INTERNATIONAL EXPLORATIONISTS GROUP EVENING MEETING NOVEMBER 18, 1987

STEVEN H. LINGREY—Biographical Sketch

Steven H. Lingrey received his M.S. in 1979 from the University of Southern California and his Ph.D. in 1982 from the University of Arizona. His dissertation concerned the structural geology and tectonic evolution of the northeast Rincon Mountains, Pima and Cochise Counties, Arizona. While studying at USC, he was employed with Shell Oil Company in Houston as an intern geologist (1974-1975). He held several teaching assistantships at the University of Arizona, teaching structural geology classes and field courses. Dr. Lingrey worked as a consulting geologist with G. H. Davis (University of Arizona) on a regional tectonic analysis of Utah and eastern Nevada in 1979. He also worked with Peter Coney (University of Arizona) as a research assistant on synthesis mapping of metamorphic core complexes in California, Nevada and Utah, and on the construction of a tectonic map for parts of California, Nevada and Utah (1979-1980). Dr. Lingrey was employed by Exxon Production Research Company, Houston, in the Basin Framework Section in 1981.

At the present time Dr. Lingrey is a senior research specialist in the Structural Geology Section with responsibilities in the research of foreland thrust and fold belts, tectonic analysis of specified exploration areas, and training of Exxon personnel in company-run structural geology schools. As a lecturer, Lingrey has taught "Fundamentals of Structural Analysis", "Basin Tectonics", and "Advanced Compressional and Extensional Tectonics", both in-house and on-site (France, Australia, Turkey). He has led field trips through the Canadian Rocky Mountains, northeast Spain, southeast France, Jura and the Alps.

Dr. Lingrey's research interests are structural geology and regional tectonics with emphasis on geologic map relationships, low-angle normal faults, metamorphic tectonites and mylonites, geometric and kinematic analysis, Cenozoic evolution of southwestern North America, thrust faults, and balanced palinspastic reconstructions.

Dr. Lingrey has published numerous papers in structural geology in various geological bulletins and in Exxon company reports. He is a member of GSA, AGU, and AGI.

EXPLORATION TECHNIQUES IN FOLD AND THRUST BELTS

Foreland fold and thrust belts are linear or curvilinear bands of folded and thrust-faulted sedimentary rocks that lie along the external margins of orogenic belts. Typically a passive margin sequence has been detached from its basement, compressed, and displaced toward the craton. Clastic foredeeps (foreland basins) develop synchronously in advance of the thrust deformation.

The structural geometry of fold and thrust belts shows consistent patterns of faults, folds, and imbrication. Thrust fault trajectories occur in two common modes: (1) as listric or inclined-planar surfaces of sledrunner shape, and (2) as irregular surfaces of staircase shape, in which the fault is alternately parallel and oblique to bedding. Flexural-slip folding is dominant in foreland fold and thrust belts, commonly exhibiting chevron style (kink domain) shape in profile. Folds are rootless and have developed as a direct consequence of fault displacements. Thrust systems display imbricate overlapping of thrust sheets above a basal decollement. Where intermediate levels of detachment occur, duplex zones can develop a special type of imbrication that affects only a specific stratigraphic interval bounded at bottom and top by flat-lying detachments.

Palinspastic restoration is a useful aid for testing the geometric viability of a structural interpretation. Restoration is also useful for reconstructing pre-tectonic and syntectonic images of the developing fold belt. Provided the timing of major structural development is known or can be estimated, the construction of intermediate (syntectonic) stage restorations allows the timing and magnitude of tectonic burial by thrust faulting to be deduced. Intermediate restorations also permit evaluation of the sequential development of syntectonic sedimentary foredeeps at the leading edge of thrust deformation, relationships only rarely preserved from subsequent erosion.

The generation of hydrocarbons is a function of time and temperature. In fold and thrust belts, the thermal history is principally a function of burial, by tectonic as well as depositional events. Palinspastic restorations make it possible to estimate both the magnitude and the timing of burial along a profile. Applying a time-temperature model of oil generation, the maturation of organic source beds can then be modeled on the restorations.
