NEW CONCEPTS IN OCEANIC SEDIMENTATION
NORMAN J. HYNE*
February 22, 1971

The deep sea drilling project, deep submersibles, and new techniques in studying deep ocean sedimentation are changing our ideas of deep ocean sediments. The mechanics of sediment transport are becoming controversial as serious objections are raised as to the importance of turbidity current and new contour currents and turbid water layers are being discovered. Continental Drift and Sea Floor Spreading have also strongly influenced the ocean sediments. These concepts of deep ocean sedimentation are now important with the increasing probability that oil and oil traps can be found in this environment.

*University of Tulsa

MINERAL RESOURCES OF OKLAHOMA
CHARLES J. MANKIN*

The mineral industry provides a principal economic base for the State of Oklahoma, as well as an important source of tax revenue. For the past three years the gross income from mineral resources has exceeded $1 billion annually. This amount ranks the state as fourth in the nation in gross mineral production. However, 95% of the total mineral production is derived from oil and gas. With the declining petroleum reserve picture for our state, the prospects for further expansion and development of the mineral industry will have to rely upon alternative resources. The further development of coal and industrial minerals provides an opportunity to offset the declining petroleum production. Owing to the diversified geology of Oklahoma, a broad spectrum of industrial minerals is available for development. With the advent of the Arkansas River Navigation Program the opportunity for expansion for industrial mineral activities in eastern Oklahoma offers promise for future growth of the minerals industry.

*Northeastern University, Boston, Mass.

NORWAY’S EKOFISK FIELD—A LANDMARK IN NORTH SEA BASIN EXPLORATION
JACK H. LEWIS*
October 12, 1970

In seven years, the North Sea has passed from a little-known basin to an established major gas and oil province. Ekofisk Field, the first significant oil discovery, occurs on an elongated dome formed by diapiric movement of the deeper Permian salt. The Danian (basal Tertiary) limestone reservoir has been penetrated by four wells on the structure. Early studies show the limestone is a typical biomicrite consisting of coccoliths and foraminifera, probably deposited in a deep quiet-water environment. Formation tests in all wells indicate reservoir continuity and high production rates of low-sulfur 35° API oil. Commercial production will begin early next year by unusual use of conventional facilities.

*Phillips Petroleum Company, Bartlesville, Oklahoma

ROLE OF SEDIMENTOLOGY IN THE DISCOVERY AND DEVELOPMENT OF CARDIUM OIL FIELDS, WESTERN CANADA
ERIC R. MICHAELIS*
March 22, 1971

Two billion barrels of oil are contained in a series of isolated linear sand bodies which form the Cardium Sand. This formation is traceable throughout 10,000 square miles of the Alberta Basin of Western Canada. Traps are purely stratigraphic. From the beginning, exploration was aided by synthesis of sedimentologic and stratigraphic data. The talk will trace the history of exploration and development of these giant oil reserves and illustrate the utility of conceptual models in exploration. A variety of models representing regressive deltaic, transgressive shelf and deep sea, turbidite deposition will be discussed. The best model for the Cardium Sand can be
chosen using only the gross geometry and stratigraphy of the tongue. This could be de-
determined from sparse control early in the play. This sedimentologic model of the sand
tongue can be used to determine exploration strategy.

*Amoco Production Company, Tulsa, Okla.

NEARSHORE-MARINE
SANDSTONES, ROCKY MOUNTAIN
CRETACEOUS
D. G. McCUBBIN*
March 8, 1971

Important types of sandstone bodies in
the Cretaceous sequence of the Rocky Mount-
tain region include regressive shoreline sand-
stones and more restricted barrier-island and
transgressive-marine deposits. Each is sup-
plied by longshore transport and deposited in nearshore-marine environments. Differences depend, in part, on the rate of sediment supply in relation to the rate of subsidence. Recognition of type and knowledge of simi-
larities and differences provide useful guides in exploration.

Regressive shoreline complexes were formed
by seaward progradation of beach and shore-
face deposits. They are as much as 100-ft. thick and sheet-like in geometry, extending
tens of miles both parallel and perpendicular
the shore. They are replaced laterally and
overlain by alluvial deposits, with channels
locally scoured into the marine sequence. These sandstones are very common in the
Rocky Mountain Cretaceous but rarely con-
tain stratigraphic oil accumulations.

Barrier-island sandstone bodies were formed
by upward (and seaward or lagoonward) ac-
cretion of beach and nearshore-marine de-
positions. They also are as much as 100-ft. thick, 10 mi. wide, and tens of miles long
parallel to shore. They commonly overlie
nonmarine or lagoonal deposits and are
overlain by lagoonal or marine shales. Some
contain stratigraphic oil accumulations.

Transgressive-marine sandstones occur in
significant thicknesses only where transgres-
sion was slow locally by topographic re-
liet. In one example where the paleotopog-
raphy is related to differential erosion of the truncated sequence ("strike valleys"), the
sandstone bodies are as much as 50-ft. thick,
a few miles wide, and tens of miles long.
They rest directly on the erosion surface,
thin laterally by onlap, and are overlain by
marine shales. Sandstones of this type contain
stratigraphic oil accumulations, but appear to
be relatively uncommon.

*Marathon Oil Corporation, Littleton, Colo.

THE GEOLOGY AND DISCOVERY
OF PRUDHOE BAY FIELD,
EASTERN ARCTIC SLOPE,
ALASKA
DEAN L. MORGRIDGE*
November 7, 1970

The Prudhoe Bay Field is recognized as
one of the largest oil fields in North America
with estimated reserves of five to ten billion
barrels. Reconstruction of the geologic history
suggests that the combination of geologic
controls on the field will be difficult to find
duplicated elsewhere.

Hydrocarbons are present in Jurassic and
Permo-Triassic sandstone and Pennsylvanian-
Mississippian carbonate reservoirs. These
strata, locally folded into a westerly-plunging,
faulted antiliminal nose, are truncated by a pre-
Cretaceous unconformity resulting in the sub-
cropping of progressively older reservoirs
to the northeast. Most of the hydrocarbons
are trapped below the unconformity and
are contained in the Permo-Triassic Sadleroch-
chit formation. This reservoir is present in the
field area as a uniform wedge of alluvial-
deltaic sandstone and conglomerate.

The pre-Cretaceous clastic reservoirs were
derived from the ancient Beaufort Arch, north
of the present coastline. In contrast, the
unconformably overlying Cretaceous and Ter-
tiary sandstone and marine shale were de-

dived from uplifts on the steep south flank
of the basin, near the present Brooks Range.

In 1944, during World War II, the U.S.
Navy initiated the first extensive Arctic
exploration program. This program was car-
ried on for ten years at a cost of over $55
million. Drilling was conducted principally
in two areas, the Barrow High and the Arctic
Foothills belt. The Umiat Field, located
on a foothills anticline, was the largest oil