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EDUCATION

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Cambridge, MA
PhD in Chemical Engineering, September 2000
Thesis: "Multiscale Molecular Modeling of Aqueous Systems from Ambient to Supercritical Conditions"
Thesis Advisors: Jefferson W. Tester, Jonathan G. Harris

UNIVERSITY OF PENNSYLVANIA, Philadelphia, PA
Bachelor of Science in Chemical Engineering, May 1994
Graduated Magna Cum Laude. AIChE Junior Award.

RESEARCH EXPERIENCE

LAWRENCE BERKELEY NATIONAL LABORATORY, Earth Sciences Division, Berkeley, CA. **Geological Research Scientist.** Research on the thermodynamics, transport, and chemistry of aqueous systems in the subsurface, including research on the thermodynamics of gas hydrates, gas production from methane hydrate systems, the coupling of methane hydrates and global climate, carbon sequestration via subsurface CO_2 injection, data reduction and uncertainty quantification using statistical methods, and "tight gas" simulation and engineering. Built and maintain online tools for physical property estimation and numerical simulation. **2004 to present.**

SANDIA NATIONAL LABORATORIES, Combustion Research Facility, Livermore, CA. **Technical Staff.** Research on uncertainty quantification and its application to chemical systems modeling and complex reacting flow. Development of MPI-based parallel reacting-flow codes and development of statistical/Monte Carlo uncertainty quantification methods and software. **2001-2004.**

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, **Research Assistant.** Research on the molecular simulation and thermodynamics of supercritical water solutions. **1995-2000.**

REFEREED PUBLICATIONS

1. Moridis, G.J., Collette, T.S., Boswell, R., Kurihara, M., Reagan, M.T., Sloan, E.D., and C. Koh, "Toward Production From Gas Hydrates: Assessment of Resources, Technology, and Potential" LBNL-00161E, SPE 114163*, SPE Journal, in press*, 2009.
2. Boswell, R., Shelander, D., Lee, M., Latham, T., Collett, T., Geurin, G., Moridis, G., Reagan, M., and D. Goldberg, "Occurrence of gas hydrate in Oligocence Frio sand: Alaminos Canyon Block 818: northern Gulf of Mexico," *Marine and Petroleum Geology,* doi:10.1016/j.marpetgeo.2009.03.005, *in press,* 2009.
3. Moridis, G.J., Silpngarmlert, S., Reagan, M.T., Collett, T., and K. Zhang, "Gas Production From the Unit D Class 3 Hydrate Deposit at the Mount Elbert Site, North Slope, Alaska," submitted to *Marine & Petroleum Geology*.
4. Reagan, M.T. and G.J. Moridis, "The dynamic response of oceanic hydrate deposits to ocean temperature change," LBNL-01026E, *J. Geophys. Res. Oceans*, **113**, C12023, doi:10.1029/2008JC004938, 2008.
5. Reagan, M.T., Moridis, G.J., and K. Zhang, "Sensitivity Analysis of Gas Production from Class 2 and Class 3 Hydrate Deposits," LBNL-01657E, *OTC 19554*, *Proceedings, 2008 Offshore Technology Conference, Houston, Texas, USA, 5-8 May 2008, in review for publication in SPE Reservoir Evaluation and Engineering.*
6. Moridis, G.J, Reagan, M.T., and K. Zhang, "Field-Scale Studies on the Enhanced Performance of Class 2 and Class 3 Hydrate Deposits Through Co-Production With Conventional Gas" *OTC 19435*, *Proceedings, 2008 Offshore Technology Conference, Houston, Texas, USA, 5-8 May 2008, in review for publication in SPE Journal.*

7. Moridis, G.J., Reagan, M.T., Kim, S.J., Seol, Y., and K. Zhang, "Evaluation of the Gas Production Potential of Marine Hydrate Deposits in the Ulleung Basin of the Korean East Sea," LBNL-63812, *SPE 110859, SPE Journal,* doi:10.2118/110859-PA.

8. Reagan, M.T. and G.J. Moridis, "Oceanic Gas Hydrate Instability and Dissociation Under Climate Change Scenarios," LBNL-62999, *Geophys. Res. Lett.*, **34**, L22709, doi: 10.1029/2007GL031671, 2007.

9. Moridis, G.J., and M.T. Reagan, "Gas Production From Class 2 Hydrate Accumulations in the Permafrost," LBNL-01615E, SPE 110858*, in review for publication in J. Petro. Sci. Eng.,* 2009.

10. Moridis, G.J. and Reagan, M.T., "Strategies for Gas Production From Oceanic Class 3 Hydrate Accumulations," LBNL-62758, *OTC 18865*, *Proceedings, 2007 Offshore Technology Conference, Houston, Texas, USA, 30 April - 3 May 2007*, *in review for publication in SPE Journal*.

11. Moridis, G.J. and Reagan, M.T., "Gas Production From Oceanic Class 2 Hydrate Accumulations," LBNL-62757, *OTC 18866*, *Proceedings, 2007 Offshore Technology Conference, Houston, Texas, USA, 30 April - 3 May 2007, in review for publication in SPE Journal*.

12. Reagan, M.T., Najm, H.N., Pebay, P.P., Knio, O.M., and R.G. Ghanem, "Quantifying Uncertainty in Chemical Systems Modeling." *Int. J. Chem. Kinetics* **37**, *6*, 368-382 (2005).

13. Reagan, M.T., Najm, H.N., Ghanem, R.G., Knio, O.M., and O.P. LeMaître, "Spectral Stochastic Uncertainty Quantification in Chemical Systems." *Combust. Theory and Modeling* **8**, *3*, 607-632 (2004).

14. LeMaître, O.P., Reagan, M.T., Debusschere, B.J., Najm, H.N., Ghanem, R.G., and O.M. Knio, "Natural Convection in a Closed Cavity under Stochastic, Non-Boussinesq Conditions." *SIAM J. Sci. Comp.* **26**, 2, 375-394 (2004).

15. Reagan, M.T., Najm, H.N., Ghanem, R.G., and O.M. Knio, "Uncertainty Quantification in Reacting Flow Simulations Through Non-Intrusive Spectral Projection." *Combustion and Flame* **132,** *3*, 545-555 (2003).

16. LeMaître, O.P., Reagan, M.T., Najm, H.N., Ghanem, R.G., and O.M. Knio, "A Stochastic Projection Method for Fluid Flow. II. Random Process." *J. Comp. Phys.* **181**, 9-44 (2002).

17. Reagan, M.T. and J.W. Tester, "The Zeno (Z=1) Behavior of Water: A Molecular Simulation Study." *Int. J. Thermophysics* **22**, *1*, 149-160 (2001).

18. Kutney, M.C., Reagan, M.T., Smith, K.A., Tester, J.W., and D.R. Herschbach, "The Zeno (Z=1) Behavior of Equations of State: An Interpretation Across Scales from Macroscopic to Molecular." *J. Phys. Chem. B* **104**, *10*, 9513-9525 (2000).

19. Ciric, A.R., Mumtaz, H.S., Corbett, G., Reagan, M.T., Seider, W.D., Fabiano, L.A., Kolesar, D.M., and S. Widagdo, "Azeotropic Distillation with an Internal Decanter." *Comp. Chem. Eng.* **24**, 2435-2446 (2000).

20. Reagan, M.T., Harris, J.G. and J.W. Tester, "Molecular Simulation of Dense Hydrothermal NaCl-H_2O Solutions from Subcritical to Supercritical Conditions." *J. Phys. Chem. B* **103**, *37*, 7935-7941 (1999).

21. Tester, J.W., Marrone, P.A., DiPippo, M.M., Sako, K., Reagan, M.T., Arias, T.A., and W.A. Peters, "Chemical Reactions and Phase Equilibria of Model Halocarbons and Salts in Sub- and Supercritical Water (200 to 300 bar, 100 to 600 ^{o}C)." *J. Supercritical Fluids* **13** 225-240 (1998).

OTHER PUBLICATIONS AND REPORTS

22. Moridis, G.J., Reagan, M.T., Boyle, K.L., and K. Zhang, "Evaluation of the Gas Production Potential of Challenging Hydrate Deposits," Proceedings, TOUGH Symposium 2009, Lawrence Berkeley National Laboratory, 14-16 Sept. 2009.

23. Reagan, M.T, Moridis, G.J., and K. Zhang, "Large-Scale Simulation if Oceanic Gas Hydrate Dissociation in Response to Climate Change," Proceedings, TOUGH Symposium 2009, Lawrence Berkeley National Laboratory, 14-16 Sept. 2009.

24. Reagan, M.T, Moridis, G.J., Zhang, K., "Modeling of Gas Hydrate Instability and Methane Release in Response to Climate Change," LBNL-00712E, Proceedings of the 6th International Conference on Gas Hydrates, Vancouver, BC, July 6-10, 2008.

25. Moridis, G.J., Reagan, M.T, Zhang, K., "The Use of Horizontal Well in Gas Production from Hydrate Accumulations," Proceedings of the 6th International Conference on Gas Hydrates, Vancouver, BC, July 6-10, 2008.

26. Moridis, G.J., Kneafsey, T., Kowalsky, M., and M.T. Reagan, "Numerical, Laboratory and Field Studies of Gas Production from Natural Hydrate Accumulations in Geologic Media," OSTI Report 918665 (Dec. 2007).

27. Reagan, M.T. and C.M. Oldenburg, "WebGasEOS v1.0 User Guide," LBNL-3188, (June 2006).

28. Najm, H.N., Reagan, M.T., Knio, O.M., Ghanem, R.G., and O.P. LeMaître, "Uncertainty Quantification in Reacting Flow Modeling." Technical Report SAND2003-8598, Sandia National Labs, Livermore, CA (2003).

29. Reagan, M.T., Najm, H.N., Ghanem, R.G., and O.M. Knio, "Analysis of Parametric Uncertainty Propagation in Detailed Combustion Chemistry." *Proceedings of the 2nd MIT Conf. on Computational Fluid and Solid Mechanics*, Cambridge, MA, 1501-1505 (2003)

30. Reagan, M.T. and J.W. Tester, "Molecular Modeling of Dense Sodium Chloride-Water Solutions Near the Critical Point." *Steam, Water, and Hydrothermal Systems*, Toronto, Ontario, 525-533 (1999).

SUMMARIES, ABSTRACTS, AND FEATURES

"A Sleeping Giant?" *Nature Reports Climate Change,* doi:10.1038/climate.2009.24 (April 2009).

"The Hydrate Hazard," *Nature Reports Climate Change*, **3**, 14, doi:10.1038/climate.2009.11 (February 2009).

"Toward Production from Gas Hydrate: Status, Technology, and Potential," *J. Petroleum Technology* (July 2008).

"Gas Production from Oceanic Class 2 Hydrate Accumulations," *J. Petroleum Technology* (August 2007).

PRESENTATIONS

1. "Regional Simulation of Oceanic Gas Hydrate Dissociation in Response to Climate Change," (poster) TOUGH Symposium 2009, Berkeley, CA, 14 September 2009.
2. "Consequences of Methane Hydrate Destabilization," (poster) Climate Change Prediction Program Workshop, Bethesda, MD, 9 April 2009.
3. "Oceanic Gas Hydrate Dissociation In Response To Climate Change And The Fate Of Hydrate-Derived Methane," (poster), AGU Fall Meeting 2008, San Francisco, CA, 15-19 December 2008.
4. "Modeling Of Oceanic Gas Hydrate Instability And Methane Release In Response To Climate Change**,"** (poster) 6th International Conference on Gas Hydrates, Vancouver, BC, 6-10 July 2008.
5. "The Use of Horizontal Wells in Gas Production from Hydrate Accumulations," (poster) 6th International Conference on Gas Hydrates, Vancouver, BC, 6-10 July 2008.
6. "Sensitivity Analysis of Gas Production from Class 2 and Class 3 Hydrate Deposits," paper OTC 19554, 2008 Offshore Technology Conference, Houston, Texas, U.S.A., 5–8 May 2008.
7. "Dynamic Response Of Oceanic Hydrate Deposits To Ocean Temperature Change," USGS Methane Hydrates Symposium, MIT, Cambridge, MA, 25-26 February 2008.
8. "Oceanic Gas Hydrate Instability And Dissociation In Response To Climate Change" GC14A-06, AGU Fall Meeting 2007, San Francisco, CA, 9-14 December 2007.
9. "Strategies for Gas Production From Oceanic Class 3 Hydrate Accumulations," paper OTC 18665, 2007 Offshore Technology Conference, Houston, Texas, U.S.A., 1-3 May 2007.
10. "Gas Hydrates and Global Climate: Dynamic Simulation Of Oceanic Gas Hydrate Dissociation And The Possible Consequences," Earth Sciences Division Seminar, 6 April 2007.
11. "Uncertainty Quantification in Reacting Flow Modeling," Western States Section of the Combustion Institute, Davis, CA, March 2004.
12. "Uncertainty Propagation in Reacting Flow Simulations Through Spectral Analysis," American Physical Society, Division of Fluid Dynamics, East Rutherford, NJ, November 2003.

13. "Spectral Methods for Uncertainty Quantification in Reacting Flow Systems,"7th US National Congress on Computational Mechanics, Albuquerque, NM, July 2003.
14. "Analysis of Parametric Uncertainty Propagation in Detailed Combustion Chemistry," 2nd MIT Conference on Computational Fluid and Solid Mechanics, Cambridge, MA, June 2003.
15. "A Spectral Method for Uncertainty Quantification in Reacting-Flow Simulations," 3rd Joint Meeting of the US Sections of the Combustion Institute, Chicago, IL, March 2003.
16. "Uncertainty Quantification through Spectral Projection," American Physical Society, Division of Fluid Dynamics, Dallas, TX, November 2002.
17. "Uncertainty Quantification through Non-Intrusive Spectral Projection," American Physical Society, Division of Fluid Dynamics, San Diego, CA, November 2001.
18. "The Zeno (Z=1) Behavior of Water: A Molecular Simulation Study," 14th International Symposium on Thermophysical Properties, Boulder, CO, July 2000.
19. "Molecular Modeling of Dense Sodium Chloride-Water Solutions Near the Critical Point," 13th Annual Conference on the Properties of Water and Steam, Toronto, Ontario, September 1999.
20. "Molecular Dynamics Modeling of Supercritical Water Solutions," Oak Ridge National Laboratory, December 1997.
21. "Molecular Dynamics Modeling of Supercritical Water Solutions," University of Tennessee at Knoxville, December 1997.

SOFTWARE DEVELOPMENT AND TOOLS

WebGasEOS, http://esdtools.lbl.gov/gaseos/

TOUGH+Input, http://esdtools.lbl.gov/input/

TOUGH+MeshMaker, http://esdtools.lbl.gov/mesh

TOUGH2+Hysteresis, a generalized addition for all EOS modules (with C. Doughty and C. Oldenburg)

COLLABORATIONS AND SERVICE

External Collaborations:

Scott Elliott, Mathew Maltrud, and Philip Jones, Los Alamos National Laboratory (Methane hydrates and climate change)

Philip Cameron-Smith, Lawrence Livermore National Laboratory (Methane hydrates and atmospheric chemistry)

Thomas Blasingame, Texas A&M University and Michael Nikolaou, Univ. of Houston (Statistical data reduction and expert system development)

Olivier Le Maître, Universite d'Evry Val D'Essoné, Evry, France and Omar M. Knio, Dept. of Mechanical Engineering, Johns Hopkins University (Intrusive reformulation of reacting flow simulations and applications of non-intrusive spectral projection methods)

Peer reviewing:

Geophysical Research Letters
SPE Journal
Geochimica et Cosmochimica Acta
Advances in Water Research
Energy & Fuels
Journal of Supercritical Fluids
Chemical & Biochemical Engineering Quarterly.

TEACHING EXPERIENCE

LAWRENCE BERKELEY NATIONAL LABORATORY, **Mentor**, Pre-Service Teaching program (UC/CalTeach), **Summer 2009**.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, **Postdoctoral Teaching Fellow,** graduate thermodynamics. **Fall 2000.**

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, **Teaching Assistant**, advanced graduate thermodynamics and statistical mechanics. **Spring 1999 and Spring 2000**.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, **Teaching Assistant,** graduate thermodynamics. **Fall 1996.**

RESEARCH INTERESTS

My research interests focus on the connection between macroscopic phenomena and the fundamental properties that drive them. I seek to understand the physical properties and behavior of chemical and multiphase systems through a multi-scale approach, combining molecular and classical thermodynamics, analytical forms, empirical correlations, numerical simulation, and with an application to practical, macro-scale problems. The application of rigorous meaningful uncertainty quantification is crucial to all simulation work, both for validation purposes and to correctly characterize the systems of interest.

REFERENCES

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Scott Elliott, Los Alamos National Laboratory (Collaborator)
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Thomas Blasingame, Texas A&M University
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(979) 845-2292
Ray Boswell, NETL (Program manager)
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Habib N. Najm, Sandia National Laboratories (PI, supervisor)
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