Abstract:
Energy infrastructure and the recovery of energy resources pervade society at the grandest scale (e.g., exajoules $10^{18}$ per year). Of the energy resources that we leverage, fossil fuels comprise 85% of the energy consumed and are recovered at rates of $\sim 10^7$ barrels per day. Hydrocarbons, however, reside in porous geological sediments and are typically confined to very small pores with length-scales $\sim 10^{-4}$ to $10^{-9}$ m. In this talk, I will show the complexity of subsurface energy systems, and the challenges in the recovery of hydrocarbons, at a massive rate, from these confined porous geometries. I will present the use of microfluidics as a method of delineating the mechanisms that ultimately underlie the recovery of subsurface resources, and show, with examples of low salinity waterflooding, how we can develop further techniques in improving the recovery of hydrocarbons.

Biography:
I am a George H. Fancher Assistant Professor of Petroleum and Geosystems Engineering at the University of Texas at Austin. My research focuses on understanding and leveraging the fundamental micro/nanoscale transport dynamics that dictate subsurface energy and environmental resources. My key contributions towards addressing the grand challenge of supplying reliable, sustainable energy to society include pioneering the field of real-rock microfluidics to enable direct, real-time, pore-scale visualization of transport dynamics in micro/nanofluidic systems with representative geometric and chemical characteristics. Alongside research, I am also passionate about education and service; I teach PGE 383: Small-Scale Fluid Flow and PGE 323K: Reservoir Engineering I. I obtained my Ph.D. degree in the Department of Energy Resources Engineering at Stanford University with a Ph.D. minor in Mechanical Engineering.