Letter from the President

This has been a year unlike any other in my recollection. With this, my final letter to you, my friends, I look back on a year where we called for compassion for victims of a tsunami; now we have devastation of comparable or greater magnitude in our own backyard – the Big Easy. Already I hear of efforts forming to evaluate the stability of levees, refineries, and structures for the massive rebuilding effort that will come. Many NSG Section members will participate in this, and once again contribute to the good of our country and our fellow peoples. Serve them well.

On to other matters: as geophysicists and breadwinners, we are always watching trends in our marketplace to gauge how healthy our sector is, what sectors may be emerging, or simply to determine if we are on the right boat as we sail into the future. The effects of those four major hurricanes a year ago and Katrina and Rita in the past few weeks not only created devastation in significant parts of the southeast United States but also brought along shifts in the geophysics market. Ground subsidence investigations (a mainstay in the southeast) has taken a very distant back seat to the need for replacing roofs, structures, and entire communities, and for remediating mold and water damage or dealing with toxic plumes that are unprecedented. Couple this with the mud slides in California and the tsunami in southeast Asia, and we can get the feeling that the capricious nature of the Earth is out to make or break those of us looking for a dependable or predictable avocation. Now think of the fresh graduate who just joined the NSG Section and wonders where the jobs are. While we may not have all the solutions, we at least have a platform in our section and this newsletter, to bring new ideas and opportunities to our membership.

Included in this issue, I have invited a long-time friend and member of the engineering geophysics community, Clark Davenport, to write a brief article on his current passion – Forensic Geophysics. With the current popularity of the CSI (Crime Scene Investigation) television programs and a recent issue of Geotimes being devoted to Forensic Geology, it is natural that geophysics pry its way into the picture. This may be one of the most challenging of our applications because of the very strict legal and quality control aspects – so prepare to sharpen your pencils, take a lot of notes, and dust off your going-to-court uniform before plunging into the mix.

Your next newsletter will be produced under the presidency of Louise Pellerin. I look forward to her tenure as our leader and to the many new ideas she can bring to the membership. I wish her and all of you well, and hope the coming year brings calmer times.

Sincerely,

Tom Dobecki, President
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NSG Section Dinner and Reception at the 75th Annual SEG Meeting

By Tom Dobecki, NSG Section President

Please be sure to join the Near-Surface Geophysics Section for its annual business meeting and dinner. Our sincere thanks to Lawrence Gochioco for doing the substantial legwork to find a location that offers good food, ambience, is close to the George R. Brown Convention Center, and is somewhat reasonably priced.

- **When:** Tuesday, November 8th, 6:30-8:30 pm
- **Where:** Hard Rock Cafe, 502 Texas Avenue, between Bagby and Smith Streets, Houston, Texas (~1.2 miles northwest of convention center, see map below), telephone 713-227-1392
- **Cost:** No charge to active NSG Section members

As has been our tradition, the evening will begin with a cash bar followed by dinner and the business meeting. There is no charge for dinner for active section members, and for those interested in becoming a member, we will be accepting new applications during the evening. The membership form included in this newsletter can be used for any colleague or student that wants to join us.

The business meeting will be the usual blend of official, old and new business, including an introduction of the incoming Executive Committee and presentation of the Harold Mooney Award. If you have any agenda items to suggest, please convey them to me by November 5th.

Lastly, please recognize the special financial donations to help cover the cost of the evening activities from our Gold ($200) and Silver ($100) Sponsors. They are great friends and supporters of NSG Section – treat them to a glass of wine!

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Feature Article: CSI – Careful Science Indeed

By Clark Davenport, GeoForensics International

Over the past twenty years, law enforcement agencies have increasingly relied on science to aid in solving crimes. I have been extremely fortunate in being able to assist law enforcement on some 100 plus cases, using techniques that I learned as an exploration and engineering geophysicist.

A large percentage of my students are enthralled with the television program CSI. Once they get past the idea of working a crime scene in low cut dresses, high heels or wingtips and sports jackets, the actual science involved in criminal investigations intrigues most of them. They are introduced to the real characteristics of crime scene investigation and criminalistics in the first few days of the course – Quality, Ethics, and Articulation.

So here comes the bad news and the good news.

The Bad News
As a geophysicist I thought I understood quality. By way of dating me, we used to grade seismic picks as Very Poor, Poor, Fair, Good, and Very Good. As an investigator and expert witness, I have discovered characteristics (and politics) of quality that far surpass this simplistic approach. The characteristics of quality, the collection, preservation, and analysis of evidence, start at a crime scene and proceed through laboratory analysis, and court testimony. A criminalist must collect evidence using proper procedures. In the laboratory, evidence must be analyzed using proper scientific techniques. In court, the evidence and results of any analyses must be presented in terms that a jury of laypersons can understand.

Fine, how in the world might this affect a geophysicist who has been asked to run ground-penetrating radar in the search for human remains or buried evidence? The

Example discovery from a forensic geophysical investigation.
The new 24-bit Geode™ II is the most versatile and cost-effective seismograph you will ever own. Rugged enough to be dropped or submerged, small and light enough to throw in your suitcase with your laptop, the Geode also expands to over 1000 channels for 2-D and 3-D acquisition. Suitable for all surveys – refraction, reflection, downhole, and tomography – you can also use the Geode's intelligent self-triggering for earthquake, vibration, and injection monitoring.

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first and foremost question is “Has ground-penetrating radar been accepted by the courts as a scientific method that provides admissible evidence?” Scientific techniques can be subjected to a special process (Frye v. United States) to determine the judicial admissibility of that technique in a court of law. This process can become very expensive. An alternative to a Frye hearing is to let the trial judge be the gatekeeper of admissibility (Daubert v. Merrell Dow Pharmaceutical, Inc.). That was the procedure used in Arizona v. Keidel where the location of the body of Mrs. Keidel (missing for 28 years) was delineated by ground-penetrating radar. That case has become the precedent for the use of ground penetrating radar in criminal investigations.

With the assumption that the ground-penetrating radar will be successful, the geophysicist will most likely end up in court, as will all of his/her notes, files, and data. At this point the politics of quality may become both evident and important – your educational background, experience and motives may all be put on trial, as will the acceptance of the geophysical methods used. Regardless of the fact that your work may have led to the indirect discovery of human remains or evidence, the job of a good defense attorney is to make those items go away, and strategies to accomplish this range from attacking your scientific credibility to attacking the geophysical method(s) used or attacking both. Other items inherent in the politics of quality may involve questions such as, who directed you to survey in this area? Were you directed to search in a specific area? Why did you select this method(s) for use? What other methods could have been used, and why were they not used? How is the data interpreted and what led you to interpret it in the manner you have? I have a tempered amount of respect for good defense attorneys – they must protect the rights of their clients, and part of that protection may involve questioning scientific methods. Attorneys I have faced have asked excellent pointed questions about geophysical methods, questions that they have developed through using paralegals for research and having access to experts.

Many exploration geophysicists have often faced the somewhat complex, and often amusing, issue of the “state line fault”, that is, a mis-tie in geophysical data across prospects that cross jurisdictional boundaries. The same scenario is relatively common on outdoor crime scenes, what agency has jurisdictional control? For example, on highly visible case involving a missing, and presumed deceased, student at a prestigious university, the law enforcement agencies involved consisted of the campus police, city police, county sheriff’s department and the FBI (Federal Bureau of Investigation). As a geophysicist who just wants to do a complete, quality survey, I can face the following issues, which ultimately may arise in court:

- Whom do I take directions from?
- Whom do I report to?
- Who is ultimately responsible for materials subject to discovery?
- What is the proper chain of custody?

The reader may assume that in this case the FBI would have final jurisdiction. In fact the local sheriff’s department was the lead agency. The city police bowed out of any involvement, the FBI was on scene at the request of the sheriff, and the campus police initially took a rather uninterested stance – the university did not want adverse publicity. One interesting aspect of this case pertains to a surprise legal issue – the parents of the missing student sued the sheriff’s department for not having conducted a proper investigation!! Although the issue was settled out of court, I was initially subpoenaed to testify as to what would constitute a proper criminal investigation, not just the geophysical portion, something that is well beyond my expertise, and to which I could not testify.
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And finally, a rather interesting case, again based on a ground-penetrating radar survey. The case in point involved the recollection of a retired police officer seeing an individual with a shovel next to a dirt parking lot. The incident took place in the very early hours of a morning some 20 years prior. What became problematic was that the individual with the shovel was recollected as a serial killer who had since been executed. The dirt parking lot, now paved, was immediately adjacent to an apartment building in which the serial killer’s mother resided. A ground-penetrating radar survey was done over the parking lot in an effort to locate disturbances consistent with burials. For whatever reason, the local media reported that the ground-penetrating radar suggested the presence of a body, perhaps several, a rib cage, and a tennis shoe! This type of statement is utter nonsense – to my knowledge there is no remote sensing instrument that can detect human remains, other than perhaps a well-trained and certified cadaver dog. What happened in this case was that the city, a major city, was sued by the apartment building owners for loss of revenue. It seems that a number of apartment dwellers did not want to live adjacent to a burial ground for murder victims, and broke their leases to leave. I was asked by the city attorney to review the ground-penetrating radar records, however I politely declined since a site visit was not to be permitted. Anytime I am asked to review crime scene data and there is a likelihood of testifying, I am adamant about actually setting foot on the scene.

The Good News
Working in criminalistics has presented me the opportunity to continually test my understanding of geophysical methods, and look for new applications for existing methods. It also provides almost real time results – criminals are for the most part dumb and lazy, so burials are often quite shallow. Once the geophysicist has performed a survey and provided a map, or maps, excavation by a forensic anthropologist or archaeologist happens rather quickly. These excavations always provide fascinating information as to the cause of a particular anomaly – an actual learning laboratory!! To paraphrase Mark Twain, I try not to let school stand in the way of my education.

Working in criminalistics has presented me the opportunity to be continually challenged by diverse disposal scenarios. NecroSearch International (www.necrosearch.org), a Colorado based nonprofit organization of volunteers, was recently asked for assistance in locating two bodies, both dismembered, in the Missouri River. The bodies had been disposed of five and four years prior to our involvement. Just assembling and assessing background information on the disposals was a challenge. Defining a search footprint became a key issue in the investigation. The search footprint was established using dismembered pigs, similar disposal containers for the “body” parts, and remote transmitters attached to the “body” parts. Once a search footprint was established by mapping the movement of the “body” parts over time, detailed searching was done using standard marine geophysical techniques. Although no human remains were found, clothing consistent with one of the victims was found. Attached to the clothing was a carpet fiber(s), which hopefully will be traceable to a suspect’s residence. Remind anyone of exploring for oil, the old needle in the haystack (fiber in the Missouri) scenario?

Opportunity
Can a scientist, particularly an earth scientist, pursue a viable career in law enforcement? At the federal level, with agencies such as the FBI or the Bureau of Alcohol, Tobacco, and Firearms, the answer is yes. For example, the FBI employs geologists and mineralogists in the Headquarters laboratory. Technicians specialized in geophysical data collection
work in other areas of the FBI, as do scientists with education and experience in thermal imaging, and photographic image analysis. At the state level, it is somewhat difficult to develop a law enforcement career as an earth scientist. This is based primarily on the lack of need, jurisdictional limitations, and the existence of earth scientists that can be called upon for assistance from federal entities and private industry. At the local level, volunteerism is the best approach.

Working as an earth scientist volunteer for law enforcement offers an exceptional way of using and developing skills to solve puzzles and contribute to society. Volunteering services to law enforcement does have an immediate drawback however – law enforcement is typically skeptical of volunteers. One way to develop credibility is to take selective courses such as crime scene investigation, constitutional law, physical anthropology, and archaeology. Many of these courses are offered through local community colleges. I spent eight years of night school obtaining an associate degree in Criminal Justice, and some of the courses were very stimulating – interview and interrogation, forensic accounting, constitution law, and crime scene reconstruction to name but a few. The knowledge gained helps the volunteer to understand and respond to an investigation with credibility and from the perspective of law. Just being able to help a detective word a warrant for the use of side-scan sonar or electromagnetics at a site will boost credibility. Although assisting law enforcement agencies in criminal investigations as earth scientists may not be appealing to everyone, it offers a chance to work with some very outstanding people from varied backgrounds; academics, law enforcement, private industry, lawyers, and yes, in some cases informants. One cannot help but learn, and learn to think outside of the proverbial box.

Finally, aside from having a real passion for this work, I derive the most satisfaction from being able to repay society. If I can help one relative of a murder victim come to closure then perhaps I am learning how to correctly use geophysics. There is no statute of limitations on murder, nor is there on grief.

—

Clark Davenport, a Forensic Geophysicist, has a degree in Geophysical Engineering from the Colorado School of Mines. He is a decorated Vietnam combat veteran, co-founder of NecroSearch International, and the founder of GeoForensics International. Davenport is registered as a geophysicist in California. He can be reached at geoforensics@comcast.net.

2006 NSG Section
Executive Committee Officers

Louise Pellerin
President
Louise is developing the geophysical division of Green Engineering, a small, woman-owned firm based in Anchorage, Alaska. She received her B.S. degree (1978) from the University of California, Berkeley and her M.S. (1988) and Ph.D. (1992) degrees from the University of Utah – all in geophysics. She has over 25 years experience in exploration geophysics including positions in industry as a field geophysicist, a research geophysicist with the US Geological Survey and Lawrence Berkeley National Laboratory, and a visiting professor at the University of Aarhus, Denmark. She has been teaching the near-surface portion of the Summer of Applied Geophysical Experience (SAGE) since 1993. Louise is active in the development and application of electrical and electromagnetic techniques, in particular, the magnetotelluric, transient EM and capacitively-coupled resistivity methods. She is an active member of the AGU, AWG, SEG and EAGE.
Partha S. Routh  
President-Elect

Partha obtained his B.S. degree in Geophysics (1991) and M.S. degree in Exploration Geophysics (1993) from the Indian Institute of Technology (IIT), Kharagpur, India. In 1999 he obtained his Ph.D. from University of British Columbia (UBC), Canada with the focus in electromagnetic problems for mining exploration. After a short post-doctoral period at UBC-Geophysical Inversion Facility, he worked as a Senior Geophysicist at the Seismic Imaging and Technology Center of Conoco Inc. (now ConocoPhillips), carrying out research and development in potential fields and pre-stack seismic inversion for reservoir characterization of oil and gas problems. Since 2003, he has been an Assistant Professor of Geophysics at Boise State University in Idaho. Broadly, his interests are EM for various applications and seismic inverse problems. His current research areas include appraisal analysis of geophysical inverse problems, geothermal exploration using EM, inversion of high frequency and low frequency EM data including radar and time-lapse ERT for contaminant transport and monitoring, and pre-stack seismic inversion for time-lapse monitoring. Partha is an active member of the AGU, SEG and SIAM.

Laurence R. Bentley  
Vice President

Larry received his B.A. degree in Physics from Hamilton College in 1971 and his M.S. degree in Geology and Geophysics from the University of Hawaii in 1974. He worked for 10 years with Western Geophysical Company as a party manager, supervisor and research geophysicist. In 1985, Larry returned to university to study subsurface flow and transport modeling. He received his Ph.D. from the Department of Civil Engineering at Princeton University in 1990. After a one-year post-doctoral fellowship at the University of Vermont, he joined the faculty of the University of Calgary in 1991. He is currently a professor in the Department of Geology and Geophysics. His research interests include hydrogeology, groundwater modeling, and near-surface geophysical applications in hydrogeology. He has been a member of the SEG since 1998.

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James Irving
Secretary
James received his B.S. degree in Earth Sciences from the University of Waterloo in 1997 and his M.S. degree in Geophysics from the University of British Columbia in 2000. He is currently completing his Ph.D. in Geophysics at Stanford University under the direction of Dr. Rosemary Knight. James’ research interests include the use of ground-penetrating radar for hydrogeological applications.

Michael Knoll
Treasurer
Michael received a B.S. degree in Environmental Science from Haverford College, an M.S. degree in Exploration Geophysics from Stanford University, and a Ph.D. (1996) in Earth and Ocean sciences from the University of British Columbia. He has worked as a computer scientist for the US Environmental Protection Agency, an exploration geophysicist for Exxon Company USA, and a hydrologist for the US Geological Survey. In 1996, he joined the faculty at Boise State University where he is currently a research professor in the Center for Geophysical Investigation of the Shallow Subsurface (CGISS). His research interests include the electromagnetic and seismic properties of near-surface geologic materials, and the use of surface and borehole geophysical methods for environmental and hydrogeologic applications. He is a member of SEG, NSG, EEGS and AGU.

Deborah Underwood
Newsletter Editor
Deborah is currently in her 6th year as a Senior Geophysicist at Geometrics, Inc. in California. Prior to Geometrics, she worked with the Seismic Hazards Group at the US Geological Survey in Menlo Park, California, and at Landmark Graphics in Denver, Colorado. She earned her M.S. degree in Near-Surface Geophysics, specializing in high-resolution reflection seismology, from UC Santa Cruz in 1998, and her B.S. degree in Geology from UC Santa Barbara in 1993.

Last Call for Nominations:
The AWG Brunton Transit Award

The Association for Women Geoscientists (AWG) Brunton Award promotes the future of field mapping and data acquisition for the upcoming generation of women geoscientists. It will be awarded to a female geoscience student at the senior level or beginning her graduate studies who has been a summer intern, excelled at field camp, or performed field data collection that will lead to a senior or graduate thesis.

The award is an engraved Brunton transit with stand, and an engraved plaque. AWG will also sponsor a one-year membership in its organization. The application deadline is October 31, 2005. The application should be sent to:

Association for Women Geoscientists
Attn: Brunton Award
P.O. Box 30645
Lincoln, NE 68503-0645
Call for Papers: The 11th International Conference on Ground Penetrating Radar

Authors are invited to submit papers (a minimum of 4 pages) on, but not limited to, the following topics relating to ground-penetrating radar. The deadline for submittal is January 13, 2006, with decision to be made February 24, 2006.

- Antennas
- Archaeology
- Agrigeeophysics
- Borehole radar
- Concrete/pavement evaluation
- Data processing/display/interpretation
- Environment/hydrology
- Forensics
- Geology/geotechnical engineering
- Glaciology/ice/permafrost
- Inverse problems/tomography
- Mining/tunneling
- NDE/NDI
- Numerical modeling/analysis
- Novel GPR systems
- Sedimentology
- Signal/image processing
- System performance
- Survey design/methodology
- Utility detection
- UXO/mine detection

The conference will be held June 19th through 22nd, 2006 at the Ohio State University, Columbus, Ohio USA. Please see http://gpr.osu.edu/ for more information.

Call for Papers: The Symposium on Geophysical Modeling, Inversion, and Visualization at the Australian Earth Sciences Convention

By Art Raiche, Chief Research Scientist, CSIRO Exploration & Mining Division

Abstracts are cordially invited for a symposium on Geophysical Modeling, Inversion, and Visualization as part of the Australian Earth Sciences Convention to be held July 2nd through 6th, 2006 in Melbourne. The convention is a joint meeting hosted by the Australian Society of Exploration Geophysicists and the Geological Society of Australia.

The symposium is under the theme – Resourcing and Innovation. As you might expect, this session invites submissions for talks and posters covering real advances in the techniques of modeling, inversion, and visualization as well as those demonstrating the successful application of existing techniques for delineating or constraining targets of interest.

What is different about this session are two additional invited categories:

1. Papers covering techniques that are promising but have yet to be proven (or unproven).

2. Methods that should have worked but failed. The intention here is to explore inherent problems to better understand if and how they might be overcome.

Is there life before death? To try to answer this question in the affirmative, a degree of preference for oral presentations will be given to those papers most likely to provoke lively discussion. Another mild innovation is that those wishing to give oral presentations should state whether they are willing to be interrupted by questions during their talk or would prefer the more traditional style of questions only after their presentation. Time limits on presentation for the traditional option will be rigidly enforced to allow time for questions. Those choosing the interruption mode will be allowed to present during the entire allotted time for the paper.

Please contact me at Art.Raiche@csiro.au with any questions or comments about the format. Also please refer to http://www.earth2006.org.au/ for the full symposium and conference details.
The Near-Surface Geophysics (NSG) Section of the Society of Exploration Geophysicists is a professional organization chartered by the SEG to promote the rigorous practice of the science of shallow-earth geophysics. You may read about the origin and goals of the section at http://edge-online.org/pdf/tle1209r0922.pdf.

Class of Membership:

- _____ Active Membership $10.00 Includes quarterly newsletter
- _____ Affiliate Membership $10.00 Includes quarterly newsletter

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- ___ Government Admin./Regulations   ___ Seismic
- ___ Other _______________________   ___ Other _______________________

SEG membership is NOT required to join the NSG Section. I am currently a member of the SEG:  _____YES or _____NO.

If you are not a member of SEG, list the names of two NSG Section or SEG sponsors or attach a current resume.

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Please print and complete this form and send with your payment and applicable attachments to:
NSGS, c/o the Society of Exploration Geophysicists (SEG) Business Office, P.O. Box 702740, Tulsa, OK 74170 USA

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2 Interest in NSG & SEG member or sponsored by two NSG or SEG members. See Bylaws III.1.b. for details.
3 Please include country and city telephone codes, if applicable.
### Near-Surface Geophysics Posters, Talks, and Activities at SEG 2006

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<th>Thursday, November 10</th>
<th>8:30 to 11:30 AM</th>
<th>NSE 5 – Near-Surface Geophysical Methods</th>
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<td>Room: 312A</td>
<td>Talks</td>
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