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Alaska: Potential for Giant Fields

The demise of Mukluk field is forcing government and the oil industry into more remote and hostile areas of Alaska at a more rapid rate than originally envisioned. It is conceivable that even giant fields may, in some circumstances, prove marginal or noncommercial. The unexplored offshore waters in the Arctic and the Bering Sea are seen as holding the greatest promise.

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Geology and Hydrocarbon Potentials of Arafura Sea

The Arafura Sea is a continental-shelf sea located between Irian Jaya (western New Guinea) and the northern part of the Australian continent. On the south it adjoins the stable Australian craton, and on the north it is bordered by the Tertiary collision zone between the Australian craton and the northern Irian Jaya island arc. On the west and northwest it is bounded by the active Banda arc collision zone, whereas on the east it is bordered by the northern extension of the Gulf of Carpentaria that also forms the western limit of the zone of late Paleozoic granites. Shelf sediments, ranging in age from late Paleozoic to Cenozoic, predominate in the Arafura Sea continental shelf, and are underlain by granitic basement. Two tectonic styles of deformation are recognizable in the area, namely a block-faulted downwarping within stratified shelf and slope sediments of the Arafura Sea and overthrusting of chaotic sediments from the Banda arc toward the Australian continent in which the intensity of deformation increases from south to north. Gas shows have been reported from Jurassic to Cretaceous fine-grained marine limestones and sandstones, and gas and condensate also are present in Cretaceous sediments and Middle Jurassic fine-grained sandstones.

At the north, the most prospective area seems to be the hinge zone of the Aru high, where a combination of traps and reservoir rocks presumably exists. On the south, the Money Shoal area is considered a significant prospect. In the Arafura basin, stratigraphic traps seem to be the most promising target for hydrocarbon exploration as tectonics seems not to have played an important role in the area. The sedimentary area occupied by the eastern extension of the Tarera-Aiduna wrench fault should also be investigated in detail for its hydrocarbon potential.

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Oil and Gas Possibilities Onshore and Offshore Ghana

Nearly half of the total area of the Republic of Ghana is covered by sedimentary rocks. These rocks are found mainly in four different parts of the country: Tano basin, Keta basin, Voltaian basin, and the continental shelf. The possibilities of finding oil and gas onshore and offshore Ghana have thus been concentrated in these four areas.

Because oil seeps in saturated superficial sands were found in the Tano basin, efforts to find oil in Ghana started as far back as 1896 in this basin, which is located at the extreme southwestern part of Ghana and has an area of 1,165 km^2 (450 mi^2). Seventeen onshore wells have been drilled so far in this basin, which is underlain by Upper Cretaceous Apollonian sediments consisting mainly of thin alternations of sand and clay with a few thin beds of gravel and fossiliferous limestone.

The Keta basin, located at the extreme southeastern part of Ghana, has an area of 2,200 km^2 (850 mi^2). It is covered in the north by Pliocene and in the south by Holocene deposits. Since 1966, three onshore wells have been drilled in this basin.

The continental shelf of Ghana is at the southern part of the country and has an area of 27,562 km^2 (10,640 mi^2). Prospecting for oil in the shelf started in 1968. In all, 34 offshore oil wells have been drilled by foreign companies in this area, which has been divided into 24 concession blocks. At present, oil is being produced from wells in Block 10. The possibility of finding oil and/or gas at the extreme western part of the continental shelf cannot be overemphasized.

The expansive Voltaian sedimentary basin, located in the central part of Ghana, covers an area of about 103,600 km^2 (40,000 mi^2). The basin is underlain by Precambrian to lower Paleozoic epicontinental Voltaian series comprised of a thick sequence of marine and continental sediments. Although no trace of hydrocarbon was found in the only well that has been drilled so far in this basin, the presence of traces of bitumen in some parts of the basin indicates that, despite of its age, the basin might prove to be an oil province.

The recent discovery of oil in the Ivory Coast means that it is possible to find oil or gas in Ghana, inasmuch as Ghana's petroleum potential is closely associated with that of the Ivory Coast basin, which extends for 560 km (300 mi) along the entire Ivory Coast and persists eastward into Ghana for an additional 320 km (200 mi), terminating in the area directly west of Accra. The Ghanian part of the Ivory Coast basin, therefore, holds the greatest possibility of finding oil or gas in Ghana.

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Oil Possibilities of Mesozoic in Mexican High Plateau

The study area is physiographically located between the Sierra Madre Oriental (mountain range) at the east, Neovolcanic axis on the south, Sierra Madre Occidental (mountain range) at the west, and the eastern part of the Province of Chihuahua on the north and northeast.

Platform rocks that crop out in the Sierra Madre Oriental possibly limit the Tampico-Misantla basin to the east and the Mexican Jurassic-Cretaceous geosyncline to the west. It is considered that part of the Sierra Madre Occidental served as a limit to the geosyncline from the west of Jalisco to the east of Sonora. A large part of the area is covered by extrusive igneous rocks, especially the region bordering the Neovolcanic axis, the eastern part of the Sierra Madre Occidental, and the Provinces of Chihuahua and Coahuila. The rocks that were studied consist of limestones, dolomites, shales, sandstones, and marls, mostly of marine origin.

Results of petroleum drilling indicate that some rocks show a degree of metamorphism, especially Jurassic and Triassic rocks. In places, rocks in allochthonous blocks were drilled that showed repetition of the formations, and the drilling objectives could not be reached. In the northern part of Chihuahua, some wells were drilled in bolsons or grabens filled by Tertiary and Quaternary clastic material or overflows and volcanic rocks.

According to the results obtained from this study, the following steps should be taken: (1) increase the studies of geologic and geochemical detail, (2) determine which parts of the area, from the thickness of Mesozoic sediments, are prospects for more detailed studies, (3) use mining information to locate and classify areas of metamorphism, which will surely condemn some areas, especially near the Sierra Madre Occidental, (4) increase drilling of stratigraphic tests as well as those with petroleum objectives, (5) construct Mesozoic isopach maps of Mesozoic formations from geophysical information and surface and subsurface geology, (6) study drilling records to obtain related to geohydrology, ecology, and electrical log information from the surface to total depth of the well. The cost of this program would be very high, but is justified inasmuch as it is so large an area to be explored and the prospects are excellent.

The Mexican Plateau comprises several future oil provinces; however, the southeast of Chiapas, the Gulf of California, and the Balsas trough must be considered to be of great interest.

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Oil and Gas Fields in East Coast and Arctic Basins of Canada

The East Coast and Arctic basins of Canada have been under serious hydrocarbon exploration for over 20 years. Although the density of drilling is low, extensive seismic control has outlined a high proportion of the structures in these basins and the stratigraphic framework of the basins is known. From west to east, the basins include the Beaufort basin, the Sverdrup basin of the high Arctic and the adjacent Parry Island foldbelt, the rift basins of Baffin Bay, and the continental-margin basins offshore Labrador, the Grand Banks, and the Scotian Shelf. Each of these basins contains oil and gas fields that typify, to some degree, the pools that may be anticipated in undrilled structures. Surprises, both good and bad, await the explorer.

The physical environment of these Canadian basins ranges from severe to almost impossible. As exploration has proceeded, great strides have been made in coping with the physical environment; however, the costs are becoming increasingly onerous, and the appreciation is growing