

Reidar B. Bratvold

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ADDRESS

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EDUCATION

- 1985 – 1989 **Stanford University**, Stanford, CA
PhD in Petroleum Engineering,
Dissertation: *An Analytical Study of Reservoir Pressure Response Following Cold Water Injection*
- 1985 – 1987 **Stanford University**, Stanford, CA
MSc (no thesis) in Mathematics
- 1982 – 1984 **University of Tulsa**, Tulsa, OK
MSc in Petroleum Engineering,
Thesis: *A Simulation Study of Gas Wells under Radial Flow Conditions*
- 1979 – 1982 **University of Stavanger**, Stavanger, Norway
DH-ingeniør (BSc equivalent) in Petroleum Engineering,

RELEVANT EXECUTIVE EDUCATION

Real Option Valuation,
Applied Decision Analysis (2001).

Leading and Managing Change,
Graduate School of Business, Stanford University (2000).

Developing and Managing a Successful Technology and Product Strategy,
Sloan School of Management, Massachusetts Institute of Technology (2000).

International Executive Program,
INSEAD, Paris, France (1998).

PROFESSIONAL EXPERIENCE

- 2007 – Present Professor of Petroleum Investment & Decision Analysis, Department of Petroleum Engineering, University of Stavanger, Norway
- 2005 – Present Adjunct Professor of Petroleum Engineering & Management, Australian School of Petroleum, University of Adelaide, Adelaide, Australia
- 2005 – 2009 Chief Scientist, IRIS (formerly RF), Stavanger, Norway
- 2005 – 2007 Professor II of Petroleum Engineering & Management, Department of Petroleum Engineering, University of Stavanger, Norway
- 2002 – 2005 Professor and Discipline Head, Petroleum Engineering & Management, Australian School of Petroleum, University of Adelaide, Adelaide, Australia
- 1998 – 2001 Vice President, Business Modeling, Reservoir Management, and Production Systems, Landmark Graphics Corporation, Houston, TX
- 1996 – 1998 General Manager, Smedvig Technologies Software (now Roxar), Stavanger, Norway
- 1993 – 1996 Founder and Managing Director, ODIN Reservoir Software & Services, Stavanger, Norway
- 1988 – 1993 Senior Scientist, IBM European Petroleum Application Center, Stavanger, Norway
- 1985 – 1987 Research Engineer, Rogaland Research Institute, Stavanger, Norway
- 1983 – 1985 Reservoir Engineer, Statoil, Stavanger, Norway

AWARDS AND HONORS

- 2003 – 2004 SPE Distinguished Lecturer
Topic: *Would You Know a Good Decision if You Saw One?*
- 2001 Special Recognition: “Risk Based Decision Support Project.”
- 2000 Landmark Graphics Best Team Award - DecisionSpace
- 1998 – 1999 SPE Distinguished Lecturer
Topic: *Uncertainty Assessment and Risk Management in Reservoir Engineering*
- 1993 IBM Exceptional Achievement Award
- 1992 IBM Travel Stipend
- 1991 IBM Exceptional Achievement Award – High Performance Computing
- 1988 Winner Ph.D. division, SPE student paper contest, Long Beach, CA

PUBLICATIONS and PRESENTATIONS

Books & Book Chapters

- Bratvold, R.B. and Begg, S.H. 2009. *Decision-Making under Uncertainty*. Dallas: SPE.
- Bratvold, R.B. and Horne, R.N. 1992. *An Analytical Solution to a Multiple-Region Moving Boundary Problem: Nonisothermal Water Injection Into Oil Reservoirs* The Mathematics of Oil Recovery, ed. P.R. King. Oxford Clarendon Press.

Refereed Journal Papers, published or accepted for publication

- Willigers, B.J.A. and Bratvold, R.B. 2009. Valuing Oil and Gas Options by Least-Squares Monte Carlo Simulation. *SPE Projects, Facilities & Construction*.
- Bratvold, R.B., Bickel, E.J., and Lohne, H.P. 2009. Value of Information: The Past, Present, and Future. *SPE Reservoir Evaluation and Engineering*.
- Bickel, E.J. and Bratvold, R.B. 2008. Decision Making in the Oil & Gas Industry: From Blissful Ignorance to Uncertainty - Induced Confusion. *ENERGY EXPLORATION & EXPLOITATION* **26**(5), 311-325.
- Bratvold, R.B. and Begg, S.H. 2008. I would rather be vaguely right than precisely wrong: A new approach to decision making in the petroleum exploration and production industry. *AAPG Bulletin* **92**(10), 1373–1392.
- Al-Harthy, M., Begg, S., and Bratvold, R.B. 2007. Copulas: A New Technique to Model Dependence in Petroleum Decision Making. *J. Pet. Sci. Eng.* **57**(1-2), 195-208.
- Al-Harthy, M., Khurana, A., Begg, S., and Bratvold, R.B. 2006. Investment Decisions, Systems Approach vs. Sequential Approach: Do Functional Dependencies And Interactions Matter? *Australian Petroleum Production and Exploration Association (APPEA) Journal* **46**(1), 511 - 524.
- Begg, S. and Bratvold, R. 2004. The Value of Flexibility. *Southern China Oil & Gas Journal* **17**(4).
- Bratvold, R.B., Holden, L., Svanes, T., and Tyler, K. 1995. STORM: Integrated 3D Stochastic Reservoir Modeling Tool for Geologists and Reservoir Engineers. *SPE Computer Applications* **7**(3), 58 – 68.
- Bratvold, R.B. and Horne, R.N. 1990. Analysis of Pressure Falloff Tests Following Cold Water Injection. *SPE Formation Evaluation* **September**, 203 - 302.
- Larsen, L. and Bratvold, R.B. 1994. Effects of Propagating Fractures on Pressure-Transient Injection and Falloff Data. *SPE Formation Evaluation*.
- Reynolds, A.C., Bratvold, R.B., and Ding, W. 1987. Semilog Analysis of Gas Well Drawdown and Buildup Data. *SPE Formation Evaluation* **December**, 657 - 670.

Conference presentations with associated full written paper

- Willigers, B.J.A., Bratvold, R.B., and Hausken, K. 2009. A Game Theoretic Approach to Conflicting and Evolving Stakeholder Preferences in the E&P Industry. Paper SPE 124178 to be presented at the SPE Annual Technical Conference and Exhibition, New Orleans, Louisiana, 4-7 October.
- Jafarizadeh, B. and Bratvold, R.B. 2009. Taking Real Options into the Real World: Asset Valuation through Option Simulation. Paper SPE 124488 to be presented at the SPE Annual Technical Conference and Exhibition, New Orleans, Louisiana, 4-7 October.
- Rajaieyamechee, M.A. and Bratvold, R.B. 2009. Real-time Decision Support in Drilling Operations using Bayesian Decision Networks. Paper SPE 124247 to be presented at the SPE Annual Technical Conference and Exhibition, New Orleans, Louisiana, 4-7 October.
- Jafarizadeh, B. and Bratvold, R.B. 2009. Real Options Analysis in Petroleum Exploration and Production: A New Paradigm in Investment Analysis. Paper SPE 121426 presented at the SPE Europec/EAGE Annual Conference and Exhibition, Amsterdam, The Netherlands, 8-11 June.
- Jafarizadeh, B. and Bratvold, R.B. 2009. Strategic Decision Making in the Digital Oil Field. Paper SPE 123213 presented at the SPE Digital Energy Conference and Exhibition, Houston, Texas, 7 - 8 April.
- Arild, Ø., Lohne, H.P., and Bratvold, R.B. 2008. A Monte Carlo Approach to Value of Information Evaluation. Paper SPE IPTC 11969 presented at the International Petroleum Technology Conference, Kuala Lumpur, Malaysia, 3 - 5 December.
- Begg, S.H. and Bratvold, R.B. 2008. Systematic Prediction Errors in O&G Project and Portfolio Selection. Paper SPE 116525 presented at the SPE Annual Technical Conference and Exhibition, Denver, Colorado, 21-24 September.
- Willigers, B.J.A. and Bratvold, R.B. 2008. Valuing Oil and Gas Options by Least-Squares Monte Carlo Simulation. Paper SPE 116026 presented at the SPE Annual Technical Conference and Exhibition, Denver, Colorado, 21-24 September.
- Fjellheim, R.A., Bratvold, R.B., and Herbert, M.C. 2008. CODIO - Collaborative Decision-Making in Integrated Operations. Paper SPE 111876 presented at the SPE Intelligent Energy Conference and Exhibition, Amsterdam, The Netherlands, 25–27 February.
- Sund, K.A. and Bratvold, R.B. 2008. Integrated Operations: How Effective is the Current Relationship between Operating Companies and Suppliers? Paper SPE 112180 presented at the SPE Intelligent Energy Conference and Exhibition, Amsterdam, The Netherlands, 25–27 February.
- Bratvold, R.B., Bickel, E.J., and Lohne, H.P. 2007. Value of Information: The Past, Present, and Future. Paper SPE 110378 presented at the SPE Annual Technical Conference and Exhibition, Anaheim, California, 11-14 November.
- Begg, S.H., Welsh, M.B., and Bratvold, R.B. 2007. The impact of common biases on the value of O&G investment decisions. Paper SPE 109610 presented at the SPE Annual Technical Conference and Exhibition, Anaheim, California, 11-14 November 2007.
- Bickel, E.J. and Bratvold, R.B. 2007. Decision Making in the Oil & Gas Industry: From Blissful Ignorance to Uncertainty - Induced Confusion. Paper SPE 109610 presented at the SPE Annual Technical Conference and Exhibition, Anaheim, California, 11-14 November 2007.

REIDAR B. BRATVOLD - RESUME

- Welsh, M.B., Begg, S.H., and Bratvold, R.B., *Efficacy of bias awareness in debiasing oil and gas judgments*, in *Proceedings of the 29th Annual Conference of the Cognitive Science Society*. 2007a. p. 1617 - 1652.
- Welsh, M.B., Begg, S.H., and Bratvold, R.B. 2007b. The impact of common biases on the value of O&G investment decisions Paper SPE 110765 presented at the SPE Annual Technical Conference and Exhibit, Anaheim, CA, 11-14 November.
- Welsh, M.B., Begg, S.H., and Bratvold, R.B. 2007c. Modeling the Economic Impact of Cognitive Biases on Oil and Gas Decisions. Paper SPE 110765 presented at the SPE Annual Technical Conference and Exhibit, Anaheim, CA, 11 - 14 November.
- Bratvold, R.B. and Begg, S. 2006. Education for the Real World: Equipping Petroleum Engineers to Manage Uncertainty. Paper SPE 103339 presented at the SPE Annual Technical Conference and Exhibition, San Antonio, Texas, 24 - 27 September.
- Welsh, M.B., Begg, S.H., and Bratvold, R.B. 2006. Correcting Common Errors in Probabilistic Evaluations: Efficacy of Debiasing. Paper SPE 102188 presented at the SPE Annual Technical Conference and Exhibit, San Antonio.
- Yao, Y., Begg, S.H., Bratvold, R.B., Behrenbruch, P., and van der Hoek, J. 2006. Case Studies for Comparison of Different Real Option Approaches. Paper SPE 101031 presented at the SPE Asia Pacific Oil and Gas Conference and Exhibition, Adelaide, Australia, September 11 – 13.
- Bratvold, R.B., Laughton, D., Enloe, T., and Begg, S.H. 2005. A Critical Comparison of Real Option Valuation Methods: Assumptions, Applicability, Mechanics, and Recommendations. Paper SPE 97011 presented at the SPE Annual Technical Conference and Exhibit, Dallas, TX, 9 - 12 October.
- Welsh, M.B., Bratvold, R.B., and Begg, S.H. 2005. Cognitive Biases in the Petroleum Industry: Impact and Remediation. Paper SPE 96423 presented at the SPE Annual Technical Conference and Exhibit, Dallas, TX, 9 - 12 October.
- Begg, S.H., Bratvold, R.B., and Campbell, J.M. 2004. Abandonment Decision and the Value of Flexibility. Paper SPE 91131 presented at the SPE Annual Technical Conference and Exhibit, Houston, TX, September 26 – 29.
- Laughton, D.G., Begg, S.H., Bratvold, R.B., and Campbell, J.M. 2004. Development as the Continuation of Appraisal by Other Means. Paper SPE 90155 presented at the SPE Annual Technical Conference and Exhibit, Houston, TX, Sept. 26 – 29.
- Welsh, M.B., Begg, S.H., Bratvold, R.B., and Lee, M.D. 2004. Problems with the Elicitation of Uncertainty. Paper SPE 90338 presented at the SPE Annual Technical Conference and Exhibit, Houston, TX, Sept. 26 – 29.
- Begg, S.H., Bratvold, R.B., and Campbell, J.F. 2003a. Decision Making under Uncertainty. Paper SPE June presented at the The 7th International Forum on Reservoir Simulation, Buhl/Baden-Baden, Germany, June.
- Begg, S.H., Bratvold, R.B., and Campbell, J.F. 2003b. Shrinks or Quants: Who will improve decision-making. Paper SPE 84238 presented at the SPE Annual Technical Conference and Exhibition, Denver, CO, 5 – 8 October
- Bratvold, R.B., Begg, S.H., and Campbell, J.F. 2003. Even Optimists Should Optimize. Paper SPE 84329 presented at the SPE Annual Technical Conference and Exhibition, Denver, CO, 5 – 8 October
- Campbell, J.F., Bratvold, R.B., and Begg, S.H. 2003 Portfolio Optimization: Living Up to Expectations. Paper SPE 82005 presented at the SPE Hydrocarbon Economics and Evaluation Symposium, Dallas, TX, 5 - 8 April

REIDAR B. BRATVOLD - RESUME

- Laughton, D.G., Begg, S.H., Bratvold, R.B., Campbell, J.F., and Deutsch, C.V. 2003 The Joint Management of Appraisal, Development and Production in a Two-block Offshore Oil Field: A Real Options Analysis. Paper SPE 82035 presented at the SPE Hydrocarbon Economics and Evaluation Symposium, Dallas, TX, 5 - 8 April
- Begg, S. and Bratvold, R. 2002. The Value of Flexibility in Managing Uncertainty in Oil and Gas Investments. Paper SPE 77586 presented at the SPE Annual Technical Conference and Exhibition, San Antonio, Texas, 29 September - 02 October.
- Bratvold, R.B., Begg, S.H., and Campbell, J.M. 2002. Would You Know a Good Decision if You Saw One? Paper SPE 77509 presented at the SPE Annual Technical Conference and Exhibition, San Antonio, TX, Sept. 29 – Oct. 2.
- Begg, S.H., Bratvold, R.B., and Campbell, J.M. 2001. Improving Investment Decisions using A Stochastic Integrated Asset Model. Paper SPE 71414 presented at the SPE Annual Technical Conference and Exhibition, New Orleans, LA, 30 September–3 October.
- Maksimov, M.M., Galushko, V.V., Kutcherov, A.B., Surguchev, L.M., and Bratvold, R.B. 1993. Parallel Nested Factorization Algorithms. Paper SPE 25242 presented at the The 12th SPE Symposium on Reservoir Simulation, New Orleans, LA, 28 February - 3 March.
- Surguchev, L.M., Zolothukin, A.B., and Bratvold, R.B. 1992. Reservoir Characterization and Modeling Supported by Expert Knowledge System. Paper SPE 24279 presented at the SPE European Petroleum Computer Conference, Stavanger, Norway, 25-27 May .
- Bratvold, R.B., Horne, R.N., and Rugland, T. 1990. Application of Advanced Workstations to Reservoir Simulation. Paper SPE 20364 presented at the SPE Petroleum Computer Conference, Denver, CO, 25-28 June.
- Bratvold, R.B. and Larsen, L. 1989 Effects of Linear Boundaries on Pressure-Transient Injection and Falloff Data. Paper SPE 19830 presented at the SPE Annual Technical Conference and Exhibition, San Antonio. Texas, 8 - 11 October.

Invited & Keynote Presentations

Invited presentation on "Decision-Making in Exploration & Production: The Good, The Bad, and The Ugly?" NPF Solstrand Seminar on Oil and Economics 17 September, 2009.

Invited presentation on "Reserves Estimation – What Can we Learn from Decision Analysis?" IQPC – Global Reserves Summit, London, UK, 9-10 September, 2008.

Invited presentation on "Value of Information Demonstration," SPE ATW – Closed-Loop Reservoir Management, Bruges, Belgium, 23-26 June, 2008.

Invited presentation on "Decision Making in the Oil & Gas Industry – From Blissful Ignorance to Uncertainty Induced Confusion." INFORMS Southwest Regional Meeting – Texas A&M, College Station, TX, 19 April, 2008.

Invited presentation on "Decision Making in the Oil & Gas Industry – From Blissful Ignorance to Uncertainty Induced Confusion." Norwegian Academy of Technological Sciences, Stavanger, Norway, 1 November, 2007.

Invited presentation on " Decision Making in the Oil & Gas Industry – From Blissful Ignorance to Uncertainty Induced Confusion." Department of Petroleum Engineering, Stanford University, 15 November 2007.

Invited presentation on "Would You Know a Good Decision if You Saw One?" NPF Solstrand Seminar on Oil and Economics 20 September, 2007.

REIDAR B. BRATVOLD - RESUME

Invited presentation on "I Would Rather be Vaguely Right than Precisely Wrong – A Decision Focused Approach to Evaluating oil & Gas Investments." NPD 29 May, 2007.

Invited presentation on "I would rather be vaguely right than precisely wrong: A new approach to evaluating oil and gas investment decisions." SPE Brunei Section August 2005.

Invited presentation on "Psychology in Decision-Making" to first meeting of newly re-constructed Santos Management Board, 2004.

Invited presentation on "Probabilistic Reserves" to Australian Journal of Mining (AJM) "Reserve Accounting and Reporting" technical conference, Perth, 2004.

Distinguished Lecturer for Society of Petroleum Engineers (SPE) – presented at ~30 locations around the world, 2003/04.

Invited presentation on "Decision Making under Uncertainty" at the "7th International Forum on Reservoir Simulation", Buhl/Baden-Baden, Germany, 2003

Invited presentation on "Real Option Valuation" at the "Strategic Analysis for Technology Commercialisation", Education Centre for Information & Commercialisation, University of Adelaide, 2002

Panelist SPE "Integrated Modeling for Asset Management", Yokohama, 2000

Invited presentation on "Managing Reservoir Uncertainty and Risk" at HARC (Houston Advanced Research Center) Geotechnology Research Institute, 1999

Keynote speaker on "Uncertainty Modeling" at Chevron Technology Conference, La Habra, CA 1998

Distinguished Lecturer for Society of Petroleum Engineers (SPE) – presented at ~20 locations around the world, 1997/98

Invited speaker on "High-Performance Computing in Oil & Gas" at IBM's Worldwide Technology Conference, La Hulpe, Belgium, 1992

Conference Presentations with no written paper, or only a published abstract

Bratvold, R.B., Rajaieyamchee, M.A., "Bayesian Decision Networks for Drilling Decision Support," Institute for Operational Research and Management Science (INFORMS) Annual Meeting, San Diego, 2009

Welsh, M.B., Begg, S.H., and **Bratvold, R.N.**, "Intuition and Bias in Risk Assessment: Impact and Remediation", accepted for AAPG Annual Conference, Paper # 106392, Perth, 2006

Bratvold, R.B., Aristeguieta, O., Begg, S.H., "Improving oil and gas business performance through project portfolio optimization", Institute for Operational Research and Management Science (INFORMS) Annual Meeting, San Francisco, 2005

Begg, S.H. and **Bratvold, R.B.**, "Would You Know a Good Decision if You Saw One?" , AAPG Annual Conference, Paper # 99490, Paris, 2005

Bratvold, R.B. and Begg, S.H., "I Would Rather be Vaguely Right than Precisely Wrong", AAPG Annual Conference, Paper # 99491, Paris, 2005

Aristeguieta, O., Begg, S.H., and **Bratvold, R.B.**, "Improving oil and gas business performance through project portfolio optimization" presented at the 6th International Conference on Optimization: Techniques and Applications, Ballarat, Australia, Dec. 2004

RESEARCH GRANTS

- CODIO – Collaborative Decision Making in Integrated Operations – Norsk Forskningsråd (NFR) Grant totaling NOK 22.8 million. Computas AS lead contract partner. PhD Fellowship, supervised by Bratvold, on the use of Bayesian Belief Networks for decision analysis.
- Australian Research Council (ARC) Linkage Project Grant LP0453894, with two industry partners – totaling AUD191,336 cash (plus AUD158,000, “in-kind”)
- CIBP Memberships - USD75,000 and AUD150,000
- Multi-applicant ARC Linkage Infrastructure Grant LE0452650 – ARC AUD689,000, collaborating partners AUD1,208,611

EDITORIAL AND COMMITTEE WORK:

- Associate Editor for SPE Economics & Management (SPEEM), 2009 -
- Member SPE Computer Application Committee, 1994 - 1997.
- Member SPE Computer Application Committee, 1991 - 1993.
- Technical Editor, SPE Reservoir Engineering (SPERE), 1991 - 1993.
- Technical Editor, SPE Formation Evaluation (SPEFE), 1989 - 1991.

CONFERENCE ORGANIZATION:

- 2002 SPE Forum Series in North America: Decision-Driven Asset Management
- 1997 SPE Forum Series in North America: 3D Reservoir Characterization Technology: A Vision for the Future.
- First SPE European Petroleum Computer Conference, Stavanger, May 20-22, 1992.
- IBM Conference - Computer Applications in Reservoir Modeling, Stavanger, June 1991.

PROFESSIONAL AFFILIATES

- Society of Petroleum Engineers
- infORMS – Institute for Operations Research and the Management Sciences
- Decision Analysis Society