## Understanding Seismic P-wave Anisotropy in Exploration and Exploitation

A one-day course, covering anisotropy in seismic P-waves

Leon Thomsen

Delta Geophysics

### Course description

**All rock masses are seismically anisotropic, but we have historically ignored this in our seismic acquisition, processing, and interpretation. The anisotropy nonetheless does affect our data, in ways that limit the value that we derive from it, if we ignore that anisotropy. Defined as a rock property, the anisotropy is usually small, but it can lead to effects in the data which are large.**

**In this short course, we will *understand* why ignoring anisotropy has been so successful in the past, and why it will be less successful in the future, as we acquire better seismic data, as we analyze it in expensive deepwater contexts, and as we realize the vast potential of shale as a reservoir rock. We will further understand how we can improve our practice, so as to more fully realize the potential inherent in our data, through algorithms and analysis which recognize the fact of seismic anisotropy. The course is accompanied by numerous class exercises, presented in .xls format.**

1. Physical principles (morning)
   a. Definition of anisotropy
   b. Anisotropy *vs.*heterogeneity
   c. Anisotropy as a function of scale
   d. Elasticity and Symmetry
   e. The Power of Notation

2. P-waves: imaging (morning, afternoon)
   a. Polar anisotropy
   b. Azimuthal anisotropy
      a. Tilted polar anisotropy
      b. Orthorhombic anisotropy
      c. Monoclinic anisotropy
   c. Slowness ellipses

3. P-waves: physical characterization (afternoon)
   a. Polar anisotropy
      i. Velocities
      ii. Amplitudes (AVO)
   b. Azimuthal anisotropy
      i. Velocities
      ii. Amplitudes (AVOAz)
   c. Stress and Fractures

4. Epilogue: (afternoon)