Most of Antarctica is ice-covered, and rock exposures comprise only some 2 to 3% of the area of the entire continent. Antarctica is divisible into two regions with different geological characteristics. East Antarctica (lying mainly in east longitudes) is the larger region, and West Antarctica the smaller. The Transantarctic Mountains, which cross the continent and pass near the South Pole, mark the inland border of East Antarctica.

East Antarctica is a continental shield that was a central piece of Gondwanaland in early Mesozoic time. The basement rocks are mainly of Precambrian age although lower Paleozoic rocks are also present in the Transantarctic Mountains. Archean rocks in the charnockite-enderbite terrane along the Indian Ocean coast have yielded apparent ages as great as 4.0 billion years. The basement complex is unconformably overlain by the subhorizontal Gondwana sequence of Devonian-Jurassic age.

West Antarctica is a younger region that makes up a segment of the Circum-Pacific mobile belt. Definite Precambrian rocks are known from only one locality, and the ice sheet–bedrock contact is below sea level throughout much of West Antarctica. Sedimentary rocks, mainly or entirely of Phanerozoic age, crop out extensively in the Antarctic Peninsula, the Ellsworth Mountains, and western Marie Byrd Land. Diverse Phanerozoic igneous and metamorphic rocks are widely distributed across West Antarctica, especially Mesozoic (Andean) intrusive bodies and Cenozoic volcanic rocks.

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Geophysical Surveys in Northeast Pacific

The major tectonic and geological boundaries in the Northeast Pacific off British Columbia have been delineated by multiparameter geophysical surveys conducted by the Pacific Geoscience Centre. Systematic magnetic, gravity, bathymetric, and seismic surveys on 5 mi (8 km) lines run perpendicular to the shelf edge to a distance of 224 mi (360 km) offshore, supplemented by detailed surveys, heat flow, ocean bottom magnetic and seismic measurements, sedimentological and geological studies, have been used to produce an integrated picture of this very complex environment.

Major components include: the Queen Charlotte transform boundary, a complex continental slope averaging 19 mi (30 km) wide with an associated -70 mgal free air anomaly centered over the outer part of the slope suggesting that the slope is largely composed of sedimentary material; adjacent ocean floor with characteristic north-south-trending magnetic linears which are complicated by anomalies associated with the Kodiak-Bowie seamount chain and transform discontinuities, and the northern Juan de Fuca and Explorer plate region, an area of short spreading ridges with a history of plate fragmentation, rotation, and subduction beneath the North American plate.

These studies have resulted in a revised model of the evolution of the western Canadian continental shelf, which has implications for petroleum exploration and potential. Designers of petroleum exploration strategies for all active margins must be cognizant of plate dynamics. Recent reports of ridge axis polymetallic sulfide mineralization also illustrate the potential economic importance of regional studies of plate boundaries and behavior.

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Geology and Potential Development of Queensland Oil Shales

Stimulated by recent interest in oil shale as an alternative source of oil, exploration since 1978 has revealed that the Tertiary and Cretaceous oil shale deposits of Queensland are of considerable size and extent. Tertiary deposits contain inferred resources of oil totaling 2,400 × 10^6 m^3 (15 billion bbls), based on average Fischer Assay yields of 60 to 80 L/t in situ, while Cretaceous deposits are perhaps one hundred times larger. However, 90% of the latter are too deeply buried to be extracted with existing technology. On present information, Jurassic, Permian, and Cambrian oil shale deposits do not appear to be of economic significance.

Cretaceous oil shales occur within the shallow marine Toolebuc Formation of western Queensland. This stratigraphic unit is thin (16 to 49 ft, 5 to 15 m) but exceedingly widespread. Tertiary oil shales, which range up to 1,970 ft (600 m) in thickness, formed in freshwater environments in several basins located in the eastern one-third of the state.

Oil shale deposits most likely to be exploited in the next decade are those of Tertiary basins close to the coast, which contain multiple seams of high oil yield, amenable to open-cut mining and with adequate supplies of water. The Condor, Rundle, Stuart, and Yaamba deposits are in this category. Mining feasibility studies of these and the Cretaceous Julia Creek deposits envisage open-cut mining and surface retorting on a large scale. Experimental retorting investigations are in progress. Extraction of oil from oil shales in areas remote from the coast probably awaits development of economic methods of in-situ retorting.

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Eruption of Mount St. Helens
(No abstract)

DELANY, FRANCES M., Secretary General, CGGMW

International Mapping Activities of the World
(No abstract)

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Philippine Geothermal Energy Resource: An Available Indigenous Alternative

The Philippines is indeed fortunate to be located within the West Pacific Island Arc dotted by Neogene volcanic centers. The multistage development of volcanic-plutonic events in this western part of the Circum-Pacific basin has generated regions of high heat flow where known potential geothermal resources are located.

With the increasing power demands reflecting a favorable growth of the country's economy, the Philippine government embarked on an accelerated program to harness the country's geothermal energy for power utilization at the start of the energy crisis in early 70s.

For a period of 10 years (1972-81), the Philippines has successfully launched a systematic and continuing program of assessing, exploring, developing, and exploiting its vast potential geothermal resources. Of the several potential areas scattered all over the archipelago, four geothermal fields have already contributed some 501 megawatts equivalent to almost 12% of the total electrical power supply of the Philippines.

This paper deals with the geothermal resource development of

the Philippines, a major achievement of a developing country of the Third World in the use of new and renewable sources of energy.

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Philippine Energy Policy for the 80s

Philippine energy policy for the 80s will tend to follow the general directions established in the mid-70s. Its application, however, should reflect the realities of this decade as well as the progress achieved and experience gained over the past several years.

The Philippines, traditionally relying on oil for 95% of its commercial energy requirements, considers this fuel to be too expensive for meeting the growing energy demand of most sectors of the economy. Accordingly the country, since 1974, has embarked on a policy that: (a) promotes judicious and efficient use of energy through a responsive pricing policy and a package of fiscal incentives; (b) reduces oil dependence in favor of more economical and preferably indigenous alternatives.

Supporting this dual policy thrust, the government has played a catalytic role through selective investments, enabling legislation, national energy policy planning, and coordination of program execution. The vigorous enlistment of foreign and private sector investment in upstream resource development continues to play a role.

By 1981, the implementation of aforementioned energy policy initiatives had resulted in a decline in the country's dependence on imported oil, from a high of 96% in the mid-70s, to 79%. Energy consumption growth rates after 1974 have been contained, on the average, to levels below real economic growth movements.

In the near future, the energy investment program targets further reduction of imported oil dependence to 43% by 1986 on the strength of projects that are now either under construction or committed.

While the 70s presented general mobilization challenges, higher real costs of money and more difficult access to foreign exchange dominated financing are expected in the 80s.

In Philippine energy sub-sectors, policy application needs to recognize specific market conditions and the accomplishments to date.

The value of oil as foreign exchange earning or expenditure prompts policymakers to maintain an aggressive oil exploration posture. Though considerable success has been achieved in geothermal exploitation and use, the country still needs to displace around 2,000 Mw of baseload of oil thermal plants, a need advantageously fulfilled by geothermal systems. On another front, coal policy is expected to heavily favor the development of domestic production. Projected demand for coal for the next 6 years indicates substantial import requirements, though prospects of increasing indigenous reserves continue to be favorable.

The country continues to face challenges in the electric power industry, biomass energy development, and energy pricing. Policy options in these instances have been developed, but it is clear that time is needed to reach a satisfactory state of affairs.

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Cooper Basin Gas Liquids and Crude Oil Development Project

Gas liquid and crude oil reserves have been proved in the Cooper basin in the northeast sector of South Australia. Engineering developments necessary to exploit these reserves and bring them to market include Moomba field wells, a liquid recovery plant, a 310-mi (500 km) pipeline from Moomba to Stony Point and fractionation facilities at Stony Point. Markets for the products to be sold—lag, condensate, and crude oil—have been determined.

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Mesozoic-Cenozoic Tectonic Evolution of Western North America—Alternative to the Orocline

A time-lapse sequence for the Lower Jurassic of North America-Siberia positions is used, geared to Mid-Atlantic opening rates and pole of rotation, to show a possible linkage between the Pacific and Arctic Oceans. With a pervasive and long-lasting right lateral movement on all terranes west of the Rocky Mountain Trench (Tintina system), one can perceive Alaska, Yukon, British Columbia, and the western states as a complex of transported microplates joined by transform faults and sutures. The modification of these boundaries and the creation of structural salients in the northern Cordillera are credited to a lower Tertiary collision of the Alaskan Brooks block and Chukotka with the eastward moving Kolyma shield complex. The concept introduces a possible linkage between the extinct Kula-Farallon Ridge and the Alpha Cordillera and credits spreading within the Arctic to Barents Shelf migration by spreading away from Alaska, between the Nansen fracture zone and the Taymyr trend.

The microplate fabrics of both Alaska and eastern Siberia favor accretionary processes, with all blocks carried out of the Pacific region or along the west edge of the North American craton, rather than rifting away from Arctic Canada.

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Status of Circum-Pacific Map Project—Southwest Quadrant, Mid-1982

The Geographic and Plate-Tectonic Maps of the Circum-Pacific Map Project, Southwest Quadrant, have already been published. The Plate-Tectonic Map is a best guess for many areas, because much remains unknown about spreading centers, plate boundaries, and passive margin features.

Compilation of the Geologic Map is practically complete, with modification of guidelines so that quadrant geology can be adequately summarized. The fundamental geologic elements within the Quadrant are fragments of Gondwanaland encircled by oceanic crust and plate boundaries; passive margin-style Mesozoic and Cainozoic deposits were added to the Gondwana Paleozoic and Precambrian terrain while interactions at the boundaries between the Pacific, Australia-India, and various Asian Plates were producing other kinds of deposits. Units hosting energy and mineral resources are also emphasized.

The concurrent draft compilation for the Quadrant Tectonic Map directly complements the Geologic Map. The draft basically shows plate interiors and plate margins, each divided into basement and cover rock areas. Major orogenies are emphasized and detailed subdivision results in about 50 kinds of mostly strato-tectonic units.

Drafts for the quadrant Energy Resources Map are in progress, but little progress has been made on the Mineral Resources Map. Most of the work on the Geodynamics Map is the responsibility of project headquarters.