
# Birth of the 'new geoscientist'

**Eldad Weiss,[*] CEO, Paradigm.**

One of the most significant changes to have taken place in the past few years in the oil and gas E&P industry has been the move from separate, isolated technology silos to integrated offerings. The borders between the different disciplines are disappearing: if in previous years, the geophysicist, petrophysicist, geologist, and reservoir engineer each performed specific tasks using the limited data available to each of them, today's advances in both hardware and software technology enable complete workflows to be performed by one professional. This leads to what I call the birth of the 'new geoscientist'.

Interpretation as it was traditionally defined – the picking of horizons and faults on a section – has been transformed into a process for generating knowledge about the subsurface, through the creation and analysis of various scenarios of the subsurface geology. The manual tasks of the interpreter have been replaced by automated horizon picking, modelling, and seismic classification and analysis tools. By accessing the full scale of the information, from regional to reservoir perspective, from seismic to reservoir model, and from petrophysical to pre-stack geophysical data, interpretation has become a process of searching and analyzing data, rather than a mundane job of picking horizons, posting the results, and mapping them.

This dramatic change has been underlined by significant advances in computing hardware and the respective development of software. In the 80s and well into the beginning of the millennium, the process of geological and geophysical data interpretation and analysis was advancing, driven by the improvements to workstations, but seismic data processing was still taking place in high-performance computing environments. The decimated end results were then forwarded to the workstations on a one-way route. Since then, the industry has moved to increasingly powerful desktop and even laptop computers, and from manual data transfer to ultra-fast networks. Part of the reasoning behind separate silos of technology was that we were unable to physically transfer the data from one 'station' to the next, because of its magnitude. Today all the data, regardless of its size, is readily accessible on every desktop and even laptop computer. These developments have made it possible, both technically and economically, for a company to load an entire basin's worth of data into its computers.

The major drop in storage costs, in tandem with increased disk capacity, is another major driver of change for the geoscientist. Not too long ago, there was a need to store data in extensive removable storage devices housed in huge warehouses, with robots employed to bring the data. Today, it is possible to store petabytes of data on the corporate network, where it can be made available online for reprocessing, analysis and interpretation work.

All of these developments – advances in computer power, the development of high-speed networks, and the drop in storage costs – have changed the level of inter-disciplinary integration.

The last major change in technology has been the vast improvement in computer graphics, from textual and presentation graphics in the 80s, to the powerful animation techniques now available on the desktop.

An article about Chevron's seismic exploration team, which appeared in a recent issue of *Forbes Magazine*, describes how the new technologies have affected one major oil company. In the article, the author[**] explains how Chevron began hunting for oil in subsalt deep water in the Gulf of Mexico.

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'To begin peering through the salt, Chevron in the early 1990s deployed a $1 million Cray supercomputer to process gulf seismic data in three dimensions … This year Chevron retired its last supercomputer and replaced it with $10,000 of gear on every desktop. 'What would have taken three months to render on a Cray in 1993 now takes two hours or less on a PC', says Barney Issen, Chevron's senior geophysicist in charge of interpreting seismic data. To crunch heavy loads, Chevron networks its computers into Linux-based clusters with hundreds of processors operating in parallel. They use high-speed graphics cards to run a customized rendering platform …'

And another quote from the same article: 'In Houston Chevron's geologists literally sit on top of 8 petabytes of seismic data – enough to fill 900,000 DVDs – housed in two floors of computer servers. Each day they collect roughly 5 terabytes of new data.'

## Where are we today?

As noted above, in the 80s each discipline used a separate system. In the late 90s,

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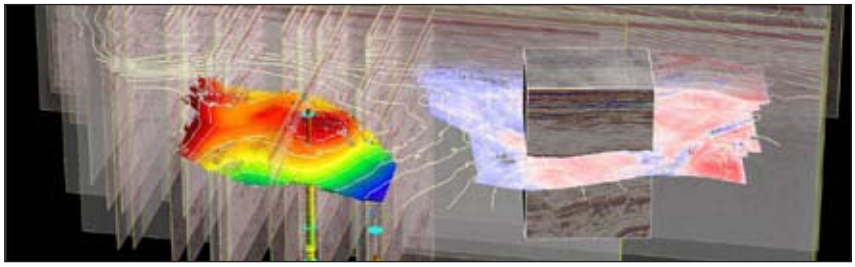
[**] *Helman, C. (2010). Chevron's Undersea Imaging. Retrieved from http://www.forbes.com/forbes/2010/1122/technology-chevron-james-cearley-topography-seeing-salt.html?partner=email. Reprinted by Permission of Forbes Media LLC © 2007.*



*Visualization of full scale of information lets interpreters search and analyze data, rather than just pick and map horizons.*

systems became increasingly integrated, but they still remained separate entities that shared some data and user interface components. It is only now, in the second half of the first decade of the new century, that the industry is seeing true multi-disciplinary data and application coupling.

The challenges for the oil and gas E&P industry, as I see them, are threefold: We need to further develop the tools required to fully utilize all of the available data within tight project deadlines; we need to build new workflows to make efficient use of multi-disciplinary integration of data and applications; and we then need to embark on a comprehensive educational programme aimed at transitioning such novel processes from advanced users to the mainstream community. This will entail a joint effort on the part of E&P software vendors and oil and gas companies.

Users are in danger of being overwhelmed by the sheer amount of data now available, including different data types and data from different projects, surveys and vintages, and by the massive integration of this data at the desktop level. The role of data management has taken on increased importance, as the need to improve data access permission, security, backup and restore, and other capabilities, has grown significantly. IT administrators need to work together with geoscientists to prepare the appropriate data management groundwork for utilizing the new capabilities and optimizing workflows. Oil companies need to adopt new procedures which strengthen data management systems and internal security, and make their IT departments an integral part of the interpretation work environment.

I believe that in the years to come our industry will master the new technologies and continue to streamline workflows, leading to even more accurate and more comprehensive knowledge about the Earth's subsurface. As hydrocarbon resources become more difficult to locate and extract, I am confident that E&P providers, together with oil and gas companies, will continue to develop the technologies needed to face new realities and challenges.