PLEISTOCENE FAULT ZONE IN SOUTHEASTERN LOUISIANA[1]

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ABSTRACT

The Baton Rouge fault zone in the Florida Parishes of Southeastern Louisiana consists of several east-west faults which were subject to movement in the Late Pleistocene. These faults may be mapped on the surface in a belt over seventy miles long and up to eight miles wide which extends generally westward from the vicinity of Slidell, St. Tammany Parish, to Baton Rouge.

This zone occurs within the terrain of the Prairie coastwise terrace (equivalent to the Beaumont plain of Texas) generally assigned to the last interglacial age. The Prairie surface is relatively flat with a gentle slope Gulfward except locally where incised by stream valleys. Subsequent displacement along the faults has produced escarpments ranging up to twenty feet in height. These furnish an accurate measurement of post-Prairie displacement along the individual faults, in all cases downthrown coastward.

Proof that these escarpments are produced by faults and do not represent boundaries between different coastwise terrace levels is available from three lines of evidence:

1. Individual escarpments when traced laterally ultimately die out so that the displaced surfaces coalesce into one terrace surface.

2. The Baton Rouge fault, one of the most prominent, may be traced from the Mississippi floodplain in south Baton Rouge eastward into Livingston Parish, a distance of twenty-five miles. Southeast of Denham Springs this fault crosses two now abandoned floodplains of the Amite River which were slightly intrenched in the Prairie surface during the last glacial age. One of these floodplains, still clearly identified by abandoned channels and natural levees, is downfaulted to the south on the order of four feet. The Prairie surface bordering this floodplain shows a displacement of fourteen feet along the same fault.[4] Displacement of the abandoned floodplain verifies faulting as the origin of the escarpment. The recurrent nature of the faulting is demonstrated by a lesser displacement of the younger floodplain compared to the Prairie surface.

3. Seismic data and subsurface well data verify the existence of the faults.

Since these escarpments occur in an area of otherwise low relief they may be traced readily in the field. Indeed they are generally bordered on the upthrown side by roads, cleared fields, and homesteads which take advantage of the better drainage otherwise lacking in a flat terrain. The faults are easily identified on the topographic maps of the area and likewise on aerial photographs. In Tangipahoa Parish a vast cypress swamp north of Lake Maurepas and northwest of Lake Pontchartrain is bounded on the north by one of these faults. Recent sedimentation of black swamp mud is occurring south of the fault while north of it the older Prairie sediments are being eroded.

Although the Prairie terrace surface normally dips Gulfward at a few feet per mile this slope is often reversed in a belt one-half to one mile wide south of the faults. This reversal is particularly noticeable adjacent to the Baton Rouge fault where an abnormal northward slope of up to ten feet per mile occurs on the southern downthrown block. In such a manner the surface topography demonstrates the "rollover" or "reverse drag" effect commonly associated with Gulf Coast down-to-the-basin faults at depth. This northward slope toward the fault escarpment produces swampy conditions adjacent to the faults on the downthrown side. Along the Baton Rouge fault, Clay Gut Bayou flows for several miles in the lowland adjacent to the fault escarpment between it and the gentle elongate ridge developed farther south at the crest of the "rollover".

Over forty wells, mainly wildcats, have been drilled close enough to the Baton Rouge fault to supplement surface data. Recorded vertical displacement in the subsurface varies from 200 to 450 feet. There appears to be no marked increase in throw with depth since average displacements at the 5,000 foot level compare favorably with those at 10,000 feet. The shallowest subsurface information available indicates a throw of 350 feet at a depth above 2,000 feet. Since the **Rangia**

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[1] Abstract of information being assimilated for publication of a bulletin on East Baton Rouge and Livingston Parishes by the Louisiana Geological Survey in 1957. Published by permission of the State Geologist of Louisiana.

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[4] Fisk, 1944, **Geological Investigation of the Alluvial Valley of the Lower Mississippi River,** Mississippi River Commission, fig. 72, first recorded this fault with an aerial photograph showing displacement of the abandoned floodplain. Measurements quoted here were determined by Gus L. Waterman, in 1953 while a graduate student at Louisiana State University.

johnsoni - Miorangia microjohnsoni zone averages 3,500 feet in depth in this area the faulting appears to have occurred principally in post-Miocene time. Its recurrent nature demonstrated by surface evidence suggests the Pleistocene as its period of activity.

A combination of surface and subsurface data demonstrates the Baton Rouge fault to have the typical lessening of dip with depth common to Gulf Coast faults. In this case a dip of approximately 70° from the surface to 3,000 feet decreases to 60° - 55° from 4,000 feet to 6,000 feet in depth and ultimately to approximately 45° below 8,000 feet.

Along the Baton Rouge fault, production occurs in the recently discovered Baton Rouge (1953) and Nesser (1955) fields from anticlinal or semi-domal structures aligned parallel to the fault on the downthrown side. Although these structures only occur in pronounced form intermittently along the fault their relationship to it is suggested since they occur along the "rollover" trend more or less beneath the surface expression of the same feature. In both of these fields, as is true in other similar cases, the fault migrates with depth toward the "rollover" structure and approaches its crest just below the level of the lower "Frio" sands.

This fault zone demonstrates characteristics similar to others which parallel the Gulf Basin, such as the Sam Fordyce-Vanderbilt trend. Its sole distinction is the relative recent history with most of the movement occurring in post-Miocene contrasted to the Miocene activity of many other trends. However, this zone separates the South Mississippi Uplift area on the north from the area of thick Pleistocene deposition to the south, the depocenter of which is near Houma, Louisiana. The belt of active faulting forms the south border of the Mobile - Tunica flexure[5] across which upper Tertiary and Pleistocene deposits thicken greatly southward. This flexure and its attendant faulting cannot be definitely ascribed to simultaneously increased deposition to the south although the two events are obviously related. Restriction of salt domes to the area south of the fault zone indicates a rejuvenation of a structural trend which much earlier formed the northern boundary of a salt basin.

[5] Howe, H. V. - 1936, **Louisiana Petroleum Stratigraphy,** General Minerals Bulletin No. 27, Department of Conservation, State of Louisiana, p. 20; also Am. Pet. Inst. Paper 901-12B.