Week. GSLC is composed of student organization officers of each student organization from Geology and Geophysics, Geography, and Meteorology. Several events were held during the week, each sponsored by a different student organization. The purpose of the events was to unite the three departments in the College of Geosciences and promote awareness of Geosciences throughout the community.

The National Association of Black Geologists and Geophysicists (NABGG) sponsored a canned food and children's items drive. Food donations were given to hurricane victims.

The Geography Clubs held a photo contest. Cash prizes were awarded to the best photos from each of the three Geoscience departments.

Sigma Gamma Epsilon (SGE) sponsored four community service activities. Students from the College attended the Center for Children and Families Neighborhood Centers After-School Program. We went to Trinity Baptist Church on Monday, Kennedy Elementary School on Tuesday, and Wilson Elementary School on both Wednesday and Thursday, bringing rock, mineral, and fossil samples to teach the children about geology. The children also assembled paper trilobites, an ancient marine critter.

On Tuesday, NABGG held a Health Fair in the atrium. Several health care organizations passed out information to students and free HIV tests were conducted. In conjunction with the health fair, SGE hosted a blood drive. The goal was to collect 40 pints of blood; we collected 45 pints!

On Wednesday, The Association of Women Geoscientists (AWG) "passed the word with sweetness" in the Oklahoma Memorial Union. Candy with earth-saving tips and facts were given out to people in the student union during lunchtime.

The Meteorology Club (SCAMS) held a picnic outside on the plaza on Thursday. Though the weather was less than cooperative, several students, faculty and staff came to enjoy the free food! Unfortunately for the students and luckily for certain faculty, it was too cold for the dunk tank.

Friday night a party was held at Mr. Bills restaurant. Undergraduate students competed in the first ever College of Geosciences Bowl. Teams of three students from each department duked it out in this game-show-style competition. A geology team came in first place and were each awarded $50. A geology and geography team tied for second, each member winning $25.

The final event of the week was an all day Girl Scout badge workshop held on Saturday, organized by Nicole Baylor, geology graduate student and veteran Girl Scout. Several Girl Scouts from around the state attended and earned one of many Geoscience-related badges.

All of the events honoring Geosciences Week were extremely successful! The student officers from all the departments worked very hard to plan the activities in a very short time and I would like to thank everyone involved. Geosciences Week ROCKED!

Homecoming

In October 2004, GSLC members participated in OU's Homecoming events. GSLC nominated two extraordinary seniors, Johnathan Rush (Geography) and Kathryn Gardner (Geology) for Homecoming King and Queen. Both nominees advanced to the interview stage. Kathryn made it to the Royalty Court, a prestigious position that only five women from the entire campus receive. Congratulations to both! Several students, and a few dogs, from the College of Geosciences also participated in the Homecoming parade. We had a Storm-Chasing van, lots of candy and a brave undergrad dress up as Captain Planet with blue tights and green hair (Thanks, COLT!!) ■



Back Row Left to Right: Colt Nickel (as Captain Planet), Sonia Bradley, Nicole Baylor, Brandon Fritz
Front Row Left to Right: Kenai, Sara Kaplan



Blood Donors: foreground, Abbie Negrey, background Sonia Bradley



Kathryn Gardner and her sister, Andrea, at the Homecoming Royalty Court Ceremony.



The NASA Academy Experience

Kathryn Gardner, Undergraduate of the School of Geology and Geophysics

Last summer I participated in a program called the NASA Academy at Goddard Space Flight Center (GSFC) in Greenbelt, Maryland. The program is a 10-week long, high intensity program. Participants live in a fraternity house on the University of Maryland campus and spend half of their time doing research at GSFC and the other half traveling to other NASA centers, hearing lectures from NASA scientists, managers and other space industry executives, working on a group project, and conducting community service in the Washington, D. C. area. It was one of the most incredible experiences I have ever had!

It was a very busy and stressful 10-week program, but I learned more than I ever imagined I would. My individual research project was very challenging. I conducted experiments to validate measurements of vapor pressure with a new experimental system up to temperatures analogous to the formation of the solar system. To do that, I measured the vapor pressure of Palladium up to 1973 K with the new equipment. Overall, the experiment was very interesting and useful because it furthered our understanding of the way metals and other materials like silicates formed in our early solar system.

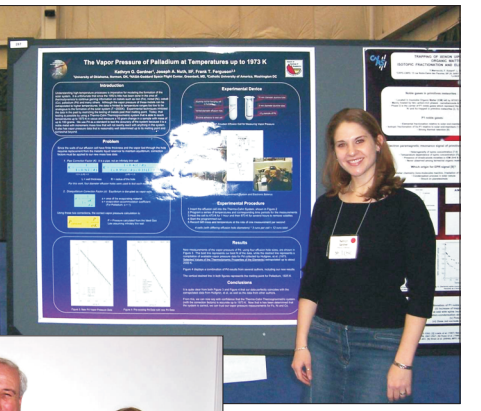
The most rewarding part of the NASA Academy was the group project. Each NASA Academy group is responsible for managing and creating their own group project which they research, write into a report and present to the people of GSFC. As a group, we decided to design a scout mission to Mars which we titled MSCLE: the Mars Surface Chemical Life Explorer. The mission included sending a lander to Mars similar to the Viking landers sent in the 1970's, which would search for present life underneath the Martian soil. MSCLE was designed by the expert engineers in the Academy group to land in the equatorial region of Mars called Valles Marineris in a location called Melas Chasma. Melas Chasma is a particularly interesting location to search for present life on Mars because recently, the Mars Orbital Camera has taken snap-shots of the area and found clouds hovering over the surface…present water! Overall, the scout mission was very difficult to design in such a short time. I was named Lead of the Science Team and that proved to be a difficult position as well. It is not easy to manage a team of scientists that all have wonderful ideas, yet all work in different ways!

Each week of the NASA Academy we heard 10-15 lectures from various scientists, engineers and other people in the space industry. Peter Diamandis, founder of the X Prize Foundation and CEO of a company called Zero G, came to discuss with us the need for people that are willing to take chances and risk their lives to explore the solar system. We also heard from congressmen that work with the House of Representatives Subcommittee on Space who are trying to implement President Bush's January of 2004 goal to have NASA get back to the moon and head to Mars. On the weekends, we flew to places like Langley, Virginia, Houston, Texas, Cleveland, Ohio, and Huntsville, Alabama to visit the NASA centers there. We even visited NASA Headquarters three times to visit with the managers and administrators of NASA. Not only did we speak with Sean O'Keefe, the NASA Administrator at the time, but we spoke with astronaut and Chief Scientist John Grunsfeld, one of the first astronauts to service the Hubble Space Telescope during a space walk. We somehow even managed to fit in a spelunking and white-water rafting trip to Pennsylvania!

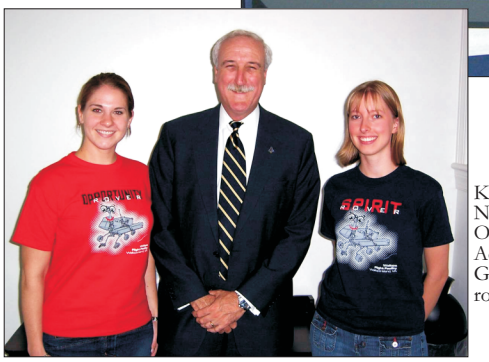
Finally, however, the NASA Academy had to end. Our final day at GSFC was filled with individual research presentations and the final presentation of our group project. On that day, I was honored to receive the NASA Academy Apollo Award which is an award for the individual who "demonstrates the most well-rounded nature" and "not only encompasses technical and scientific expertise, but an intellect in the arts, prophecy and human nature."

I cannot put into words what the NASA Academy means to me. When I started the program, I already knew that I wanted to be a Planetary Scientist that conducted research in space as an astronaut. What I did not know was how much I enjoyed the administrative aspects of NASA. Now, I hope to work as an astronaut and then someday go to NASA Headquarters to be Chief Scientist. My first step toward that goal will be starting the doctoral program in Planetary Science at the University of Arizona's Lunar and Planetary Laboratory this fall.

For more information on the NASA Academy at GSFC, go to: http://academy.gsfc.nasa.gov/2004/index.html. ■



Kathryn presents her NASA Academy research at the Lunar and Planetary Science Conference in March 2005



Kathryn Gardner with then NASA Administrator, Sean O'Keefe, and NASA Academy friend Kathryn Goben. Note the Mars rover t-shirts!

Taking the Magic of SGG to Egypt

During Fall 2004 Roger Slatt taught a reservoir characterization course for an organization in Egypt. It was truly an international course with participants from Libya, Kuwait, Egypt, Saudi Arabia and Senegal. The course was held in the luxury resort area of Sharm El-Sheikh on the Red Sea (see figure). Sightseeing, camel riding and bazaar shopping (no pun intended) were among the out-of-class highlights for Roger and his wife Linda Gay (see figures). The hospitality of the Egyptians was excellent and a good time was had by all. Roger has been invited back to teach again this Fall, and he and Linda Gay have graciously accepted the invitation. ■

New location for Summer Field





Roger and Linda Gay recruiting a potential graduate student.



Roger and Linda Gay checking out exclusive retirement villas.

Roger of Normania-What—they don't sell larger shades??



In The News - 2005 AAPG/SEG Spring Student Expo

Thanks to everyone who attended the fifth annual AAPG/SEG Spring Student Expo held in Norman, Oklahoma at the Sarkeys Energy Center, March 10-12. What an Expo we had! Hosted by the School of Geology and Geophysics, we had record participation by companies and students, and a record number of posters presented. Spring Expo just keeps getting better and better. We had 24 companies participating, 14 of whom conducted formal interviews, and 166 students came from 42 colleges and universities in 22 states. The poster contest attracted 68 participants; 41 with geology posters and 27 entering geophysical posters.

Expo brings energy oriented geology and geophysics students together with energy companies in both formal interview and informal venues. Companies are looking for graduates and undergraduates for internships and graduates for full-time employment. This year's Expo was coordinated by Carol Drayton with the monumental assistance of the SGG student body and the staff. Aaron Rothfolk, a geology master's student, coordinated the student effort with help from team captains, Kerry Moreland, Sonia Bradley and Sabata Periera. The students, judges and other Expo volunteers were honored at an Appreciation Luncheon on April 15.



Kerry Moreland, Aaron Rothfolk and Matt Poole at work.



Sabata Periera, Dileep Tiwary, David Ramirez and Heidy Correa man the registration desk.



Mike Hsieh and Tomieka Searcy blow up balloons for our balloon banners.

EXPO SPONSORS

Many thanks to our wonderful sponsors who make Expo possible year after year. This year's contributors were:

Major Event Sponsors ($3000 and above):

Chesapeake Energy Corporation
(Many thanks for sponsoring the Friday Night Icebreaker)
Pioneer Natural Resources
(We have Pioneer to thank for the Saturday Luncheon)

Gold Level Sponsors ($500 - $1,499)

Core Laboratories
Crawley Petroleum
EOG Resources
geoPLUS
MAP Exploration
Mewbourne Oil
Minerals Management Services
Oklahoma Geological Survey/South Mid-Continent Region PTTC
Omnilabs
Panhandle Royalty
Questar
Schlumberger
Shell Oil
Wagner and Brown

Platinum Level Sponsors ($1,500 - $2,900)

AAPG
ChevronTexaco
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Devon Energy
Dominion Exploration and Production
Kerr-McGee Oil and Gas
Potts-Stephenson Exploration
Samson
SEG
Vintage Petroleum

Silver Level Sponsors ($100 - $499)

Robert Allen
Dave Campbell
Indian Exploration
McKenny Energy
Jon Withrow

The Friday evening Icebreaker was a great hit, with entertainment by OU students who performed Latin music and a traditional dance. Music continued for dancing and company representatives and students were able to meet and mingle while enjoying plenty of food.

Formal interviews began Saturday morning for most of the companies and went throughout the day. At the same time, other company representatives were visiting with students at company exhibit booths. A large message center gave companies and students the opportunity to leave each other messages of their interest and contact information. We will expand on this idea next year. The Saturday luncheon was another opportunity for students and company representatives to meet and visit. Some representatives hardly took time for lunch as they tried to get as many students into their schedules as possible.



Fabricio Parra-Galvis, David Ramirez, Rodrigo Bastidas, Oswaldo Davogustto and Camilo Mutis perform Latin music.



Martin Morales and Luz Angela Lozano perform a traditional dance.

POSTER CONTEST

Students took the opportunity to present their work in poster form in record numbers. The posters were separated by discipline in an effort to increase traffic at the posters and for convenience in judging. This year's posters were exceptional and the judges had a difficult time coming to a consensus. The judging was coordinated by Dave Campbell, who kept recruiting more judges as the number of posters registered kept mounting. Ultimately he found eight experts to do the judging and found himself included as a judge as well when one judge couldn't make it at the last minute. Judging posters this year with Dave were Larry Lunardi, Travis Wilson (a former poster contest winner), Glen Brown, Mike Pollok, Dr. Tom Rowland, Ben Hare and Jon Withrow, and we greatly appreciate them. (You will find the poster contest winners and their abstracts in the Student Abstract section of this magazine.)

The energy industry exhibits were set up around the two atria for maximum exposure, where most of the Expo activities were centered. They were attractive and informative and well attended by students.

SPECIAL EVENTS

Each year the School tries to provide educational opportunities for students and company representatives as part of the Expo. This year Dr. Roger Slatt presented his "Petroleum Geology of Deepwater (Turbidite) Depositional Systems" class, and Jamie Rich (doctoral student of Dr. Alan Witten-recently deceased) presented Dr. Witten's "Computer Graphics for Geophysics" class. These classes were held Thursday afternoon and all day Friday. Dr. M. Charles Gilbert took participants on a field trip to the Wichita Mountains Friday. Responses by participants after the fact were very favorable.

Once again, thanks to everyone who came and contributed to Expo's success. Plans are underway to make it even better next year. ■

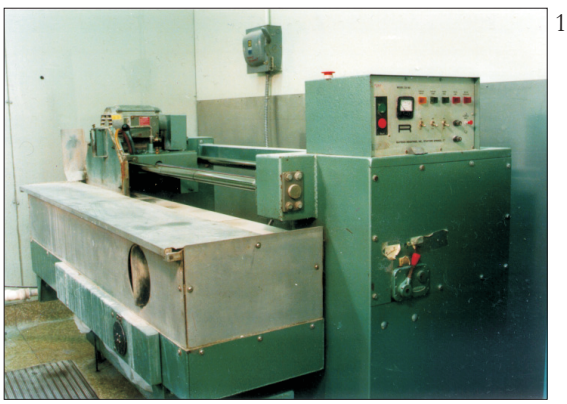


Field Trip to the Wichita Mountains with Dr. Gilbert

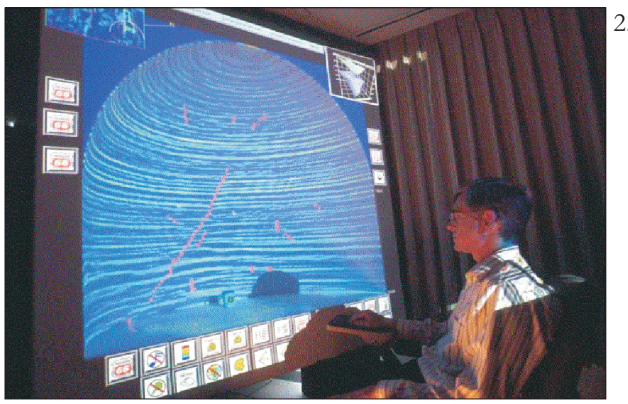


In addition the School provided three shorter activities:





1. Tours were provided to the Oklahoma Petroleum Information Center (OPIC) in Norman, where Mr. Gene Kullman led participants through the center, showed them the more than 100 miles of core, the well data library, core-services facilities and described the Center's future plans (see article in "In the News" section).



2. Demonstrations of the School's 3D Visualization Theatre by John Grismore and Ozzie Ilaboya.



3. Sara Kaplan, an OU geology graduate student, prepared a self-tour brochure so participants could tour the many interesting displays and sites at the Sarkeys Energy Center, beginning with the 24 mineral and paleo galleries prepared by Dr. David London, School of Geology and Geophysics mineralogist.



Wherever You Go, There You Are: Experiences of an Undergrad in South Africa

by **Kate Moore**



When I began my inquiries about a possible RA job in the department of Geology and Geophysics at the beginning of my senior year, I had no idea what the next few months would hold. All of my imaginings concerning a research job revolved around laboratories, microscopes and computer simulation. A mere five months after I decided to work for Dr. Ze'ev Reches, I was on an airplane headed for South Africa, ready to do field research in some of the harshest field conditions on the globe.

Dr.'s Reches and Dewers, Vincent Heesakkers and I were joined by Curnell Campher, Selwyn Adams and Reggie Domoney (two students and a professor) from the University of the Western Cape. We went down in the mines twice as visitors before we began the odyssey of obtaining a work permit to work as contractors at Tau Tona, the deepest gold mine in the world. After three days spent tied up in the red-tape of medical exams, photo IDs, and getting access to the mines, not to mention one day spent in "induction," we were able to work for AngloGold/Ashanti as contractors (all the Americans were listed as migrant workers from Swaziland so the paperwork could finally be completed).

As we were slowly cutting through the bureaucracy and politics that does not favor contractors in any way, we began work on describing, in painstaking detail, over 150 meters of core that consisted mainly of Achaean quartzite. The logging continued after we got our permits to work at Tau Tona (we trade off working in the shed and underground) and by the time we finished, Tom had discovered ripples in the quartzite, I had discovered gold 30 meters off the gold-bearing reef, and Vincent had realized how much he hates the phrase "subrounded medium well sorted gray quartzite".

Just when work in the mines began in earnest, we moved in to a house in Fochville (closer and cheaper), which made it easier to get to the 7:45 a.m. cage every morning. We left the house around 6:30 a.m., drove to the mine, changed into our stylish white jumpers, signed up to go underground, got our headlamps and caught the cage. After switching cages twice to travel the full 3.7km to level 120, we exited the cage, already sweating, and, depending on the level we stopped at and the mood of the shift boss, we either caught a train to our destination or set off to walk the 3 km.

Once at the site, we had from 50 to 90 minutes to work before we had to head back to catch the train or the cage out of the mine. In temperatures of about 34°C and humidity approaching 100%, it is easy to see why "newbies" like us would need over a liter of water while underground for only four or five hours. We sometimes worked in close proximity with the mining front, where most of the rockbursts and other accidents happen. There is nothing scarier than working within 10 meters of the mining front and hearing a crash, seeing boulders and a dozen mine workers coming your way in a hurry when you have tens of thousands of dollars of equipment and your life at stake. Those actually only happened once; most days at the bottom were less traumatic.

The geologic structures at 3.7 km are remarkable. Since most of my time was spent mapping the fault zone, I spent a lot of time using the frames we set up to examine and draw the structures on the hallway walls. I was used to seeing fault zone material and structures in outcrops after exhumation, but at depth, I was amazed at the behavior of fractures and the ability to trace them in 3D as they encircled the hallway.

On our way out of the mine we were often crunched for time and were only unsuccessful on one occasion. Catching the cage back up with the other white-helmeted "officials" was a special treat because there was breathing room and polite office-like banter all the way up. However, if we stayed later at the site and rode up with the shift, we were crammed in to a cage with over 40 very sweaty, very smelly, mine workers who had been in the mines since 4:00 a.m. and were very anxious to get out.

Fresh air always tastes better after time spent in a mine. Every time I walked out of the mine I filled my lungs with the clean air surrounding me and felt myself relax. Working in a mine at 3.7 km below the surface is a rush, however, and I found myself completely unsatisfied with the amount of work we were able to do under the time constraints and I always found myself wanting to return the next day despite the heat and humidity. A girl could get used to this type of thing. ■





NELSAM: Natural Earthquake Laboratory in South African Mines

Vincent Heesakkers (PhD Student), University of Oklahoma., Supervisor: Dr. Ze'ev Reches.

The NELSAM project is designed to resolve fundamental, open questions of earthquakes physics. Its central tool is establishing monitoring stations in gold mines in South Africa. Such stations will provide near-field observations of the initiation, nucleation and propagation of earthquakes; this information will lead to better understanding of fault behavior before, during and after the earthquake. The first station is being built in the TauTona mine, located in the Witwatersrand Basin about 80 km south-west of Johannesburg. The station is situated at 3.6 km below ground surface, the deepest mining area in the world. The mining operations will trigger hundreds to thousands of earthquakes in the footprint of the station, which range in magnitude from -2 to perhaps 4. We will also monitor the nature fault, the insitu microbiological activity and the rock fluid geochemistry.

The main theme of NELSAM is to analyze earthquakes along the Pretorius fault, an Archaean fault that is reactivated by the mining in TauTona and other mines. The Pretorius fault extends for at least 10 km, with a throw of a few tens of meters. Its fault-zone is subvertical with many secondary internal segments, and thickness of 25-30 m. The first stage of the NELSAM operations started in January 2005 focusing on structural mapping of this fault-zone. The objectives are characterization of its mechanical properties and evaluation of the likelihood of the fault segments being reactivated by the mining stresses. We found that many of the segments contain pseudotachyllites (Fig.1) that are commonly viewed as earthquake induced melts. We also found white gouge, known as "rock-flour" in South African mines that indicate recent seismic slip along the Pretorius fault. This fault-zone forms a major source of hazard to the TauTona mine and our research operations have been enthusiastically supported by the mine management and workers.

The second stage of NELSAM is the instrumentation of the earthquake laboratory. The instrumentation includes a three-dimensional array with seismometers, accelerometers, strain-meters and creepmeters installed 1-100 m from the anticipated hypocenters. We also will install sensors for temperature, electromagnetic radiation and acoustic emission. The instruments will be placed in small boreholes drilled in the mine tunnels.

The working conditions at the deepest mining area in the world are extreme: temperature is about 30°C and humidity is 95-100%. Poor ventilation can cause worse conditions temporarily. Getting to the working site, we take three cages (lifts) in which 40 people are squeezed. After reaching the deepest level, a carriage has to be taken for 1.5 km, followed by a walk of another 1.5 km. The inverse route has to be taken to get back to the surface. The long travel time results in a short working time at the site, which is up to 2 hours per day. Sometimes climbs through very narrow tunnels, as small as 1 m are required (Fig 2).

We often see support of the mine being squeezed out due to the weight of overburden rock, resulting in a slow closure of the mined reef. Working at these areas is scary and tough (Fig. 3), but the thrill of being 3.6 km below surface, conquering the rocks above you, makes the fieldwork worthwhile.

NELSAM is an international project with participants from the US (OU, USGS, USC, Stanford, Princeton), Germany, Japan and Israel, and includes many South African investigators. It is headed by Ze'ev Reches, Geology & Geophysics, OU. On site we greatly appreciate the South African support we receive. The help of TauTona geologists, rock-engineers and miners is outstanding; ISS International (a seismic analysis company) provides great assistance; and people from the Free State University (Bloemfontein) and the University of Western Cape are deeply involved in the project. ■

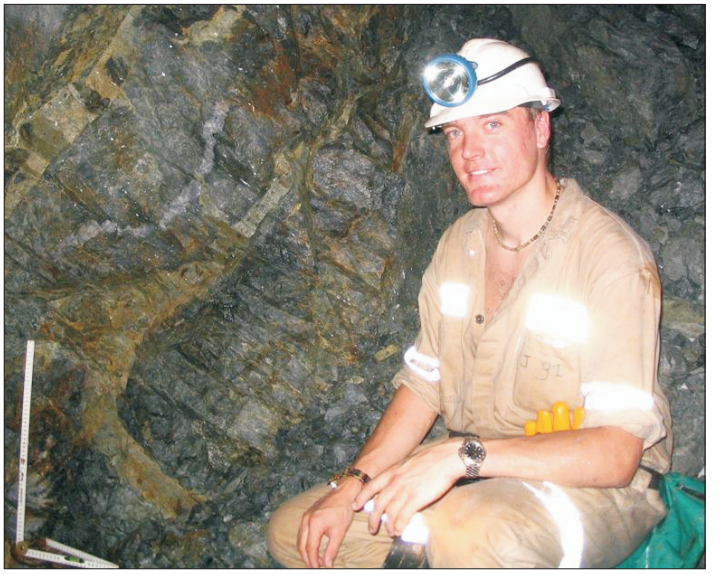


Fig. 1: Vincent next to pseudotachylite zones found in the 118 Level of the TauTona mine, South Africa.



Fig. 2: Curnell Campher, University of Western Cape, crawls back to the shaft. The wooden support on the right was squeezed out by the 3.6 km overburden.



Fig. 3: Miners drilling to install explosions into the stop. The backfill on the right is used to support the stop roof. The small working space is just 1 m high and 2 m wide.

http://earthquakes.ou.edu

ROCKHOUNDS THE MOVIE

by **Elizabeth K. Dennie**

The lights dim, the music begins, and all of a sudden you find yourself watching a geology based documentary titled "RockHounds: The Movie". You are not entirely sure what to expect, yet once it begins you find yourself engrossed. The documentary is broken up into four 15 minute segments: the first takes place in Mount Ida, Arkansas at the annual World Championship Quartz Crystal Dig; the second takes place near Canyon Lake, Texas during a fossil hunt; the third in Norman and Noble, Oklahoma during an informal field trip looking for the barite rose; and the fourth at a gem and mineral show in Houston, Texas. Each segment emphasizes the people, why they are rockhounds, what they are trying to find and what they do with what they have found.

The Norman/Noble episode features a couple of University of Oklahoma geologists: David London, professor, School of Geology and Geophysics; and Neil Suneson, Assistant Director of Geology for the Oklahoma Geological Survey, as well as several OU graduate students, Norman residents and friends. The field-trip was held in the middle of February, 2005 on a cold and rainy day. The graduate students quickly learn that hunting for any rock or fossil is not always as easy as it may seem. Recent high levels of rain had caused the original, less known site to be buried under a couple feet of water. Therefore the shoot had to be moved to a well known location which was unfortunately picked over. This did not deter these avid Rockhounds; they hunted the barite rose any way. Dr. London continued the discussion of the barite rose back at the university with a demonstration of his own personal recipe for precipitating barite.

The School of Geology and Geophysics Mineralogy lab also played as the backdrop for many informative segments starring geology Ph.D. student Devin Dennie. His off-beat humor endears the viewer as well as educates them. In addition to hosting these segments Dennie co-produced the documentary along with long-time friend Todd Kent, who also directs the film.

This documentary is one of many collaborations these friends have worked on together. Their first was a north Texas based science and travel television program called "North Texas Explorer". Since then they have produced, "Fast Food" and "Toad Spotting: The Legend of Old Rip." Todd worked on the award winning "Solid Waste: Out of Sight, Out of Mind" (co-produced with Scott Harris) and "American Music" and "Weekend Welder" (both with Ben McCall). Dennie and Kent are currently working on a facet of Devin Dennie's Ph.D. work, entitled "GeoAmerica: Our Roots in Rock," currently under development by Explorer Multimedia, a non-profit multimedia educational group (of which Dennie is president), in partnership with the University of Oklahoma's School of Geology and Geophysics. "GeoAmerica: Our Roots in Rock" is securing funding for full broadcast production and is scheduled to commence shooting in late 2005 or early 2006.

"RockHounds: The Movie" had its official first showing Thursday April 21, 2005 at the University of Oklahoma, where it received a warm reception. "RockHounds: The Movie" and "GeoAmerica: Our Roots in Rock" have both been featured in a number of national publications, including Rock and Gem magazine, AGI GeoTimes magazine, and the AAPG Explorer. "RockHounds: The Movie" is currently touring the film festival circuit and through gem and mineral organizations for exhibition at their shows, meetings and special viewings. Screenings are now scheduled in theaters all across North America and internationally as far away as Australia and South Africa. ■



Todd Kent (cameraman), Devin Dennie, Dr. David London and Dr. Neil Suneson.



Todd Kent-cameraman, co-producer and director.



Vanessa O'Brien and her trusty rock hammer.

Seismic Reflection Processing Short Course Developed

Dr. Roger Young, geophysics professor at SGG, has designed a laboratory short course on seismic processing based on 15 years experience lecturing at OU. This is an interactive, computer-based, course of instruction in fundamentals of seismic reflection processing. It was designed to extend the understanding of principals learned in lectures by the addition of hands-on exercises illustrating the consequences of model simplifications and mathematical assumptions imposed on the real earth in order to make it more tractable. Each student receives a copy of his book, A Lab Manual of Seismic Reflection Processing (published by the EAGE), which includes a CD having all class notes, seismic data used, and files produced by the Seismic Processing Workshop software, as well as the complete SPW software package keyed to the specific data used in the course.

Roger has taught the course at Adelaide University, Australia, at the National Center for Petroleum Geology and Geophysics; in London at the European Association of Geoscientists and Engineers Continuing Education Days (see photo); and will be giving the course this summer at a workshop of the Incorporated Research Institutions for Seismology (IRIS) in Portland, Oregon, and in the winter at SAGEEP 2006, the annual meeting of the Environmental and Engineering Geophysical Society in Seattle, Washington.

The ultimate goal is to fashion the course into a real-time, remote, interactive version using the Internet so that students in far-flung locations such as Venezuela and Germany could participate as fully as students on campus. ■



Short-legged instructor (center) with students from Spain, Britain, and Norway at the EAGE Continuing Education Days in London, Mar 2005.

Papers Presented at GSA

On May 23-25, 2005, a number of SGG faculty and students presented papers at the 57th Annual Meeting of the Rocky Mountain Section of the Geological Society of America (GSA). The meeting was hosted by the Department of Physical and Environmental Sciences at Mesa State College in Grand Junction, Colorado and approximately 200 geoscientists attended.
Abstracts presented by SGG were:

- Dr. Gerilyn S. Soreghan, associate professor: Late Paleozoic Glaciation in Western Equatorial Pangaea
- Dustin Sweet, geology Ph.D. student: Periglacial Features in the Fountain Formation (Permo-Pennsylvanian, Colorado)
- Kristen Marra, geology M.S. student: Preliminary Results of Deep Drilling in Western Unaweep Canyon (Colorado): A Paleozoic to Cenozoic History Revealed
- Sara Ann Kaplan, geology M.S. student: The History of the Ancestral Gunnison River Through Western Unaweep Canyon and Gateway (Colorado)
- Yoscel Suarez, geophysics M.S. student: Preliminary Results from Seismic Imaging of the Basement Profile in Western Unaweep Canyon, Colorado
- Oswaldo Davogustto, undergraduate geophysics student: A Gravity Survey in Western Unaweep Canyon: Looking for the Bedrock Boundary and its Shape
- Brooke K. Wilborn, geology Ph.D. student: Magnetostratigraphy of the Morrison Formation, Northern Bighorn Basin, Wyoming



SCIF News

by **Jan Dodson**, SCIF Manager

In January we moved our server and network attached storage to the machine room on the 10th floor of the Energy Center. This room is specifically designed to provide a secure and climate controlled environment for computing systems. No more worries of water leaks in the basement when it rains.

We've upgraded the operating systems in E222 (the PC lab) to Windows XP Professional Edition. And new task chairs were purchased to replace the "old instruments of torture." If you worked in E222 before the new chairs were purchased, you know what we are talking about!

Lab sections held in E222 during the Spring 2005 semester included Geology and Geophysics for Petroleum Engineers, Advanced Reservoir Characterization and Advanced Seismic Exploration. The lab instructor for these courses was the SCIF manager, Jan Dodson. Graduate students Carla Valerio, Rodrigo Bastidas, Nick Gregg, Tomieka Searcy, Satish Sinha, and Julie Staggs, perform their thesis and dissertation research in E222. Abbey Negrey, Martin Morales, Bukky Ojo, Carlos Bahamon, Carla Valerio and Yoscel Suarez perform parts of their thesis work in E124 (Unix-Linux lab) using specialized software for seismic modeling, processing, analysis and interpretation.

The Director of the SCIF Labs, Dr. Roger A. Young, taught a seismic processing course in London this spring. The course was sponsored by the EAGE. A recently published lab manual written by Dr. Young was used as the course text. Dr. Young is also working on a project to teach the same course remotely via videoconferencing. We will keep you posted.

Finally, Dr. Shankar Mitra presented an advanced course in structural geology to a group of geoscientists from the Mexican state oil company, Pemex. They worked on the integration of 3-D seismic interpretation, balanced cross sections and 3-D modeling to develop structural interpretations of complex areas. ■



SGG Graduate Joining the Peace Corps

SGG's own Sara Ann Kaplan, a geology M.S. graduate with an emphasis in environment, will be joining the Peace Corps. She has jumped most of the medical exam hurdles and should know soon where she will be sent. The Peace Corps works in countries from Asia to Central America, and from Europe to Africa. In each of these countries, volunteers work with governments, schools and entrepreneurs to address changing and complex needs in education, health and HIV/AIDS, business, information technology, agriculture and the environment. With her background and with her warm, generous personality, Sara will be an asset wherever she goes. We will miss her. Sara has been one of the best and the brightest in the School and she has been generous with her time and talents in helping wherever she was needed. We look forward to regular reports on her assignment. All the very best Sara, wherever you go. ■



SGG Employee Heads Back to School

Terry Brady, who has served the School, and particularly the Alumni, for the past seven and a half years, is heading back to the classroom. She will be completing her History undergraduate degree and adding a second major in Classical Culture. She also hopes to include two minors. This should be interesting. All the best Terry. ■

School of Geology and Geophysics Graduating Seniors

Students graduating with a Bachelor of Science in Geology, May 2005:

Alicia Anne Branch
Deane Bernice Browning
Lydia Caree Busse, Russian minor
Kathryn Gail Gardner, Mathematics minor, summa cum laude
Brian Stewart Harms, summa cum laude Phi Beta Kappa
Christopher Thomas Harms, summa cum laude, Phi Beta Kappa
Kurt Alan Johnson
Kristen Rachele Marra
Breanne Nicole Minor, Mathematics minor
Katherine DeVries Moore, French Minor, cum laude
Victor Fabricio Parra Galvis
Jeffery Alan Patrick
Anh Ngoc Pham
Ronald Warren Pike
Paul Allen Richardson
Leonardo Jesus Rojas
Aaron Cord Siemers
Jose del Valle Villalobos, Marketing minor

Undergraduate Student Sponsorships

Student	Sponsorship
Awakessien, Inyene	Exxon Education Fund-Geology
Badra, Henry	Robert Edward Lowry Scholarship Fund in Geology
Bell, Aaron	Harry J. Brown Memorial Scholarship
Bowen, Paul	Patrick K. Sutherland Memorial Scholarship Fund
Galvis-Parra, Victor	G&G Enhancement/Enrichment Fund
Gardner, Kathryn	G&G Summer Field Camp
Grimm, Christopher	Exxon Education Fund-Geology
Guess, John	Harry J. Brown Memorial Scholarship
Gunderson, Katie	Harry J. Brown Memorial Scholarship
Hafner, Andrew	G&G Enhancement/Enrichment Fund
Harms, Brian	Questar Education Scholarship; Geology and Geophysics Summer Field Camp
Harms, Christopher	Jon R. Withrow Geology and Geophysics Scholarship Fund; Browning Enterprises Summer Field Camp Scholarship
Harms, Jason	Harry J. Brown Memorial Scholarship
Koleowo, Oluwadara	G&G Enhancement/Enrichment Fund
Moore, Kathryn	Browning Enterprises Summer Field Camp Scholarship
Nickel, Colt	Houston Oil and Minerals; Gene and Astrid Van Dyke Scholarship
Patrick, Jeffrey	G&G Enhancement/Enrichment Fund
Pham, Anh	G&G Enhancement/Enrichment Fund
Richardson, Paul	G&G Enhancement/Enrichment Fund
Rush, Johnathan	SGE Scholarships
Villalobos, Jose	G&G Enhancement/Enrichment Fund

Graduate Student Sponsorships

Student	Sponsorship
Alahdal, Ahmed	Conoco Geology & Geophysics Scholarship
Amati, Lisa	Edward Lamb McCullough Endowment
Banerjee, Subotosh	Victor E. Monnett Chair in Energy Research Enhancement Fund; Jaye & Betty Dyer Endowed Scholarship Fund; Conoco Geology and Geophysics Scholarship
Bayer, Walter	Phillips Petroleum Geology and Geophysics; Chevron Geology & Geophysics Graduate Fellowship; Gene and Astrid Van Dyke Scholarship
Bahamon, Carlos	Gene and Astrid Van Dyke Scholarship
Bose, Shamik	A. Rodger Denison Edowment Fund
Boyce, Matthew	Chevron Geology and Geophysics Graduate Fellowship
Bradley, Sonia	G&G Enhancement/Enrichment Fund
Branch-Decker, Alicia	O.H. "Ike" Hill Enrichment Fund
Correa, Heidy	International Petroleum Exposition Geology; Hubert E. Clift Memorial Fund
Dulin, Shannon	Arthur Myers Scholarship Fund
Gebretsadik, Eshetu	Edward Lamb McCullough Endowment
Ghosh, Kajari	Jaye and Betty Dyer Endowed Scholarship Fund; Phil & Roberta Kirschner Geological Fund; Victor E. Monnett Chair in Energy Research Enhancement Fund
Goyeneche, Javier C	Gene and Astrid Van Dyke Scholarship
Gregg, Nicholas	Conoco Geology and Geophysics Scholarship
Hamilton, Sarah	Cecil Von Hagen Geology Scholarship; William P. Arper Memorial Fund
Hoang, Ngoc	Edward Lamb McCullough Endowment
Kaplan, Sara	William P. Arper Memorial Fund
Lozano, Luz Angela	G&G Director's Research General Support; G&G Enhancement/Enrichment Fund
Mai, Ha	G&G Director's Startup Fund; Gene and Astrid Van Dyke Scholarship
Marine, Christian	Middle East Basin Analysis-Seismic Stratigraphy; G&G Enhancement/Enrichment Fund
Marra, Kristen	Houston Oil & Minerals; Gene and Astrid Van Dyke Scholarship; Arthur Myers Scholarship Fund
McCarthy, Michelle	Richard Hollingsworth Memorial Scholarship; Arthur Myers Scholarship Fund
Miller, Ryan	Donald J. Duffy Memorial Fund
Moore, Kate	Edward Lamb McCullough Endowment
Moreland, Kerry	Devon Energy Corporation Geosciences; Exxon Education Fund-Geology
Negrey, Abbie	Amoco Education Fund for Geology and Geophysics
O'Brien, Vanessa	Donald J. Duffy Memorial Fund
Ojo, Olubukola	G&G Director's Startup Fund; G&G Enhancement/Enrichment Fund
Pereira, Sabata	William P. Arper Memorial Fund
Poole, Matthew	G&G Enhancement/Enrichment Fund
Ramirez Mejia, David	Chevron Geology and Geophysics Graduate Fellowship
Rich, Jamie	Frank A. Schultz Fund
Romero, Gloria	Gene and Astrid Van Dyke Scholarship
Rothfolk, Aaron	Conoco Geology and Geophysics Scholarship; SGE Scholarship
Salazar, Isabel	Frank Gouin Scholarship Fund
Shear, Adam	Amoco Education Fund for Geology and Geophysics
Singh, Prerna	Chevron Geology and Geophysics Graduate Fellowship
Soyinka, Olatunde	G&G Director's Research General Support
Stephens, Tiffany Naeher	Ruffel Graduate Assistant Fund
Sweet, Dustin	Arthur Myers Scholarship Fund; Sun Geology and Geophysics Fund
Taneza, Pamela	Edward Lamb McCullough Endowment
Verrett, Joni	Amoco Education Fund for Geology and Geophysics; Shell Aid
Waskiewicz, Raina	Heston Geology Scholarship Fund; The Beveridge Company Scholarship; Frank A. Melton Memorial Geological Research Fund

School of Geology and Geophysics Graduates

Name of Graduate	Degree	Thesis or Dissertation Title
Fall 2004 Graduates		
Cabarcas, Carlos	M.S. Geophysics	Using instantaneous spectral analysis as a thin bed reservoir characterization tool
Cunningham, Stanley	M.S. Geophysics	Instantaneous spectral analysis of a high impedance Atokan sandstone in the northern Arkoma basin
Geerdes-Salazar, Isabel	M.S. Geophysics	Spectral decomposition of 3-D ground penetrating radar data from an alluvial environment
Minken, Jonathan	M.S. Geology	Deep-water depositional elements: A comparison between outcroups of the Dad Sandstone, Lewis Shale, Wyoming and 3-D seismic of slope Pleistocene deposits, Gulf of Mexico
Niglio, Louis	M.S. Geophysics	Fracture Analysis of Precambrian and Paleozoic rocks in selected areas of the Grand Canyon National Park, USA
Pigott, Kulwadee	Ph.D. Geology	Elemental and stable carbon isotope chemostratigraphy of the Upper Jurassic Smackover sequence of southwest Alabama Basins, Alabama, U.S.A.
Wilson, Brenton	M.S. Geology	Meso- and Micro-Structural Analysis of the San Andreas Fault at Tejon Pass, California
Spring 2005 Graduates		
Abraham, Michelle	Ph.D. Geophysics	Investigation of thin bed strata using a borehole image log and high resolution seismic data
Cox, Eric	M.S. Geology	Paleomagnetism of Devonian red beds in the Appalachian plateau and valley and ridge provinces, timing and acquisition of a secondary CRM
Goyeneche, Camilo	M.S. Geology	Outcrop characterization, 3D geological modeling, and upscaling for "reservoir" simulation of Jackfork group turbidites in Hollywood Quarry, Arkansas
Poole, Matthew	M.S. Geology	Depositional modeling and characterization of the Granite Wash, Wheeler County, Texas and Beckham County, Oklahoma
August 2005 graduates		
Bastidas, Rodrigo	M.S. Geology	Reservoir characterization and 3D geological modeling of Balcon field
Bradley, Sonia	M.S. Geology	Depositional history and stratigraphic framework of the Boatwright member of the Springer formation in the deep Anadarko basin, Caddo and Grady counties, Oklahoma
Doyle, Walter	M.S. Geology	Sequence Stratagraphic Framework of Miocene Ab Carst Interval, Neptune Fields, Gulf of Mexico
Gebretsadik, Eshetu	Ph.D. Geology	Geologically and Well-log Constrained Quality Factor (Q) Analysis for Reservoir Characterization
Gregg, Nicholas	M.S. Geophysics	Comparative analysis of seismic imaging techniques in Hollywood quarry, Arkansas
Haiar, Chad	M.S. Geology	Sequence Stratigraphy of the Pennsylvania Granite Wash in the Dalhart Basin, Hartley County, Texas
Hoang, Ngoc	M.S. Geophysics	2D basin modeling and petroleum analysis of La Concepcion Field, Maracaibo Basin, Venezuela.
Kaplan, Sara	M.S. Geology	Revealing Unaweep Canyon: The late Cenozoic exhumation history of Unaweep Canyon as recorded by gravels in Gateway, Colorado
Lozano, Luz	M.S. Geology	Reconstruction of the geologic history and reservoir characterization of the Canfield Ranch area, California
Lynch, Justin	M.S. Geology	Reservoir characterization of the lower Brushy Canyon formation at Los Medanos Field, Eddy County, NM
Maughan, Tyler	M.S. Geology	Gas occurrence in the Caney Shale
Moreland, Kerry	M.S. Geophysics	Origin and paleomagnetic dating of diagenetic events in the Madison Formation, Teton anticline, NW Montana
Negrey, Abbie	M.S. Geophysics	Evaluating a deepwater channel prospect in Permian Wolfcamp limestone, Midland Basin, Glasscock County, Texas
Ojo, Olabukola	M.S. Geophysics	Characterizing complex lithology and architecture of seismic volumes of leveed channel reservoirs by scaled outcrop characterization
Pereira, Sabata	M.S. Geology	Variations in detrital flux recorded in upper Pennsylvanian mounds of Horseshoe Atoll, TX
Searcy, Tomieka	M.S. Geology	Microseismic investigations in the Barnett Shale, Newark east field, Wise County TX.
Stephens, Tiffany	M.S. Geology	Paleoecological analysis of early mammal habitats: Cedar Mountain Fm. (Cinemania), Utah
Waskiewicz, Raina	M.S. Geology	Trilobite biostratigraphy of the Elvinia zone, Honey Creek Formation, Southern OK
Zavala-Torres, Ricardo	M.S. Geophysics	AVO and spectral decomposition in the Pipila Field, Burgos Basin, Mexico

External Support: Faculty Chairs and Special Funds

Applied Structural Geology
For research in applied geology

Bartell Professorhip in Geosciences
To endow a chair

Basin Analysis Study Program Fund
To provide support to establish a Basin Analysis Study Program in the School of Geology and Geophsyics

Carl E. & Thelma Gungoll Family Chair in Petroleum Geology & Geophysics
An endowed fund to establish and support an endowed chair

Charles W Harper Field Camp Endowment
Provide support for student scholarships and operational expenses for summer field camp (Geol 4346)

Clyde Becker, Sr. Endowed Chair in Geology & Geophysics
Established to fund an endowed chair

Dupont Young Professor
To help young U.S. professors begin their research

Eberly Family Chair in Geology and Geophysics
An endowed fund to support the Director

Edward Lamb McCollough Chair
Endowed fund to support the Chair

Frank A. Schulz Fund
An endowed fund to support the Chair

Geology & Geophysics Director's Startup Fund
Establish and support personal research programs and professional activities

Geology & Geophysics Director's Research General Support Fund
Provide support for faculty and students engaged in research areas that will offer educational and scientific benefits to those interested in the earth sciences

Geology & Geophysics Enhancement/Enrichment Fund
Supports development and enrichment of the School's instructional, research and service programs

Geology Exhibits Fund
Provide support for displays highlighting G&G (primarily in the Sarkeys Energy Center)

Hugh E. Hunter Fund
An endowed fund to support teaching, research and other relevant activities in hard-rock petrology and mineralogy

Industrial Research Exploration
To support research in the field of exploration seismology

Institute of Exploration and Development Geosciences
To support general operating funds of the Institute

Joe & Robert Klabzuba Chair
To establish and support an endowed chair

Kerr McGee Centennial Professorship in Geology
An endowed fund to support the professorship

Lissa and Cy Wagner Professorship of Geology & Geophysics
An endowed fund to support a professorship

Middle East Basin Analysis – Seismic Stratigraphy
To pay any and all expenses incurred for Middle Eastern basin analysis and seismic stratigraphy research and training conducted by visiting scholars

Nonesuch Shale
To provide support for investigations by the School of Geology and Geophysics on the sedimentary, diagenesis and organic geochemistry of Nonesuch Shale

Paleomagnetics and Diagenesis Industry Program
To support Diagenetic Magnetite research in the School of Geology and Geophysics

Petroleum Geochemistry
To support petroleum geochemistry

Presidential Professorships (2)
Awarded for four years for discretionary purposes to full-time OU faculty member

Presidential Young Investigator Award
A fund to be used for the Presidential Award Matching Funds

R.E. and Doris Klabzuba Professorship of Geology and Geophysics
An endowed fund to support the professorship

Structural Geology and Geophysics
To support research in structural geology including graduate fellowships, travel, expendables and equipment

Texaco, Inc. X-ray Laboratory
To support the Energy Center X-ray laboratory

Unocal Centennial Professorship
An endowed fund to support the Professorship

Victor E. Monnett Chair
Endowed fund to support the Chair

Victor E. Monnett Chair in Energy Resources Enhancement Fund
To support and enhance State Regents Matching Fund

Willard L. Miller Professorship in Geology and Geophysics
An endowed fund to support the professorship

Youngblood Geology Library Endowment
An endowed fund to support the library

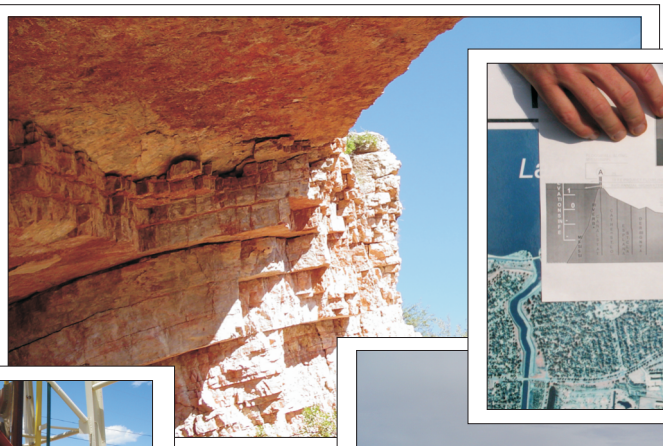
SHELL OIL COLLOQUIUM SERIES SCHEDULE FALL 2004 AND SPRING 2005

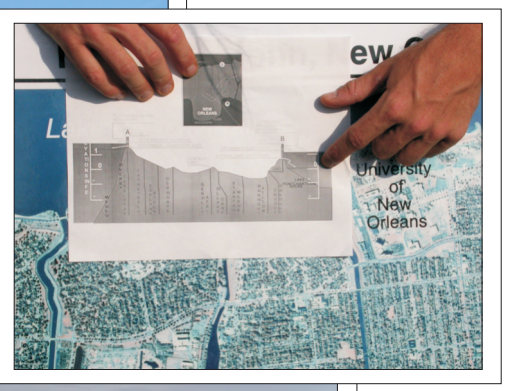
University of Oklahoma School of Geology and Geophysics
Thursdays at 3:30 pm. in room A235 of Sarkeys Energy Center
100 East Boyd Street Norman OK 405-325-3253

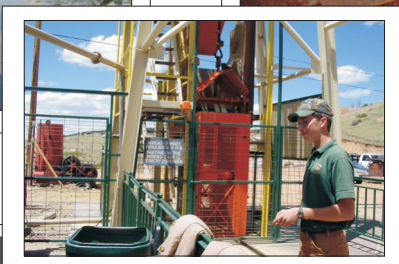
Date	Speaker	Title/Topic
Sep 02	Evgeni M. Chesnokov University of Oklahoma	Geophysical Research in the Barnett Shale Gas Play, North Texas
Sep 09	Eric Eslinger Eric Geoscience Inc.	Reservoir Characterization Using Core Rock Properties and Well Logs
Sep 16	M. Charles Gilbert University of Oklahoma	Geologic Mysteries of the Wichita Mountains and Southern Oklahoma Aulacogen
Sep 23	John D. Pigott University of Oklahoma	Does the Earth Matter? A Geoethical Approach
Sep 30	Daniel J. O'Meara Jr University of Oklahoma	Log-Derived J Functions for Calculating Saturations, Estimating Permeability and Identifying Reservoir Compartments
Oct 07	Klaus Helbig ISSZ	Half a Century of Anisotropy in Exploration and Reservoir Seismic
Oct 21	Kerry V. Magruder University of Oklahoma	Whole-Earth Thinking Before Wegener: Global Sections and Views in Theories of the Earth
Oct 28	Bob Davis Schlumberger Oilfield Services	Identification and Characterization of Faults and Folds Using Borehole Electrical Images
Nov 04	Jon Stigant Devon Energy Corp	GPS and GIS - Getting Lost Faster Than Ever Before
Nov 18	Stephen T. Hasiotis University of Kansas	Interpreting Ancient Environments, Ecosystems and Climates Through Organism Behavior: Examples from Triassic and Jurassic Continental Rocks of the Colorado Plateau
Dec 02	Roy A. Johnson University of Arizona	Coupled Basin Evolution, Core Complex Exhumation and Upper Crustal Extension in the Southern Basin and Range Province, SE Arizona
Dec 09	Allen M. Shapiro Darcy Lecturer	Recent Advances in Characterizing Ground Water Flow and Chemical Transport in Fractured Rock: From Cores to Kilometers
Jan 20	Daniel T. Boyd Oklahoma Geological Survey	Oklahoma Oil, Natural Gas, and Our Place in the Big Picture
Jan 27	Elena Centeno Garcia Univ. Nacional Autonoma de Mexico	New Findings in the Upper Paleozoic Successions of Mexico: Tectonic and Paleogeographic Implications
Feb 03	Brian E. O'Brien Saxet Petroleum Inc.	Comanche Ranch Field: Maverick County, Texas
Feb 10	Stephen Macko University of Virginia	Perspectives on Ancient Humans Through Stable Isotope Analysis
Feb 17	William B. Simmons University of New Orleans	Discovering and Proposing New Minerals: Examples of Two Recently Approved Minerals from Madagascar – Londonite and Pezzottaite
Feb 24	Lori L. Summa AAPG Distinguished Lecturer	Tertiary Deltas – What We Have Learned: Example from Deepwater Nigeria
Mar 03	James Clanin CJ Mining	Mining Gem Bearing Pegmatites
Mar 08	Greg Partyka SEG Distinguished Lecturer	Spectral Decomposition
Mar 10	Sven Treitel	Multiresolution Wavelet Analysis
Mar 24	Heloise B. Lynn SEG/AAPG Distinguished Lecturer	The Winds of Change: Anisotropic Rocks, Their Preferred Direction of Fluid Flow and Their Associated Seismic Signatures
Mar 31	Lynn Soreghan University of Oklahoma	GeoSytems: Alternative-Earth Extemes in Deep Time
Apr 07	Paul Philp University of Oklahoma	Environmental Forensic Geochemistry or CSI Without the Violence
Apr 14	B. Charlotte Schreiber Appalachian State University	How Can You Recognize a Sabkha Deposit in the Ancient Record
Apr 21	Cin-Ty Lee Rice University	Mass Balance of Redox-Sensitive Elements in the Marine Environment - Source to Sink
Apr 28	Sheila Seaman University of Massachusetts	Water, Water Everywhere: Exploring the Role of Water in Crystallization and Eruption of Magmas

In the Field with SGG

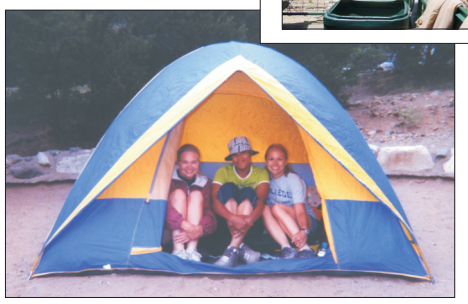








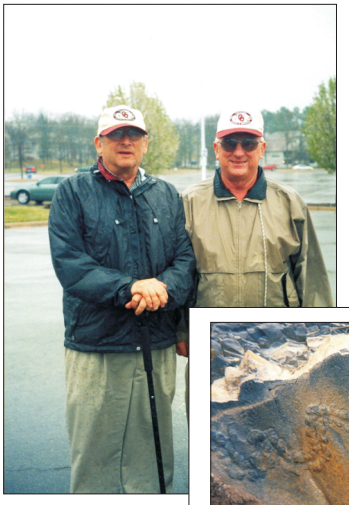




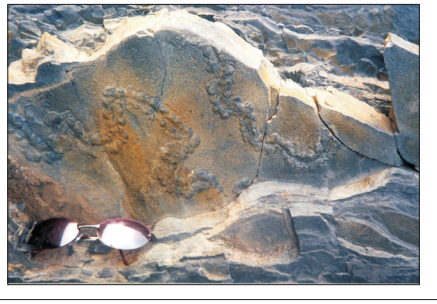
















Summer Field Camp 2004

by **Alicia Branch**

Summer Field Camp is an epic rite of passage for OU geology students. Six weeks of Canon City good times for Lydia Busse, Rebecca Kepler, Deane Browning, Breane Minor, Meryl McDowell, Joni Verrett, Ronnie Pike, Alicia Branch and Kurt Johnson. Faculty included Dr. Charles Harper, Dr. Tom Dewers, Dr. Roger Young, Dr. Roger Slatt and Dr. Alan Witten as well as teaching assistants Brandon Fritz, Ozzie Ilaboya, Demola Soyinka, Bukky Ojo and Yoscel Suarez.

We were enlightened on regional stratigraphy, tectonics, shallow geophysical methods, Global Positioning and Geographical Information Systems, Gravity and Magnetic surveys and – everyone's favorite—MAPPING!! Our many adventures included the Dakota Hogback, Gnat Hollow, Grape Creek, Blue Ridge, the Mixing Bowl, Gem Park, North and South Twin Mountain (who could forget Nasty Knob??), camping at Sands National Monument, Spanish Peaks, Florisssant Fossil Beds, Garden of the Gods, rafting through the Royal Gorge, Dinosaur Ridge, Red Rocks and our regional field trip to map the channel sands of the Lewis shale near the Cherokee Ridge Arch.

Of course, this left plenty of spare time on the weekends to hang out at Alfonso's Taco Shop while we waited on our laundry, or to enjoy a frosty schooner or Fat Tire at My Brother's Place and reminisce about the previous week's enjoyable eight-hour hikes in the sun. But mostly the discussion was about how we were becoming "real" geologists now. Though we may have griped about our farmer's tans and cactus wounds, everyone agreed that summer field camp was the crowning achievement of our undergraduate experience. ■



Dr. Slatt in the trenches.



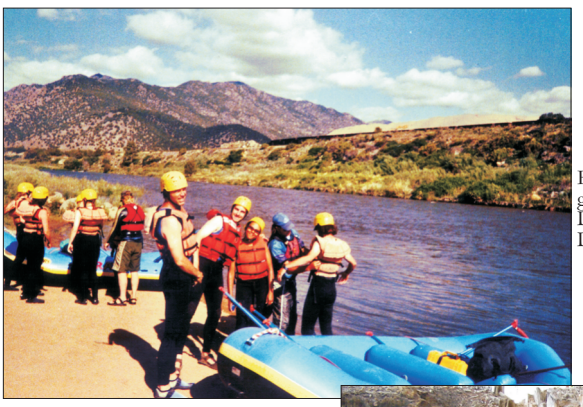
Sangre de Cristo Range



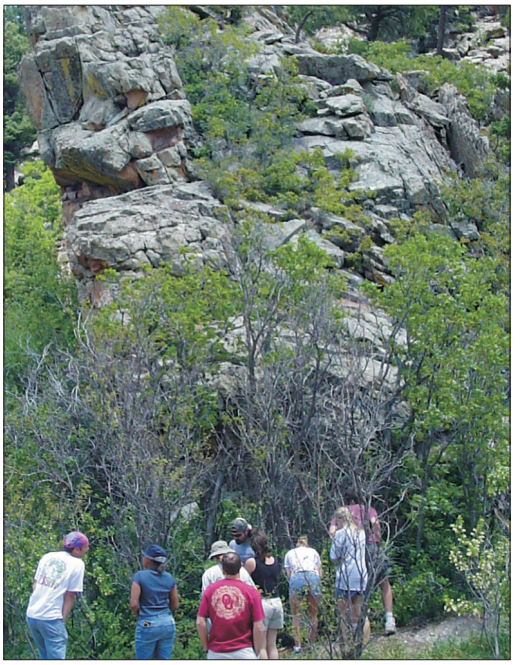
Garden of the Gods - Manitou Springs



Dr. Harper explaining the importance of the "quick and dirty" approach to geology near Manitou Springs.



Extreme geology with Dr. Tom Dewers

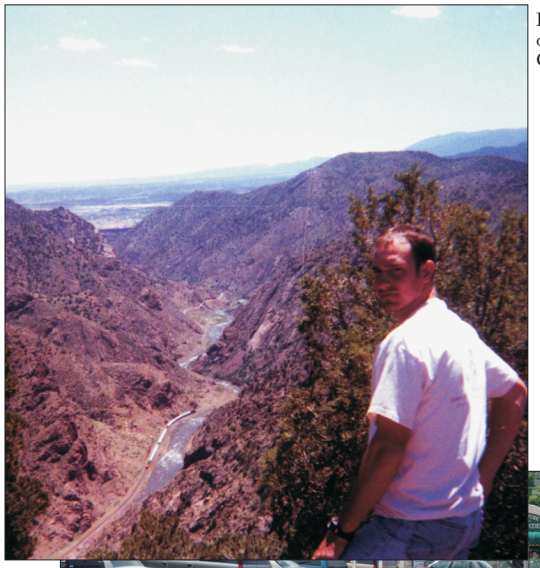


Students studying volcanic dykes radiating from the Spanish Peaks



Florissant National Park - Petrified Sequoia trees

Summer Field Camp 2004 continued...



Brandon Fritz overlooks Royal Gorge



Alicia Branch posing with the Dakota Group at Dinosaur Ridge near Morrison Colorado.



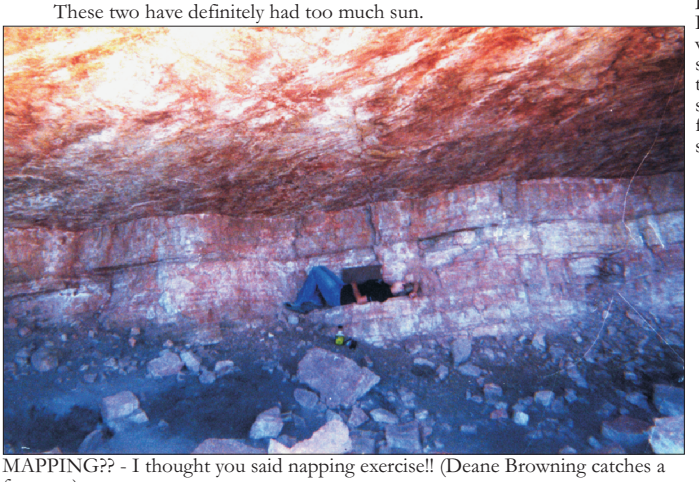
These two have definitely had too much sun.



Into the bowels of the earth--Cripple Creek Gold Mine tour.



Deane Browning wielding a sledge hammer to generate a seismic wave for a hammer seismic survey.



MAPPING?? - I thought you said napping exercise!! (Deane Browning catches a few zzzs)



Cripple Creek Gold Mine tour.
Joni Verrett, Lydia Busse, Rebekah Kepler, Ronnie Pike, Meryl McDowell, Breane Minor



Back row left to right: Lydia Busse, Meryl McDowell, Kurt Johnson, Joni Verrett, Bukky Ojo, Breane Minor, Rebekah Kepler, Deane Browning and Demola Soyinka
Front row left to right: Ozzie Ilaboya, Alicia Branch and Ronnie Pike

Clastic Facies fieldtrip with Dr. Doug Elmore
Lower Mississippi River and Coastal Geology of Louisiana

September 28-October 3, 2004

by **Jennifer Eoff**

Students in the Clastic Facies class examined the lower Mississippi River and the coastal geology of Louisiana to understand general fluvial, deltaic and coastal processes. Delta plain geometry and subsidence, resulting from past river avulsions and delta lobe abandonment, were investigated, as were the coastal processes of barrier island and strandplain formation and migration. Coastal erosion and wetland loss are key issues along the Louisiana coast, not just because they allow further understanding of geologically significant hydrological regimes, but because of their effects on the petroleum, fishing, shrimp and oyster industries. New Orleans and surrounding areas are at risk for flooding by the Mississippi River and by large storm events. Efforts to combat these hazards include: restoration of barrier islands and marshes; sea walls, groynes and jetties; extensive levee systems; and control structures along the Mississippi River to prevent flooding and capture by the Atchafalaya River.

Special thanks are given to geology alumni for funding the fieldtrip, the undergraduate students for their initiative and LUMCOM for use of its research facilities. ■



Joe, a friendly local of the Jean Lafitte area swamps



Petroleum facilities along Louisiana coast south of Cocodrie. Threat of storm damage and environmental hazards increased due to loss of vital protection (e.g., barrier islands) oceanward.



Gate of Low Sill Structure, an Old River control facility along the Mississippi River. Average head between the Atchafalaya River (left) and Mississippi River (right) is 4-19 feet.



Students dig a trench through a beach berm at Port Fourchon to analyze beach stratigraphy and sediment transport.



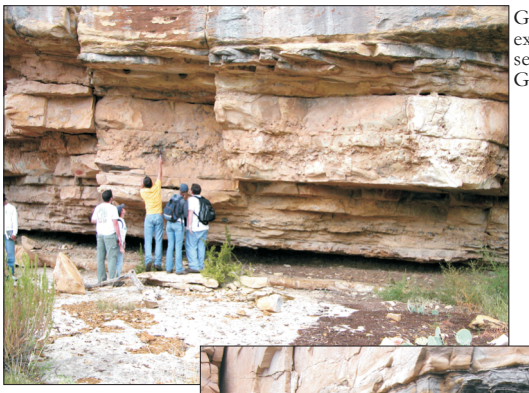
Seated from left: Rodrigo Bastidas, Martin Morales, Sebastian Bayer, Alicia Branch-Decker, Paul Richardson, Jennifer Roberts, Vanessa O'Brien, Shannon Dulin, Sarah Hamilton, Yasser Mohamed and Dr. Mark Kulp (UNO)

Standing from left: Sara Austin, Devin Dennie, Adam Shear, Aaron Rothfolk, Dr. Douglas Elmore, Matt Boyce, Colt Nickel, Chris Harms, Ronnie Pike, Sara Kaplan, Michelle McCarthy, Kristen Marra, Sonia Bradley, Raina Waskiewicz, Dr. Matt Totten (UNO), Louise Totten, Brian Harms, Jennifer Eoff, Mike Miner (UNO) and Brian Davis

Stratigraphy Field Trip

Fall of 2004 (September 23 – 26) a group of about 30 students accompanied Dr. Lynn Soreghan to the Guadalupe Mountains in West Texas and to the Sacramento Mountains in New Mexico. They were there for the sole purpose of learning about carbonate reef systems, eolian systems, Late Paleozoic systems and sequence stratigraphy. And that's just what they did. It is obvious they found many wonderful examples that Dr. Soreghan carefully explained to them. But, they did a little clowning around too.

Brian Harms recollections: After taking a charter bus (the only way to travel) Thursday, we got busy Friday, spending half the day in the Sacramento Mountains making a stratigraphic section of a late Paleozoic (Mississippian) reef system. We learned how global sea level changes affected the stratigraphy, and looked at the Castile Formation in the Delaware Basin (once a deep inland sea). We also learned how seasonal variations in precipitation and evaporation account for its characteristic calcite/anhydrite banding. Saturday, at the Guadalupe Mountains, we looked at different types of debris flows such as the Rader debris flow; the boulders in the picture broke off of the forereef slope when it catastrophically failed. We also observed grain flows in action at White Sands National Monument (we discovered the best way to start a grain flow is through horseplay). Sunday we went to Carlsbad Caverns and learned how hydrogen sulfide from a nearby oil and gas deposit dissolved into groundwater and carved out the caverns. Then we drove home, most of us soaking wet. ■



Geol 4113 students examining condensed sediments in the Guadalupe



Dustin Sweet, geology graduate student, pointing to a slump formation in the Brushy Canyon Formation, Guadalupe Mountains.



Jennifer Eoff, geology graduate student, examines an alluvial fan in the Abo Formation in New Mexico



Students examining the Rader Debris Flow in the Guadalupe Mountains.



The time the class spent at White Sands proved a problem for Paul Richardson.

Chris Harms, Ronnie Pike, Kristen Marra, Brian Harms, Alicia Branch and Kurt Johnson





Taken at El Capitan in the Guadalupe Mountains

Back row, l-r: Jennifer Eoff, Brian Harms, Paul Richardson, Kurt Johnson, Chris Harms, Jeffrey Patrick, Dustin Sweet, Aaron Siemers, Colt Nickel, Jason Wycoff, Sarah Werning, Jennifer Larsen.

Middle row, l-r: Alicia Branch, Kristen Marra, Jose Villalobos, Kathryn Gardner, Lydia Busse, Kate Moore, Deane Browning, Joni Verrett, Breanne Minor, Sohini Sur, Anh Pham, Carlos Bahamom.



Deepwater Depositional Systems Field Trip with Dr. Slatt

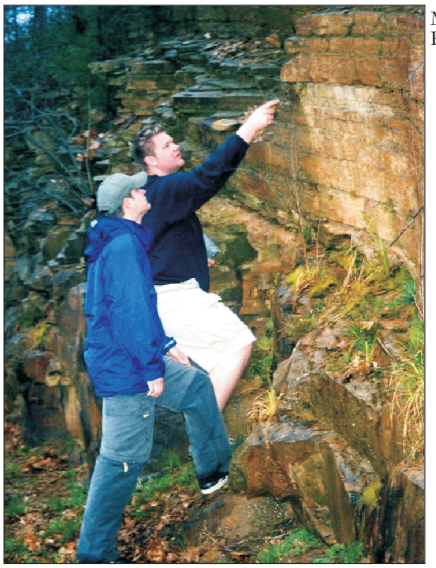
by **Matthew Boyce**, SGG graduate student

Field trips are a fundamental way to learn about geology; I remember conversations with fellow students about the benefits of such trips and on one occasion recall a student saying he learned more on a two week field experience than he learned in a whole semester in the classroom. Geology requires an understanding of scales and visualization in three dimensions; this may be hard to appreciate without the benefit of field experience. Also, many of us chose geology because of a love for the outdoors and nothing could be a better reminder of why we sit inside classrooms and offices.

The deepwater depositional systems field trip (March 19-21, 2005) taught our class a great deal about the spatial relation of architectural elements and their sequence stratigraphic significance. Over the course of three days we visited Big Rock, Hollywood, and Baumgartner Quarries, the DeGray Lake Spillway, and various roadcuts. My most memorable experience was DeGray Lake where we traipsed through six inches of muddy water to correlate a gamma log to the outcrop, and then used the log and outcrop to understand the sequence stratigraphy. Hollywood Quarry was another favorite stop of mine as we could easily see faulting and shale continuity at reservoir scale. On the last day we visited Big Rock Quarry to view a channel complex and its architecture. This was a great conclusion to our trip as it pulled together the concepts we discussed at our prior stops and concepts we learned in class. A solid month in the classroom would not make up for this field experience. ■



Dr. Roger Slatt instructing students



Matt Boyce and Aaron Rothfolk checking it out.



Experienced (old) geologists, Dr. Roger Slatt, Director of the School of Geology and Geophysics at OU, and Charlie Stone, geologist with the Arkansas Geological Commission



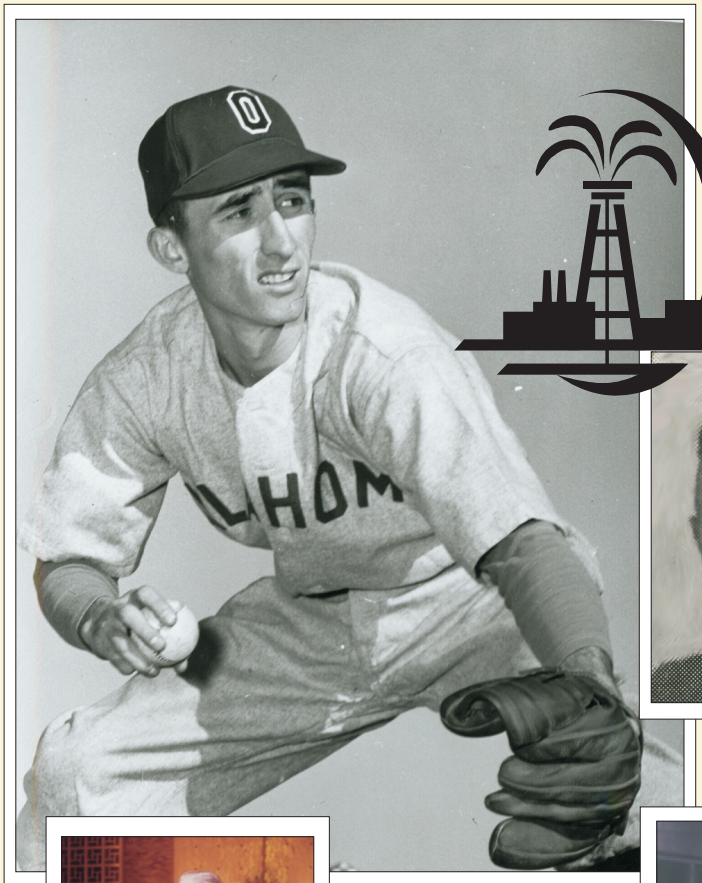
Young geologists, Aaron Rothfolk and Kerry Moreland, M.S. graduate students.



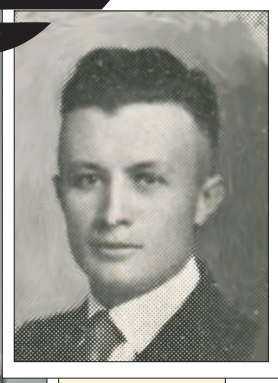
Looks like a soggy day, but, as Dr. Slatt says, "Any day in the field is better than a day in the office."

L-R: Efrain Mendez, Adam Shear, Roger Wagerle of BP, Oswaldo Davogustto, Terry Wiseman of BP, Javier Perez, Ryan Miller, Belinda Ferrero, Prerna Singh, Christian Marine, Carla Valerio, Ramon Asuaje, Matt Sparkman, Deanne Browning, David Ramirez, Yoscel Suarez, Dr. Slatt, Gabriel Borges, Mike Burnett (Fusion Geophysical), Sebastian Bayer, Luz Lozano.

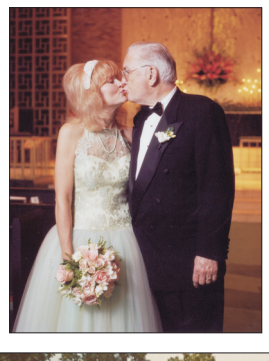
Alumni Corner





















Alumni Corner - Profiles



Robert L. Stephenson

by **Ray Potts**

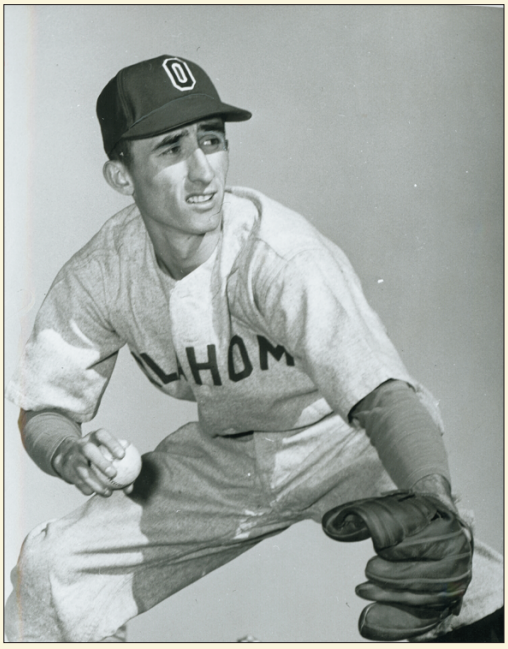
It is an honor and pleasure to say a few words about Robert L. Stephenson.

Bob was born and raised on a farm in southwest Oklahoma. He attended Blair High School where he played basketball and baseball and won a state championship in basketball. In 1945 he played on the first Altus American Legion team that won the state title in baseball. After graduating from Blair he attended the University of Oklahoma where he majored in Geology and played baseball as shortstop for three years. In 1950 he was named to second team All American in the U.S. Upon graduation in 1950 Bob signed a professional baseball contract with the St. Louis Cardinals and played seven years in the majors and triple AAA leagues.

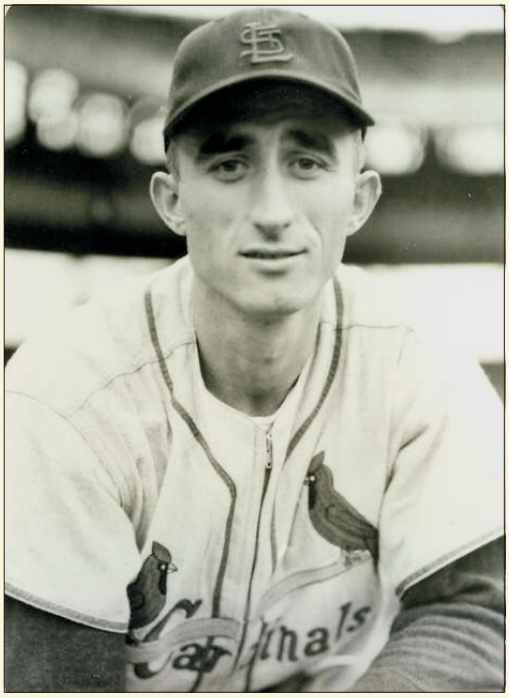
Bob retired from baseball in 1957 and began his career as a geologist with the Pure Oil Company and this is when I became acquainted with him. His talents as a geologist were quickly recognized by Pure and he was promoted to district geologist. After nine years with Pure he left and we formed an independent oil and gas company known as Potts-Stephenson Exploration Co.

Our community is better because of Bob's generous donation of time, talents and resources. He has quietly given extremely generous financial gifts to many organizations, especially to the University of Oklahoma, and has served on many boards and councils. In his church, he currently serves on the Associated Baptist Press and Coordinating Council of Cooperative Baptist Fellowship boards. He was founder of Mainstream Oklahoma Baptist and North Haven Church. Previously he served on The Petroleum Club Board and Norman Regional Hospital Foundation. He is a member of the OKC Geological Society, American Association of Petroleum Geologists, Oklahoma Independent Petroleum Association, McCollough Chair Search Committee, Sarkeys Energy Center Board and the School of Geology and Geophysics Alumni Advisory Council.

I have known Bob for over 40 years and have been his business partner for 30 of those years. Bob is one of the finest human beings I have ever known. His priorities in life are: church, family and O.U. His integrity is beyond reproach and he is crystal clear about right and wrong. When he believes in something strongly, he will do everything within his power to pursue that belief. He does not seek recognition and goes to great lengths to avoid publicity. His attitude towards life is always positive and he loves to pull off practical jokes on his friends. One that comes quickly to mind occurred shortly after Pure Oil Co (both Bob and I worked for Pure) closed their Ardmore office and consolidated it with OKC. Bob had been working in the Ardmore office and I was in the OKC office. Shortly after Bob arrived in OKC I started getting a lot of visits from Insurance salesmen at the office. After the third or fourth one I finally asked how he got my name and he said he had just called on Mr. Stephenson (who officed next to me) to try to sell him insurance. Bob told the salesman that he didn't need any but he thought that I was looking for some insurance. This had been his procedure whenever a salesman stopped by to see him. I immediately went next door to Bob's office and let him know I didn't appreciate his sending these sales people to see me. He had a big laugh and we soon became good friends. We've been good friends ever since. ■



Bob when he was playing for OU.



Bob suited up to play for the St. Louis Cardinals.



My Friend Dave Campbell: The Geologist's Version of the Energizer Bunny

by **Dr. Tom Rowland**

Dave and I met in July 1955. It was at summer Geology Field Camp in Canon City, Colorado. Dr. Carl Moore, the camp director, asked if I would partner with a Dave Campbell. That led to a 50 year friendship with a person I greatly admire. There were six girls and 24 boys attending camp that year, and Dr. Moore asked Dave to include two of the girls in our field party. I was standing behind Dr. Moore frantically waving the "no" sign at Dave, who looked perplexed and then began to laugh. Dr. Moore turned to me and asked if I had a problem. Naturally I quickly agreed to the arrangement. Again Dave saved the day—one of his many talents. We had a good relationship with our female geology partners and a successful four weeks of learning field geology methods.

Dave is originally from Oklahoma City. He received his B.S. degree in Geology from the University of Tulsa in 1953 and then spent two years in the army. He got his M.S. in Geology from the University of Oklahoma in 1957 and joined Lone Star Producing Company in the Oklahoma City office. In 1965, he joined Tenneco Oil serving as exploration project geologist in Denver, district exploration geologist in Oklahoma City and mid-continent division geologist consultant. In 1977, he joined Leede Exploration and in 1980 formed Earthhawk Inc., engaged in oil and gas exploration. From 1983 to 1986 the firm was affiliated with Petrocorp, with Dave serving as general manager from 1992 to 1996. Petrocorp had called on Dave and his son Carl to open the Oklahoma City office in 1983. Dave was also consulting for Nova Energy.

Earthhawk became Dave's sole operation in 1996. Our energizer bunny geologist was very busy in those early years. To add additional duties, Dave became heavily involved in the School of Geology and Geophysics Alumni Advisory Council in 1983. He has been on numerous committees for the Council and served as chairman 1992-93. Dave is a lifetime member and is on the Council Board of Directors. He is also a member of the OU Presidents Associates.

Dave has been an active member of AAPG since 1956 and is a Certified Petroleum Geologist. He is a delegate at large of the AAPG House of Delegates (chair 1981-82), on the Advisory Council as an elected councilor of the mid-continent section (1984-87), and also as Energy Minerals Division councilor (1992-94). He was a member of the Committee on Committees (chair 1992-98), on the Astrogeology committee, the membership and convention coordinating committees and chair of two special ad hoc committees. He served as AAPG Vice President for 1990-91. His AAPG honors include the Distinguished Service Award and Honorary Membership. As an AAPG Foundation trustee associate he served five years as a member of the Foundation Corporation and on the Advisory Board for the Treatise of Petroleum Geology 1986-91.

Dave is a member of EMD and was a Charter Member of the Division of Environmental Geosciences. Other professional affiliations include the Society of Independent Professional Earth Scientists; Petroleum Exploration Society of Great Britain; Houston and Tulsa Geological Societies; Sigma Xi; the New York Academy of Sciences; charter member of the Geological Society of Moscow, Russia (he has probably attended some of their meetings); and is an honorary life member of the Oklahoma City Geological Society. He was the founding president of the Oklahoma City Geological Foundation, formed in 1994, and he is a life member. Dave is listed in the current Who's Who in Science and Engineering, Who's Who in America and Who's Who in the World (and he is definitely in Who's Who at SGG).

One would wonder by this time if our geologist energizer bunny was running out of current. Well, guess again! He just keeps going and going. Dave's more recent activities include serving as a member and past president of Red Earth, Inc. He has served on the board since 1991. He served as a gubernatorial appointee to the Native American cultural and Education Authority in 2002 and as a business consultant and Junior Achievement volunteer since 1995.

Whew! I'm out of breath, but I will push on. In 2001 the School began a Spring Student Exposition. Guess who helped organize the Expo for the School and has been head judge each year ever since. Our energizer bunny strikes again. Dave has been an extremely valuable asset to the School, serving on many Alumni Advisory Council committees. The office staff at the School wanted me to add that they love Dave. He is their good will ambassador. He is always appreciative and encouraging. They all look for his smiling face at the School functions and, whenever possible, he is there, encouraging the staff, encouraging the students—supporting the School. So Wa Do! (Cherokee for thank you) Dave. ■



Dave Campbell (left) and Tom Rowland (right) as they appeared at Summer Geology Field Camp, in 1955.



Gene Van Dyke

by a Reliable Anonymous Source

Gene Van Dyke was born November 5, 1926 in Normal, Illinois. The town's name in no way describes Gene's life. His father was a high school teacher and his mother was a homemaker. They were an average family in a small town, but somehow they produced Gene Van Dyke—and he's not your average guy.

After high school and a stint in the service, Gene spent a semester at the University of Illinois. Somehow, though, he wound up in Oklahoma City working for Kerr-McGee. He came to OU and got a degree in Geological Engineering in January, 1950. While at OU Gene served as president of BOQ (Bachelor Officer's Quarters—named because that was the original use of the facility which was part of the North and South Base property the Navy donated to the University after WWII). This position was equivalent to being dorm president. December 3, 1949, there was a fire in BOQ that took the lives of three young men. As president, it was Gene's task to go with President George Lynn Cross to visit the families of the young men who died to extend the universities condolences—an unimaginably difficult task.

The fire destroyed the clothes, books and thesis of everyone, including Gene. The morning after the fire, a relief station was set up at the Flood Street fire house. Gene said it was the first time in his life he had owned a matching coat and pants. One of his classmates came down to the relief station and, seeing Gene, took off his overcoat and put it on him. Gene was hugely impressed with the kindness and generosity of this man and they are friends to this day.

In 1947, Kerr-McGee drilled the first well in the U.S. drilled out in the continental shelf. Gene has always been proud of the fact that he worked on that well. It is the opinion of many that this is where his love of off-shore drilling developed and why it still holds his interest.

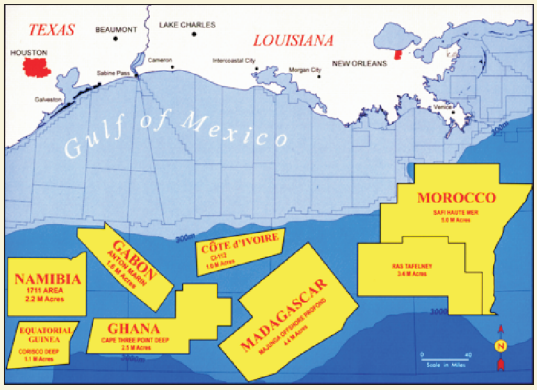
Now for a little classic Gene—the textbook entrepreneur. In the early days of his professional life Gene went to Wichita Falls as an independent. He lived at the Y.M.C.A. But it didn't say that on his business cards. He used the "Y" street address and even included a suite number. The phone number on his card was actually the pay phone down the hall.

Gene has had an interesting career. In 1958, Gene moved to Houston and started an exploration company in partnership with Georg Mejlaender, a Norwegian who came to OU after WWII. They were a wonderful team. Georg was the creator and Gene was the salesman. Gene's own creativity has served him well. His willingness to gamble has served him well too. He went from Van Dyke and Mejlaender, working the Texas Gulf Coast, to Van Dyke Oil Company, concentrating on exploration and production in South Louisiana, then moving exclusively to international offshore exploration, to his current company, Vanco Energy Company. Vanco is focused on a new frontier in deepwater exploration off the coast of West Africa, one of the finest arenas for exploration in the world. At one point Gene had more holdings off the coast of West Africa than his two next competitors combined, with 31 million acres. He has operated with Chevron, Reading and Bates, Repsol (Spanish National Oil Co.), the Chinese National Oil company, the National Oil Company of India, AGIP (an Italian oil company), Shell Oil Company and Union Oil of California.

His mind for business is acute. When Gene presents a prospect, the package is so complete that there is no question you could ask that has not been addressed in the information he provided. And he is amazingly creative. If you sit down with Gene and say, "I have a problem with . . .," in about the space of three minutes he comes up with five different solutions to your problem.

Gene Van Dyke is a pioneer, an entrepreneur, a gambler, a visionary; a smart, creative and generous human being. He's a fine man and a good friend. ■

Vanco's acreage offshore Africa covers the equivalent of 70% of deepwater exploration area in the Gulf of Mexico.





Gene, the early years



Gene and Astrid Van Dyke

Alumni Corner - New Fellowships and Scholarships

The School is indebted to the continued support and interest of its alumni. Your support makes so many things possible for the School and the students. A look through this magazine will show you how alumni support impacts SGG year after year. Thank you from everyone at the School.

Glenn Eugene Laskey Memorial Fellowship Fund



The School of Geology and Geophysics announces with appreciation the endowment of a new Fellowship fund. Ann Marie Laskey Terry, daughter of 1920 alumni, Glenn Eugene Laskey, has established a $100,000 endowment in her father's name to help fund graduate fellowships.

Mr. Laskey was born in 1895. His family came from Iowa and participated in the Oklahoma land run. Ms. Terry was quick to point out that they were Boomers, not Sooners (although her father became a huge Sooner football fan and remained so until his death in 1976). Glenn's mother, Anna Klaskee Laskey, moved her young family to Oklahoma City after her husband died from blood poisoning from a wound he received working on the homestead. She managed to raise her family and went on to become one of the first women legislators in Oklahoma.

Glenn attended Central High in Oklahoma City. After WWI he went to OU where he was active in Sigma Chi, the Geology Honor Society, tennis and track, and was a huge Sooner football fan. After graduation he went to work for Shell Oil Company in Wichita Falls and married Virginia Davis. The Depression, however, ended his career with Shell. He found work with T.L. James in Rustin, Louisiana where he worked until retirement. He also worked doing consulting (Ms. Terry says they didn't call it that back then) for smaller oil companies.

We are so grateful to Mrs. Terry for honoring her father in this productive way.

The Norman R. Gelphman Professorship of Geology and Geophysics

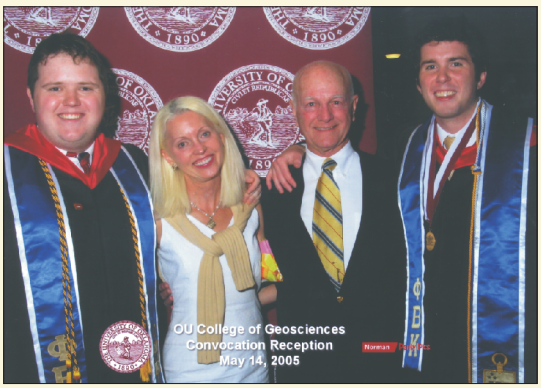


The Estate of Norman R. Gelphman, SGG graduate of 1954 and 1959, has established the Norman R. Gelphman Professorship of Geology and Geophysics to enhance the ability of the School to attract and/or retain a faculty of the highest quality and reputation and, as a corollary, to attract a student body of exceptional ability. The School is indebted to Mr. Gelphman for his generous gift of over $295,000, and will see that it is wisely used.

Jon R. Withrow Geology and Geophysics Graduate Fellowship



This is Mr. Withrow's second fellowship for the School. A number of our students already benefit from his generosity. This fellowship, in the amount of $10,000, is available to full-time, regularly enrolled SGG students who are Oklahoma residents and who have achieved and maintained a 3.00 GPA on a 4.00 scale, and who are making progress toward graduation and are in need of supplemental financial assistance. Preference is given to graduate students. Jon Withrow has served faithfully on the AAC and was Chair for 2004-05. The School is deeply indebted to you, Jon, for your continued support.



The Devon Energy Corporation Geosciences Fellowship

The School would like to acknowledge with gratitude the generous support of Devon Energy in setting up the Devon Energy Corporation Geosciences Fellowship. This fund, in the amount of $10,000, was established to award scholarships to students who are U.S. citizens enrolled full-time in an SGG program and who have achieved and maintained at least a 3.0 overall GPA.

The Alan J. Witten Scholarship Fund



A scholarship fund has been established in the name of Alan J. Witten in memory of Dr. Witten, geophysics professor at the School, who we lost to a heart attack in February 2005. We welcome donations in Dr. Wittens name and extend our thanks to all those who have already contributed to this fund.

Alumni Corner - Deaths

The School is sad to report the loss of the following alumni (the university received notice of the passing of these alumni in the past year although their death dates might be considerably older):

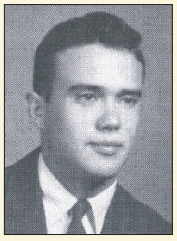
Name of Alumni	Grad	Date of Death
Clive V. Andriesse	1967	19-Apr-97
Louis G. Arrington	1950	20-Sep-04
William G. Bates	1953	8-May-04
Jim W. Beaver, DDS	1957	31-Dec-04
Clyde G. Beckwith, Jr.	1950	4-Jul-96
Col. Harold Benham	1948	17-Oct-00
James C. Black	1949	17-Jun-04
James F. Bollman	1950	11-Aug-02
Philip H. Brammell	1955	28-Jul-04
John W. Branson	1948	12-Jun-98
Curran R. Campbell	1946	30-Aug-04
Clifford S. Cannan	1951	28-Apr-80
Terry L. Cherryhomes	1955	6-Apr-02
Richard L. Conkling	1952	24-May-04
James J. Connor	1949	23-Dec-04
Paul F. Connor	1950	8-Jan-05
Robert P. Cooper	1938	1-Sep-72
John B. Cummings	1982	26-Oct-03
David W. Deax	1965	16-Feb-05
Charles W. Deupree	1952	11-Mar-05
Capt. Everett J. Dewees, Jr.	1954	1-Aug-86
Walden J. Evans	1940	28-Nov-02
Lewis G. Fearing	1951	4-Sep-04
Rene E. Garcia	1950	23-May-90
Dr. Edwin T. Green	1970 1971 1977	3-May-04
Yorke J. Gunn	1955	8-Jan-05

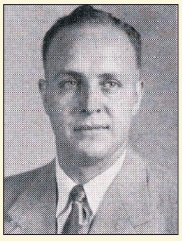
Name of Alumni	Grad	Date of Death
Edward Haddad	1952	14-Feb-05
Jack A. Harris	1939	29-Mar-05
George Heilborn	1949	8-Jan-04
Stewart A. Hoge	1951	8-Jan-05
Gene L. Jeary	1962	13-Jul-04
Joe J. Klabzuba	1936	12-Aug-04
Thomas M. LaMonica	1950	23-Nov-2004
Robert C. Lang, III	1949/1951	1-Jul-93
Harry C. Lee	1954/1959	2-Dec-04
Leonard L. Limes	1950	24-Feb-05
Charles C. Lord	1949	13-Feb-05
Donovan S. McKee	1949	10-Aug-95
Ray C. Morris	1939	18-Jun-04
William M. Plaster	1929	14-Jul-04
Trammell P. Rutherford, Jr.	1940	27-Apr-95
Floyd E. Schoonover	1947/1948	15-Mar-99
Anthony G. Sharp	1951	6-Dec-04
George E. Summers, Jr.	1948	6-Sep-2004
Joe Van	1952	12-Jul-04
Ralph W. Viersen, Jr.	1957	8-Jan-05
Lawrence J. Vittrup	1932	19-Feb-04
Jack L. Walper	1947/1949	12-Apr-05
Thomas A. Wilkinson	1954/1956	18-Jan-05
Raymond L. Winstead, Jr.	1960	22-Apr-05
Randolph E. Wright, Jr.	1938	18-Oct-04
Jacob W. Zadik	1939	4-Aug-04

We were able to find photographs for the following alumni.

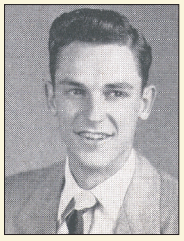

William G. Bates

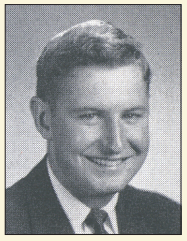

Jim W. Beaver, DDS

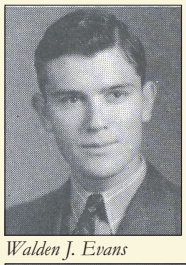

Terry L. Cherryhomes

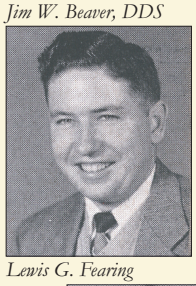

Richard L. Conkling

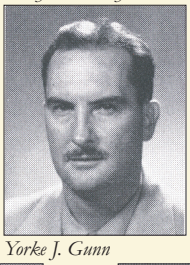

James J. Connor

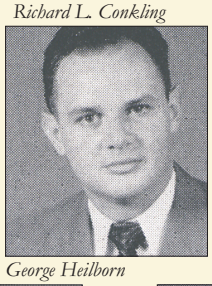

Charles W. Deupree

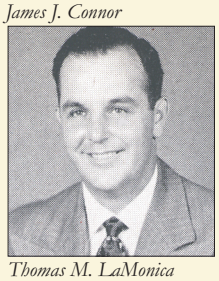

Everett J. Dewees, Jr.

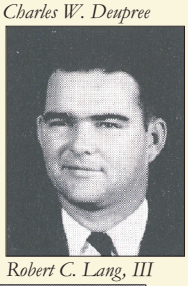

Walden J. Evans


Lewis G. Fearing


Yorke J. Gunn

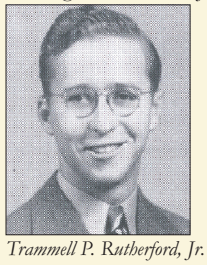

George Heilborn

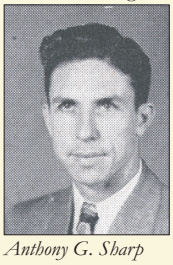

Thomas M. LaMonica

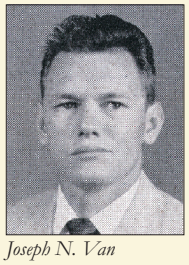

Robert C. Lang, III


Harry C. Lee

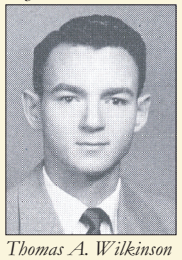

Leonard L. Limes


Trammell P. Rutherford, Jr.

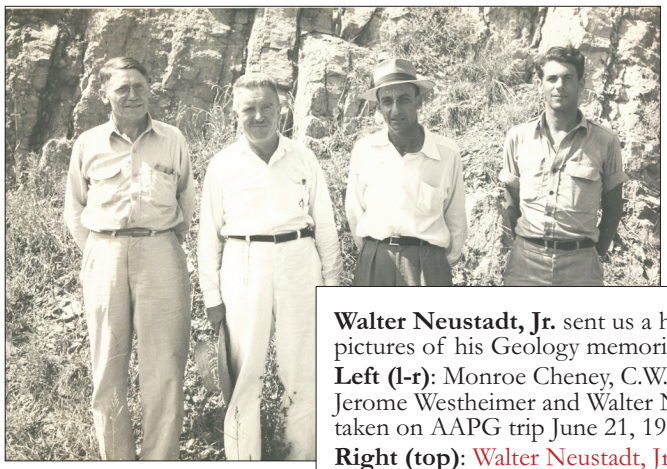

Anthony G. Sharp

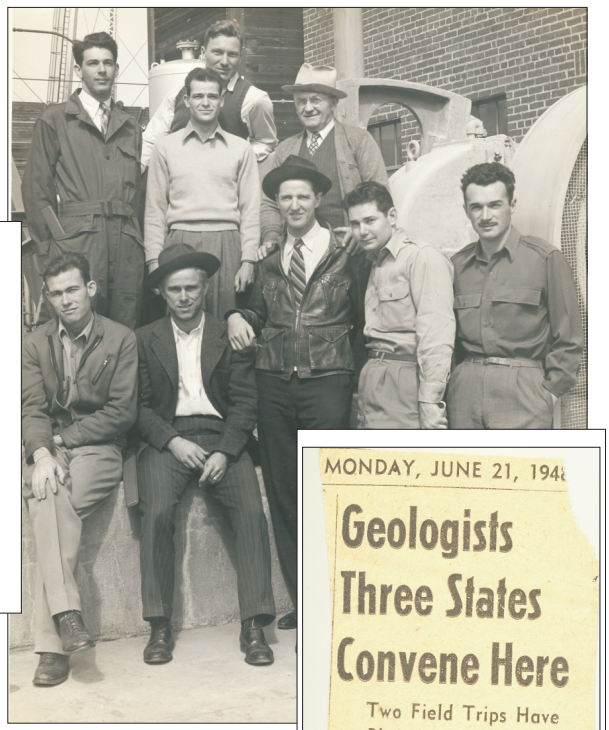

Joseph N. Van


Jack L. Walper


Thomas A. Wilkinson

Alumni Corner - Nostalgia





Walter Neustadt, Jr. sent us a handful of pictures of his Geology memories.
Left (l-r): Monroe Cheney, C.W. Tomlinson, Jerome Westheimer and Walter Neustadt, Jr., taken on AAPG trip June 21, 1948.
Right (top): Walter Neustadt, Jr., Ross W. Coe, Jr., W.E. Harman, Jr., Prof. N.F. Cloud
Bottom row: Walter Hart, Leo Wade, Alan H. Meldrum, Bob Caywood, Donald D. Eley
The ones Walter is sure of are in red, the others are guesses. We know the names of the others because they all signed the back, but we're not sure of their position in the picture. Can you help??



MONDAY, JUNE 21, 194

Geologists Three States Convene Here

Two Field Trips Have Place on Program Which Was Highlighted by Banquet at YWCA

Including a banquet, two field trips and a movie in color, the three-day Ardmore geological field conference ended June 19, according to F. S. Millard, secretary-treasurer of the Ardmore Geological society.

Geologists from Texas, Kansas and Oklahoma attended the meeting. At an informal gathering June 17, color movies of the Tulsa field trip held in the Wichita mountains regions last year were shown by John Ferguson.

Highlight of the gathering was a banquet at the Y. W. C. A. Friday evening at which 176 oil men heard Dr. M. G. Cheney of the Anzac Petroleum corporation talk on the correlation of Pennsylvanina formations in Oklahoma and Texas.

Dr. C. W. Tomlinson led the field trip on Friday and Jerome Westheimer on Saturday. Included in the gathering of almost 240 were Dr. H. R. Wanless of the department of geology, University of Illinois; Hugh B. Miser, with the geological survey; Richard Hollingsworth of Midland, and Walter Neustadt Jr., president of the local organization.

On the committee to plan the field trip were Westheimer and Tomlinson, Ed Hannun, Fred Schweers, John Mayes and Curtis Hicks. W. L. Mullen had charge of reservations.



Now this is serious field camp! They are like ants dotting the landscape.





"OKC Field Trip 1945"



"Strickland, Frances Coleman, John, Gordon, Margy"



"Margy, Betty Lou Thicke, Tarquetta Rutledge, Ann Scott, Pat, Walter Neustadt, Jr."

Thanks for the memories, Walter.



We heard from **Hollis A. Scoggins**, a 1950 graduate, about the picture to the left. He says that the man on the front row to the right (#8) is George G. Huffman. (Check last years Earth Scientist for a larger view) He says the man on the back row to the right (#9) is Carl A. Moore.

Thanks for getting back to us on this Mr. Scoggins.



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