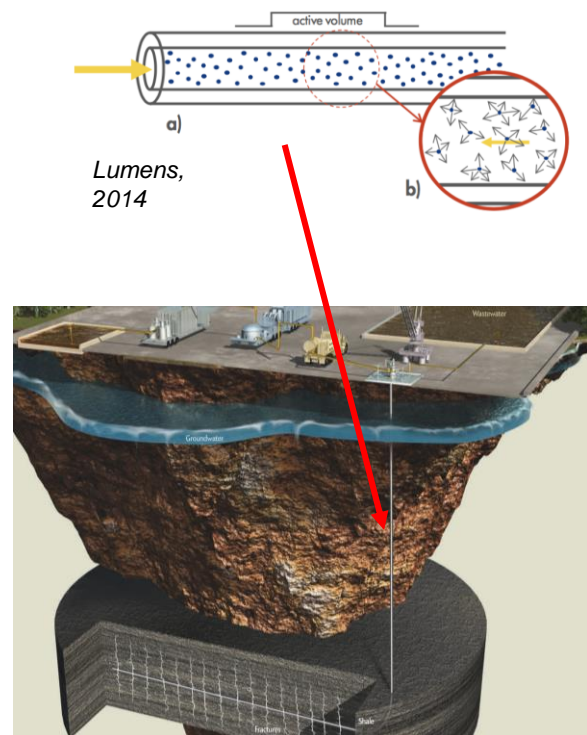


# Machine Learning Applications for DAS Monitoring

Christopher Sherman, Robert Mellors, Rick Ryerson,  
Joseph Morris, Charles Yu, Mike Messerly

# Fiber Optic Distributed Acoustic Sensors (DAS)

- DAS is designed to measure signals at a high spatial resolution ( $\sim 1$  m) over large distances (multiple km)
  - DAS uses the fiber itself as a sensor to measure strain (or strain rate) along its length
  - Simultaneous distributed temperature measurements (DTS) are also possible
- Its development has opened up a massive source of data for subsurface characterization / monitoring
- Questions:
  - How can we optimize the performance of DAS?
  - How do we interpret the data we collect?



# Synthetic Datasets and CNN Design

- Develop deep learning approaches for interpreting these data
  - Generate a massive synthetic dataset using GEOS (LLNL) to train the initial network
  - Use transfer learning to optimize for site-conditions and/or field measurements
  - Hydraulic fracturing example: height, length, proppant placement, in-situ stress?
  - Underground excavations: rock stability, etc.
- Goal: Real-time DAS monitoring without the need for expert analysis

