

The evolution of image log interpretation; Muwais and Smith, 1990: Back to the future part IV

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In 1990, Walid Muwais and Derald Smith published the first paper demonstrating the use of dipmeter logs for mapping point bar deposits in the McMurray Formation. Recognizing lateral and vertical accretion deposits allowed them to correlate depositional elements when only lithofacies correlations were possible before. Subsurface dipmeter logs were closely spaced and tied to geological exposures in mineface walls, allowing them to hone their interpretations and prove that their correlations were reliable.

Breccias and other elements were also interpreted from dipmeter logs; these logs look simplistic by comparison to today's logging technology. Twenty five years on, the available data has gone from six squiggly dipmeter curves to micro-resistivity image logs with nearly 200 colour-scaled curves that yield a high definition image with nearly photo-like quality. In the past, we used our imaginations to contemplate breccia clasts from dipmeter curves, and now we use image logs to see the clasts as they are in the subsurface. Slumps, stromatoporoids, dinosaur footprints, and all sorts of geological oddities are easily observed using image logs. More importantly, we've progressed from simple lithostratigraphic correlations to routinely correlating depositional elements, and now geologists are making detailed sequence stratigraphic correlations with this data.

It's the silver anniversary of Muwais and Smith, and although we have newer and better tools, their conclusions still hold true today:

1. Vertical accretion channel fill deposits are as common as lateral accretion deposits in the McMurray Formation at the Syncrude Mine site.
2. Lateral accretion channel-fill deposits can be interpreted from geophysical downhole wireline dipmeter logs, which show a pattern of increasing dip angle upsection.
3. Vertical accretion channel-fill deposits can be interpreted from dipmeter-logs, which show decreasing dip angle upsection.
4. Dipmeter logs have become the most important method in determining subsurface lithology and sedimentary structures. Such information is vital in the daily mining operations and long-range mine planning at Syncrude to prevent highwall slope failures and subsequent loss of mining machinery, and downtime.