displacement direction are not orthogonal, both extension and shearing contribute to the rift deformation.

In clay models of combined regional extension and right-lateral shearing, steeply dipping, planar, conjugate strike-slip faults form if the angle betwen the rift axis and the displacement direction is less than 30°. The dextral stike-slip faults trend subparallel to and the sinistral strike-slip faults trend at large angles to the rift axis. If the angle equals 30°, oblique-slip and normal faults form. The dextral oblique-slip faults trend subparallel to, the sinistral oblique-slip faults trend at large angles to, and the normal faults trend about 30° clockwise to the rift axis. The oblique-slip and normal faults have steep to moderate dips and are relatively planar. If the angle exceeds 30°, normal faults form. These faults strike obliquely to the rift axis and to the relative displacement direction between lithospheric segments, except if the rift axis and the displacement direction are orthogonal. In cross-sectional view, the moderately dipping, relatively planar normal faults commonly die out into other faults of splay out near gently dipping horizons within the clay. Analytical models support these experimental results.

The models apply to the Gulf of California and Gulf of Aden, two continental rift systems produced by combined regional extension and right-lateral shearing. The modeling results can explain the presence of north-trending normal faults (striking obliquely to the Gulf of California trend and to the displacement direction between Baja California and mainland Mexico), northwest-trending, dextral strike-slip faults, and northeast-trending, sinistral strike-slip faults formed during the late Miocene/early Pliocene opening of the Gulf of California. The modeling results can also explain why many normal faults which formed during the opening of the Gulf of Aden trend west-northwest to west, obliquely to the Gulf of Aden trend and to the displacement direction between the Arabian Peninsula and the Horn of Africa.

WITHJACK, MARTHA O., ARCO Oil & Gas Co.

Rift Deformation Produced by Combined Extension and Shearing

Continental rifts form when lithospheric segments move apart. In response, the brittle, upper lithosphere faults and the ductile, lower lithosphere flows. Clay and analytical models suggest that rift-fault patterns depend on the angle between the rift axis and the relative displacement direction between the divergent lithospheric segments. If the axis and

Earth Science Bulletin, 1984