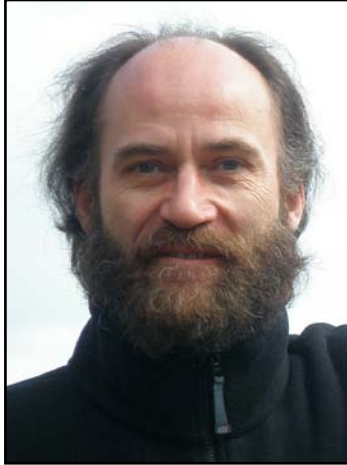




Society of Exploration Geophysicists
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From Imaging to Inversion
Presented by Ian F. Jones
ION GX Technology, United Kingdom



Hydrocarbon exploration has many phases: from the heavy engineering aspects of the rig building and drilling industries, to the geological interpretation and attribute analysis of oil company geologists and rock physicists. However, underpinning all this activity is geophysical signal processing, which produces, as a final product, a 3D image of the subsurface of the Earth and related attribute volumes. This image is then used by rock physicists and engineers to infer what fluids are present in the rock formations, and by geologists to decide where to drill exploration wells.

Since the late 1970s, geophysicists have constructed images of the Earth's subsurface by estimating the speed of sound in the different rock layers, and using this information to reposition seismic data recorded on the Earth's surface, back to the subsurface reflecting surfaces to form a seismic image. This latter process is called migration.

In writing a migration algorithm, it is possible to make many simplifying approximations, so that forming an image becomes a tractable problem for the available computer power. However, to form the image, the migration algorithm needs a good estimate of the velocity of sound in the various subsurface rock layers, and there are many techniques for estimating these velocities.

In this talk, I'll review these aspects of contemporary imaging, and introduce some emerging ideas which perhaps seem to promise circumvention of the current two-step imaging procedure of velocity model building followed by migration, so as to estimate subsurface reflectivity, velocity, density and absorption parameter fields directly from the recorded data. This emerging technology is known as full waveform inversion.

Biography

Ian Jones has been the senior geophysical advisor for ION GX Technology in their UK office since 2000. Prior to that, he worked in signals processing research for CGG in their London and Paris offices, latterly as manager of the depth-imaging research group.

He received a joint honors BSc in physics with geology from the University of Manchester, UK; an MSc in seismology from the University of Western Ontario, Canada; and a PhD in geophysical signal processing from the University of British Columbia, Canada (1985).

His interests include velocity model building and migration, and his most recent activity includes writing the text book [An Introduction to Velocity Model Building](#) (published by EAGE in 2010) and co-editing the SEG Geophysics Reprints series volumes [Classics of Elastic Wave Theory](#) and [Pre-Stack Depth Migration and Velocity Model Building](#).

He is an associate editor for *GEOPHYSICS* and *Geophysical Prospecting*, and teaches the EAGE continuing education course "Velocity Model Building." Ian was awarded the EAGE's Anstey Medal in 2003 for contributions to the depth-imaging literature.