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What’s Good For Your Home Is Good For The Environment!
Notes from GHPC

By John Kelly
Executive Director,
Geothermal Heat Pump Consortium

Training is the renewable energy that fuels the GeoExchange industry – without it, enthusiastic new customers may miss the opportunity to have ground source heat pump (GSHP) systems provide them with comfortable homes and businesses while saving energy and reducing emissions.

Every day we get phone calls from customers looking for companies to design or install GSHP systems. Most of the time we’re able to refer them to experienced contractors listed on our Web site at www.GeoExchange.org or to accredited installers or Certified GeoExchange Designers from the IGSPHA business directory at www.ighspha.okstate.edu.

But too often our search reveals that there are no trained contractors near the customer. As the interest in GeoExchange continues to grow, more and more companies need training in order to be able to join the industry and serve new areas.

Frequently we get phone calls from engineers and HVAC companies interested in getting into the GSHP business, and we refer them to IGSPHAs training schedule. Training is also provided by GSHP manufacturers and their partners, colleges and universities.

Trainees are essential to the GSHP industry — they not only provide the technical information needed to support our industry, they also spread the GeoExchange story.

Notes from IGSHPA

By Jim Bose
Executive Director,
International Ground Source Heat Pump Association

Twenty years ago IGSHPA was founded to begin a grass roots effort for a new technology: geothermal; and take it into the mainstream of HVAC technology. Early on, industry leaders recognized that training on the design and installation of these systems was the foundation upon which the industry and association should be built. The installer’s course was developed by a handful of forward thinking individuals. The first class in Stillwater in 1984 trained three new installers. At that time, research was just beginning across the country. Researchers were working with “pioneers” who were successfully installing geothermal systems so the new science would flourish without unnecessary failure and gain the financial support of federal, state and private funding agencies. Consequently; data and training materials needed to support this emerging technology came into being.

Each and every player in this industry by their work; successes and failures, has woven the fabric of information that evolved into materials that support training today. In other words, everyone in this industry is a trainer. All that is known worldwide about this industry has been enhanced by people in the field and their willingness to share that information with each other. Competitors worked together to forge this industry. In this issue, you will read about that success and notice that everyone’s achievement is interwoven with their competition. They are the builders of this industry.

As this industry grows, it will be important to remember the lessons that these pioneers have learned over the last 30 years. So, when you think about geothermal technology, remember who planted the seed—IGSHPA and its members.
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**Kris Kyler**

President
Indiana Geothermal

Kris Kyler has over 22 years of experience with the ground source heat pump industry. In addition to being founder and president of family owned and operated Indiana Geothermal, Kyler is vice president of Kyler Brothers Services, a heating and cooling service company in the Indianapolis area specializing in geothermal systems.

Founded in 1989, Indiana Geothermal is a leading closed-loop geothermal system contractor serving mechanical contractors and architects in Indiana and parts of Illinois, Michigan, Ohio and Kentucky. Kyler is a Certified GeoExchange Designer, and his IGHPA accredited installers put in ground loops for both residential and commercial systems all the way up to a 500-ton lake loop system. A current school project will include a 300-ton horizontal loop.

Kris also promotes geothermal technology by making presentations to schools, electric utilities and developer technical staffs.

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**Jack DiEnna**

Executive Director
Geothermal National & International Initiative

Jack DiEnna is the Executive Director of GEO-NII; a collaborative effort between the Geothermal Heat Pump Consortium (GHPC), The International Ground Source Heat Pump Association (IGHPA) and the National Association of State Energy Officials (NASEO). He is a marketing and sales professional with over 40 years experience in the electric utility industry and over 20 years in the geothermal industry. DiEnna is a nationally recognized authority on geothermal heat pump technology, the marketing of it and is the industry representative in DC and with State officials. He authored the “Road to 30%”, a document that shows the impact of a 30% market share for GHPs and how this technology can solve some of the nation’s energy issues.

DiEnna was appointed to serve as a member of the Dept. of Energy’s Federal Energy Management Advisory Committee (FEMAC) and joined the Asian Pacific Partnership on the Renewable Energy & Building task force. He is also IGHPA’s Marketing Committee Chairman.
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How the West Was Won and is Still Winning

By Dara McCoy
Every industry grows or falters on the efforts of those who live and work, invest time and money, and build businesses and careers in it. The ground source heat pump (GSHP) industry is no different. However, there is a small section of the industry who takes a personal stake in growing GSHP technology one step further.

IGSHPA-accredited trainers around the country and world spend valuable time imparting their knowledge to anyone interested in joining or learning about the GSHP industry—even if those trainees may later become competitors. It is a singular commitment to the success of the overall industry, not just a personal business.

Cary Smith, Certified GeoExchange Designer and Energy Manager and a principal of Sound Geothermal in Sandy, Utah, started his ground source design company in 1997. He completed the IGSHPA trainer program the following year and has been pushing GSHP technology ever since. One of Smith’s most recent GSHP projects brought the technology to the big-time sporting stage of NASCAR at Las Vegas Motor Speedway’s (LVMS) Busch and Nextel Cup series race events March 10-11.

**Bumpy Road for Drivers, Smooth Running for GSHP**

While the newly renovated track at LVMS presented challenges for the NASCAR drivers (21 caution flags were recorded for the weekend of racing), the GSHP debuted flawlessly in the LVMS Media Center and fun interactive Neon Garage. “The weekend in Las Vegas was absolutely amazing,” said Smith, who was on site during the race weekend to monitor the system’s first run. “We had absolutely no problems, all of the units worked.”

Smith said the system is the first large-scale closed loop hybrid GSHP running in Las Vegas. The 60,000 square feet of media center and garages, and 2,000-square-foot Richard Petty/Mario Andretti Speed Training classrooms required 150 boreholes at 400 feet deep, 60 Florida Heat Pump (FHP) two-step units and a 100-ton Evapco fluid cooler making up the hybrid portion.

“The native ground temperature in Las Vegas is 72 degrees and the loop temperature never got over 77,” Smith said. “When we ran the fluid cooler, the loop temperature actually reduced back to 69. We didn’t need it, but we ran it part of the day just to test that system too.”

The system worked so well that Smith and most of his crew were able to relax in the contractor’s suite and enjoy the race. Smith called it “fundamentally amazing” that all 60 of the two-step FHP units (one of the first sets of that kind to leave the factory) and the entire system worked without even a minor hitch, especially since the project was rushed to be completed by race day.

John Zudell, senior construction manager for LVMS-owner Speedway Motorsports Inc., (SMI) was no less impressed with the system’s performance. “It went online with minutes to spare—it was right down to the wire as we crammed about a $58 million complete facility renovation into eight months,” Zudell said. “It’s every bit of an 18-month project, but it went online and
worked flawlessly. Cary’s team did a great job of designing the well field and making it work.”

Smith was quick to point out the work of many team members made the short turnaround possible. Bertram Drilling started on the first of June and finished the 150 boreholes by mid-July. “Bertram Drilling did a fantastic job,” Smith said. “That’s the kind of stuff that makes you look good.”

FHP showed strong support for the high-profile project by sending Allen Niles to the system’s LVMS debut, Smith said. “Florida Heat Pump was integral in the equation in supplying all of the two-stage water source heat pumps,” Zudell added.

The hard work to get the system running perfectly in time wasn’t lost on the end users of the media center. Press members, who can heat up a room fast with sheer numbers and equipment, made a point to tell Smith the room environment “was the best thing that they’d experienced in years in Las Vegas.”

GSHP Enters the NASCAR Scene

Bruton Smith, CEO of Speedway Motorsports Inc., bought the Las Vegas track in 1998 to enter “one of the greatest markets in the world,” Zudell said. A new drag strip and additional seating were added to LVMS, but the larger project of renovating the race track and building the new media center and garages started as other SMI projects were completed. One such project included a new SMI office building in 2004 near its speedway in Bristol, Tenn.

James “Edd” Hill of HVAC Inc., also in Bristol, was the impetus for SMI to first consider ground source technology for the Bristol office building. The long design life, seven-year payback, efficiency considering rising utility rates and the invisibility of the technology sold Zudell. “It ended up just being a great system,” Zudell said. “Everything at Bristol ended up being a big success.”

The Bristol project was wrapping up around the time planning for LVMS began. It was late in the project planning when SMI began to wonder if ground source technology could work in the desert climate of Las Vegas. Paul Dean, president and owner of Behade Builders, SMI’s general contractor, located Smith, who was working with the Clark County School District.

“I thought, if the school district in Clark County, which is really progressive and is building a lot of schools, is using geothermal systems, we definitely need to take a look at it,” Zudell said. Smith presented the hybrid ground source system and was given the green light.

While lifespan and payback were still great selling points, the GSHP had specific benefits for the Las Vegas track. “Las Vegas is the first speedway we’ve ever had that eclipsed a $1 million power bill for the year,” Zudell said. Zudell also said Las Vegas is tied in with the power grid of southern California facing rates similar to Los Angeles and San Diego and suffering from brown outs in recent years.

“With an unlimited potential for rates to go up, it makes that much more long-term sense to have a conservative system that doesn’t utilize a lot of power and is inherently environmentally friendly,” he said. “It’s not exactly a philosophical corporate decision as much as it is common sense.”
How the West Was Won

Prior to 1983, Cary Smith was an oil man. He owned a Utah-based drilling engineering firm with two partners when the oil field market throughout the world collapsed that year. Before the recent oil and gas industry turnaround, Smith didn’t see the venture going anywhere and started looking at “different but similar business opportunities” to explore.

He served an eight-year stint on the Geological Survey Board of the State of Utah and met numerous people who worked with high and low temperature geothermal resources. The story of ground source technology piqued Smith’s interest and sent him to a geothermal energy conference in Sacramento, Calif., where John Geyer explained how the technology worked.

“I became fascinated by it,” Smith said, who took the idea to his partners Terry Crow and Mark Eckels and formed Sound Geothermal in 1997. “We looked at it as an alternative market where we could apply what we knew and had learned from the oil and gas business, drilling technology and deep earth technology, and what we might be able to apply to this new industry—ground source.”

The more Smith and his partners learned, the more they needed to know. Smith attended an IGSHAAP-accredited installer class taught by then-struggling Colorado business owner Terry Proffier. “I was in a real stressful time in my life and I was doing a training class as we’re trying to get a handle on things to keep our company afloat,” said Proffier, a Certified GeoExchange Designer, IGSHAAP trainer and installer currently with Major Geothermal in Wheat Ridge, Colo.

Proffier and his partners “learned a lot about how to get them (GSHPs) in right, but weren’t very good businessmen” and eventually his upstart company, Earth Energy, failed, Proffier said. “Cary Smith and his partners made me an offer and it took me about a nanosecond to accept because I was going to get a paycheck, and I was tired of starving,” Proffier said.

With newly acquired knowledge, Sound Geothermal became a driving force in splitting the western United States ground source market wide open. Holding two or three training sessions a year through Sound Geothermal, Proffier and Smith were responsible for training hundreds from Utah, Colorado, Idaho, Nevada
The ground source heat pump system was a late addition to the Las Vegas Motor Speedway’s renovation and media center construction, but it ran flawlessly in its debut at the Busch and Nextel Cup Series events in March.

and even some from Canada. “Terry got us excited, his enthusiasm got us excited,” Smith said. “The IGSHPA training was one of the keys to building this market 10 years ago and bringing the Rocky Mountain market alive.”

Two Trainers on What Makes the Industry Great

If you ask Smith who was integral in his success as GHSP trainer, designer and businessman, the roll call will commence: Terry Proffer, Jim Bose, Larry Eitelman, Phil Schoen, Garen Ewbank, Marvin Smith, Jeff Spitler, Steve Kavanaugh and on and on.

Proffer, Smith’s trainer and colleague, wouldn’t disagree, but offers another view of why Smith’s company has been vital to the GSHP market in the Rocky Mountain region. “Of all the people I have dealt with that have gotten into this business, I’d never seen anyone come to understand the technical parts of this business faster than Cary Smith,” Proffer said. “He’s been able to not only accept the technology, how it works, but also learned to expand and learn how to design ground loops. For someone with no history in mechanical engineering or much contracting, the guy learns scary fast.”

Whatever the reason for Sound Geothermal’s success, both men agree that the attitude toward helping colleagues and the willingness to share information are strengths of the GSHP industry. Proffer and his old com-
pany learned the hard way what one competitor’s botched GSHP job could do to a market or business. The entire industry learned the hard way in the mid-90s.

“We have a small community still as far as ground source heat pump people that design and engineer these things and most of us will go pick up a phone and call someone halfway across the country or even across the world to ask questions, and we’re more than happy to help each other out,” Proffer said. “If you get one bad system in an area that doesn’t have a lot of history in ground source, it will effectively kill that market, bad news travels a lot faster than good news.”

**Still Contributing**

Smith’s contributions to the ground source industry didn’t end with using IGSHPA training as a GSHP marketing vehicle. In recent years, his company has been a forerunner in hybrid GSHP designs. His first hybrid GSHP project was installed in 2003 at Murray High School in Murray, Utah.

The system utilized a 125-ton fluid cooler to assist the 316 borehole (300 ft deep) GSHP field due to the higher number of heating days in the area. The hybrid GSHP ended up being around $4 per square foot cheaper to install than a conventional system. “When we first started this there was no data, no guide, no textbook on how-to, we were writing it, but we didn’t know that,” Smith said.

With the help of science and research from Drs. Spitzer, Smith and Kavanaugh, the company was able to design successful hybrid GSHP systems for the range of dry desert climates to high country mountain snow regions in Sound Geothermal’s market. “All of those people helped and were willing to contribute, walk us through our perceptions and verify that what we were doing would probably be correct,” Smith said.

In turn, Smith tries to put his knowledge to work for the industry as a voting member of the ASHRAE Technical Committee, 6.8 “Geothermal Energy Utilization” and as an IGSHPA training committee member. Whether training others in proper GSHP installation, developing hybrid GSHP applications, having a voice in GSHP-promoting organizations or placing ground source in high profile projects like NASCAR speedways, Smith’s commitment goes beyond personal profit.

“There’s a commitment from both sides that it takes to make this industry go,” Smith said. “Part of it, is those who take something from it and make a living from it need to give something back so we can progress and expand.”

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**Key Players**

**Speedway Motor Sports Inc.**

O. Bruton Smith, CEO,
John Zudell, Mike Swift

**Behade Builders**

Paul Dean, owner, and Mike Zaun

**Florida Heat Pump**

Allen Niles and Chris Smith

**Sound Geothermal**

Cary Smith, CGD CEM

**Bertram Drilling**

Ken Brew

**LoopMaster**

Stan Bartel and Jeff Corey

**Centennial Pipe**

Steve Curtis

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Profile to Success: Tom Miller

By Jennifer Thorley

After installing his first geothermal system for a friend in the early 1980s, Tom Miller began his career in the industry as a dealer for WaterFurnace of Indiana in 1985. Three years later he founded Geo-Flo where he continues to hold the position of Chief Executive Officer.

According to the company’s Web site, Geo-Flo offers the largest selection of loop pump modules in the industry, which incorporate industry standard pumps Grundfos. The company has also designed several proprietary valves.

Miller said over the years the proprietary valves the company has designed has helped to make their loop pump modules popular with the geothermal industry.

Although Miller said his influence to start the company was because he “wasn’t smart enough to design a geothermal heat pump,” he has designed and assisted in the design of a number of loop pump modules and valves.

In 1990, Geo-Flo introduced a new three-way FPT valve body with ports supporting full one inch flow, according to the company’s Web site. Miller designed the valve, which increases the reliability of loop pump modules.

Then in 2001 and 2005, the company developed two more front flush valves.

As part of his 20 year career in the industry, Miller has also been an International Ground Source Heat Pump Association (IGSHPA) member since 1988. “There’s no industry that I would rather be in than the geothermal industry,” Miller said.

With high-quality modules and a business philosophy to always deliver what you promise, Geo-Flo as well as Miller have certainly made an impact in the geothermal industry. Miller said the reason he is a success is simple: “We help our customers be successful.”

Geo-Flo founder, Tom Miller stands in front of the company located in Bedford, Indiana. Geo-Flo offers the largest selection of loop pump modules in the industry as well as a variety of other items such as the die cast brass valve.
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Experience Meets Energy

By Kelly Green

Using geothermal with radiant floor heating and cooling, this 4,600-square-foot house is heated and cooled for almost $350 a year.
With a background in carpentry, undergraduate degrees in math and physics, a Masters degree in Educational Leadership and experience in geothermal installations, Eric Dickie said teaching geothermal training courses has been a winning combination of his experience. He received his accredited installer designation from the International Ground Source Heat Pump Association (IGSHPA) in 2003 and became a trainer for IGSHPA that same year. In addition to geothermal, Dickie has taught math, physics, electronics, construction and automotive repair. “What happened really or what I’ve discovered is that all these skills have just meshed together incredibly well,” he said. “Having a sense of construction and having the teaching background has really been helpful as a trainer.”

Dickie said he first heard about geothermal technology 15 years ago and was immediately drawn to its environmental benefits. “It’s a mesh of environmental and economics,” Dickie said. “So many of the ‘green’ things come with a price tag so a person has to make the decision, but with geo we’ve got it all going for us.”

Geof Thompson is one of Dickie’s former students and says Dickie is unique as a trainer because he effectively communicates to his students whether their background is academic or trade based. Thompson said Dickie can not only deal with things on a law of physics perspective but he also has the ability to put himself into a tradesman’s shoes and understand things from their perspective as well. “To be able to communicate at both levels without any noticeable frustration is rather unusual,” Thompson said. “He’s got the knowledge at the depth that anybody could ask him a question and if somehow he doesn’t know he tells them straight up that he will get the information and he does.”

Even with his successes as a trainer, Dickie’s involvement in the geothermal industry goes far beyond teaching. Delta Geothermal, the company Dickie founded in 1995, has a distributorship in western Canada for Nordic and Addison heat pumps. Dickie is still involved with installations, often consulting for former students or customers who purchase his products. He has also authored a new design and installation manual focused on Canadian applications. “The trouble with this is there are so many aspects to the industry and they’re all so much fun that it’s hard to let anything go,” he said. Recently, Thompson and Dickie collaborated on two sophisticated residential geothermal projects. Thompson has a background in mechanical engineering and instrumentation. He earned his IGSHPA Accredited Installer designation in 2005.

Making a Splash

The first project, located in Canada’s Okanagan Valley, uses a horizontal slinky system and 10 tons of heat pumps. Dickie designed the home’s geothermal system and Thompson, who owns Paradise Climate Controls, set up the home’s advanced controls system. The 5,000-square-foot home has a large outdoor pool utilized for a hot side-cold side application. Dickie explained that a hot side-cold side application uses a heat pump without a reversing valve where one side continually generates hot water and the other side continually generates cold water. In many of his projects, Dickie said he has been able to significantly increase efficiency by designing systems this way. “I can achieve coefficients of performance (COP) as high as 10 by designing the system as a hot side-cold side application,” Dickie said. “The average COP on a water-to-air heat pump system is about three.”

Here’s how the application works: During the cooling season the heat pumps take the heat out of the house...
and put it directly in the pool. Once the pool reaches its optimum temperature, the remaining waste heat is dumped into the loop field. “By running the compressor once, if you want to think of it that way, I am achieving two things with it,” Dickie said. “That’s what I’m talking about when I say making the COP really high.”

Dave Chisholm, the homeowner, said an outdoor pool was always part of the construction plan, but he did not realize until after conversations with Dickie it could be tied into the geothermal system. “We tried to look at being somewhat innovative in more than just the style of house we had built,” Chisholm said. “We were aware of emerging technologies and had read up on different things: solar, geothermal and so forth.”

After about a 13-month construction process, the home was occupied in April 2005 and the unique geothermal application was put to the test in May 2005 when swim season began. Chisholm said the system heated the pool from the low 50s to the mid-80s in only four days. “We were amazed, just amazed that it heated that fast with this low grade energy,” Chisholm said. “After some rough calculations, I figured the only cost associated with heating the pool was no more than $100 during the shoulder seasons when the house wasn’t being cooled continually.” Chisholm said even using natural gas, which is still relatively cheap in his area, heating the pool would have cost hundreds of dollars.

As for the energy savings on the interior heating and cooling of the home, Chisholm said the results were not exactly as he expected but believes it is due to home’s design, not the geothermal system. “We have large windows facing southwest, so especially in the summer we have a high cooling load,” Chisholm said. “We have external motorized shades but in the winter there’s nothing to reduce the heat loss from those windows, which I think puts a bigger demand on the total system.”

Thompson was enlisted in the later stages of the project to handle the home’s complex controls system. The system uses a digital control and can be monitored and manipulated using the Chisholm’s home computer.
Thompson can also access the control system remotely to adjust settings or troubleshoot. “I can access virtually anything and control virtually anything, but I leave the sophisticated things to Geof,” Chisholm said.

While Chisholm said he would recommend this type of system to others, he would encourage them to bring in someone like Thompson earlier in the process. “We were relying on the distribution mechanical contractor to take care of the control systems and it wasn’t anywhere near sophisticated enough to handle this house,” Chisholm said. The additional cost and complexity of the control system were elements Chisholm had not planned on, but said they were necessary. “The geothermal cost we anticipated up front and those worked out exactly as we anticipated,” he said.

In the end Chisholm said the system operates well and a number of people have been interested in seeing it. He enjoys the home’s uniqueness and said working with Dickie made his decision to incorporate geothermal smooth and stress-free. “Eric is great at interactive communication,” Chisholm said. “That’s what we appreciated as much as the skill he brought to the job.”

Controlling Comfort

In the second residential installation, Thompson designed a system that utilizes an ultra low-temperature hydronic distribution system with some minor in-floor cooling. Through his years in the industry, Dickie said he has discovered the secret to increasing a geothermal system’s efficiency is to pair it with an appropriate distribution system. He adds a strong warning to those considering the use of in-floor cooling, however. “Something like this would have to be very carefully designed so you don’t get condensation happening on the floor,” Dickie said. Although Dickie said he would not recommend total hydronic floor cooling, the application is effective for this home due in part to the semi-arid climate of the area. The in-floor cooling is used as a base and the home’s total cooling is supplemented by forced air. What Dickie likes about this application is the 4,600-square-foot home’s heating and cooling costs are less than 8 cents per square foot or $350 per year.

“What we’re doing is supplying the heat to the floor at as low a temperature as we possibly can and what

(Continued on page 22)
1824

William Thomson, Lord Kelvin

Lording Over Geothermal

By Jennifer Thorley

William Thomson, dubbed Lord Kelvin by Queen Victoria in 1892, was born on June 26, 1824, in Belfast, Ireland. Thomson’s college career began at the University of Glasgow when he was 10 years old. He graduated at 21 from Peterhouse College at the University of Cambridge with a bachelor of arts degree. A year later in 1846, he was elected as a Fellow of Peterhouse and returned to the University of Glasgow as a professor and chair of natural philosophy, which is more commonly known today as physics. Then in 1848 he received a master’s of arts degree from Cambridge.

Not only did he make his mark as a professor but he also was a pioneer in many other areas including heat and energy. The concept he and James Prescott Joule developed in the early 1850s contributes significantly to the geothermal industry, even
though he is better known for the Kelvin scale of absolute temperature measurement and his contributions to establishing the second law of thermodynamics.

Thomson is the first to mention a heat multiplier, better known as a heat pump, according to Dr. Robin Curtis’s Earth Energy in the UK report. He designed and outlined the heat multiplier machine, which would permit a room to be heated to a higher temperature than the ambient temperature by using less fuel.

When Joule and Thomson began working together in the early 1850s, they developed the principle functioning of refrigerators and air conditioners. The discovery became known as the Joule-Thomson effect.

The effect is associated with the cooling down and subsequent liquefaction of gases, said Matthew Trainer, a senior technician at the University of Glasgow’s department of physics and astronomy teaching laboratories. The effect allows the rapid cooling of gases to very low temperatures with the minimum of equipment using either a compressor or compressed gas supply and an orifice connected to the equipment requiring cooling, Trainer explained.

In the mid-19th century Thomson played an important role in the Atlantic telegraph cable project, Trainer said. Thomson also created a mariner’s compass and navigational deep-sea sounding equipment and dynamos. When Thomson was 68 he was the first science Lord granted by Queen Victoria taking his name from the river Kelvin that flows past the University of Glasgow. In 1899, after 53 years of teaching Lord Kelvin retired from his position as a professor at the university. Then from 1904 until his death in 1907, Lord Kelvin was Chancellor of the University of Glasgow.

On the 100th anniversary of his death, the university launched the Kelvin Centenary Year, a celebration of his lifetime of achievements. The celebration began January 9 and continues throughout the year with a series of events on the university’s campus.

“Lord Kelvin – Revolutionary Scientist” is a new permanent display at the Hunterian Museum and Art Gallery located on the university’s campus featuring Kelvin’s life and work. The Kelvin Building is home of the department of physics and astronomy that honors Lord Kelvin’s influence on the campus. The Kelvin Society is an educational Web site dedicated to creating awareness about Lord Kelvin. It is maintained by Trainer and promoted through the university’s physics and astronomy department.

Lord Kelvin had a considerable influence on science and technology in Victorian Great Britain, Trainer said. Not only did Lord Kelvin impact the science and academic fields but he also developed the concept that paved the way for the geothermal industry. The impact of Lord Kelvin’s work is visible even more than 100 years after he was awarded the title Lord by Queen Victoria. In 2005, her great-great-granddaughter, Queen Elizabeth had a geothermal system installed at Buckingham Palace.
that does is dramatically increase the COP of the pump itself,” Dickie said. “There are dramatic things that can be achieved by meshing the geo with an appropriate distribution system. I really think that’s where a lot of our gains are going to come.”

This home employs four tons of heat pumps. The system’s ground heat exchanger uses three vertical boreholes drilled to 180 feet. Dickie notes the wells are drilled to a relatively shallow depth due to the high thermal conductivity/diffusivity of the ground in the area.

Thompson attributes much of the home’s efficiency to design of the hydronic floor system. “The way I do my tubing on the floors is totally different than the way everybody else does and the temperatures I use are drastically lower,” Thompson said. “By keeping the hot side of the heat pump down it also keeps the cold side of the heat pump up so your efficiencies are much higher.”

Thompson said he gave a tour of the home to the local utility about two weeks after the system became operational. Even amidst frigid temperatures that day, Thompson said it was about 16 degrees below zero, the house was being heated to 70 degrees with 79 degree water. “One of the companies we work with up here, Stantec Engineering, has looked at it (the house) and they believe that at least 50 percent of the efficiencies we’re getting are due to the way I’m doing my hydronics,” Thompson said.

He also ensured maximum efficiency by installing precise controls for the system. While the water that heats the house goes up and down in temperature as required, controls keep the water in the storage tanks at the absolute minimum in order to keep the efficiency of the heat pump maximized. Thompson also installed current sensors on all of the equipment to measure power consumption. “I can actually tell you to the second how long each of those things has run and when,” he said.

Thompson encourages consumers to think about their home’s mechanical elements as one complete system. He believes it is the only way to really get the most out of the systems in terms of efficiency. “In a lot of typical houses you’ll have several programmable thermostats and you’re going to have heat on in one zone and cooling on in another zone adjacent to each other just because you’ve got different thermostats that aren’t talking to each other,” Thompson said. “The amount of energy you waste doing both is just phenomenal.”

What Thompson provides instead is a complete, integrated mechanical system. “I go in and do the whole shooting match, the entire mechanical is all integrated,” he said. “My controls are making sure the heating works with the cooling that works with the hot water that works with the geo – everything is tuned and designed to work together, including the floor system.”

**Good Today, Better Tomorrow**

Dickie said projects like these highlight the fact that geothermal is a design-intensive field and systems that are not designed properly will not perform. On the other hand, those that are designed properly can exceed expectations. “I think training is hugely important,” Dickie
said. “Ultimately I see this being a true trade-qualified career, but in the meantime we’ve got to fill the gap for the demand and it’s critical that people learn that they can’t just go by all the rules of thumb that seem to have popped up in the industry.” He said it is also important to note that there are huge variations in geothermal systems. “The idea that a geo system is a geo system is a geo system is just not correct,” he said.

To those considering a career in this field who wonder if the investment will pay off, Dickie says it will. “This field has so much potential, and the growth we’ve got happening is staggering,” he said. In his next breath, however, he insists that newcomers to the industry be properly trained. “We’d like to do more than that with the training, but just driving home the idea that there’s more to it than digging a hole in the ground, throwing in some pipe and making it work is hugely important,” Dickie said. “It has to be done right and that’s the critical part of it all.”

To those who already participate in this rapidly expanding industry, Dickie says keep learning. “This is a field where nobody knows it all and there are new things being discovered everyday so the onus is really on us to keep learning as much as we can,” he said. “It’s getting better and better as we learn more. It’s good now and it will be better tomorrow.”
Taking the LEAD

By Kelly Green

With about 25 years in the geothermal industry, Sonny Hampton, training manager for WaterFurnace International, knows the ins and outs of the business. He also understands the importance of training. Starting out as the owner of a plumbing and heating company, Hampton took his first geothermal training after being approached by a homeowner with an interest in geothermal. He later installed his first geothermal system at that individual’s home in Illinois around 1983. “I already had the plumbing contract on this new house,” Hampton said. “I guess I got interested and took a couple of short classes that were offered in central Indiana and turned around and gave the man a bid on a piece of geothermal equipment and sold it.”

This near zero energy home is being built by Sage Homebuilders with the goal of reaching LEED Platinum.
Sonny Hampton, IGSHPA trainer and training manager for WaterFurnace, discusses installation methods with a group of students.

After that first installation Hampton said his geothermal work grew rapidly. He installed two units his first year, five units the next and 12 by just his third year in the business. “I had a very excellent co-op rep that promoted geothermal quite heavily, so I had the opportunity to install equipment and sell more jobs,” Hampton said. Because there were so few geothermal contractors in his area at the time, Hampton said he was also able to work in a larger mile radius than he did installing conventional equipment.

Hampton went on to work for Applied Energy Systems, a WaterFurnace distributor that also taught people how to sell, install and take care of geothermal equipment. Hampton earned his accredited installer designation from the International Ground Source Heat Pump Association (IGSHPA) in 1992 and went through IGSHPA’s Train-the-Trainer program in 1996. He now trains full time for WaterFurnace teaching about 30 classes a year in locations around the world. “WaterFurnace takes the attitude that training is a very important part of the industry,” Hampton said. “We have to make sure that the equipment is sized correctly, installed correctly and serviced correctly. Better trained dealers increase our sales and help to decrease our warranty costs.”

In addition to IGSHPA’s accredited installer course, WaterFurnace offers several other geothermal training courses. Hampton said his most popular class is “Service for Installation” where he teaches students how to size, install and service geothermal equipment. He also teaches: hydronic training for in-floor heating applications with geothermal, training on software promoted by WaterFurnace and some courses on how to sell geothermal products.
From the Classroom to the Field

As part of a WaterFurnace “Pipe and Design School” in 1999 Hampton’s students assisted with the installation of the ground heat exchanger at the offices of Jim’s Heating and Cooling in Washington, Mo. The owner, Les Crawford, and several of his employees were enrolled in the class that day. Jim’s is a WaterFurnace dealer that previously sub-contracted all its geothermal installations because its employees had not yet been trained. While Crawford said the company still sub-contracts most of its jobs, employees are now trained and prepared to install or service systems when necessary.

The “Pipe and Design School” was Crawford’s third class with Hampton. The first was “Service for Installation” and the second was IGSHA’s accredited installer course. Crawford believes training is essential, especially in the geothermal industry. “I think training and sizing and everything is more important in geothermal than in the rest of it because of the money they spend.”
he said. “Any training that comes through here I send a couple of guys even if they’ve been through it before. Everybody learns something.” Geothermal totals about 40 percent of Crawford’s business, so he and his employees have plenty of opportunities to put their training to the test.

Crawford said having a geothermal system in his facility has been a benefit not only because of its lower operating costs but also because it serves as his personal endorsement of the systems. He also has a geothermal system in his home. “It’s a good conversation piece for people coming in,” Crawford said. “If you’re trying to sell them a geothermal system and you’ve got one in your shop and you’ve got one in your house it’s a plus.”

**Training at Work**

Since taking Hampton’s course eight years ago, Crawford has established a reputation for geothermal knowledge and reliability among members of the Missouri building community. “We interviewed a couple of people and through the grapevine heard that Les Crawford was the guy to go to,” Mike Greene of Sage

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A Rig from Boessen Underground Construction drills one of the six boreholes necessary for the house’s geothermal system.
Homebuilders said. Greene and Crawford recently worked together on a near zero energy home located in a high-end St. Louis suburb called Creve Coeur. The home was a stop on the National Association of Homebuilders’ Green Building Tour of Homes during its annual conference in March. Sage is building the home with the goal of earning a Platinum rating from WaterFurnace Envision package unit. The system required six boreholes drilled to 200 feet. “We did pay for drilling knowing that it is hard to get people to donate labor,” Greene said. “We did get a very favorable rate on the drilling and we were very pleased at how Les set that up for us.”

Greene said he was also pleasantly surprised at how

An array of solar panels generates valuable electricity that helps the home achieve its near zero energy status.

the Leadership in Energy and Environmental Design (LEED) program. The home is set for completion this summer.

“From what we’ve experienced, Jim’s Heating and Cooling really knows what they’re doing and really understands the processes of how all this works,” Greene continued.

Crawford’s company handled the geothermal installation at the 5,000-square-foot showcase home. Many of the home’s elements were donated, including its quickly the drilling was completed. “It was the afternoon of one day and the morning of the next and they were done,” he said. “It was extremely fast and efficient.”

Greene said geothermal was chosen for the home because of its efficiency. “When you can get 300 and 400 percent efficiencies out of your heating and cooling system, how can you not go that route,” Greene said. “We understand that there is added cost especially with the drilling, but we feel like on a house this size and
actually on a house of any price point, we can drill and install a system appropriate for any home.” Greene said the absence of exterior compressors and the ability to use the system to heat water also made geothermal the best choice.

Greene said Sage Homebuilders has made sustainability the focus of all its projects and believes in the next few years that more and more builders will make the same commitment to sustainable building practices. “I think in general over the last 50-60 years we have de-emphasized quality and longevity in our building community,” Greene said. “We are seeing a dramatic shift from that to doing better design and more sustainable building practices. Hopefully, we embody the change that is coming quickly.”

**Changing with the Times**

Just as a customer request nudged Hampton into the geothermal industry almost 30 years ago, Greene believes the continuing shift to environmentally friendly building will be market driven. “The whole buzz now is environmental awareness and I think that’s going to be a huge factor,” he said. This buzz is generating more interest in geothermal as well.

Over the last few years Hampton said he and WaterFurnace as a company have seen a continual rise in training. To meet the growing demand, WaterFurnace has increased the number of classes offered and is also planning new training subjects including classes in sales and software. Even with the expansion in classes Hampton said he still sometimes has to turn people away because a class is too full.

They believe this growth is directly related to a customer-driven interest in geothermal. “The people that probably enter the geothermal industry today are people that have a fairly heavy background in HVAC and/or plumbing,” Hampton said. “They’re getting into geothermal the industry because they see their customer base requesting bids on geothermal.” Like he did in the 1980s, Hampton said these students need additional training in the installation of the ground loop and in ways to sell geothermal against conventional equipment if they are going to be successful in the industry.
Transitioning to Success

By Jennifer Thorley

Over the past 14 years Terry Proffer has been recognized for his contributions to the geothermal industry. He is acknowledged for system designs dealing with extreme weather conditioning requirements, unusual GeoExchange applications and difficult loop installation conditions. He has become an International Ground Source Heat Pump Association (IGSHPA) accredited installer, IGSHPA trainer and a Certified GeoExchange

Terry Proffer has trained about 435 people since 1998, and he continues to teach such as his recent course in Colorado for United Power.
The Kiva Lodge reflects that environmental features including geothermal can be achieved in a structure of beauty and enhance the surrounding area.

Designer. Proffer has trained about 435 people since 1998. He provides several installer classes every year, and is expanding into commercial design training.

Before deciding to make the transition to geothermal Proffer spent about 18 years as a geologist in the petroleum industry, often supervising field operations for geophysical seismograph surveying companies where they utilized a number of drilling contractors; one of those contractors was Bertram Drilling. “My contact was actually Terry Wattie with Bertram Drilling at the time,” Proffer said. “They are the ones actually responsible for getting me into this career change.”

Proffer teamed up with some of the people from Bertram Drilling including Wattie, who was one of his GSHP installation mentors, forming Earth Energy Inc. of Montana.

In 1992, Proffer relocated his family to Montrose, Colorado, opening up a second office for Earth Energy of Montana. “It was not a good business decision, as at the time geo was not an accepted technology in this part of the world, and being in a small town, everything we did required a lot of travel. But it was a great place to raise kids.” As a result of Proffer’s initial efforts with local contractors and utilities, the western slope of Colorado is now a significant market for GSHP installations.

Proffer and his partners soon discovered there was more to the industry then being a wholesaler. “I thought all we were going to do was be a warehouse, sell heat pumps and life would be good,” Proffer said. “What we found out in short order was very few mechanical contractors were installing systems correctly. This was not a situation that could sustain our wholesale business, so our partners thought that one of us should take advantage of IGSHPA’s Train-the-Trainer course in Stillwater. I was volunteered.”

Proffer said he and his partners understood that if they could not find a way to support their contractor base with technical support they were nothing more than widget salesmen. After all, contractors could go to any wholesaler and buy anything they want. “We had to set ourselves apart by providing that technical expertise, and that’s what we did,” Proffer said.
At the time the company had been hiring third party trainers; some were very good such as Jeff Hammond, who Proffer considers one of the best “geo-junky” brains in the business, and some not so good. Proffer said many of the trainers knew the theory correctly but most did not have a lot of practical experience.

“We were acquiring a lot of hands-on experience, and we were learning the technical side of the business better; we just felt we could do a better job by integrating our experience with the training program,” Proffer said.

In 1997, Proffer accepted a position with Sound Geothermal as a start-up consulting and GSHP manufacturer's representative based in northeastern Utah. Although Proffer is no longer with Sound Geothermal, three of the four founding partners - Cary Smith, John Geyer, and Terry Crow - continue to be involved in the GSHP industry.

“I owe Cary, John, Terry and Mark Eckels, who is the fourth partner in Sound Geothermal, a great deal of thanks. We all bit into a very new market that was just beginning to be accepted in the Rockies, and made it work. I am still friends with all of these guys and enjoy seeing their continued success in the industry,” Proffer said.

Later, Proffer relocated to the Denver area where he continues his career in the geothermal industry with Major Geothermal.

Learning to Teach

Major Heating was established in 1970 by Jack Major as a residential and commercial HVAC service contractor based in Wheat Ridge, Colorado. The firm is now run by his son, Jack Major, Jr. and grandsons, Jack C. and Bob Major. As the company progressed, Bob became interested in geothermal mechanical systems and convinced his father to consider getting into this portion of the industry.

As it turned out, Bob and Jack Jr. attended one of Proffer’s IGSHA accredited installer classes in early 2001, and they decided that the potential for this growing industry existed in Colorado.

The company determined that hiring an experienced person would cost less than going though a steep learn-
The Mission Bell Events Center and Pavilion will have 250 seats that can be divided into five separate rooms for breakout meetings or entertaining.

ing curve, and asked Proffer if he would consider working for Major Heating. Proffer joined forces with the Majors.

Proffer said within a few months of starting at Major Heating he and Jack Jr. realized there was a market beyond being an installation contractor in Denver, so they became a GSHP distributor and formed Major Geothermal. Even though the company distributes GSHP equipment, related products, tool and HDPE pipe, Proffer’s primary role continued to expand with GSHP design, consulting, commissioning and IGSHPA training.

Proffer said what really helped him was installing systems that he was involved in designing, dating back to his days with Earth Energy. “We had a good policy with both Earth Energy and Sound Geothermal; we went out with our contractor clients routinely on installations until they learned the basics about loop installations, tie-ins, purging and startup. The problem was that as we grew, it became harder to stay up with the travel and stress,” he said.

Through training Proffer discovered the good will of the industry. Not only was IGSHPA helpful but other people in the industry were very open about sharing their hard-earned experience. “What I found was there were a lot of people out there willing to coach people like me along, even competitors,” Proffer said. “I have always benefited from the veterans in our industry; they always seem to make time for anyone like me with a question. Folks like Larry Eitleman, Chuck Remund, Ed Lohrenz,
John Manning, Jeff Hammond, Allan Skouby and many others have been tolerating my goofy questions for years. Through training and our company’s work, I have an opportunity to return what I have learned to people new to the geo market, and see our industry grow.”

After 12 years of being a trainer, Proffer noted the benefits and struggles of the position. “I feel like our company and myself have earned a good reputation; that’s a benefit,” he said. “But we work hard to do things the right way.”

Proffer said one of the biggest challenges is meeting the turnaround time for design and consulting work as people begin to perceive the details required for a competent GSHP installation. “Being a trainer has really opened up a lot of business for us,” he said. However, it has also made the company extremely busy.

High Profile Design

Since Proffer has a strong reputation in the industry, he was asked by a mechanical contractor in Grand Junction, Colorado, to determine if a GSHP system would work in a large custom home. “It turns out the home was being built for Mr. John Hendricks, founder and CEO of Discovery Communications,” Proffer said.

Proffer then asked David Houghton, president, founder and principal engineer of Resource Engineering Group, to join him on the project. Houghton handled the design of the internal mechanical system including radiant delivery system for heating and cooling. Proffer calculated the GSHP requirements and provided the specifications for the heat pumps.

“Terry and I have worked together for a long time, he was actually my instructor when I got my IGHPA accreditation way back in 1998,” Houghton said. “I went to a three-day course in Utah and since then we have

The Kiva Lodge is one of the three lodging facilities located on the resort, and it is scheduled to open this summer. The Kiva Lodge has 40 rooms and each room has its own individual GSHP unit.
teamed up on a lot of projects and he is our go-to guy in loop design.”

Proffer said the Hendricks house is about 25,000 square feet, and it is heated and cooled by radiant tubing in the floors. He also said all of the radiant conditioning is driven by six water-to-water heat pumps tied to a vertical ground loop. The heat pumps also provide all of the house’s domestic hot water needs.

“There are a dozen boreholes in the driveway and then we have a bank of six water-to-water heat pumps,” Houghton said. “They are all pretty much operating in parallel; two of them were heating and cooling and three of them were heating only. The heating load was bigger than the cooling load as we usually find it is in our climate.”

A Gateway to Change

Hendricks was so pleased with the success of the geothermal system at his house he wanted to consider the technology for another project. He began to develop a series of projects at Gateway Canyons, a resort he owns in Colorado where the Dolores River and West Creek come together. Hendricks’ vision was to create a sustainable, scenic-based recreation economy designed to replace the area’s long-lost mining economy, according to the Gateway Canyons Web site.

“John Hendricks was pleased with the results and efficiency of geothermal in his house,” John Williams, president of Gateway Canyons Resort, said. This was one of the main reasons the resort decided on geothermal. Another reason was the environmentally friendly aspect of heating and cooling.

The resort plans to utilize bodies of water on-site for geothermal pond loop systems. “We are particularly pleased with the reported efficiency of the Slim Jims and coil system in ponds,” Williams said. Proffer’s design expertise was also enlisted for this project.
Getting Down to Business

Proffer’s first task was to evaluate and determine a solution for a troubled GSHP installed in a high-end automobile museum located on the resortis property. The Gateway Colorado Automobile Museum is devoted to understanding and celebrating the history, science, design and social impact of the American car, according to the museum’s Web site. The 30,000-square-foot facility accommodates more than 40 cars.

To cure the problems with the museum’s GSHP system, Proffer redesigned the pond loop, and Major Geothermal is currently correcting the internal mechanical portion of the system.

“I determined that the current loop was insufficient for the environment it was installed in; it was designed correctly but was not installed to specification,” Proffer said. “Horizontal options were developed, but as several ponds throughout the property were planned we recommended that stainless steel pond heat exchanges be considered for ease of installation, proven performance and reduced labor.”

Although there have been some difficulties with the GSHP system at the museum, Williams said he doesn’t anticipate the owner would change from using geothermal. “I think the owner is quite happy with the results of geothermal heating and cooling,” Williams said. “The one (GSHP) in the museum, particularly when we get the pond system in will be terrific.”
The most current project at Gateway Canyons is the Kiva Lodge, which is scheduled to open this summer. Kiva Lodge is one of three lodging facilities located on the resort. The Kiva Lodge has 40 rooms with a variety of options and amenities to choose from such as a dining facility, a fitness center and an outdoor patio lounge, according to the resort’s Web site. Proffer said each room has its own individual GSHP unit. He also said Major Geothermal designed the pond loop for the lodge and Houghton’s firm engineered the internal portion of the HVAC system.

In addition to the Kiva lodge, the resort has two other lodging options including the Canyon Casitas and the Outpost Motor Inn. Both were completed in phase one of the Gateway Canyons projects. Not only does the resort feature the three luxurious lodging facilities but the plan also calls for as many as 60 additional lodging units in the next three to four years, according to the Web site.

“We have confidence we will get a green LEED (Leadership in Energy and Environmental Design) standard on the Kiva, and we are shooting for a silver/gold on the next building, which will be the Palisade Academy Building, which is an event center and educational building, and it too will be geothermal,” Williams said.

Proffer also said other projects could be candidates for LEED certification. These include the Mission Bell facility and the Sola Vista Lodge, which are all in the final planning stages. He said he will be designing the pond loops and working with other key people from Major Geothermal on advising about the internal mechanical portions of the facilities.

Hendricks, Williams and Houghton are all pleased with Proffer’s efforts. Houghton said Proffer is very knowledgeable about the equipment and what’s going on behind the scenes with equipment development.

“We rely on him a lot for information,” Houghton said. “He’s really been a big help to the whole industry.”

Earth Insights, continued

or any of the other potential disasters had gotten installed? How long does it take to get an agency or user to try geothermal again – not to mention the bad referrals?

- After 30 years in the industry, it is much more than my profession. I welcome anyone that wants to become proficient in their portion of designing or installing geothermal systems in a quality and professional manner. My heartburn is that bad on designing or installing a project, or attempt to perform the installation when they know little, if anything about what they are doing, resulting in substandard work that screws up a project and gives the industry a black eye.

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If you have a question about geothermal installation, design or troubleshooting, send it to Phil Rawlings in care of Geo Outlook, Oklahoma State University, 374 Cordell South, Stillwater, OK 74078 or via e-mail to igshpa.news@okstate.edu.

Quality Designs and Installations

I received this from a PE and thought it and some expansion of my responses to him would be beneficial to those considering working in the industry.

Dear Phil: We do a fair amount of geothermal work and would love to become a Certified Geothermal Designer (CGD). I just want to make a quick comment regarding your Earth Insights Volume 1, Number 3. I agree that a licensed PE has no business designing geo-exchange if he/she has no experience in it; however, in most states technical consulting/design work can only be done by a licensed PE according to law. So if you are saying not to exclude qualified CGDs that are not PEs, then you should clarify that that person must be a licensed contractor (with the appropriate insurance) or a CGD in a firm with a PE in that state.

My expanded response is as follows:

• This is not about state requirements or levels of insurance
• You and I probably approach this from the same basis – we provide quality designs and applications and stand behind our work.
• The problem is those in the industry that do not – from the designer to the helper on an installation crew.
• As an installing or design build contractor and advocate for the industry, here’s what troubles me greatly:
  • Specifications stating that a PE do the ground loop design but do not include a requirement for experience and/or training in geothermal. My personal belief is training and experience is a MUST!! CGD is the answer!!
  • Engineers that don’t let lack of understanding and/or training hold them back from putting out geothermal system designs on stamped drawings that have no hope of working, much less performing appropriately. Space does not allow listing examples, but there are many – one for the first geothermal application considered by a major government agency.
  • Geothermal technology is only 30 years old and has only begun to have significant market penetration in the last 10 years. The vast majorities of HVAC technologies in use today have a long history and are well known. If an engineer or designer with a known track record and acceptable body of work with other technologies screws up a geothermal design, geothermal technology often gets the blame.
  • The old adage 1 good job gets you 10 referrals and a bad job gets 100 negative referrals is all too true. What if the government agency project

(Continued on page 37)
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