ABSTRACT

PETROLEUM TRAP ASSOCIATION: A BASIS FOR SYSTEMATIC PROSPECTING

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A petroleum prospecting strategy is proposed that attempts to consider "all possible" types of trap in potentially petroliferous rocks, and to associate them with the responsible trap-forming features, -events, and -conditions recorded therein, for the purpose of systematically developing prospects and plays. The novel component of this strategy is a comprehensive genetic classification of trap-elements which, when suitably combined, will create the many lithologic configurations that actually do the trapping. The -elements are classified according to their principal process of origin as depositional, diagenetic, deformational (structural) and erosional (beneath unconformities). They are of two distinct kinds, reservoir-elements and seal-elements; at least one of each must combine to form a geometric trap (which may or may not actually contain any petroleum). Furthermore, the materials, form and position of the seal-element(s) must relate appropriately to the reservoir-element(s).

The geometric traps and trap-elements are products of particular environmental conditions and histories, evidence of which is preserved in the rock record. From this record we can infer which kinds are likely to be present in particular bodies of rock; and with what geologic features each is likely to be associated,herein termed trap-forming features. Also recorded may be (cyclic?) events that interrupted the continuity of deposition and so may have led to isolation of reservoir bodies within sealing material, or to development of unconformities, or formation of folds and faults, etc., herein termed trap-forming events.

Prospecting begins with a preliminary determination of which trap-elements have an acceptable likelihood of occurrence in the particular body of rocks. Appropriate combinations of these -elements serve collectively as multiple working

hypotheses as to the types of traps that may be expected in them . The geologic record is then searched for specific features, events and conditions conducive to the development and localization of these types. To the degree that this record is available and decipherable, it should in theory be possible to infer not only what types of trap could be present, but also about where and in what stratigraphic positions they might occur.

Fluvial systems, for example, are common trap-forming features, and a compatible trap-forming event would be a still-stand in sealevel during an intermittent marine transgression. This combination is likely to produce a pattern of barrier islands, beaches, deltas and point bars with reservoir potential, some of which may be in a position to have received a sealing cover of clay after transgression resumed. When such possibilities are recognized in a potentially petroliferous section, they should be investigated in some detail and predictions made as to the likely positions of any appropriate types of geometric trap that could have formed.

One can begin to apply this approach with (potential) trap-forming features or -events; but starting with a study of known petroleum production has the advantage that all the requirements for an accumulation, particularly the petroleum charge, have actually been met there. After discerning the trap-forming feature(s) and -event(s) responsible for the production, more or less similar occurrences along the same trend(s) and in about the same stratigraphic postions(s) should be sought. Next, one should branch out into related kinds of traps, other comparable features, and similar (sequences of) events elsewhere in the section. Finally, with experience, totally new sorts of traps, features and events that might also have localized petroleum accumulations may be envisioned.