The storage and migration zones are not controlled by depth alone, but depend on the quantity of petroleum which has been generated. Beds which contain a large amount of organic material generate larger amounts of petroleum at an early stage, and migration takes place near 7,000 ft. On the other had, beds which contain smaller amounts of organic material generate lesser amounts of petroleum. Migration takes place at somewhat greater depths. Therefore, the storage and migration of oil depends largely on organic richness.

The primary migration of oil from the low-permeability matrix to open tectonic fractures apprears to take place by means of micro-scale fractures formed during oil generation. The microfractures have been observed in cores of the Austin Chalk from the Pearsall field, Dimmitt County, South Texas. The lower part of the cored section shown in Fig. 14 is highly resistive and has an average oil saturation of about 60%. This section represents a storage zone of non-producible oil. No tectonic fractures were found in the core, and no production test was made of the section.

Microfractures were abundant at many levels in the core. The microfactures appear to be dissolution seams and are parallel to the bedding. Their widths are on the scale of micrometers. Truncated fossil fragments at the margins are primary evidence for dissolution. Thin section analysis indicates the microfactures are filled with a matrix of organic material, clay, pyrite, and other insolubles. Oil is present in discontinuous laminae within the matrix and suggests that the dissolution seams could provide the paths for primary migration of oil. A geochemical analysis will be made of selected samples in the storage interval to determine the maturity of organic matter and its relation to oil generation, saturation, and well-log response.

Field Applications of Study - The correlation of resistivity and fluid saturation suggests that resistivity also may be related to productivity. For example, true resistivity may reflect the relative amount of oil that has migrated from the rock matrix to tectonic fractures. High resistivity would indicate that oil is retained in the matrix whereas lower resistivity would suggest that most of the oil has migrated and now resides in nearby fractures where it is readily producible.

In order to test this hypothesis, a producing area in Pearsall field was selected for an initial study. Fig. 15 show the lease contains 6 producing wells and 1 dry hole. Wells 7, 8, 10, and 11 were vertical holes drilled and completed at an earlier date.