bank, and partially dolomitized trends (largely in the immediate offshore areas) are recognized. More exploration should test these features, which although high-risk leads, may contain giant fields.

ZHAI GUANG MING, Petroleum Corporation of the People's Republic of China, Beijing, China

Geology and Petroleum Potential of Northwestern China

The northwestern part of China is one of the country's most prospective onshore oil and gas regions, where many large sedimentary basins are located (i.e., the Zhungeer, Talimu, Tulufan, Chaidamu, and West Gansu). In all these basins, both Mesozoic-Cenozoic sediments of continental origin and Paleozoic sediments of marine origin were deposited, totaling more than 10,000 m (33,000 ft) in thickness. As the rocks are mostly unmetamorphosed, they are highly prospective targets for oil and gas exploration. Tectonically, the northwest basins are widely different from others in China, most of which are formed by tension and normal faults that tend to produce fault structure zones or rollover anticlines. In the northwest, the basins are mostly formed by compression in which thrust faults and reverse faults that develop into many structure zones and local structures occur. The rows of structural zones at the piedmont of Tianshan, Kunlunshan, Alkinshan, and Nanshan mountains are good objectives for oil exploration.

Although most of the reservoir rocks in northwest China are of Mesozoic age, with only a small amount of Cenozoic strata, Paleozoic rocks are also considered as exploration objectives. It is anticipated that varied types of oil pools, typical structural oil pools, or large-scale stratigraphic accumulations may be found in these Paleozoic rocks.

Many oil and gas fields have already been discovered in these basins and are in production. They may constitute an important oil production base in China.

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## 1984 ANNUAL CONVENTION WITH DIVISIONS: SEPM/EMD/DPA
## May 20-23, 1984
## San Antonio, Texas

### Late Abstracts

CUSHMAN, ROBERT A., JR., H. PAUL BUCHHEIM, and LANNY H. FISK, Loma Linda Univ., Riverside, CA

Palynology and Oil Shale Genesis in Fossil Butte Member of Eocene Green River Formation, Wyoming

The palynoflora of the Fossil Butte Member of the Green River Formation was studied to relate the flora and climate to the genesis of oil shale in ancient Fossil Lake. Samples were collected from measured sections representing open and marginal lacustrine environments. These samples were analyzed using standard palynologic and visual kerogen techniques.

Evidence from the palynoflora suggests that during deposition of the Fossil Butte Member, the climate was in transition between humid, subtropical to a cooler, drier, warm temperate one with moderate fluctuations during various episodes of deposition. Additional evidence indicates that moist lowlands and flood plains existed around Fossil Lake, with upland forests on the surrounding ridges and mountains. Streams originating in the highlands supplied water to Fossil Lake and the surrounding vegetation. The age of the palynoflora along with K-Ar age determinations indicate that deposition of oil shale in Fossil basin was contemporaneous with deposition of the evaporite facies of the Wilkins Peak Member in the Green River basin. This suggests that factors affecting oil shale deposition in the two basins were locally, as well as regionally, controlled. The dominance of amorphous kerogen in the kerogen samples suggests an algal origin for the majority of the oil shales.

The palynoflora, the kerogen type, and the stratigraphic relationships indicate that the deposition of oil shale in Fossil basin was due to local climatic and environmental conditions.

WALI, ASHRAF, Cairo Univ., Giza, Egypt

Implications of Some Flow Sedimentary Structures Within Miocene Evaporitic Sequence, Red Sea, Egypt

Some typical flow sedimentary structures were clearly detected within the middle Miocene alternating gypsiferous and anhydritic clays of the evaporitic sequence in Ras Gemsa and Um El-Huweitat localities.

Sedimentologic analyses of the different structural forms revealed that they were originally formed from unlithified sediments and due to submarine flowage. These structures were formed as a result of stress—load, compression, and rotation.

Such a genetic approach is helpful in deducing the environmental conditions within which these sediments accumulated. Degrees of flowage and affected stresses on similar lithologic associations could be considered strong evidence for correlation within the extended Miocene evaporitic sequence along the Red Sea coast.

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## Fossil Fuels of Europe Conference and Exhibition
## July 15-18, 1984
## Geneva, Switzerland

### Late Abstract

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Heavy and Tar Sand Oil Deposits of Europe

Several hundred heavy and extra-heavy oil and natural bitumen occurrences from 26 European countries (including European Turkey and the western borderlands of the USSR) were compiled. The definitions used for heavy crude oils and natural bitumens, as proposed by or prepared with the UNITAR/UNDP information centre, were applied.

Information on stratigraphy, lithology, and depth as well as on gravity, viscosity, and gas and water content, is given.

Deposits are characteristically distributed along the flanks of the basins or within the separating uplifts. Nevertheless, they are found from the surface down to depths of 3,000 m (9,800 ft). Up to now, big accumulations have been exploited in Albania and Sicily, but they have been discovered also in the British North Sea, France, Spain, and West Germany. In carbonates, they were mostly encountered in fractures of synsedimentary or tectonic origin. The accumulations are the result of either intrusion of immature heavy oil from a source rock or of the immigration of mature oil, which was biodegraded afterward. In many cases, there have been at least two separate migration/accumulation events. In some cases paleoseepages did supply a source rock with asphaltic material or became an effective seal of a later hydrocarbon accumulation.