Remote sensing

State of the art seismic imaging (October 2005)

For many decades the primary tool of petroleum exploration has been reflection seismic surveying. As oil has become harder to find, industry has hugely improved means of processing seismic waves that return to detectors and expanded data gathering as a means of showing subtle structures and sedimentological detail. From individual seismic sections up to the 1970s, seismic surveys have moved towards multiple lines with ever-decreasing spacing as a means of producing 3-dimensional subsurface maps. Until recently the results of 3-D seismics have been glimpsed only rarely by the academic community, but once their commercial usefulness has been exploited they are increasingly becoming accessible. Richard Davies of the 3DLab at the University of Cardiff, UK and Henry Posamentier of Anadarko Canada provide an exquisite overview of the possibilities for research in the October 2005 issue of GSA Today (Davies, R.J. & Posamentier, H.W. 2005. Geologic processes in sedimentary basins inferred from three-dimensional seismic imaging. GSA Today, v. 15(10), p. 4-9; DOI: 10.1130/1052-5173(2005)015[4:GPISBI]2.0.CO;2).

Perspective image of a meandering Pleistocene channel beneath the floor of the Gulf of Mexico, revealed by 3-D seismic imaging (Credit: Davies & Posamentier; Fig. 2)

They show examples of derivatives from 3-D seismics, produced by a variety of image-processing techniques as well as the basic seismic processing, which demonstrate the depth to which these data can be interrogated. Featured are an example of meandering Pleistocene channels beneath the Gulf of Mexico, structures produced by sediment
compaction between the Shetland and Faeroe islands in the North Atlantic, and the shapes taken by basaltic sills as they flowed into place. The graphics are wonderful, and would certainly tempt an IT-literate researcher. However, no funding agency could afford to commission such revealing surveys, and the geoscience community will always rely on the activities and generosity of the petroleum industry to enter this awesome world. Some might think of midnight meetings at lonely crossroads or an armful of long-handled spoons. Yet the potential results far transcend the kind of information one might extract from exposed geology.