Life Experiences in
MATHEMATICS

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Sid Richardson Building SR344

ALAN SCHIEMENZ
B.Sc. (Baylor, 2004)
Ph.D (Brown University, 2009)

Alan is a native Texan, originally from the city of Springtown. He graduated summa cum laude from Baylor with a Bachelor of Science degree in mathematics in 2004. While at Baylor, he was a member of Phi Beta Kappa and Kappa Kappa Psi, a service fraternity for band members. He played the euphonium in the Golden Wave Marching Band, the Symphonic Band, and the Courtside Players.

After Baylor, Alan attended graduate school at Brown University, earning a Ph. D. in applied mathematics in 2009. There, he applied high-order numerical methods to the study of magma genesis and evolution in the earth's mantle, as part of a multidisciplinary collaboration between applied mathematics, geophysics, and geochemistry.

Alan entered the computational seismology community in 2010 as a postdoctoral appointee in the QUEST initial training network at Ludwig Maximilian University of Munich, Germany, working in the field of seismic full-waveform inversion. In 2013 he began a career in the oil industry as a member of the seismic modeling and inversion research team at Schlumberger.

Alan currrently resides in Houston with his wife and two sons.

Numerical Solution to the Seismic Wave Equation and Application to Hydrocarbon Exploration

Nuclear test ban treaty monitoring, earthquake early warning systems, and understanding of the earth's deep interior are all possible by analysis of seismic waves. Numerical solutions of the seismic wave equation are also widely utilized for hydrocarbon exploration, requiring supercomputers equipped with efficient mathematical algorithms to perform large numbers of simulations. Seismic full-waveform inversion is an ill-posed, nonlinear system which seeks to minimize a cost function measuring the misfit between recorded seismograms and synthesized data. The seismic velocity model, representing the speed of sound throughout the ground, is iteratively updated via gradient-based methods to reduce misfit. In this talk I will introduce the foundations of seismic wave propagation and the seismic inverse problem, which consists of a multidisciplinary amalgam of engineering, physics and applied mathematics. I will present their application in the context of the oil and gas industry, where improved seismic velocity models yield more detailed seismic images, reducing drilling risks and enhancing recovery of hydrocarbons.