Sequence Systematics: an Introduction to the Workshop
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The "systematics" of sequences remains controversial. The definitions of some of the sequence concepts (sequence boundaries, systems tracts, parasequences, the sequence hierarchy) remain to be clarified. Such issues of what surfaces bound sequences, which systems tract is present at the base of a sequence, and how correlative conformities should be defined, have led to confusion and controversy that have served to distract from the application of sequence stratigraphy. The purpose of this workshop is to discuss these and other major problems and to identify common ground that could provide the basis for resolving conceptual disputes. Sequence stratigraphy constitutes an extension of the descriptive mapping methods of allostratigraphy. Whereas allostratigraphic units are defined on the basis of unconformable surfaces, sequence stratigraphic units are defined on the basis of unconformable surfaces and their correlative conformities. Such surfaces commonly are defined by extending unconformable surfaces into conformable sections by conventional stratigraphic methods. In effect, identifying the correlative conformity locally may be impossible. This raises the issue of what constitutes or defines a sequence where only correlative conformities are present. In effect, then, the sequence stratigraphic approach is based on depositional concepts, and the application of these concepts is interpretive. Three approaches to sequence analysis are most common: sequence stratigraphy commonly referred to as the Exxon approach, genetic sequence stratigraphy, and T-R cycle sequence stratigraphy. The distinction between these three, and most importantly the advantages and disadvantages of each approach must be clarified and a uniform terminology must be developed. Mapping and sequence definition can be carried out by any of the three, wherever appropriate as determined by the user. The timing of sequence boundary formation is an issue that has provoked much discussion. One approach (Exxonian sequence stratigraphy) uses unconformities and their correlative conformities to bound sequences, whereas another approach (genetic sequence stratigraphy) is out of phase with this, bounding sequences with maximum flooding surfaces. Yet both approaches produce a succession of "sequences" that have no resemblance to each other; hence the confusion. The Exxon approach to sequence stratigraphy is arguably the most popular. However, even internal to this approach, there exist significant controversies. One such issue involves the designation of the sequence bounding surface. Some argue that the sequence boundary should be that surface which exists at the time sea-level fall is initiated. This surface would be characterized in part as an unconformable surface and in part as a conformable surface. Others argue that the sequence boundary should be that surface which exists at that moment when the relative sea-level fall gives way to relative sea-level rise. This surface, too, would be characterized in part as an unconformable surface and in part as a conformable surface. The difference is that the former would place the sediments deposited during sea-level fall at the base of the (overlying) sequence, whereas the latter would place these same sediments at the top of the (underlying) sequence. Another issue involves the lack of a universally accepted hierarchy of sequences. The nesting of sequences within sequences needs a conceptual basis with appropriate terminology. It may be, however, that increased knowledge of the sequence record and of sequence generating mechanisms may lead us to conclude that no simple classification may be possible at this time.

Upper Jurassic and Lower Cretaceous Sandstone and Carbonate Oil Reservoirs Associated With Basement Paleotopography in Southwest Alabama
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More than fifty Upper Jurassic and Lower Cretaceous oil fields in southwest Alabama are associated with basement paleohighs that generally consist of granitic igneous rocks. Although basement-related reservoirs account for a significant amount of the oil produced from southwest Alabama, a comprehensive regional depositional model has yet to emerge. In an effort to develop a more comprehensive model, we undertook an interdisciplinary investigation of tectonics, stratigraphy, and sedimentation. A series of large-scale ridges and embayments formed in southwest Alabama during Gulf rifting. As much as 1,000 feet of local erosional relief was developed on basement in response to thermal uplift and extensional collapse. As the crust cooled, remnant subsidence combined with sea level fluctuation favored submergence of basement and widespread deposition. During the Late Jurassic, subsidence was driven largely by tectonic processes, whereas sediment loading and compaction became increasingly important during the Early Cretaceous. Reservoirs are in Upper Jurassic Norphlet Formation sandstone, Smackover Formation carbonate, Haynesville Formation sandstone, and in Lower Cretaceous Hosston Formation sandstone. Norphlet reservoirs are developed along the margins of paleovalleys associated with the Conecuh ridge complex and were apparently deposited in arid alluvial-fan, fluval, and solan environments. Smackover reservoirs occur on basement of the Choctaw and Conecuh ridge complexes, and include a spectrum of carbonate deposits formed by shoaling around and on basement highs. Haynesville reservoirs are primarily siliciclastic beach-shoreface sands that accreted around discrete inselbergs of igneous rock. Haynesville reservoirs on the Choctaw ridge complex represent sandy shorefaces forming immediately seaward of rocky beaches, whereas those in the Conecuh embayment represent muddier barrier-lagoon systems. Hosston sandstone reservoirs, by comparison, are interpreted as semi-arid to semi-arid fluvial-deltaic facies that formed as streams were diverted around a basement high. The principal trapping mechanisms for these reservoirs are updip pinchout of reservoir rocks against impermeable basement. Trapping in Upper Jurassic reservoirs is a direct reflection of paleotopography with only a minor component of differential compaction. In these reservoirs, sediment accretion was facilitated mainly by tectonic subsidence and by relative sea-level variation. By contrast, Hosston reservoirs formed as sediment loading and compaction became major components of total regional subsidence. In these reservoirs, compaction of sediment around basement highs contributed significantly to structural relief.