the Late Triassic (Indosinian events). In the eastern part of the continent, four major east-trending sutures (Red River, Qin Ling, Yan Shan, and Mongol-Okhotsk) bound three major blocks (respectively, South China, North China-Korea, and Manchuria-Bureya).

The Yanshanian geology in eastern Asia, particularly the widespread belts of calc-alkaline igneous rocks, can be interpreted as resulting from magmatism superposed above major peripheral subduction zones that dipped northwestward under South China and westward under North China-Korea and Central Mongolia from 200 to 100 m.y.B.P., and westward under North China-Korea (fronted by Southwest Honshu) and Manchuria-Bureya from 100 to 50 m.y.B.P. Some subduction also took place from 200 to 100 m.y.B.P., parallel to the Qin Ling, Yan Shan, and Mongol-Okhotsk sutures, as all finally closed. Hydrocarbon-rich basins formed as the result of major epeirogenic subsidence on western margins of the oldest continental nuclei, farthest from the eastern subduction zones. Rates of subsidence and subduction appear correlative; areas of magmatic arcs and volumes of sedimentary basins reflect subduction rates; both reach a maximum in the Late Jurassic and Early Cretaceous.

The post-Yanshanian (since 50 m.y.) geology in eastern Asia can be interpreted as resulting from northeast-southwest crustal extension in the region between the Siberian craton and the continental margin from Primorye to Taiwan, contemporaneously with collisions between Asia and the Okhotsk block in the northeast, the India block in the southwest, and the Philippine arc in the southeast. The extension is evidenced by hydrocarbon-rich Tertiary grabens, by voluminous Late Tertiary alkalic basalt volcanism localized along former plate sutures, and by historically recorded, scattered, intraplate, shallow seismicity.

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Tectonic Guidelines for Oil and Gas in the Circum-Pacific

(No abstract)

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Petroleum Potential of Southern Part of Tonga Platform

The Tonga platform is roughly outlined by the 2,000-m isobath with an average width of about 60 to 75 mi (100 to 120 km) surrounding the Tongan Islands of Vava'u, Ha'apal, and Tongatapu. Single-channel seismic profiles across the platform were acquired between 1977 and 1979 by scientific expeditions sponsored by CCOP/SOPAC (Committee for Cooperation of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas) and ORSTOM (Office de la Recherche Scientific et Technique Outre Mer). This survey and a five-well drilling program on Tongatapu were inspired by the discovery of seeps of weathered crude oil from vuggy coralline limestone. Reef buildups and normal fault structures are interpreted from seismic data, and the wells penetrated Miocene and Eocene limestones, volcanogenic clastics, and some reached volcanic basement. Few oil and gas fields are found in fore-arc basins, of which the Tonga platform is typical, but the reefs offer prospects and the seeps suggest that the requirements of source rock and maturation may be satisfied.

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Preliminary Results of Leg 3 *Lee* Cruise—Basin Development and Resource Potential of Central Solomons Trough

A CCOP/SOPAC cruise funded by Australia, New Zealand, and the United States surveyed parts of the Solomon Islands region in May and June 1982, in order to assess the potential for petroleum accumulations and to identify geologic hazards. Work was concentrated in the central Solomons trough (the Slot) between the islands of Guadalcanal, Santa Ysabel, New Georgia, and Choiseul, where continuous multichannel, single channel, and high resolution seismic records were acquired together with magnetic and gravity profiles.

The Slot is underlain by a composite depositional basin that contains as much as 2.8 mi (4.5 km) of Cenozoic sediments. Despite its complex island-arc setting, submarine volcanoes, and 2,625 to 5,900 ft (800 to 1,800 m) water depths, the basin includes structural, stratigraphic, and possibly thermal elements that favor generation and entrapment of hydrocarbons.

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A Review of United States Active/Passive Solar Cooling Program for Building

(No abstract)

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New Gold-Silver-Copper Orebody at El Indio, Chile

In June 1975, a St. Joe Minerals Corp. geologist, Dave Thomson, visited a remote prospect called El Indio, 300 mi (500 km) north of Santiago, close to the Argentine frontier at 13,000 ft (4,000 m) elevation. He recognized the great potential and St. Joe moved promptly. However, an agreement to purchase 80% of the property was not signed until June 30, 1976. Intensive exploration and development followed. It took another year to negotiate a foreign investment agreement with the government of Chile.

On December 2, 1981, the El Indio mine-mill complex was dedicated. The total investment approximates U.S.$200 million and the facility will process 1,380 tons (1,250 MT) ore per day. Mill-feed ore reserves at the time of dedication were calculated at 3.1 million tons averaging 12 g gold, 144 g silver, and 3.5% copper. In addition, direct shipping high-grade ore reserves are estimated at 70,000 tons averaging 11 oz (345 g) of gold per ton. Similar material has been mined and shipped since 1979, containing in excess of 345,000 oz (10,750 kg) of gold. Our geological assessment is that continued exploration at El Indio will discover considerably more ore of both types.

The ore is found in a complex vein system within volcanic andesites, dacites, and quartz dacites within, but near the border

of, a caldera. The regional structural pattern is north-south faulting. Northeast cross faults forming sigmoid loops are very important ore controls.

Massive enargite-pyrite veins are up to 33 ft (10 m) wide. Propylitic, argillic, quartz-sericite, and siliceous alteration are widespread, with precious metal content favoring the highly siliceous areas. Gold is rarely visible as average grain size of the native metal is 5 microns.

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Australian Energy Development and Policies for the 80s

Australia has substantial reserves of energy resources and energy-related minerals, and therefore has the potential for major increases in the production of such resources and the processing of minerals for export. Realization of this potential in the 80s will depend largely on the state of world markets.

Australia's resource base and its energy position have been described, and evaluated in the context of the development of Australia's energy resources as a contribution to the national and global transition away from oil. The economic growth that will flow from energy resources development and related activity is noted and possible constraints on development are considered.

The role of the Commonwealth government is addressed, proceeding from the key energy policy goal of ensuring adequate supplies of liquid fuels for Australian industry, especially the transport sector, and private consumers. Specific objectives and achievements in energy conservation, fuel substitution, oil exploration and production, and the development of synthetic fuels are discussed. The preparations made by the Commonwealth and State governments and the private sector to deal with severe disruptions to imported oil supplies are outlined. Energy research and development policies and programs are described briefly.

The Commonwealth government's policies are also examined in the context of setting the scene for resource development in the 80s. The importance of appropriate macro-economic and other supporting policies is emphasized.

Major individual resource projects are described, and Australia's potential contribution to the Pacific region, both in direct energy trade and in technological cooperation, is considered.

It is concluded that Australia has developed a flexible policy framework which will facilitate the development of its natural resources in the 80s.

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Impact of Renewables on China's Energy Supplies

The People's Republic of China has abundant conventional as well as renewable energy resources. During the 33 years since liberation, the energy production has increased some 25 times and the country is now self-sufficient for all the 800 million tce (ton coal equivalent) energy demands, including the biomass consumed as fuel in the vast rural region. However, due to the enormous population, the energy consumption per capita is rather low, around some 0.8 tce/capita including the noncommercial energy sources. The PRC is now making great efforts to increase the energy supplies to meet the tremendous energy demands in the course of "Four Modernizations."

The renewables constitute a considerable portion of China's energy supply. The potential hydraulic resources amount to 680 Gw, of which about 430 Gw is exploitable. Mini-hydro stations constitute the main supply for the electrification in rural regions. Agriculture waste provides about 33% of the rural energy supply, 28% comes from firewood, and 10% from coal from local small mines. Due to the shortage of domestic fuel in some regions, excessive burning of agriculture wastes and deforestation results, threatening the future of agriculture production. Therefore, policies are being adopted to develop biogas as well as other renewables in order to improve the ecological equilibrium in rural regions.

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Operating Experience of Johnson & Johnson Solar Industrial Process Steam Facility

(No abstract)

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Study of Microearthquake Activity in Four Geothermal Areas of Taiwan

Detailed microearthquake surveys were conducted in four geothermal areas of Taiwan, namely, Tatun volcanic region, Chingshui-Tuchang geothermal area, Lushan hot spring area, and Hungyeh hot spring area, during the past few years. It is found that most of them have microearthquake activity. Based on the microearthquake data, fracture zones permitting deep circulation of water are inferred. Microearthquakes in the Tatun volcanic region are concentrated in a 1.9 mi (3 km) wide and 4.3 mi (7 km) long, northeast-striking elongated zone, where conspicuous geothermal manifestations are present. The focal depths of these events are mostly less than 0.6 mi (1 km). The occurrence of these microearthquakes may be related to the minor normal faults in that region. In the Chingshui-Tuchang geothermal area, microearthquakes are located in a northeast-striking zone, 25 mi (40 km) long and 4.3 mi (7 km) wide. The foci clearly define a northwest-dipping fracture zone with a thickness of about 1.9 mi (3 km). Three composite fault plane solutions are all of the normal fault type. No microearthquake activity was found within a 3 mi (5 km) radial range around the Lushan hot spring area, during a 34-day recording period. A highly active microearthquake zone was found in a region 1.25 mi (2 km) to the west of the Hungyeh hot spring area and the foci define an east dipping fracture zone. However, the causative faults of these events are of the thrust fault type.

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Bulgugsa Granitic Activity and Metallogeny in South Korea

South Korea can be divided into five northeast-trending geologic provinces: the Precambrian Gyeonggi and Ryeongnam massifs, the Ogcheon fold belt, the Paleozoic Taebaegsan basin, and the Mesozoic Gyeongsang basin. The Gyeongsang basin occupies the southeast quarter of South Korea and contains Lower Cretaceous post-orogenic fluvial and lacustrine deposits overlain by volvaniclastic and volcanic rocks of middle and Late Cretaceous age. Granitic plutons, ranging in age from 107 to 44 m.y., occur mostly in the Gyeongsang basin, but are also exposed to the north in the Ogcheon zone and Taebaegsan basin.