**AAPG Annual Convention**
**Salt Lake City, Utah**
**May 11-14, 2003**

Thang Dinh Bui[1], Catherine L. Hanks[2], Jerry L Jensen[1] (1) Texas A&M University, College Station, TX (2) University of Alaska, Fairbanks, AK

**Using Neural Networks to Understand the Effects of Geologic Variables on Fracture Spacing in Folded Carbonates**

Natural fractures can provide important permeability pathways in carbonate reservoirs. However, adequate prediction of fracture character and spacing in a potential carbonate reservoir is notoriously difficult, in large part due to the variety of potential geologic factors that could influence fracture distribution. Neural networks provide one means of analyzing the effect of multiple geologic factors on the final fracture distribution. These factors include, but are not limited to bed thickness, degree of folding, lithology, and structural position.

The majority of fractures from five detachment folds in Lisburne Group carbonates fall into one of two fracture sets: EW-striking fractures that are parallel to fold axes and later NS-striking fractures that are perpendicular to fold axes. Both fracture sets have similar average and median spacings. Further statistical analysis shows that, as the folds tighten, the fracture spacing in both sets increases by a factor of two or three and becomes slightly more variable. This analysis suggests that bed thickness does not have a significant effect on the fracture spacing distribution and that fractures are only weakly related to the folding process.

However, the application of neural network analysis to the same data set indicates that the relationship between fracture spacing, degree of folding and bed thickness is more complicated. For thick beds ($h>2m$), the fracture spacing decreases as the folds tighten. For thinner beds ($h<2m$), the fracture spacing increases with folding. This behavior is more obvious in the fold hinges. The lithology has little effect on the fracture spacing regardless of bed thickness or degree of folding.