



# NEAR-SURFACE VIEWS

Newsletter of the NEAR-SURFACE GEOPHYSICS Section of The Society of Exploration Geophysicists  
Third Quarter 2006, Vol. 13, No. 3

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## Letter from the President

The new NSG Section website is ready!!! Deborah Underwood, the Newsletter Editor, spent considerable time over the past year revamping the NSG Section website which was sorely needed. It has a new look and feel consistent with the SEG website, is easy to navigate, and contains valuable information for professionals and students. Although the website was designed for low maintenance,

because website content is dynamic, the executive committee has voted to support a paid webmaster position in the future so it can be fully maintained. I encourage you to check it out at [nsgs.seg.org](http://nsgs.seg.org). If you have an article, announcement, or comment to contribute, let us hear from you.

Partha Routh, President-Elect, has done a great job organizing the NSG technical sessions at the upcoming SEG Annual Meeting. There are 24 oral presentations scheduled for Monday and Tuesday and ten posters will be presented on Wednesday. Refer to the schedule of NSG events on Page 4 for the full details.

Larry Bentley, Vice President, is our host of the dinner and reception on Tuesday evening at Mulate's Cajun Restaurant – an easy walk from the convention center. Due to the generous support of corporate sponsors, the authentic Cajun dinner will be free to all members. Refer to Page 3 for the full details.

During the NSG Section business meeting, proceeding the dinner, the Frischknecht and Mooney awards will be presented to individuals for excellent work and significant contributions to the NSG community. Tom Dobecki, Past-President, organized the nominations received from the membership. The Frischknecht Leadership Award is bestowed jointly by the NSG Section and the Environmental and Engineering Geophysical Society (EEGS). We will also acknowledge recipients of the Student Travel Grants. Contributions from Joe Savage and Geometrics, Inc. made it possible to provide three students funding to attend the SEG Annual Meeting.

This is my last letter as the president of the NSG Section. It has been a very good year and many of my objectives were achieved: we are better organized and financially solvent, the upcoming executive committee is energetic and will continue to move the section forward, and the NSG Section is more visible within the SEG. We have several proposals for SEG, EEGS, and the EAGE-NSGD (European Association of Geoscientists and Engineers-Near-Surface Geoscience Division) cooperative projects to strengthen the NSG community, and we supported the excellent research workshop on Hydrogeophysics in Vancouver in August. I want to thank the executive committee and the membership for making it such a rewarding year for the NSG Section and presidency.

I look forward to seeing you in New Orleans!

Louise Pellerin, President  
Near-Surface Geophysics Section



## For the GPR Professional

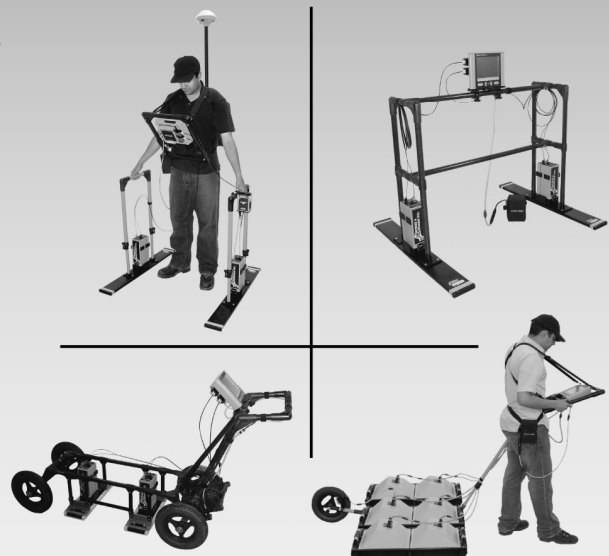
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## NSG Section Business Meeting and Reception at the SEG 2006 Annual Meeting

Be sure to attend the NSG Section annual business meeting and dinner reception!

When: Tuesday, October 3, 2006  
Start, 6:00 pm  
Business Meeting, 6:30 – 7:30 pm  
Dinner Reception, 7:30 – 9:00 pm

Where: Mulate's, The Original Cajun Restaurant  
201 Julia Street, New Orleans, across the street from the convention center

Cost: No cost to active NSG Section members

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.

Thanks to Louise Pellerin's fund raising efforts, we had tremendous support this year. Please recognize the financial donations that help cover the cost of the evening activities from our Gold (\$200) and Silver (\$100) Sponsors.

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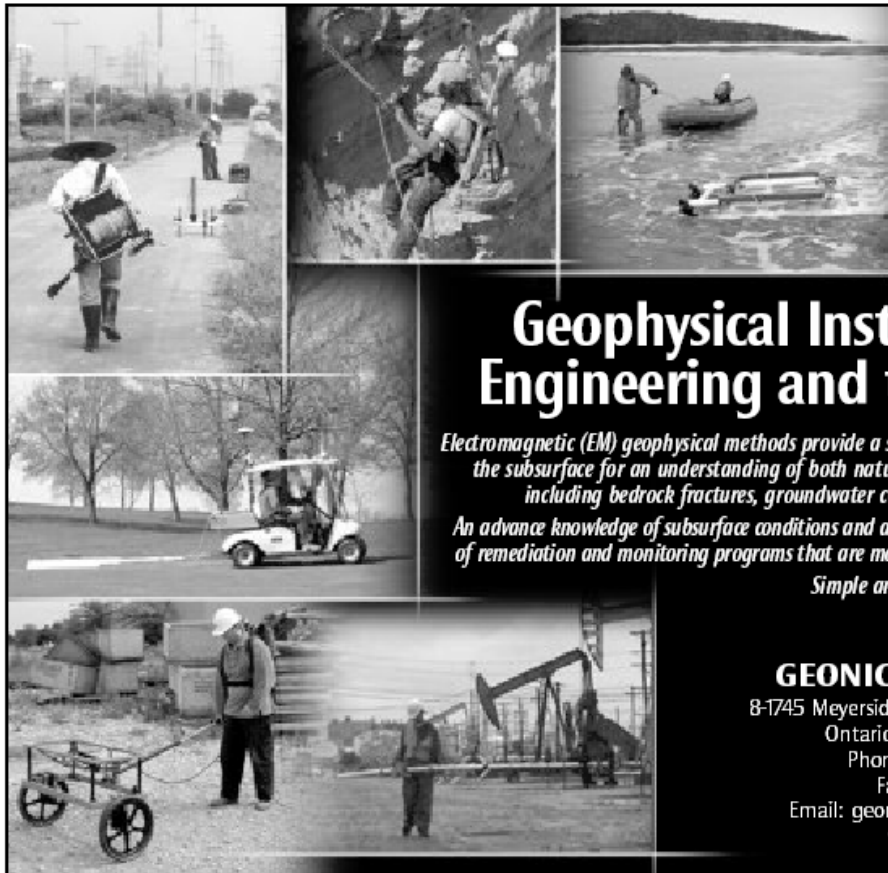
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## Near-Surface Geophysics Posters, Talks, and Activities at the SEG 2006 Annual Meeting

<b>Sunday, October 1</b>					
			6 to 8 PM	Icebreaker/ Exhibition Preview	
<b>Monday, October 2</b>					
			1:30 to 5 PM Room: 282 Talks	NSE 1 – Hydrogeophysics and Environmental Applications	
<b>Tuesday, October 3</b>					
8:30 AM to Noon Room: 282 Talks	NSE 2 – Engineering, Hazard, and Shear-Wave Applications	1:30 to 5 PM Room: 282 Talks	NSE 3 – Advances in Processing and Inversion: GPR and Seismic	6 to 9 PM Mulate's, The Original Cajun Restaurant	Near-Surface Geophysics Section Dinner and Business Meeting
<b>Wednesday, October 4</b>					
8:30 AM to Noon Exhibit Hall Posters	NSE P1 – Integrated Approach for Improved Characterization	1:30 to 4 PM Exhibit Hall Posters	NSE P2 – Near- Surface Seismic: VSP and Shear Waves		

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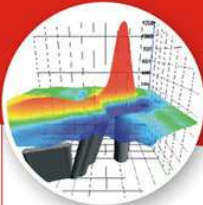
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## THE NSG SECTION

The objectives of the Near-Surface Geophysics Section of the Society of Exploration Geophysicists are as follows:

- to promote the rigorous practice of the science of shallow-earth geophysics including engineering, environmental, groundwater, mining, geothermal and archeological applications,
- to represent that science to public, governmental and other regulatory bodies,
- to encourage fellowship and cooperation among those persons interested in related geophysical methods and problems,
- to support the mutual economic, professional and educational interests of such persons, and
- to foster the development of programs and activities that relate to those interests.

To join or renew your membership with the NSG Section, go to <http://seg.org> and click on “My SEG” or complete the application included in the newsletter.

## NEAR-SURFACE VIEWS

Near-Surface Views is published quarterly by the Near-Surface Geophysics Section to convey information of common interest to people working in near-surface geophysics.

To be effective, Near-Surface Views requires the contribution of information from a variety of sources. If you have an item to communicate to other members of the near-surface geophysics community, *especially a feature article or photo*, please send it to the Editor. **All contributions are welcome.** The Editor reserves the right to reject items that are felt to be too highly commercial or technically inappropriate.

**ALL SUBMISSIONS SHOULD BE SENT DIRECTLY TO THE EDITOR.**

## 2007 NSG Section Executive Committee Officers

### Partha S. Routh President

Partha obtained his B.S. degree in Geophysics (1991) and M.S. degree in Exploration Geophysics (1993) from the Indian Institute of Technology, 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 the 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. Partha served the NSG Section as President-Elect last year.



### Wendy Wempe President-Elect

Wendy Wempe joined the Schlumberger Water Services team in Sacramento, California, as a Senior Hydrogeologist in 2006, where she work on characterization of hydrogeologic properties using borehole geophysical data. Wendy received a B.S. degree in Earth Sciences from University of California, Santa Cruz, in 1994, and a Ph.D. degree in Geophysics from Stanford University in 2000. While at Standford University, she developed new theory for constraining aquifer transport properties using geophysical data. Afterwards, she worked as a research associate at the Cooperative Institute for Research in Environmental Sciences in Boulder, Colorado, continuing the development of a new technology that identifies changes in fluid saturation and granular wettability using seismic attenuation data. She then developed and co-taught “Groundwater Law and Hydrology”, an advanced law seminar at the University of Colorado, Boulder. The development of this course led her to providing introductory hydrogeology public short courses and in-house training programs to water lawyers, policy-makers, and resource managers through a retired consulting company she created called Hydro Info.



### Louise Pellerin Past-President

Louise has been 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

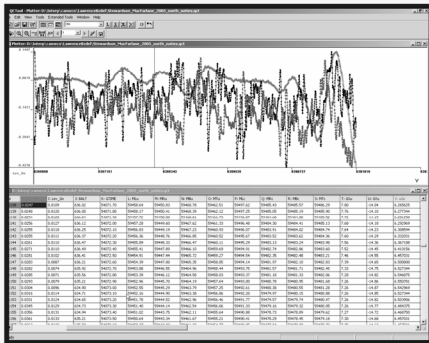




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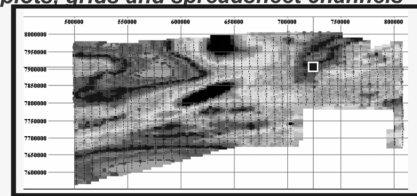
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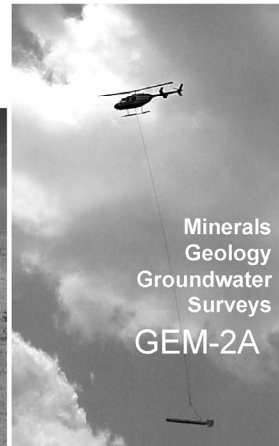
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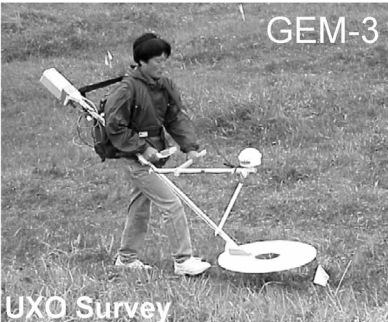
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***The submission deadline for the next issue is November 30<sup>th</sup>.***

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## THE NSG SECTION & EEGS

The Near-Surface Geophysics Section and the Environmental and Engineering Geophysics Society (EEGS) are actively pursuing common areas of interest and cooperation.

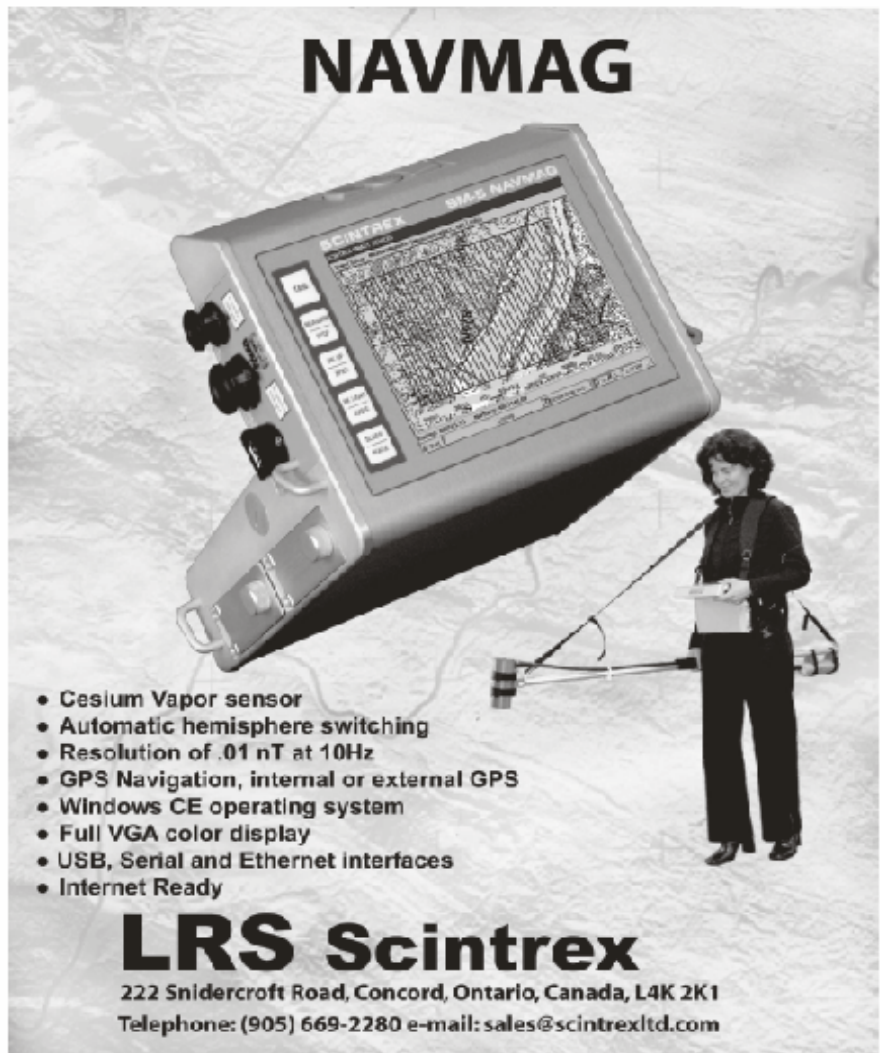
If anyone has comments or ideas on areas of cooperation, please contact Louise Pellerin, NSG Section President.

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. Louise served the NSG Section as President last year.

### Deborah Underwood

#### Vice President/Website Editor

Deborah is currently in her 7th year as a Senior Geophysicist at Geometrics, Inc. in San Jose, 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 the University of California, Santa Cruz in 1998, and her B.S. degree in Geology from the University of California, Santa Barbara, in 1993. She has served the NSG Section for the last three years as Newsletter Editor and also Website Editor for the last year.



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Laurence R. Bentley

Treasurer

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. degree 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. Larry served the NSG Section as Vice President last year.



Matthew Ludwig

Newsletter Editor

Matthew Ludwig completed the M.S. degree in near-surface geophysics, with an emphasis in electromagnetics, in the Geological Engineering Program at the University of Wisconsin, Madison, in 2004, and a B.S. degree in Geology with a minor in Physics in 1995 at Eastern Michigan University. He is currently on leave from the pursuit of a Ph.D. degree from the Geological Engineering Program at the University of Wisconsin, Madison. Following a short period with the US Department of Agriculture in Van Wert, Ohio, he taught middle school science, computers, and algebra for four years in northwest Ohio. He has interned at both Idaho National Environmental and Engineering Laboratory and Sandia National Laboratory. He received the Robert Riecker award in 2002 and also had the pleasure to work as a teaching assistant at the Summer of Applied Geophysical Experience in Santa Fe, New Mexico, three of the last four years. Most recently he has been working in magnetotellurics for groundwater investigations for Green Engineering, Inc. Matthew is a member of the SEG, AGU, GSA, and AGWSE.



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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. James served the NSG Section as Secretary last year.



With this new Executive Committee, we will see the retirement of Mike Knoll, who served as Treasurer for 3 years, and Tom Dobecki who served as Past-President, President, President-Elect, and Vice President over the last 4 years. *Great thanks to Mike and Tom for their service to the NSG Section.*



## Feature Article: Overview of Hydrogeophysics Workshop

*By Louise Pellerin, NSG Section President*

A Hydrogeophysics Workshop sponsored by the SEG Research Committee was recently held in Vancouver, BC, Canada, to explore the science of geophysics as related to the exploration, development, remediation, storage, and monitoring of water resources. Rosemary Knight, Stanford University, Klaus Holliger, University of Lausanne, and David Hyndman, Michigan State University, organized the workshop with sponsorship from Schlumberger Water Services, ABEM, Geonics, Geotomographie, IRIS Instruments, Mt. Sopris, and Sensors and Software. It was a good example of a recent effort by SEG to emphasize smaller, theme-based forums and workshops at low cost to members. More than one person commented along these lines: "I get my networking done at the large conventions, but I get my technology updates at these small meetings." By all measures, this meeting was a huge success and the SEG Near-Surface Geophysics Section (NSGS) looks forward to future workshops held in collaboration with societies of allied disciplines.

The workshop was organized around the scale of hydrogeophysical measurements in both oral and poster presentations. In the first session seven presentations covered characterization of aquifers and reservoirs at the regional scale; 15 presentations discussed characterization of aquifers and reservoirs at the site scale; eight presentations demonstrated imaging of subsurface flow and transport processes; and in another eight presentations case histories illustrated emerging hydrogeophysical methods. Eighteen posters with topics covering all of the above, most with excellent case studies, were presented in an evening session.

Over 80 scientists from academia, government and industry attended from countries representing the Americas, Europe, Africa Asia and Australia. The diversity of the attendees was reflected in the diversity of the presentations ranging from state-of-the-art airborne electromagnetic characterization methods, to implementation of fiber-optic technology to monitor temperature variations and characterize submarine groundwater discharge. Full waveform inversion of radar data showed significant improvements over conventional ray-based approaches. The inversion of streaming potential parameters inferred from self-potential measurements, although in the early stages, showed promising for the recovery

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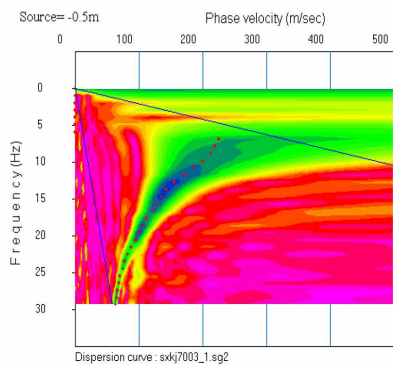
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**Geometrics SeisImager™ suite of software includes the only surface wave inversion program that works with active sources and passive micro-tremors, and also does refraction analysis and tomographic imaging.**

- IBC Vs30 site classification
- Estimating the strength of subsurface materials
- Mapping the subsurface
- Earthquake site response
- Soil compaction control
- Liquefaction analysis
- Foundation engineering
- Void detection
- Landfill investigation

Want to solve problems for civil engineers? Want to make better use of your seismic data? Surface wave inversion is a powerful tool that can give you subsurface information in terms that civil engineers can use.

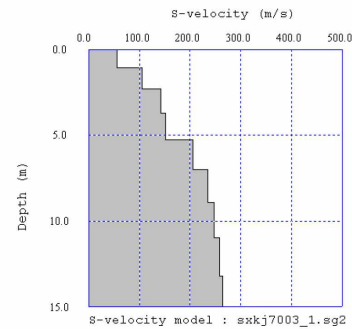
SeisImager/SW automatically inverts complex seismic data into a graph of shear wave velocity vs. depth. Shear wave velocity is directly related to shear strength, so you can immediately estimate the load-bearing properties of the ground and evaluate site classification. SeisImager/2D analyzes refraction data to get a complete wavefield solution.



**SeisImager automatically picks the dispersion curve with no subjective estimations.**

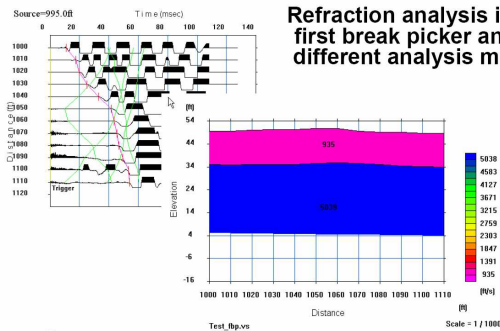
Use a sledgehammer or weight-drop to generate easy-to-record surface waves on your multi-channel seismograph. SeisImager/SW analyzes the data to determine near-surface shear wave velocities right in the field. For deeper penetration, collect passive micro-tremor events with our unique 2D array that reduces spurious high velocities. Combine the results, stitching the active and passive dispersion curves together to provide a continuous profile over the whole depth range.

SeisImager/2D provides a complete refraction solution, and lets you compare delay time, reciprocal, and tomographic methods. You can even use the surface wave data for a starting model for the refraction inversion.



**Results are readable by civil engineers.**

Integrated surveys require a high-resolution seismograph to collect precision data, instruments like the Geometrics ES-3000, Geode, or StrataVisor NZ.



**Refraction analysis includes first break picker and three different analysis methods.**

**The SeisImager™ software suite is available for other seismographs but works best with Geometrics models.**

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of hydrological flow parameters directly from geophysical data. Several researchers working on aquifer storage and recovery (ASR) characterization and monitoring stimulated new ideas for many of us. Recent technological advances in gravity instrumentation have permitted measurements of changes in water mass in aquifers to sufficient precision to allow for quantitative estimates of specific storage and water level change. Electrical and electromagnetic methods can be used to estimate water quality in an ASR system. Magnetic Resonance Sounding (MRS) technology is developing in both instrumentation and application to directly mapping subsurface water.

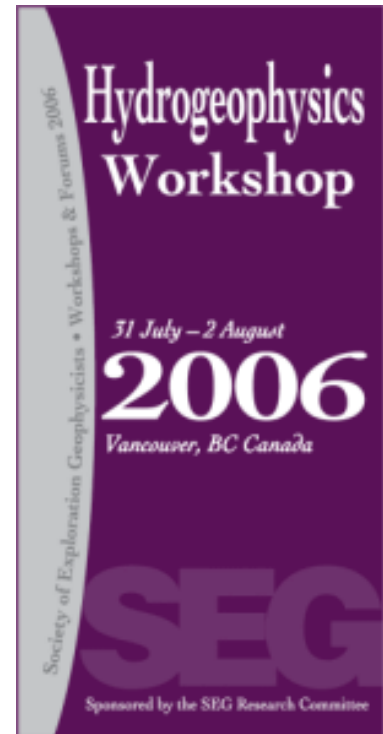
Data integration was a common theme, as hydrogeophysicists seek to combine multiple datasets, including geophysical, geological, and hydrological, and provide quantitative estimates of hydrologic parameters. Case histories brought home the reality that *hydrogeophysical problems are local*. Every site is different—empirical rock physics relations developed at one site may not hold elsewhere, and no one method is a panacea. The increasing strain on the water resources is ubiquitous and the geophysical approaches for looking for new groundwater sources in the desert, determining seawater incursion in coastal areas, or managing ASR operations in urban areas need too be dealt with individually.

The hurdles to general acceptance of hydrogeophysics among the hydrology community no longer seem to be the availability of technologies or the interest of geophysicists. Instead, the problems facing practitioners seem to be two-fold: the lack of familiarity among hydrologists for the ability of geophysics to provide useful results, and the difficulty that geophysicists face in presenting their results in

terms that the hydrologists can appreciate. These hurdles are similar to the ones faced by reflection seismologists in the petroleum industry in recent decades as they tried to attract the attention of reservoir engineers in applying geophysical techniques to reservoir development and production. The solution was a result of years of developing products that showed images of actual reservoir effects that were of interest to the engineers. It is one thing, in solving a hydrogeophysical problem, to show results in a cross section or map of, say, resistivity or acoustic impedance, and quite another to show those interpreted results using petrophysical relationships and other prior information in terms of salinity or fluid type. The hydrogeophysical community has only recently tackled this problem directly, and many results are still being couched in terms that the end user does not appreciate. Estimates of the uncertainty, or appraisal of the quality, of the predicted geophysical and hydrological parameters are required; and again, the hydrogeophysical community is just beginning to grapple with this problem in a routine manner.

Being a workshop, there were discussions on the needs and future paths of hydrogeophysics. Many people felt a need for better documentation of choices made in data processing and inversion; additional well-characterized field test sites to promote testing and comparison of new instruments and field methods; and a database available (webservices) for research so that the community can capitalize on past work and datasets. We need better petrophysical models to permit meaningful translation of geophysical data to hydrological information; new approaches to overcoming issues of scale in comparing geophysical and hydrologic measurements; technological advances within established geophysical methodologies to provide access to previously unobtainable aquifer parameters from geophysics measurements; emerging technologies with the potential to make significant contribution to geophysical characterization of near-surface hydrogeology; and geophysical monitoring system for observing dynamic hydrogeological processes over a range of time scales.

There is wide recognition of the challenges we face throughout the world in providing clean sources of water for human consumption, including agricultural and industrial development usage, while balancing the needs of the natural world. Evaluating, developing and managing groundwater and surface supplies in a sustainable manner require significant advances in both science and technology. The emerging field of hydrogeophysics has a role to play in achieving these goals that is comparable to the role played by reservoir geophysics in securing the world's energy supplies. It was clear from the energy, enthusiasm, and international origins of the participants that hydrogeophysics is a growing and vibrant community within SEG.



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## Winners of the NSG Section Student Travel Grants for the SEG 2006 Annual Meeting

Due to the generous support of Joe Savage, USACE ERDC, retired, and Geometrics, Inc. the NSG Section was able to offer three travel grants for the following students to attend the upcoming SEG 2006 Annual Meeting in New Orleans.

Ho Trong Long  
Graduate School of Engineering  
Kyushu University, Japan

Ho Trong is a second year Ph.D. student researching applications for soft computing in geophysical data interpretation. Ho's academic advisor is Prof. Dr. Keisuke Ushijima. His SEG poster is entitled *Borehole-to-surface electrical data interpretation at Takigami geothermal field in Kyushu, Japan using a neural network*, to be presented on Tuesday, October 3, in the Exhibit Hall as part of the session MIN P1 – Mineral and Energy Resource Characterization.

Cedric Schmelzbach  
Department of Earth Sciences  
Uppsala University, Sweden

Cedric is a Ph.D. student in reflection seismology under the supervision of Prof. Dr. Christopher Juhlin. Cedric's SEG talk is entitled *High-resolution 3D seismic imaging of the upper crystalline crust at a nuclear-waste disposal study site on Ävrö Island, southeastern Sweden*, to be presented on Tuesday, October 3, in Room 282 as part of the session NSE 2 – Engineering, Hazard, and Shear Wave Applications.

Shelby Walters  
University of Kansas  
Lawrence, Kansas USA

Shelby is a M.S. student and research assistant at the Kansas Geological Survey working under the supervision of Dr. Richard D. Miller. Shelby's SEG talk is entitled *Repeatability observations from a time-lapse seismic survey*, to be presented on Tuesday, October 3, in Room 272 as part of the session TL 2 – 4D Acquisition and Processing.

Please show your support for these NSG students and attend their presentations!

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## In Memory of Dr. Robert F. Corwin (1939 – 2006)

*By Dr. Dwain K. Butler (DB) and Richard D. Markiewicz (RM)*

It is with great sadness that we must report that since our nomination of Dr. Robert F. Corwin (Bob) for the 2006 Joint NSG Section/EEGS Frank Frischknecht Leadership Award, Bob has passed away after a lengthy battle with Multiple Myeloma. His wife Janice reported that Bob passed on in peace in the hospice wing of the hospital, as was their wish.

Bob had been a practicing geophysicist for 40 years. He received his B.S. degree in Mechanical Engineering from University of Missouri, Rolla, and his M.S. and Ph.D. degrees in Engineering Geoscience from University of California, Berkeley.

He is most widely known, of course, for his tireless work in promoting and using self-potential (SP) surveys. “Dr. Bob” played a pioneering role in developing, using, and explaining SP surveys for dam seepage delineation and geothermal exploration. From

his work at Harding-Lawson Associates in the 1980s to his work at his company “SP Surveys” for more than 20 years, Bob always showed a vision for promoting high quality, repeatable, data acquisition as the key to a successful interpretation of SP data.

As Ken Lum, one of his clients at BC Hydro has said, “Bob was practical and looked at things from an owner’s needs perspective. He had patience and enthusiasm and helped me understand the complexities (of SP surveying)”.

One of our (RM) first field experiences with Bob was mapping seepage at a dam in Utah. We realized the best place to acquire the SP data would be in the reservoir just upstream of the suspected seepage path. While I made the preparations to get a boat, Bob reconfigured his SP acquisition equipment to collect the data offshore. By the next day, we were running an offshore survey, and the data acquisition system worked beautifully.

Another of our (DB) experiences with Bob was conducting waterborne electrical resistivity and SP surveys along the Mississippi River for detection and condition assessment of the articulated concrete mattresses (ACM) that are used to control erosion. Despite the difficult environment, Bob’s ingenuity and persistence succeeded in demonstrating ACM detection, mapping, and condition assessment.

Bob was instrumental in developing the concept of SP monitoring, where SP measurements are made over a fixed network of electrode locations as a function of time. Bob also was a leading figure in developing a technique to remove telluric background noise from land SP measurements, an extremely valuable technique in use today.

Bob always had patience and enthusiasm for “spreading the word” about SP surveys and geophysics in general. As Megan Sheffer, Ph.D. candidate at University of British Columbia has stated, “Bob has set the standard for effective self-potential data acquisition and responsible field practice. I consider him a mentor who has laid the foundation for new developments in data interpretation and practical application of the method.”

In addition to self-potential surveys, Dr. Bob was extensively involved with sea-bottom electrical geophysical measurements, including dredging performance prediction and sea-bottom resource exploration projects. Bob’s love of science and engineering led his inquisitive mind into many areas where his contributions still stand.

Bob always had his eye towards making data acquisition and interpretation better, more efficient, and more explainable to dam owners and engineers. His career in near-surface geophysics is an inspiration to all who have worked with him and known him. He set a wonderful example of ethical and fiscally responsible geophysical practice. As his wife Janice mentioned to me (RM) after Dr. Bob passed on, “Bob told me that he always tried to do the very best work possible”. That sentiment was clearly evident throughout Bob’s outstanding career. Regardless of the task at hand, whether conducting field SP measurements or documenting the state-of-the-practice in his many journal articles and monographs, Dr. Bob always approached his work with the very highest standards. It was and is truly an honor to be able to nominate Dr. Robert F. Corwin for the 2006 Frank Frischknecht Leadership award.





# Near-Surface Geophysics Section of the SEG Membership Application

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.

### Class of Membership

<input type="checkbox"/>	Active Membership <sup>1</sup>	\$15.00	Includes quarterly newsletter
<input type="checkbox"/>	Affiliate Membership <sup>2</sup>	\$15.00	Includes quarterly newsletter
<input type="checkbox"/>	Student Membership <sup>3</sup>	Free	Includes quarterly newsletter

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### Expertise (check all that apply)

- Borehole geophysics
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- Electromagnetics
- Gravity
- Radar
- Radiometry
- Magnetics
- Seismic
- Other \_\_\_\_\_

I am currently a member of the SEG:  YES or  NO. SEG membership is NOT required to join the NSG Section. Note that student SEG membership is free through the Corporate Sponsorship Program. Go to [www.seg.org](http://www.seg.org), Membership Services, to learn more. If you are not a member of SEG, provide two NSG Section or SEG sponsors or attach a current resume.

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