

Quantitative Interpretation, New Challenges, and Economic Value



Lee Hunt, P. Geoph

2012 CSEG Distinguished Lecturer

[Download Lee Hunt's CDL CSEG Luncheon talk \(PDF\)](#)

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Lee Hunt Radio Interview

This radio interview was given by the CDL Lecturer, Lee Hunt, to the Vancouver Island University radio program "Not Rocket Science" on CHLY 101.7 FM in Nanaimo, BC prior to Lee's visit there. The interview discusses the public interest in the CDL Tour lecture and touches upon the need for scientific literacy.

[Listen to the radio interview with Lee Hunt \(18mb - MP3\)](#)

Abstract

Recent advances in drilling and completions technology, economics, and changes in our business models have been profound. These advances are overwhelmingly concerned with a quantitative description of material properties, stress, and azimuthal properties of our reservoir and its bounding materials. Surface seismic data can provide estimates of many of these variables, but has tended not to be used to its full extent because of an historical lack of quantitative orientation from interpreting geophysicists working in the oil and gas industry. There are many reasons for this unfortunate deficiency, not the least of which is the phenomenal pace of change in the new business model driven by the exploitation of tight reservoirs. We must address these changes in business and engineering technology by embracing quantitative methods, and get deeper into the fight to cost efficiently develop these tight resources. A number of recent publications have begun the process of addressing the need for quantitative approaches. This talk is meant to support the previous efforts and encourage the work yet to be done on this subject. The relationship between business needs and university research is a motif that is ubiquitous in this discussion.

My lecture will define and explain "quantitative methods", their history, their value, their weaknesses, and why they are not only essential to tight reservoirs, but to all our efforts in effectively describing the earth. Quantitative methods are intimately related to the kinds of seismic data being used and the business purpose to which they are aimed, and so both need to be examined. This leads us first to a discussion of seismic

data types and attributes, with an emphasis on some of the newer techniques and their related business problems. In particular, amplitude versus offset analysis (AVO), amplitude variation with azimuth (AVAz), velocity variation with azimuth (VVAz), curvature, and depth prediction will be discussed. Some of the quantitative work done on these attributes will be surveyed, including special challenges involved in relating them to the relevant geologic, engineering, or performance data that represent the business side of the problem.

Measurable value will be demonstrated from this approach in a number of ways. In particular we will follow the causal chain of the use of interpolation to produce better imaging, to obtain better AVO results, to achieve better drilling results, and to enjoy better economic results. Each element of this chain will be shown quantitatively, which allows us to see the value of enabling technology (interpolation), better physical measures (AVO), and finally better wells. This chain started with work on interpolation performed at Canadian universities, and unequivocally demonstrates the value of the research and encourages similar work.

We will delve further into the value of good research and seismic processing relative to operational performance, specifically steering horizontal wells. Converting seismic times to estimated depth is one of the oldest uses seismic has been put to, and with the need to steer horizontal wells within thin reservoirs or to avoid geo-hazards, the accuracy of these predictions has taken on a new meaning. The effects of reprocessing 3D seismic data using the latest research to produce higher resolution data and achieve more accurate time-depth predictions will be shown. Further, I will demonstrate statistically the improvement in our ability to steer horizontal wells after this work has been done, and relate that improvement to production increases and economic advantage.

All of these examples are testament to the value of research and its appropriate application to business. Quantitative interpretation is an extension or continued use of the scientific method by the oil and gas geoscientist, and forms a structure around which better decisions can be made. The research elements being discussed and the emphasis of the scientific method reinforce the importance of what we learn in universities and the ongoing research that happens there.

Biography

Lee Hunt currently consults, primarily for Fairborne Energy. He graduated from the University of Alberta with a B.Sc. in geophysics in 1990, after which he started his career working for PanCanadian Petroleum Ltd. At PanCanadian he was mentored by Bill Goodway, who invited all geophysicists at the company to ask questions and

remain scientists, even if they were applied scientists. With this encouragement, Lee formed a task force devoted to improving the suppression of short period multiples. This project taught him how productive university-industry relationships could be.

The latter two thirds of Lee's career have largely been at junior oil and gas companies. He has been through six corporate take-overs. His experience ranges from interpretation to managing a business unit, and he has conducted several winter access only drilling campaigns in NEBC and Northern Alberta. To date, he has drilled over 300 wells in most of the play types within the Western Canadian Sedimentary Basin. This drilling experience includes heavy oil, shallow gas, deep carbonate exploration, deep basin, Peace River Arch, Saskatchewan and Manitoba oil, and includes vertical as well as horizontal drilling. This diversity of experience has encouraged him to test a broad variety of technologies and to remain close to most research relevant to these endeavours. He has employed qualitative and quantitative analysis of his drilling results throughout his career as a method to assess and improve his technique. This experience includes living on the sharp end (that is, the results of) of the analysis of multiple attenuation, resolution enhancement, depth and geo-hazard predictions, AVO, AVAz, VVAz, curvature, and the prediction of fluid, lithology, porosity, fracture treatment characteristics, and production. This continuous evaluation has resulted in numerous technical publications.

Lee has been involved in the publication of 30 professional lectures, papers, and formal presentations. In these presentations, he almost always works with people in the processing and research community, as well as other geoscientists, in an attempt to present a balanced work. Lee and his co-authors won Excellence of Oral Presentation for the 1997 SEPM Convention, and he was also co-recipient of the 2000 CSEG Convention Best Paper Award, as well as the 2008 CSEG Convention Best Geophysical Abstract, the 2008 CSEG Best Technical Luncheon Talk, and the 2010 CSEG Convention Best Geophysical Oral Presentation. Lee has contributed to the CSEG in the past by acting as the 2001 CSEG Convention Technical Chairman, has chaired numerous sessions at CSEG annual conventions, and was one of the co-creators of the CSEG MLA. He is a supporter of APEGGA, and was a participant in the creation of APEGGA's Q.I. Practise Standard as well as APEGGA's Guideline for the Ethical Use of Geophysical Data.

Distinguished Lecture Tour Itinerary

Date	Universities or Institutions Included	City
LEG 1		
Sep 16, 2011	Lakehead University	Thunder Bay, ON
Sep 19, 2011	Memorial University, Newfoundland Mines & Energy	St. John's, NFLD
Sep 20, 2011	Dalhousie University, GSCA	Halifax, NS
LEG 2		
Oct 3, 2011	Queen's University	Kingston, ON
Oct 4, 2011	Laurentian University	Sudbury, ON
Oct 5, 2011	University of Toronto	Toronto, ON
Oct 6, 2011	Carleton University, University of Ottawa, GSC Logan	Ottawa, ON
Oct 7, 2011	University of Western Ontario	London, ON
LEG 3		
Oct 12, 2011	University of Calgary	Calgary, AB
Oct 13, 2011	University of Alberta	Edmonton, AB
Oct 27, 2011	University of Regina	Regina, SK
Oct 28, 2011	University of Saskatchewan	Saskatoon, SK
LEG 4		
Jan 9, 2012	Mount Royal University	Calgary, AB
Jan 16, 2012	University of Victoria, PGC	Victoria, BC
Jan 17, 2012	Simon Fraser University	Vancouver, BC
Jan 18, 2012	Vancouver Island University	Nanaimo, BC
Jan 19, 2012	University of British Columbia	Vancouver, BC
Jan 23, 2012	CSEG Luncheon	Calgary, AB