different contractors searched so intensely for oil anywhere in southeast Asia. More miles of geophysical work have been done in the past 5 years than in all previous periods of Indonesian exploration. Even though oil drilling activity in Indonesia began in 1872, more widely scattered exploratory tests have been drilled in the current exploration cycle than during any comparable exploration period. The results have been variable. Although most exploration data remain confidential, it is known that some geologic interpretation and dogma have been disproved. Even though the majority of the exploratory ventures have resulted in economic failure, a measure of success has been recorded in 3 areas. The Ardjuna and Cinta fields are producing at the rate of 25,000 and 40,000 bbl/day of oil, respectively, and the Ardjuna complex is expected to reach 75,000 bbl/day of oil in late 1972. Also, the Attaka field was scheduled at 30,000 bbl/day of oil by October 1971 and to exceed 100,000 bbl/day of oil during 1973. These do not appear to be giant oil fields, but they are economic ventures. The Attaka field, containing an estimated 300 million bbl of recoverable oil, appears to be Indonesia's best offshore discovery to date.

Will another giant oil field like Minas be found? The applicable geologic criteria do not rule out the possibility, but the probability of several small giant fields being present appears better. The current search, with a fair measure of success, should discover them.

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Near-Surface Coal Resources and Reserves of Western United States

Near-surface resources of coal and lignite in 11 of the 14 western states of the conterminous United States are estimated by the Bureau of Mines to be 48 billion tons; of this amount 26.7 billion tons could be economically recovered under present economic conditions by strip mining.

About 24.8 billion tons of this strippable reserve is low-sulfur coal (below 1% sulfur), 1.5 billion tons is medium-sulfur coal (1–2% sulfur), and 0.5 billion tons is high-sulfur coal (over 2% sulfur).

The Bureau has estimated the near-surface resources of coal and lignite in the United States to be 119 billion tons. About 45 billion tons of this resource is economically recoverable by strip mining. About 32 billion tons of this is low-sulfur coal, 4 billion tons is medium-sulfur coal, and 9 billion tons is high-sulfur coal.

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Depositional Cycles of Lodgepole Formation (Mississippian) in Central Montana

Detailed stratigraphic and petrographic investigations of lower Madison Group outcrops reveal that the Lodgepole Formation is composed of 5 two-part depositional cycles. The stratigraphically lowest cycle includes the entire Paine Member; the remaining cycles comprise all but the lower part of the Woodhurst Member.

Each cycle is characterized by a fine-grained lower unit and a coarser upper unit. The lower unit is dominated by horizontally laminated carbonate mudstones, pellet carbonate grainstones, and finely crystalline dolomites. These lithologies are interpreted to be the deposits of calm, nonturbulent lithotopes. The upper unit of each cycle is characterized by cross-laminated, medium- to coarse-grained, bioclastic and oolitic carbonate grainstones, interpreted to have been deposited in shallow, turbulent environments. From the lithology, sedimentary structures, lateral petrographic and stratigraphic continuity, and modern analogues, these oolitic and bioclastic beds are interpreted to be generally synchronous within individual outcrop belts in central Montana. Regionally, however, cycle-capping intervals are probably diachronous stratigraphic units.

Facies interpretations of Lodgepole depositional cycles suggest that rocks of the fine-grained lower unit are deposits of deeper water transgressive phases of the Lodgepole sea; lithologies of the upper coarse-grained unit are accumulations of the shallower water regressive phases.

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Reef Calcification

Of the life processes on a coral reef, calcification produces the most conspicuous end product—the reef framework and sediments. Most of the information relevant to coral-reef calcification comes from studies of the rates of $CaCO_3$ retention by the reef or studies of individual organism calcification rates. Neither of these types of studies really assesses the rate at which the reef community produces $CaCO_3$.

Alkalinity depletion as water flows across a reef, together with volume transport of that water, can be used to compute the rate of reef calcification. This procedure has been employed across a predominantly coral community and across a predominantly coralline algal community on windward inter-island reef flats of Eniwetok Atoll, Marshall Islands.

The mean alkalinity of water approaching the reef is about 2.30 meq/l, and the alkalinity as the water crosses the reef is typically depleted by less than 0.01 meq/l. The product of Δ alkalinity times volume transport, divided by the reef length, averages approximately 0.0025 (meq/sq m)/sec, with no significant difference in depletion rate between the 2 calcifying communities examined. This alkalinity depletion rate is equivalent to a $CaCO_3$ production rate of 4×10^3 (g $CaCO_3/m^2$)/year.

If the porosity of the sediment produced by calcification is 50%, then the $CaCO_3$ production rate is sufficient for an upward reef growth rate of about 3 mm/year. Because the present rate of eustatic sea level rise is considerably less than 3 mm/year, the reef is either catching up with sea level, or most of the $CaCO_3$ produced is being removed. Sediment accumulations downstream from actively calcifying reef areas favor the latter hypothesis.

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Sequence of Bedform and Stratification in Silts, Based on Flume Experiments

Flume experiments with 2 silt sediments indicate development of a sequence of bed forms and stratification which is systematically related to flow intensity. At a fixed flow depth, each silt is transported as ripples over a wide range of mean velocities above the threshold for movement. With still higher velocities, ripples disappear abruptly and a flat-bed mode of transport occurs. Dunes are not present at velocities intermediate between rippled and flat beds, as they are for sand.

At lower velocities, ripples develop forms very similar to sand ripples; planar lee slopes accrete by slump-