

## 3-D MT OIL SURVEY PRODUCES VALUABLE CASE HISTORY

**P**hoenix engineers recently took part in an exciting 3-D MT survey with the Hungarian Oil Co. (MOL) and GES (Geophysical Exploration Co.) The breakthrough survey is the first 3-D MT oil exploration survey undertaken on a production basis in a developed sedimentary basin (rather than a frontier area) and was made possible by the low acquisition cost and high density capabilities of the V5 System 2000. (Although 3-D is standard in seismic, it is just becoming so in MT because of the low cost provided by the V5 System 2000.)

George Balint and Gerry Graham flew to Hungary in August to co-operate with MOL and GES employees in the Pannonian Basin. MOL has used MT and Controlled Source EM (CSEM) extensively in the Pannonian Basin for more than 20 years, complementing its seismic exploration. This extensive, systematic long-term MT coverage of the basin has given MOL unique insights into the capability of MT to delineate both stratigraphic and structural traps, in ways only now beginning to be understood by other oil companies. The survey area, previously surveyed with seismic includes a stratigraphic target in Oligocene sediments and a deeper structural target -- a Mesozoic basement uplift with complex faulting and thrusting.

The week-long, 81-site survey was conducted on a 30 square kilometre grid in farm country about 60 km outside Budapest. Data quality was satisfactory, despite weak signals, summer thunderstorms and other noise sources including cathodic protected pipelines, 120 KV power lines, villages and electric railways. Also, data acquisition was



Phoenix engineer Gerry Graham and Party Chief Gyula Lux of Hungary's GES perform last-minute check of V5 System 2000 boxes.

shorter than usual since no overnight soundings were allowed.

Following the MT survey, a few sites were reoccupied for experimental acquisition of Tensor Controlled-Source EM data, which can improve MT interpretation.

"The efficiency, flexibility and robustness of the V5 SYSTEM 2000 is recognized and highly appreciated", said MOL MT expert Dr. Zoltan Nagy

The case history resulting from this survey is a valuable tool allowing explorationists to compare MT and seismic interpretation from the same place, and also compare them to the electric (induction) logs from two nearby oil wells which penetrate the top of the Mesozoic basement rocks.

Although oil companies world-wide have made many tens of thousands of MT measurements, 99% of the information is proprietary -- there are only a handful of published case histories.

For example, the 1996-1997 "MT successes" in Italy, though known to several oil companies, remain unpublished. This is detrimental to the advancement and effective utilization of MT in oil exploration. This survey and the resulting comprehensive case history helps to fill that void.

Contact Phoenix's head office for further information about acquiring this ground breaking case history.

## CONTENTS

- 2 President's Message
- 3 On The Road  
Kumamoto U. Buys System
- 4 Hoping To See You  
Agent's Corner  
Sensor Grant

## MESSAGE FROM THE PRESIDENT

**C**lients who purchase our geophysical equipment may perceive us primarily as a manufacturer of geophysical equipment but we also have a very active services division.

As we go to press we are operating field surveys on three continents: 3-D AMT (for mining exploration) in the Sudbury Basin north of Toronto; a 3-D MT oil exploration survey in the Pannonian Basin of Hungary (see front page story); and a combined V5-16/V5-2000 3-D MT survey for geothermal exploration near Kagoshima, Japan.

Our service business increases steadily due to our advances in technology (such as the V5 System 2000) and our continual investigation and development of new applications (such as AMT for deep mining exploration and 3-D MT in stratigraphic trap exploration).

Field surveys are unpredictable

because so many factors are beyond the control of the operators and field managers. Noise, weather, signal strength, logistics -- every survey is different and we learn something new from every one. Every survey provides valuable feedback to our Research and Development and Engineering departments; this feedback translates into continuous improvement and optimization of our equipment. This means our buyers can be sure our equipment has been used and proven in commercial surveys.

And speaking of surveys ... there's a boom in the use of AMT for mining exploration. The wave of interest started in 1992 with a mere two sites on either side of a two-kilometre deep nickel body near Sudbury -- over the last four years this use of AMT has increased at a com-

pound rate of about 200 percent a year.

Major mining companies recognize "the technological variable" -- they know that AMT significantly increases the efficiency of exploration while permitting them to look three times deeper than before. Without a doubt, use of this highly-leveraged technology will increase in coming years.

I look forward to meeting many of you at the GSA's exposition in Toronto in October (see Exhibition schedule, back page). If anyone would like to visit our plant in Scarborough (about 20 kilometres northeast of downtown Toronto) during that week, let us know ahead of time and we'll make arrangements.

-Leo Fox



# PHOENIX EXPLORATION Deep, Far and Wide



## ON THE ROAD

**G**ary McNeice, George Elliott and other field crew members participated in an extensive 3-D AMT survey in the Sudbury Basin. The objective was to map deep nickel ore bodies.

Gerry Graham and Gary McNeice visited Costa Rica to provide continued training to personnel of ICE (Instituto Costarricense de Electricidad) for the V5-16 system purchased in 1997.

Mits Yamashita made several visits to Japan for sales, survey work, and to service the stationary MT "earthquake observatory" installations.

Leo Fox attended the EAGE meeting in Leipzig, Germany in June.



Phoenix Engineer Lu Yi was surprised to see snow as he travelled with the 5th Division's personnel to a remote area of the Taklimakan desert in the Tarim Basin in Xinjiang at the end of April.



Gerry and Lu travelled to a remote location in the Tarim Basin, China, to assist the 5th Division with startup of their V5 System 2000 survey. The ruins of an abandoned town can be seen in the background -- they provided a handy headquarters for the team.

## KUMAMOTO U. BUYS V5 2000

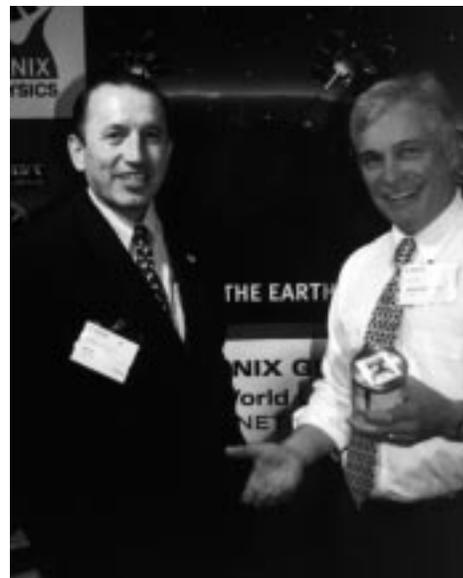
Kumamoto University of Japan will soon join the club of V5 System 2000 owners. Prof. Michito Ohmi and several students visited the Phoenix MT survey near Kagoshima, Japan to view MTU-5, MTU-2E and MTU-2H in operation in August, 1998.



Phoenix engineer Gerry Graham (wearing Phoenix cap) isn't looking for water in the Taklimakan Desert, China -- he's levelling a magnetic sensor during the Xinjiang Petroleum Administration acceptance of their V5 2000 System (April, 1998).



Lu Yi, Dr. Dai Shikun and others of Beijing Petroleum University check out their V-5 System 2000 boxes at the university campus before going to the field.

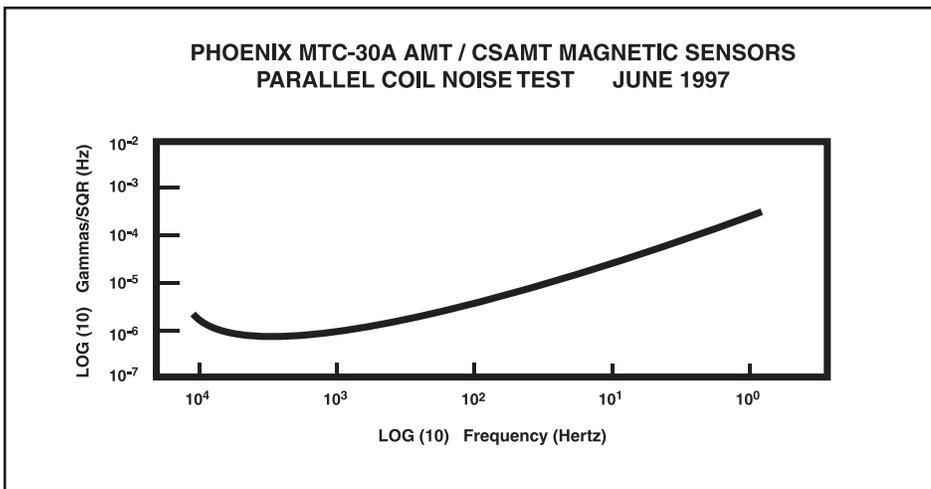


Karat Sydikov, President of Geotex, Almaty, Kazakhstan accepts his maple syrup winnings at the EAGE in Leipzig in June, from Phoenix President Leo Fox.

## SENSOR DEVELOPMENT GRANT

**P**hoenix has received a grant from the Government of Canada's IRAP (Industrial Research Assistance Program) to develop improved magnetic sensors. The present phase will focus on improvement of MT magnetic sensors.

Phase One of this project in 1997 resulted in development of an outstanding new low-noise, light-weight AMT sensor, the MTC-30A, which provides a decade (or more) of extra bandwidth compared to other commercially available AMT sensors. The MTC-30A provides excellent performance from 10 kHz all the way down to 1 Hz. The low-frequency performance is especially important in mining and geothermal applications where targets of interest are relatively shallow and thus are often sensed in the 1Hz to 10Hz range. Without the extra bandwidth, it would be necessary to carry an additional set of low-frequency (MT) sensors and to change sensors during the sounding.



## HOPING TO SEE YOU...

### Meeting & Exhibition Schedule

**P**hoenix is pleased to be taking part in the 110th Geological Society of America Annual Meeting being held Oct 25 to 28 in Toronto. The meeting (last held in Toronto 20 years ago) is expected to draw more than 6,000 professional geologists and students; the venue is the Royal Ontario Museum in the heart of the city.

Featured Canadian speakers include friends of Phoenix you've read about in these pages: Director of LITHOPROBE and geophysics professor at the University of British Columbia, Dr. Ron Clowes and geophysicist Dr. Alan Jones of the Geological Survey of Canada, Ottawa.

We look forward to seeing many of you in Toronto in October.

## AGENT'S CORNER



**F**rancisco Torres, President of Geoelec S.A., has been Phoenix's agent in Mexico since 1984. He is an electronics engineer with a master's degree from a California university.

Active in the Mexican mining geophysical scene, Francisco is also well-known to Toronto geophysical companies as he represents several of them in the Mexican mining market.

Geoelec is headquartered in Aguascalientes, Mexico. The company can be reached at:

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