***Education***

* **Doctor of Philosophy in Mechanical Engineering (1991)** University of Arizona, Tucson Arizona (with minor in Applied Mathematics)
* **Master of Science in Aerospace Engineering (1987)** University of Arizona, Tucson, Arizona
* **Bachelor of Science in Mechanical Engineering (1985)** University of Arizona, Tucson, Arizona (with Highest Distinction)

***Experience***

* **Senior Stimulation Consultant (June 2012 – present) ExxonMobil Production Company**. Provide expertise in stimulation technology and applications of this technology to new and existing business opportunities. Work with ExxonMobil’s global business units on technology strategy, deployment, and applications. Working across ExxonMobil’s Upstream organizations, work collaboratively addressing key technical and business priorities and further developing the capability of the Subsurface Engineering Job Family. Coordinate ExxonMobil’s Upstream Fracturing Center of Excellence.
* **Sr. Advisor (Aug 2010 – May 2012) ExxonMobil Production Company.** Provided leadership and direction in establishing and coordinating ExxonMobil’s Upstream Fracturing Center of Excellence responsible for global application of best practices, application of new technologies, and coordination of worldwide hydraulic fracturing resources and fracturing related technical interfaces.
* **Sr. Supervisor (May 2009 – July 2010) ExxonMobil Upstream Research Co, Unconventional Gas Recovery Section** Supervisor of R&E staff responsible for developing ExxonMobil’s next generation completion and reservoir recovery technologies focused on unconventional resources (tight gas, shale gas, tight oil, and coal-bed methane), and providing global technical support to business units in the broad area of unconventional resources.
* **Sr. Supervisor (Aug 2007 –Apr 2009) ExxonMobil Upstream Research Co, Well Construction Section** Supervisor of R&E staff responsible for developing ExxonMobil’s next generation wellbore drilling technologies in the areas drilling mechanics , drill-string vibration mitigation, and borehole stability and hole-cleaning; and providing global technical support to business units in the broad area of drilling technologies.
* **Sr. Supervisor (Aug 2005 – July 2007) ExxonMobil Upstream Research Co, Well Completion Section.** Supervisor of R&E staff responsible for developing ExxonMobil’s next generation completion technologies in the areas of completion hardware, stimulation methods and techniques, and wellbore tubular designs; and providing global technical support to business units in the broad area of completion technologies.
* **Sr. Supervisor (Aug 2005-Dec 2005) ExxonMobil Upstream Research Co, Well Stimulation Section.** Supervisor of R&E staff responsible for developing ExxonMobil’s next generation stimulation technologies; and responsible for providing global technical support to business units performing hydraulic fracturing and acid stimulation.
* **Engineering Associate (1999-2005) ExxonMobil Upstream Research Co, Special Projects Division.**  Responsible for development and field trials of “Multi-Zone Stimulation Technology” in Piceance Basin Colorado. Leader of the “Mesa Verde Completion Team” responsible for overall coordination of completion activities and technology deployment.
* **Research Engineer / Engineering Specialist (1992 - 1999) ExxonMobil Upstream Research Co, Drilling & Completions Division. P**rovided consulting to Exxon affiliates on wellbore hydraulics, completion design, formation damage and removal. Led development of the HPHT lab facility for testing phase behavior and production chemistry of well fluids and chemicals. Provided business unit support in completion engineering and subsurface engineering. Coordinated and taught in internal schools in addition to providing expert production log interpretations.
* **Adjunct Professor (1991-1992) University of Arizona Department of Aerospace and Mechanical Engineering.** Taught undergraduate courses in fluid mechanics, instrumentation, and solid mechanics. Conducted research in experimental fluid mechanics and shear flow control.

***Industry Publications***

**SPE Paper 153152 “Just-In-Time Perforating for Controlled, Cost-Effective Stimulation and Production Uplift of Unconventional Reservoirs”** (2012) Renzo Angeles, SPE, ExxonMobil Upstream Research Company, Randy Tolman, SPE, RC Tolman LLC, Wadood El-Rabaa, SPE, ExxonMobil Upstream Research Company, Shalawn Jackson, SPE, ExxonMobil Upstream Research Company, and Kris Nygaard, SPE, ExxonMobil Production Company, presented at SPE/EAGE European

**SPE Paper 119757 “Method and Apparatus for Simultaneous Stimulation of Multi-Well Pads”** (2009) R.C. Tolman, SPE, and J.W. Simons, ExxonMobil Production Co., and D.H. Petrie, SPE, K.J. Nygaard, SPE, S.R. Clingman, SPE, and A.M. Farah, SPE, ExxonMobil Upstream Research Co. presented at SPE Hydraulic Fracturing Technology Conference, 19-21 January 2009, The Woodlands, Texas

**WGRR Conference Paper “Multi-Zone Stimulation Technologies for Tight Gas” (2007)** K. J. Nygaard, ExxonMobil Upstream Research Company, C. E. Shuchart, T. W. Pirog, A. M. El-Rabaa, ExxonMobil Upstream Research Company, S. B. Lonnes, T.J. Hall, R.C. Tolman, ExxonMobil Production Company presented at World Gas Resources and Reserves and Advanced Development Technologies International Conference, 2007, Moscow.

**SPE Paper 95778 “Advanced Multi-Zone Stimulation Technology”** (2005) S.B. Lonnes, K.J. Nygaard, and W.A. Sorem, ExxonMobil Upstream Research Co., and T.J. Hall, SPE, and R.C. Tolman, ExxonMobil Production Co., presented at SPE Annual Technical Conference and Exhibition, 9-12 October 2005, Dallas, Texas.

***Refereed Journal Articles***

“The effect of phase variations and cross-shear on vortical structures in a plane shear layer” (1994) Nygaard, K.J. and Glezer, A., Journal of Fluid Mechanics, Volume 276, pp. 21-59.

“Evolution of stream wise vortices and generation of small-scale motion in a plane mixing layer” (1991) Nygaard, K.J. and Glezer, A., Journal of Fluid Mechanics, Volume 231, pp. 257-301.

“Core instability of the spanwise vortices in a plane mixing layer” (1990) Nygaard, K. J. and Glezer, A., [Phys. Fluids A **2**, 461 (1990PFADEB000002000003000461000001](http://link.aip.org/link/?&l_creator=getabs-normal1&l_dir=FWD&l_rel=CITES&from_key=PHFLE6000006000001000381000001&from_keyType=CVIPS&from_loc=AIP&to_j=PFADEB&to_v=2&to_p=461&to_loc=AIP&to_url=http%3A%2F%2Flink.aip.org%2Flink%2F%3FPFA%2F2%2F461%2F1)

***Patents & Patent Applications***

**USA Patent Application No. 20090114392** “Method and Apparatus Associated With Stimulation Treatments for Wells”, Tolman; Randy C.; (Spring, TX) ; Sorem; William A.; (Houston, TX) ; Nygaard; Kris J.; (Houston, TX) ; Simons; Jeff W.; (Rifle, CO) ; Kofoed; Curtis W.; (Kuala Lumpur, MY)

**USA Patent No. 7,059,407** “Method and apparatus for stimulation of multiple formation intervals”, Tolman; Randy C. (Marbleton, WY), Carlson; Lawrence O. (Cypress, TX), Kinison; David A. (Kingwood, TX), Nygaard; Kris J. (Houston, TX), Goss; Glenn S. (Kingwood, TX), Sorem; William A. (Katy, TX), Shafer; Lee L. (Big Piney, WY)

**USA Patent No. 6,957,701** “Method and apparatus for stimulation of multiple formation intervals”, Tolman; Randy C. (Marbleton, WY), Carlson; Lawrence O. (Cypress, TX), Kinison; David A. (Kingwood, TX), Nygaard; Kris J. (Houston, TX), Goss; Glenn S. (Kingwood, TX), Sorem; William A. (Katy, TX), Shafer; Lee L. (Big Piney, WY)

**USA Patent No. 6,672,405** “Perforating gun assembly for use in multi-stage stimulation operations“, Tolman; Randy C. (Spring, TX), Kinison; David A. (Kingwood, TX), Nygaard; Kris J. (Houston, TX), Sorem; William A. (Katy, TX), Hall; Timothy J. (Houston, TX), Bailey; Jeffrey R. (Houston, TX)

**USA Patent No. 6,543,538** “Method for treating multiple wellbore intervals”, Tolman; Randy C. (Spring, TX), Nygaard; Kris J. (Houston, TX), El-Rabaa; Abdel Wadood M. (Houston, TX), Sorem; William A. (Katy, TX)

**USA Patent No. 6,520,255** “Method and apparatus for stimulation of multiple formation intervals”, Tolman; Randy C. (Marbleton, WY), Carlson; Lawrence O. (Cypress, TX), Kinison; David A. (Kingwood, TX), Nygaard; Kris J. (Houston, TX), Goss; Glenn S. (Kingwood, TX), Sorem; William A. (Katy, TX), Shafer; Lee L. (Big Piney, WY)

**USA Patent No. 6,394,184** “Method and apparatus for stimulation of multiple formation intervals”, Tolman; Randy C. (Marbleton, WY), Carlson; Lawrence O. (Cypress, TX), Kinison; David A. (Kingwood, TX), Nygaard; Kris J. (Houston, TX), Goss; Glenn S. (Kingwood, TX), Sorem; William A. (Katy, TX), Shafer; Lee L. (Big Piney, WY)

**USA Patent No. 5,040,560** “Method and apparatus for controlled modification of fluid flow”, Glezer; Ari (Tucson, AZ), Nygaard; Kris J. (Glendale, AZ), Wiltse; and John M. (Tucson, AZ)

***Internal ExxonMobil Company Reports: Author or Co-author on 14 internal ExxonMobil research reports related to subsurface engineering and subsurface technology.***

***Professional Society Memberships & Involvement***

Member - *Society of Petroleum Engineers*

Member - *American Society of Mechanical Engineers*

Co-Chair - Society of Petroleum Engineers Applied Technology Workshop: *Shale as a Reservoir: Leveraging Formation Characterisation, Well Placement and Unique Completions to Improve Multi-Stage Stimulation”*, Prague, Oct 1-4 2012.