DINNER MEETING — SEPTEMBER 13, 1982

PETER R. VAIL — Biographical Sketch

Peter Vail is a Senior Research Scientist with Exxon Production Research Company. This is the highest attainable technical position at Exxon's Houston-based research affiliate.

Pete received his AB from Dartmouth College in 1952, and his MS and PhD degrees from Northwestern University which he attended from 1952-56.

He began his Exxon career in 1956 as a research geologist with the Carter Oil Company, an Exxon affiliate. During his career he has conducted research in stratigraphic mapping, well log correlation, computer applications to geology and the stratigraphic and structural interpretaion of seismic data.

Pete is, however, best (and widely) known for his pioneering efforts in seismic stratigraphic interpretation. His ideas have formed the basis for the development of the seismic stratigraphic interpretation techniques that are currently in use today. His publications on seismic stratigraphy and worldwide sea-level changes have contributed significantly to the general understanding of sedimentary processes and their influence on the generation, migration, and entrapment of hydrocarbons.

During 1975-76, he served as an American Association of Petroleum Geologists Distinguished Lecturer. In 1978, he was a William Smith Lecturer for the Geological Society of London. In 1976, Dr. Vail received the Society of Exploration Geophysicists Virgil Kaufman Gold Medal Award for the advancement of the science of geophysical exploration. In 1979, he was co-recipient of the American Association of Petroleum Geologists President's award for best AAPG paper published in 1977. In 1982, he was awarded Honorary Membership in the Geophysical Society of Houston.

Dr. Vail is a Fellow and Councilor of the GSA, and a member of AAPG, SEG, API, AAAS, the Geophysical Society of Houston and the Houston Geological Society. He is also a member of the Joint Oceanographic Institute's Deep Earth Sampling Passive Margin Panel, the Consortium for Continental Reflection Profiling Site Selection Committee, the International Subcommittee on Stratigraphic Classification, and the Ocean Science Board of the United States National Academy of Science.

JURASSIC UNCONFORMITIES AND GLOBAL SEA-LEVEL CHANGES FROM SEISMIC AND BIOSTRATIGRAPHY

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Integration of seismic with biostratigraphic data provided the means both to recognize two new types of unconformities and to explain the origin of starved (condensed) intervals of marine section. We use the Jurassic sediments to illustrate these concepts of stratigraphy.

We call the two types of unconformities simply Type 1 and Type 2. Global unconformities which cut both subaerial and submarine strata of the same age are called Type 1 and we attribute them to *rapid falls* of eustatic sea level. Global unconformities which cut only subaerial strata are called Type 2 and attributed to *slow falls* of eustatic sea level.

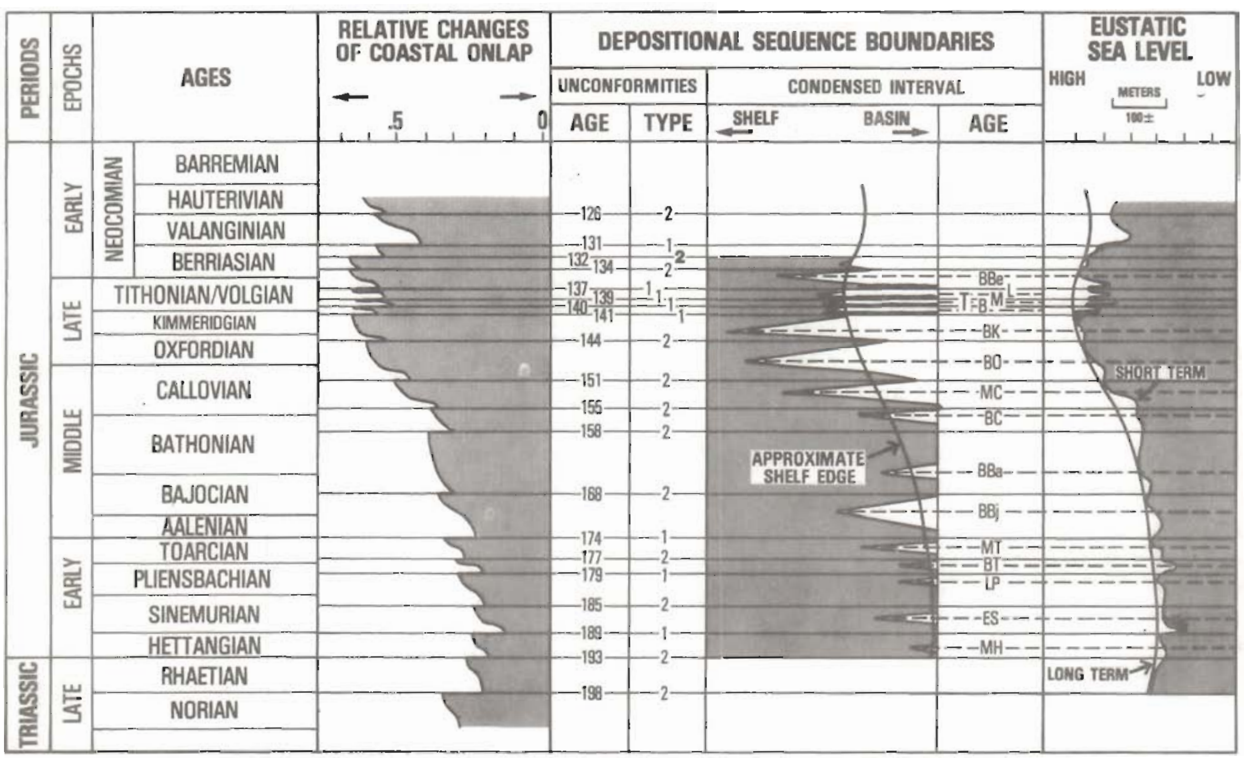

Figure 1. Chart showing relative changes of coastal onlap, sequence boundaries (including types of unconformities and condensed sections), and eustatic sea level changes for the Jurassic.

Marine condensed strata are sedimentary sections which are generally quite thin and uninterrupted by unconformities. Such sediments have sometimes been called starved intervals, and are caused by *rapid rises* of sea level. The transgression moves the depositional site landward thereby preventing significant quantities of sediment from reaching the deeper parts of basins.

Unconformity recognition is locally or regionally enhanced by periodic truncation of folded and faulted strata during sea-level lowstands and onlap onto topographic highs during sea-level highstands, but we find no evidence that the tectonics caused the global unconformities.

Seventeen global unconformities and their correlative conformities (sequence boundaries) subdivide the strata of the Jurassic (Fig.1). These 16 cycles comprise the Jurassic supercycle (Vail et al, 1977, Part 8 AAPG *Memoir 26*). Eight of the global unconformities are both subaerial and submarine (Type 1); the remaining nine unconformities are subaerial only (Type 2). In addition, over 12 marine-condensed (starved) intervals have been identified. The 16 cycles of the Jurassic supercycle are chronostratigraphic intervals that subdivide the Jurassic into a series of genetic depositional sequences, which are ideal for facies analysis.

The Jurassic unconformities and the stratigraphic and facies patterns between them are caused by the interaction of basement subsidence, eustatic sea-level changes and varying sediment supply. Detailed analysis of the sediments with seismic stratigraphy and well data permit quantification of the subsidence history and reconstruction of paleoenvironment and sea-level changes through time.

The integrated use of seismic stratigraphy and biostratigraphy provides a better geologic age history than could be obtained by either method alone. Paleobathymetry, sediment facies, and relative changes of sea level can be interpreted from seismic data and confirmed or improved by well control. Geohistory analysis provides a quantitative analysis of basin subsidence. When this subsidence is corrected for compaction and sediment loading, the tectonic subsidence and long-term eustatic changes may be determined. Short-term, rapid changes of sea level can be demonstrated from seismic and well data. The stratigraphic resolution of these changes rarely allows exact quantification of their magnitude, but a minimum rate of change of sea level often can be determined. We shall use examples to illustrate the application of these procedures.