

“Think outside the box? – He doesn’t even know there is a box!”

– An interview with Roice Nelson



Roice Nelson is an experienced explorer who has been successful in both entrepreneurial and technical roles in the oil and gas industry. Roice was honoured by the SEG with the Cecil Green Enterprise Award in 1999.

Roice is best known as the initial founder of Landmark Graphics Corporation, where his insight led to the company providing interactive seismic interpretation tools especially for interpreting 3D seismic data. Before that he was a Senior Research Scientist at University of Houston’s Seismic Acoustic Laboratory (SAL). Under his dynamic leadership four new labs were created from SAL that resulted in increased sponsorships and growth in personnel. He is a well-published author who has presented famously at Conventions and Workshops. His name is also familiar through his book entitled ‘New Technologies in Exploration Geophysics’ published

by Gulf Publishing Company in 1983. This book was well ahead of the times then and forecast the impact that interactive interpretation technologies would have in our industry.

After leaving Landmark Graphics in 1992, Roice started several new companies, including Dynamic Resources Corporation (DRC), Continuum Resources International Corporation, HyperMedia Corporation, and Walden 3-D, Inc. (W3D). Presently Roice is residing at DRC and W3D in Houston. His rich experience in seismic data acquisition, processing, and interpretation includes acquisition projects not only in the US but also offshore Nigeria and The Cameroons. Interpretation projects span different parts of the world.

During the month of July 2007, Roice was in Calgary enjoying the Stampede, and Satinder Chopra and Penny Colton did not miss the opportunity of interviewing him. Following are excerpts from the interview.

S: *Roice, let’s begin by asking you about your educational qualifications and your work experience. Briefly can you summarize these for us?*

R: I graduated from Cedar City High School, went to the University of Utah because I had a scholarship there and didn’t have a scholarship to the home town College, which is now Southern Utah University. I went to the “U” for two years, then took two years off to serve a mission for the LDS Church in Britain, and came back and graduated with a B.S. in Geophysics in July of ‘74.

After graduating I went to work for Mobil Oil in Dallas. I went to a night MBA Program, and got an MBA from Southern Methodist University with an emphasis in entrepreneurship. This degree was actually completed after I went to work for Fred Hilterman at University of Houston. I took the last two courses at the U of H, and received the MBA from SMU in 1981.

S: *What about your work experience?*

R: Bob Otis – my “Big Brother” in the Fraternity I joined at the “U” – talked me into going over to the Geophysics

Department where he was studying. I ended up getting the Pan American Scholarship, and working at Pan American and AMOCO the summer after my second and third year of College and after my Mission. So I worked in Denver the summers of 1970 and 1973.

I always intended to do graduate work, but the oil embargo happened and oil companies were offering more money than the professors were making. There was a bidding war and I ended up going to work for Mobil Oil. I worked at Mobil from July of 1974 until January of 1980, and was recruited to the University of Houston by Fred Hilterman, who had also been at Mobil.

Fred founded and was running the Seismic Acoustics Lab (initials SAL), and hired me as an Associate Research Scientist at SAL. During the three years there we founded the Allied Geophysical Labs (AGL), and I became the General Manager of the integrated seismic acquisition, physical modeling, numerical modeling, image processing, computational research, and well log testing laboratories. We put together books summarizing research for each lab’s sponsors, and built numerous calibration,

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structural, and stratigraphic physical models. In earning the MBA I learned the best place to really learn about new opportunities was at the interface between university research and industry. The AGL, SAL, and related laboratories provided the perfect forum to test my ideas for an interactive 3-D seismic interpretation system.

In the fall of 1982 we started Landmark Graphics, and I was full time with Landmark for about 10 years. Then we started five other companies at the same time. None of them were financially successful, even though they were each built on solid technical concepts.

For several years after Landmark I worked for HyperMedia Corporation. We had built a UNIX, X-Windows, Motif, Client-Server hypertext engine in 1988 through Landmark at what is now The University of Louisiana at Lafayette. HyperMedia attempted to commercialize this very early web browser for geoscientists. Mosaic came out in 1992 or 1993, followed by NetScape and then Explorer. This was just as we finished productizing our hypertext engine. I did not comprehend the NetScape “free software” business model, and HyperMedia could not compete financially.

I’ve worked for several companies we started. HyperMedia was incubated by Walden 3-D, Inc., my consulting company and an incubator for several other companies. For instance, Walden Visualization Systems, was merged with Energy Innovations to create Continuum Resources Corporation, which built the first visualization theaters for oil exploration. We were doing simultaneous terabyte volume visualization collaboration between London, Houston, and Perth in 2000. We’d store the data at each site, and transfer the move commands and state changes over standard DSL lines.

One of the companies we started earlier was Dynamic Oil and Gas Corporation. I re-incorporated this company after I left Continuum Resources as Dynamic Resources Corporation. I worked very hard to put together an oil company. It was under capitalized and I ended up going to work for Geophysical Development Corporation. GDC was owned by Geokinetics, and GDC became the processing and interpretation division of Geokinetics after the purchase of Trace Energy and Grant Geophysical.

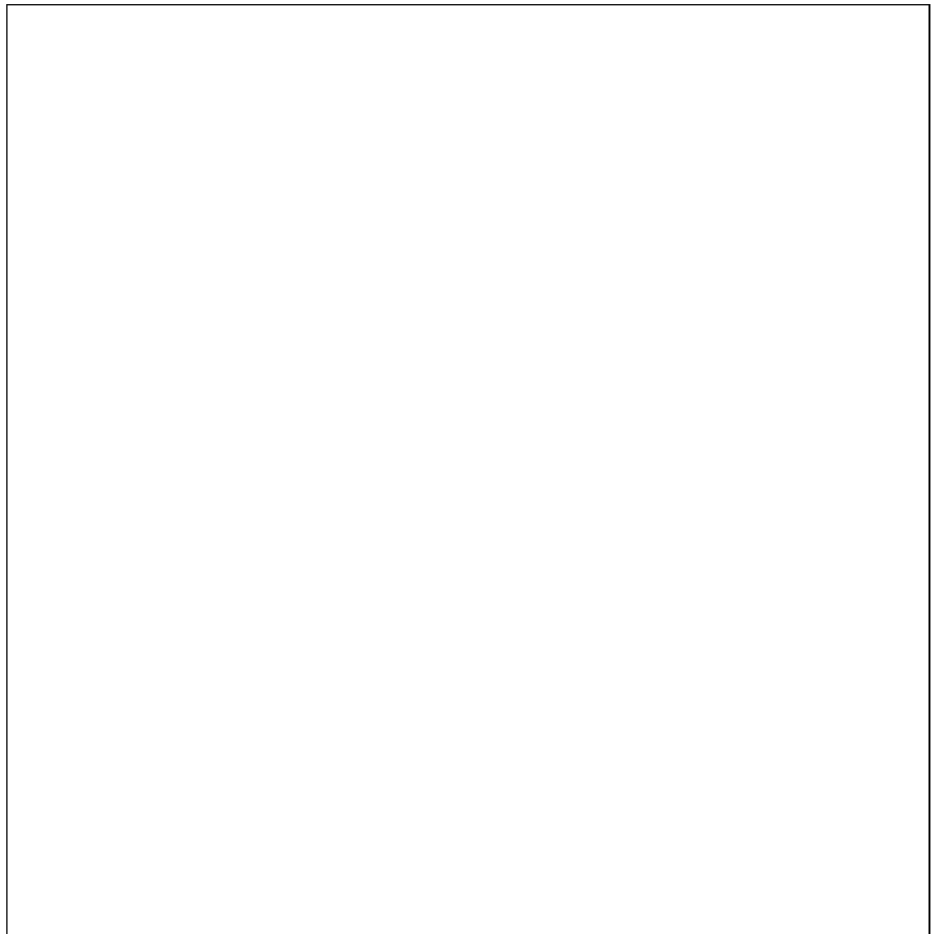
S: *So, how did you get interested in geophysics first of all?*

R: Interest in geology comes along with growing up in Cedar City in Southern Utah. I spent a lot of time on a horse. We had cattle and I love

the out-crops and the geology. There are iron mines out in the valley, and coal mines up Cedar mountain, and in my youth we visited both sites many times. I was interested in geology and this interest fit with what Bob Otis told me about geophysics. I originally signed up to be a math major with the University of Utah. Geophysics was closer to my interests and so I have been involved with geophysics since my first visit to the Geophysical Department at the “U.”

It was interesting – when I came back from my mission in the fall of 1972 – my professors said, “You know Roice, there are no jobs, no scholarship money, and you turned down the last two years of the Pan American Scholarship to go on your mission. You really ought to go into some other profession. You went on a Mission, and obviously are not a geologist.” I thought it was funny. I had really enjoyed my summer with Pan American and so I stuck with geophysics. Of course, the oil embargo happened and less than a year later the oil companies came in and were offering all this money, just because a few of us had a little bit of experience.

S: *Tell us about how and where did you get the idea of 3D seismic interpretation on workstations, which was a dream that you later realized with Landmark Graphics.*



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R: When I was working for Pan American in Denver the first summer, it just seemed like there was a better way to do seismic interpretation. The interpreter, Alex Benton, had me posting picks – he would call up the numbers and I would post the pick on a map – then he would contour the picks. When being shown how to contour, I said, "You know this is three-dimensional. You should be able to look at these surfaces in three-dimensions."

Dr. Ralph Shuey was my Advisor before my mission. Dr. Bob Smith was my Advisor after I returned and was working with data from Yellowstone Lake. Dr. Smith and his graduate students had collected some sparker reflection seismic data across the lake. Because I'd worked for Amoco, he gave me the data and asked me to interpret it. So I did. I made a map of the Base of the Quaternary Sediments in Yellowstone Lake. When I showed the map to Bob Otis, he said this will contour nice in 3-D. He was doing some secret research for the Government in 3-D computer graphics. In those days the University of Utah was very involved in creating the computer graphics revolution. The system they were using was developed by Ivan Sutherland and Dave Evans, and was called the Line Drawing System-One, or LDS-1. This system led to the formation of Evans & Sutherland, the leaders in flight simulators, planetarium presentations, and related high-end 3-D vector graphics applications. Bob took my map, digitized it, and made several three-dimensional projections of the map. It was obvious to me that this needed to be the way geoscientists look at three-dimensional subsurface data.

Before leaving the University of Utah I had drawn different pictures on several pieces of paper, describing an interactive 3-D seismic interpretation workstation. I didn't know anything about 3D seismic. These initial drawings were simply 3-D visualization concepts. When I reported to work for Mobil, the first day they gave me these papers to sign, including patent release forms, which I refused to sign. I told them the ideas I have are too valuable to just give to Mobil. I was not willing to sign papers giving Mobil ownership of everything I had ever done or would do. They talked to me and talked to me and had me go meet with various people around the company. Finally I was ushered in to meet the Manager of ESC (Exploration Services Center), Bob Peacock. He said, "Roice, develop your ideas here. Try to get them developed internally, and if Mobil won't develop them, just go someplace else and do it."

I had grown up on a farm working for my Dad in the family meat packing plant, which had been shut down by the government. So this idea of changing jobs was a whole new concept to me. I thought when you went to work for a big company you were there for your whole life. So I said "Are you sure it's okay if I leave and develop the ideas someplace else?" Bob said, "Yes, people do it all the time." And so that's what we ended up doing. As a sideline, Bob Peacock was the manager of Mobil Norway when they became one of Landmark's biggest customers earlier on.

S: *You have talked about how one thing led to another and you ended up at Landmark Graphics; can you also tell us about the business aspects, how Landmark was financed, or other developments that took place?*

R: When I went to work for Fred at the University of Houston I said, "Fred, we have too many kids to work here very long." We had four children at the time and three years later we had six. So I told Fred I would work at SAL for 2 or 3 years, and then I was going to go and make an interactive 3-D interpretation workstation. This is even though the University of Houston actually paid me very well for a staff geophysicist. I was told I was actually making more than the Chairman in the Department of Engineering, which seemed unfair since I almost had an MBA, and he had PhD.

When I was introduced to the Seis Lab, at the first "3-D Seismic Techniques" course taught in Houston, I knew I needed to be at SAL. Wayne Wade, the E&S salesman gave me the encouragement to sit at the lunch table with Fred and start the conversation. My goal, which was successful, was to use SAL as a test bed to prototype and do a proof-of-concept of interactive 3-D seismic interpretation workstations. Over three years we formed the Image Processing Lab (IPL), the Keck Research Computational Lab (KRCL), the Field Research Lab (FRL), and the Seis Lab (SAL) and Well Logging Lab (WLL) were already formed. So we had five research labs under the Allied Geophysical Labs (AGL). All of these labs were tied to visualization and integration of subsurface data. This was an ideal environment within which to do a proof-of-concept of ideas, which became Landmark Graphics, or other systems like SMT. Tom Smith, the founder of Seismic Micro Technology, was a Ph.D. student at SAL, and influenced development of all of the other commercial workstations which have been developed.

I took the very first notes made at the University of Utah and published them shortly after getting to SAL as a paper called "Introduction to Interactive 3-D Interpretation." Six months later it was published in the Oil and Gas Journal. This paper outlines Landmark Graphics. A while after this publication I got a phone call out of the blue from Kevin Kinsella. He was a venture capital broker, who didn't like the term.

Kevin had helped start a couple of companies in San Diego. One was a company called SpectraGraphics, which built high resolution computer graphics systems for IBM computers. The graphics processors allowed high speed visualization. Kevin was talking to some people in Denver and he saw some seismic sections. He mentioned these data should be displayed on computer screens. The people he was talking to

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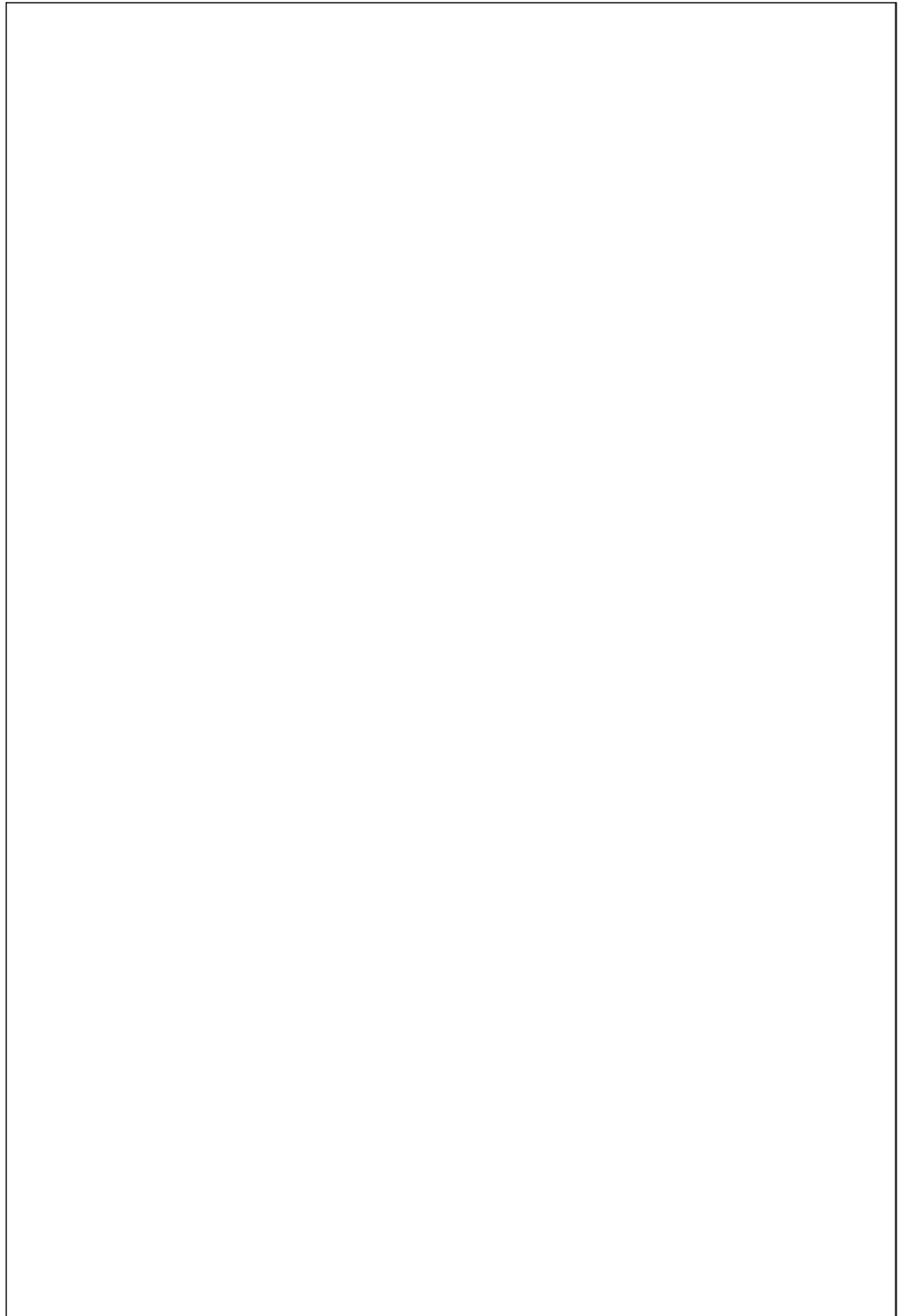
said there was an article in the Oil & Gas Journal about this topic by a very famous geophysicist named Fred Hilterman, and another researcher named G.H.F. Gardner. (I was very insecure and so had put the names of the SAL Principal Investigators on the paper I had written.) Kevin contacted Fred, who by that time had left the Seis Lab to co-found Geophysical Development Corporation. Kevin talked to the principals at GDC about forming a new company to use SpectraGraphics monitors to display seismic.

Let me back up a little bit. At the Seis Lab, I would take sponsors out to lunch regularly. We had grown the sponsorship from 26 to about 42 sponsors. I had made good friends among the sponsors. One day Reg Neil took me out to lunch and said, “You know Roice, maybe you ought to leave the Seis Lab and go into industry.” Then shortly later John Sherwood took me to lunch, and the same conversation was repeated. The next thing I know Fred tells me he is leaving the University of Houston to start a new company with Reg Neil and John Sherwood. These are the three folks Kevin Kinsella was talking to at GDC.

Because the discussions were not progressing as fast as he wanted, Kevin put an ad in the Houston Post for somebody with an MBA, a geophysicist interested in visualization, and who understood geophysics, to manage a new company. Kevin had not told the GDC people about this ad. He showed the ad to Reg, and Reg asked if he had been talking to Roice Nelson. Kevin said “No. Who is that?” Reg told him a little bit about me. Then he showed the ad to John Sherwood, and John asked if he had been talking to Roice Nelson. Finally he showed the ad to Fred, and I recall being told Fred thought Kevin had set him up, in order to bring me into the picture.

So Kevin phones me out of the blue and says he has this idea he wants to discuss. We agreed to meet at The Inn on the Park the evening of the 26th of December 1981. I remember the day, partly because it was the day after Christmas, Boxing Day. So we met and talked for couple of hours. Kevin’s ideas were very close to mine, and this started the business plan conversation.

Kevin and I became friends, and unintentionally ended up taking him away from his discussions at GDC. Kevin attempted to recruit a computer hardware specialist and a software guy. We were turned down by high ranking people. Originally Kevin approached me

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about being the manager, but after he got to know me he told me I didn't have enough gray hair and he would never be able to sell me to the Venture Capitalists. I was 32 at the time. Kevin decided I would play a better role as the geophysicist.

Kevin and I approached many people. We probably spent four months doing this in spare time, and had a fairly decent business plan put together in the spring of 1981. However, everybody had turned us down. So we weren't ready to take the business plan to investors. Kevin flew into Houston from San Diego and we had lunch. During this BBQ lunch, he mentioned we need a really good marketing guy. I told him the best in the industry was Bob Limbaugh, who has been successfully selling the Digicon Disco System. Kevin suggested I approach Bob. It turned out I already had an appointment with Bob to interview him for an article I was writing for World Oil on new technology in exploration geophysics. The topic was about the future of data bases. When we finished the interview I asked if the two of us could talk for a few minutes alone. I asked Bob how he would like to "quit your job, take a cut in pay, and be my boss?" He replied, "Absolutely!" I told him about Kevin and about my efforts to recruit a hardware and software guy. Bob agreed we needed the best in the industry. He told me they are former Exxon Ph.D.'s who have a consulting company called Cyberan Geophysical, named Andy Hildebrand and John Mouton. So Bob went out later that day and asked them if they were interested. They said, "Absolutely!" That's how the five founding shareholders of Landmark got together. Four of us had 100,000 shares each, and Kevin Kinsella had 25,000 shares.

S: *Great. Would you like to share with us some of the hardships that you faced with this plan that you had drawn up and contacting the right people and all that?*

R: Well, it was hard to get the money. It is always hard to raise investment money. It turned out that the work I was doing at the Seis Lab helped find the initial investors. I was doing a lot of consulting with Geosource and Control Data Corporation (CDC). The University of Houston allowed me to consult one day a week. I would go to CDC Executive Seminars in Minneapolis and give presentations to oil executives about results from the Research Computation Lab. We were comparing array processors with Cray and with CDC vector processors. In the spring of 1981 I told my contact it would be my last presentation for them. He wanted to know why, and I told him several of us had put a business plan together, and are looking at starting a new company. I told him I could not tell

him about the business plan. The next thing I knew, CDC flew somebody to Houston to meet with me and they became the first investor group to commit to invest in Landmark Graphics.

About the same time I got a phone call from the assistant to Peter Grauer with Donaldson, Lufkin & Jenrette in New York. He called me because of my series of articles in World Oil. Peter called back a little later and he became the lead investor.

Kevin Kinsella made contact with the people in Dallas who funded Compaq Computers, Lotus 1,2,3, and several other high tech start-ups. L.J. Sevin visited SAL with his associate Dr. Jon Bayless, who became the Chairman of Landmark's Board of Directors, and made a significant difference in helping the company to navigate start up issues. Jon became the most important investor. When the company needed more seasoned management, he found them and brought them into the company.

The fourth initial investor was Elf Aquitaine's venture capital group called NovaTech. Philippe Zaccagnino from Elf Aquitaine's Paris office was building a very complicated physical model. We had everything finished for building the model when he came for a review, and I told him I would be leaving SAL and the folks he had been working with would finish up the model and the data collection. He asked me where I was going, and I told him I was leaving to start a new company. The next thing I knew they had their venture people over to visit with us.

So those four companies, Control Data Capital Corporation, D.L.J. Sprout, Bayless-Sevin-Rosen, and Novatec became the four initial investors in Landmark Graphics.

We had a lot of start-up problems. We hired a really good guy to be in charge of manufacturing, and a really good guy being in charge of marketing. The marketing guy was optimistic, the manufacturing guy based everything he did on what the marketing guy said. He bought too much inventory, and it about put the company under. Jon Bayless brought in Gene Ennis from Texas Instruments, who cleaned up the inventory problems, fired some people, and did things which tore me apart inside. Gene pulled us out of the hole and made it so we actually could deliver those first Landmark workstations.

S: *The success of Landmark Graphics and its public offering must have made you a rich man?*

R: Yes, I made a whole bunch of money, at least a whole bunch to a farm boy from Southern Utah. I turned around and re-invested it in my ideas. I started a company called China Cattle Corporation. The President of the Bureau of Geophysical Prospecting (BGP) in China was retiring to his home community and he wanted to start something to help his region. We got all the paper work done in the states, and everything was all set up to repeat the process in China, when the Tiananmen Square Massacre happened. China shut down. All communications stopped. The project died.

Getting back to the other investments I made with money from Landmark, I started Dynamic Oil and Gas Corporation with Roger Anderson at Columbia University and Larry Cathles at Cornell. We had started the Global

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Basin Research Network (GBRN) and we had done very interesting geotechnical work proving some oil and some gas fields dynamically replenish. Dynamic Oil and Gas Corporation was going to take advantage of and commercial these concepts.

The central hub of my other investments was Walden 3D, Inc. which was to be the general contractor to implement my dream of building a new kind of city. Walden 3-D was named after Henry Thoreau’s “Walden Pond,” and B.F. Skinner’s “Walden 2.” In my mind Landmark Graphics was originally to be the economic and demographic basis of a new type city, Walden 3D was going to be the general contractor for prototyping a city built around people instead of around cars.

The company investment which generated and lost the most cash was HyperMedia Corporation. As mentioned earlier, Landmark paid what is now the University of Louisiana at Lafayette to build a hypertext engine in 1988. This was originally to provide help support to Landmark users. HyperMedia Corporation (originally Hypermedia eXchange Corporation) set out to commercialize this product. I guaranteed loans to run HyperMedia Corporation with Landmark stock. Landmark stock went from \$26.00 per share to \$8.00 per share, and although I thought I was well collateralized, it was not by a factor of 3. The bank called the note, and I have never financially recovered. So that is why I say we made some money, and we spent it all.

S: *Any regrets on doing that?*

R: Oh, it caused problems. You know, there are always regrets when negative things happen, forcing life’s flow to go a different way than you want it to go. It would have been a lot better to invest in more conservative things. Although we were technically right on track with each of the new companies, they were financial failures.

S: *What strategies had you employed to pursue the career options that you actually pursued? I know you had some ideas, you started working on them, and then where-ever you went, you had the same focus in mind all the time?*

R: I did. And this is something which doesn’t get talked about much. When I first arrived in England for my Mission the leaders introduced us to tracting, or knocking on doors, to find those interested

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in our message. The very first day in London I went from door to door in a cement jungle. I decided this way of housing people needs to change. And striving to influence this change became my focus.

My best friend, the drummer in our High School band, Ray Gardner, was getting his architecture degree. I wrote to him about the experience. He wrote back and sent some articles about Paleo Solari, one of Frank Lloyd Wright students, who

is building the new city named Arcosanti at Cordes Junction, 60 miles north of Phoenix, Arizona. I became fascinated with the concept of Archologies, and building cities around people instead of around cars. This became the theme of my projects. Walden 3-D was to be the General Contractor prototyping a new type of city. Landmark Graphics provided a way to accurately define the foundation of the city, and was intended to generate enough money to go and build this city and employees to populate it. HyperMedia Corporation was to provide an information infrastructure for the new city. Dynamic Oil and Gas Corporation, now Dynamic Resources Corporation, was to provide energy for the new city. China Cattle Corporation was to provide food for the new city. Continuum Resources Corporation was to provide a way to design the city in virtual reality. Each project is related to moving along the major goal. We have collected a lot of information and technology over the last 37 years, and we have yet to build any kind of a new city, except in inexpensive virtual reality.

S: *I suggest you remain optimistic.*

R: I do remain optimistic. Cities can be built more three-dimensionally, taking advantage of putting the people together on 5% of the property, and leaving the rest of the property as nature so inhabitants can keep in touch with natural cycles. Mass transit will connect similar kinds of communities. Everything in these communities will be within walking distance. The name Walden 3-D is meant to reflect these concepts.

P: *You may well be there one day.*

R: We'll be forced to. Remember in 1979 when there were all of the lines at gasoline stations? At the time, I was helping run 4 land company seismic crews for Mobil Oil. Attempting to get oil and gas for the crews through the U.S. Government quota system was hard. The government officials would not provide a quota if there was not proof of similar expenditures in the area the year before. So here we are, working to find oil and gas, and we couldn't get oil and gas to run our crews. At the same time I'm pursuing these ideas about trying to minimize the use of oil and gas for automobiles, so we can use it for medicines and fertilizers and make-up and synthetics and paints and other options which have more long term relevance than burning it up for transportation because we have built our infrastructure around the concept of inexpensive gasoline, and because the impact of Peak Oil has yet to be widely recognized.

S: *Roice let me ask you this. What personal quality or qualities did you draw on when you led all these efforts, including Landmark?*

R: The ones that are important to me are hard work, which I learned from my Dad; honesty, which came from my Dad and my Mom; and studying problems out. My Mom was a university professor and administrator. I think just telling the truth and working hard and believing things are going to turn out OK, are what is important.

S: *The other quality that you mentioned before is dreaming big?*

R: Well I have never known how not to. One of my friends once said, "Roice doesn't think outside the box, he doesn't even know there is a box."

S: *What personal and professional vision are you working towards?*

R: I have several things that I am working on. I have a book which I talked to you a little bit about – it's called "An Open Mind." I have some new ideas for exploration that I would like to pursue, which I think are very valuable. In fact, I think they are revolutionary. I only talk about details after a non-compete has been exercised. I think we've got some ideas, developed over many years, with the potential to make bigger change to society than we made with Landmark.

S: *Good. Tell us about this Walden 3-D you mentioned this a couple of times, what is the state of that consultancy?*

R: W3D is my vehicle for doing seismic interpretation consulting. Landmark gave me two lifetime licenses to their seismic interpretation software, and I use this software through W3D.

S: *I had the opportunity of looking at the website a couple of years ago. The impression I have is that it was really interesting; something about cross plotting, something about attributes, etc.*

R: There are a variety of things that I have worked on over the years I have kept proprietary, and kept the rights to, even when I went to work for Geokinetics.

We have some data mining techniques that I think are unique, particularly when they are tied with some of the work of some of my colleagues.

One of my colleagues, Sam Leroy, taught me about geopressure pods. This concept is particularly useful on the Gulf Coast. Fluids are dynamically migrating into these geopressure cells, feeding them. Dynamic gas and fluid movements and vapor lock seals occur in the Gulf Coast, as well as in places like Alberta. Elmworth is an Alberta example.

S: *Tell me about the biggest compliment that you have ever received?*

R: I am sure the complements that mean the most to me have to do with my kids and my grandkids. I remarried and my wife has 4 kids, so we have 10 kids now. We just went to blessings for grandchildren 7 and 8, one in St. Louis two weeks ago, and then last Sunday in Salt Lake. Family is what is most important

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to me. The kids are all doing well. Given this context, the compliment which meant the most to me was from the kid's orthodontist. He has put braces on almost all of these kids, and when he realized they are all from the same family he said, "I can't believe it these kids are all from the same family. They are so different from each other." I thought it was wonderful we have been able to raise these kids so that they could become

their own person and they are not replicas of whoever, or whatever. They are each their own person.

S: *I would like you to comment on the changes that you perceived in our industry in the last 30 years or so, what are the most noticeable changes that you observed?*

R: Workstations are a big change. It's fun to go on the floor to one of the conventions with somebody that was around before the workstations, and listen to them talk. Workstations have made a big change in our industry. However, I am not sure it's always for the better. Technology can seem to be so easy you don't need to think any more, and this is a problem. Look at the number of people that have left our industry over the timeframe of our careers. It is phenomenal the industry is able to function with the number of people that have been fired, retired, or who quit.

S: *Is that because of the fluctuation of oil prices?*

R: Oil prices were a big part. A lot of the reason folks were forced out of the industry was because the oil companies had got too big, and were not running as efficiently as they should. There are the corporate raiders. Then there is the other big factor – technology. Technology did come in and replace a lot of people.

There are just a lot of people who have left the industry. I find it quite scary, specifically because our society is so dependent upon hydrocarbons for so many aspects besides transportation. I have been part of the Visiting Geologists Program (VGP) for the AAPG for several years. It is scary when you go around the schools and give a presentations and to three students at the University of Texas, where a few years earlier there had been 60 students. There are more students now, and I doubt if the growth is fast enough to meet industry needs. Especially since many of the students are from National Oil Companies, and will be returning to these companies after graduating. Along these lines, I see the fact we are not capturing the experience and the knowledge leaving the industry by retirement as a significant problem. I don't think we'll ever see the kind of well rounded scientists who initially built up our industry again. There are just not a lot of folks like Nigel Anstey who come along.

S: *You forgot to mention the Internet that we use in our daily professional lives. It is so convenient now to transfer data, get ready access to tons of information, I thought you would mention that too.*

R: HyperMedia was built on Internet concepts. Actually so was Landmark. When we put together our first business plan, we got the initial investment on the 15th of December 1982. Nine months later we had our first three prototype systems built, which we loaded into my van and drove to Las Vegas for the September 1983 SEG Convention. Our family had a big van for six kids. We put two systems on the floor of the convention, and the third in the hotel suite, in case one of the others broke down. The two systems on the floor of the convention were connected by a yellow umbilical cable. One was in our booth, and one was in Control Data Corporation's booth. Looking back, it was visionary John Mouton who had the Ethernet connection available with our first workstations. This was in 1982 and shows Landmark was involved in Internet technologies from the beginning. In fact, Landmark installed the first commercial dedicated internet connection in Houston – between Rice University and Katy, because of joint research projects we were doing with the Landmark University Program. Particularly because of the GBRN work we were doing with Roger Anderson at LDEO and Larry Cathles at Cornell. I already mentioned how Continuum Resources used DSL Internet connections to do collaboration with terabyte 3D seismic surveys all across the world.

S: *A straight forward question for you: Do you believe new geophysical technologies hold the promise of extraction of more information to characterize hydrocarbon reservoirs? I realize you have some revolutionary ideas based on technology you are working on, and I would still like you to mention something about the probable future impact of new technologies.*

R: In my opinion most of the world oil basins are now production environments. We've got enough holes. We've got enough data and if we use that data correctly we have a pretty good idea about what we are going to find in these basins. And so the question is: How do we mine the data? How do we look at that data differently? Data mining techniques and technologies are very powerful. One of the tools I have used extensively the last few years is a tool called Spotfire. It allows cross-plotting of lots and lots of data in many dimensions, colors, shapes, and types of displays. We have found this extremely useful in terms of finding trends and patterns and understanding what is happening.

One of the things that Fred did just the other day, just blew me away, and he has known this for a long time. If you look at an incised valley, in the areas both above and under the unconformity the rocks are woven together during deposition, they are more ridged than at the unconformity surface. So if you look at the rigidity term in the AVO equation, you realize seismic amplitudes from the unconformity surface at far offsets of 40-50 degrees will bloom. In fact, in areas of conformable deposition, depositional weaving implies the rigidity term in the AVO equation will still give seismic reflections from the unconformity surface or Sequence Boundary. Peter Vail taught industry seismic reflections come from time surface boundaries. I did a lot of work with Pete Vail back in the 1980's, and never understood how the velocity and density terms in acoustic impedance are related to chronostratigraphic time surfaces. Well, what Fred taught me is reflections come

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from time surfaces because of the rigidity term in the AVO equations. So if you have far offset data, you are actually imaging these time surfaces. If you can do this, and if you understand what is causing the reflections, then all of a sudden the sequence stratigraphy concepts become very important exploration tools.

S: *And in the Gulf Coast you have plenty of sequence boundaries.*

R: You still have Leduc Reefs and other stratigraphic surface boundaries in Alberta.

S: *What new areas of geosciences interest you more than the others?*

R: Well, I guess probably the thing that has interested me the most that I haven't really had a chance to pursue as much as I would like for the last four, five years has to do with cuttings. I think that there is a jewel there.

S: *Drill bit cuttings you mean?*

R: Yes, just drill bit cuttings. The reason I think there is a jewel here is because those cuttings have information we don't really have any other way to access. Things like color, grain size, grain shape, chemistry, and various other things like that.

P: *How much value is in this information?*

R: I have a friend named Christian Singfield. He is a Canadian who lives in Brisbane, Australia, and is a metallurgist by training. He developed a technique based on CCD arrays, basically a fax machine, where you take a core or cuttings and you run this scanner across it with perfect white light at 45 degrees on either side of the scanner. The result is a repeatable image. By capturing the image in a controlled environment, the data are digitized in a repeatable fashion, and for the first time become shared scientific data. The data can be correlated well to well based on color, grain size, chemistry, and geostatistics. Christian has also developed, patented, and trademarked a new type of cuttings tray, which fits in a slide carousel type devise. Two of these carousels can handle all of the cuttings from a 10,000 foot well. The geostatistics associated with being able to take every individual grain from the cuttings, digitally removing those grains which come from cave-ins further up the hole, will lead to new ways of correlating and tying geological and geophysical data.

S: *Apart from this anything else?*

R: Oh, I like sequence stratigraphy, I like large scale geology stuff. We went up to Lake Louise and the surrounding area yesterday. I just love looking at the outcrops.

S: *Well, this one you have answered. In the early 80s you had written a book on "New Technologies and Exploration Geophysics," if I remember it correctly. How is it we didn't see anything any other book from you after that?*

R: You have to understand why I wrote that book. I wrote that book as an advertisement for Landmark.

S: *What's the word harbinger? Forerunner for what is coming?*

R: Yes. Laura Pankonien was the Exploration Editor of Gulf Publishing and asked if I would write an article about exploration research at the University of Houston. I told her, "No, but I will write ten articles, if at the end you will publish them as a book." She told me this would be no problem. I wrote ten articles in 1981 and 1982, and added a couple of chapters and published it as a book in early 1983. Then I got a contract with Nigel Anstey's and Dave Donohue's company, International Human Resource Development Corporation (IHRDC), to teach a course based on the book. Basically that covered the cost for me to go from Europe to India to Venezuela and to Calgary to market Landmark technologies.

There are two stories, which haven't been told very often, and which your readers might enjoy. First, Landmark's initial convention in Europe was in 1983, when Bob Limbaugh and I went to the Oslo EAEG. We only had our plans and conceptual ideas. John Denham, Chief Geophysicist at Broken Hill Proprietary, came to our booth and asked us if we could actually do anything. I said, "Yes, and much more in September." He replied, "Well, if I bring a 3-D survey on a tape to the SEG in September, and if you can load it and make a map with it, BHP will buy your system." He brought the data, we loaded it and interpreted it, and he bought the first Landmark system delivered, serial #2.

Second, the next year, the 1984 EAEG was in London. After the convention I moved a workstation from the floor of the convention to the Sheraton in Kensington for an IHRDC course and I gave a course based on my book. We had people from all over Europe. I started my introductions, "You know the book is called, "New Technologies and Exploration Geophysics" and it is already obsolete. It was dedicated to my wife and five kids, and we have six kids now." Years later I found out that during the first break, one of the guys from Shell Expo and one of the guys from Shell Research in Rijksweg, Holland had a talk and one put down a five pound bill and said, "I bet I can get one through the bureaucracy quicker than you can." And that's how Landmark got into Shell. Two guys working on the inside over a 5 pound bet, to get past bureaucratic hurdles.

I wrote the "New Technologies in Exploration Geophysics" because we needed to get the word out about the technology. I am not sure why I haven't really felt a need to write more books. I have never considered myself much of a writer. I'm visual and struggle with words.

However, to exercise that part of my mind, I do a lot of writing for my kids. I have posted what would now be called a blog every week since 1996. I continue to work on a hypertext poem for them called "Prime Words." There are paintings, songs, and about 300 pages of 4 line stanzas full of advice, in the versions I've printed for the kids so far.

I have also been working on a book about science and religion called "An Open Mind." The title comes from a verse out of the Book of Mormon. It bothers me so many people say you

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can not have religious beliefs if you are a scientist. Of course, any book about religion is going to come from your own personal perspective. I have been attempting to make my writing as generic as possible, explaining if you have an open mind there are things scientists can learn from the religious, and there are things people involved in religion can learn from science. Basically I'm attempting to counter some of the "Scope's Monkey Trial" baloney which goes on in the States. As mentioned before, my book is called "An Open Mind," and the first 200+ pages are on-line.

P: *Openmind.com?*

R: No, it is at <http://www.walden3d.com/openmind/i.html> and I am about half way through the third chapter. I have outlined ten chapters. So at the rate I am going, since I only work on it when I can, I figure it might take another 10 years to complete.

S: *Roice, tell us what are your other interests?*

R: Oh, my kids and my grandkids, my wife, my family, house. I play the guitar, I have written maybe 130 songs and I enjoy that. I enjoy my church work. I teach 7 & 8 year olds at church, and they are a blast. They are about my age socially. We get along great. I like to read. I read a lot. I've got a fairly extensive library. I am always reading, trying to learn something.

S: *What would be your message for young entrance to our profession?*

R: I wish I was smart enough to give you a sentence.

S: *Well, you can elaborate, no problem.*

R: I think that geophysics is a wonderful profession. I think that there are really no limits to what we can do, other than the limits we put on our own mind. The impact we have on society as a whole is phenomenal. I think of the impact 3-D seismic and workstation technologies have had over the last 25 years. It's been phenomenal. I think how we haven't repeated the gasoline lines we had in 1979. I think a lot of the reason has to do with technologies and resulting new discoveries. I do feel like we are going to have gasoline lines again. I think some of the ideas I am playing with, the idea of dynamic replenishment, geopressure cells, correlation of cuttings, and others can continue to make a positive difference.

I think that there are things that could be done that are not being done. Taking advantage of tides and putting lots of turbines in rivers and oceans. I love the idea of the Solar



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Tower, which is being built in Western Australia, or at least they are talking about it.

S: *Yes, in general I think many of us see there are many opportunities which can be pursued. Are there any other interests you have not talked about?*

R: I guess one of my interests that I didn't talk about is water. I grew up on the back end of a shovel and so I know how much water is worth. We had to irrigate all of our crops in Cedar City (Southern Utah). I have fairly closely followed the activities of the Central Iron County Water Conservancy District. I think there are several things that we could do we haven't done. For instance, just as an out-of-the-box idea for a young entrant to our profession, think of the impact of coming up with a way to easily and abundantly capture condensation.

S: *Okay Roice, we are done with the questions. Thank you very much for giving us this opportunity of sitting down and chatting with you.*

R: Two post-interview comments. First, I did do a dump on my old database of contacts, and found 238 names in Canada. Many names brought back good memories and I'm sure most are at different companies now than listed in my old database now. It was wonderful to play guitars together with Peter, Brian Russel, and Rob Stewart at SEG Conventions, and to see how

this grew into the Presidential Jam Session. I was surprised how many university connections are in my Canadian contact list. This is probably from the days of the Landmark University Program.



Second, all of these memories bring back to mind a comment I've made several times at various places around the globe. Because of how my career evolved, I have had the opportunity to work with geophysicists all across the globe, and from many different companies. This rather unique opportunity has allowed me to build a picture in my mind of different geophysical cultures. My comment is there is something about the geology in Alberta, whether it is complex overthrusting or hard to find Leduc Reefs, which requires geophysicists to become exceptionally competent technically. In my experience Canadian geophysicists are technically a cut above other geophysicists across the world.

Thanks for the recognition accompanying the astute forum associated with this interview. Hopefully some who read this will find something useful. **R**

GeoSkills Day & Geoscience Mixer Wednesday February 6, 2008

Mark the date! More info to follow!

Organized and Sponsored by: APEGGA, CSEG, CSPG, and undergraduate student societies U of A: GUSS, P.S. Warren; U of C: GUSS, Rundle. A day of mini-courses geared for undergrads, recent grads & industry mentors.

Location: Donated venues in downtown Calgary
(Chartered bus for U of A Students)

10 am - 4 pm: Courses & lunch. Fees TBA. Registration will be required.

4 pm - 6:30 pm: Geoscience Student-Industry Mixer, Metropolitan Centre, Calgary

More info to follow on APEGGA, CSEG, CSPG websites, thru e-mails, or contact Becky Windley in the APEGGA Calgary office bwindley@apegga.org (403-262-7714) or Flo Primeau in Edmonton (1-800-661-7020).