through until 1967 to supply essentially a thermal market. Meanwhile coal had been discovered in the Crowsnest Pass in the Rocky Mountains in 1873, and was first produced at the turn of the century for coking purposes. Coal production has grown in this area to become the sole supplier for today's export markets.

A notable increase has occurred in the production of coal since 1970, from 937,000 to 12,900,000 tons (850,000 to 11,700,000 MT) in 1981. Since the end of the moratorium on the issuance of coal licenses on February 10, 1978, a concentration of effort on exploration and development has taken place mainly in the southeast and northeast of British Columbia. Government policy was revised to meet present-day requirements with the passing of the Coal Act in 1974 and the Coal Act Regulations in 1979.

Based on the signing of contracts at the beginning of this decade, the projected production will increase to a total of about 27,500,000 tons (25,000,000 MT) in 1985 and possibly to 38,600,000 tons (35,000,000 MT) by 1990.

The coal measures are Cretaceous and Tertiary in age, the former is essentially coking whereas the latter is mainly thermal. The new mines will be in the Cretaceous measures in northeast and southeast British Columbia; some 85% of the production will be used for metallurgical purposes and the remaining 15% of oxidized coals will be used for thermal purposes.

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Preliminary Metallogenic Map of New Caledonia—Second Part: Mineral Deposits Nonassociated with Ultrabasic Rocks

In 1979, the Bureau de Recherches Geologiques et Minieres of the New Caledonia Territory launched a 5-year program to inventory mining activities and design strategies for prospecting and exploiting mineral resources. Its aim is to bring about diversification in an industry which is presently based mainly on the extraction of nickel, chromium, and cobalt associated with ultrabasic rocks. The island's most prospective areas have been investigated with the aid of a new 1/200,000 scale geologic map, published by the B.R.G.M. (J. P. Paris, 1981), and the results, combined with studies of about 300 showings, ancient mines, and new discoveries, are presented on a preliminary metallogenic map.

Ore bodies are concentrated in certain provinces or geologic units, or are aligned along major and minor tectonic features. The following are the most significant metallic mineral concentrations: the pre-Senonian mafic plutono-volcanic central units with Cu (Au) deposits, probably of the massive sulfide type; the Diahot Province, to the north with Cu, Pb, Zn (Au, Ag) deposits of volcano-sedimentary type, related to Senonian-Eocene mafic volcanic activity; the West Coast Basalts Province, with Cu (Au) deposits of massive sulfide type, and Mn deposits, related to Senonian-Eocene mafic volcanic activity; the East Coast Basalts Province, identical to the former western province; the mineral deposits related to major faults with Sb, Hb, W, and Cu deposits; the mineral occurrences related to Oligocene-Miocene granodioritic intrusions with Mo, W, Sb (Cu, Au) minor deposits.

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New Surficial Sediment Maps of Pacific Ocean: Circum-Pacific Map Project (1:10,000,000)

Surface-sediment maps, just completed, are the first depiction of sea-floor sediment distributions on a systematic and uniform scheme for the entire Pacific basin. Ten dominant sediment types are mapped, using a classification based on calcareous-biosiliceous biogenic components and conventional textural categories for nonbiogenic components (gravel/sand/silt/clay); three minor sediment types distinguish volcanic and organic-skeletal gravels/sands/silts. Primary data were from more than 4,000 Pacific Ocean cores in the Lamont-Doherty Geological Observatory collection. Qualitative smear-slid analyses were done on these cores, using petrographic microscopes combined with laboratory determinations of $CaCO_3$ for quantitative control; many additional data were taken from unpublished smear-slide descriptions, the World Data Bank, and published information on sea-floor deposits. The maps depict unconsolidated sediments exposed on the ocean floor, presumably at the sediment-water interface, recovered by coring and do not necessarily represent Holocene material. Additional maps showing details of sediment types and the enormous data base, with an explanation of sea-floor sampling techniques and core samples of all 13 sediment types are also available for viewing.

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Economic Geology and Mineral Resource Base of People's Republic of China

China's oil production, essentially stabilized at 2.1 million bbl per day, will climb again as offshore Eocene, Oligocene, and Miocene discoveries in the Neocathaysian graben system are developed and produced. Exploration onshore has discovered several new fields in such geographically diverse areas as the Tarim basin (Miocene-Jurassic), the Qaidam basin (Cretaceous-Lower Pliocene), the Junggar basin (Permian-Cretaceous), and the Sichuan basin (Proterozoic-Jurassic). Indigenous, but commercial Proterozoic gas is produced in the Sichuan basin.

Coal production, which reached a high of 700 million tons (635 million MT) in 1979, once again is increasing. Principal deposits are of Permian, Jurassic, and early Tertiary ages. China's coal-resource base is among the three greatest in the world, and China's principal source of energy continues to be coal (67% of China's energy mix).

Shale oil is exploited on a modest scale. Most of the shale oil currently being mined is of early Tertiary age.

China's wealth of non-hydrocarbon minerals is enormous. Huge Mesabi-type and sedimentary iron ores are widespread in the country. Other resources present in great abundance include bauxite, copper minerals, lead-zinc, antimony, chromium, cobalt, manganese, platinum metals, rare earths and rare metals, tin, tungsten, uranium, asbestos, barite, borates, fluorspar, jade, magnesite, pyrite, various kinds of salts, and talc. The country has the potential to produce large amounts of molybdenum, gold, nickel, diamonds, phosphates, and potash. Silver and titanium are in short supply. Although the country is by no means self-sufficient in all minerals, it is more richly endowed than all countries of the world outside of the USSR.

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Geology of Northern Thailand

Northern Thailand resembles the Great Basin of the western

USA in that it occupies an area of late Cenozoic, north-trending grabens and half-grabens, with a very high geothermal gradient, near the western margin of a continent. Similarities in the tectonic setting of the two regions include their location east of an inactive magmatic arc, the presence of a late Cenozoic transform fault to the west, a marginal basin to the southwest, and existence to the southeast of a major plateau, uplifted in the late Cenozoic. These similarities suggest plate boundary events in and west of northern Thailand, comparable to those in the Great Basin region. Mineral deposits of probable late Cenozoic age in northern Thailand are confined largely to fluorite and antimony; comparison with the Great Basin suggests a possible lineament control on their location. Absence in northern Thailand of the late Cenozoic silver-gold deposits, so widespread in the Great Basin, may reflect the lack of late Cenozoic basaltic and rhyolitic flows forming potential source rocks, although the large basaltic bodies postulated at depth in the region suggest that subsurface precious metal or mercury deposits could be present.

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Tertiary Dismemberment of Western North America

Before coastal California began moving along the San Andreas fault, strike-slip faults displaced two other large terranes, thereby affecting petroleum maturation and migration. During the early Eocene, the Pacific plate converged against North America, because at that time it moved parallel to the Emperor Seamounts hot-spot trace. Later, when the Pacific plate began to move parallel to the Hawaiian Ridge (43 m.y. ago), the Pacific-Farallon spreading axis was contacting North America at Oregon. Strike-slip faulting, as evidenced by displaced Tertiary paleolatitudes in Alaska, then detached the Wrangellia-Chugach terrane from the Pacific Northwest and began to move it northward. Today, this block, with a pointed leading edge at the Alaska Peninsula, lies between the Aleutian Trench and the Denali fault. Local deformation indicates that during the Pliocene it curved to the west and came to rest along an ancestral Aleutian subduction zone. Magnetic lineations show that in the middle Tertiary another segment of the Pacific-Farallon spreading axis intersected the continent at northern Baja California. A terrane from Vizcaino Bay to the Olympic Peninsula, which included the Sierra Nevada and Klamath Mountains, moved northward along a fault that joined the earlier strike-slip fault near Vancouver Island. This terrane juxtaposed Obispo-block Franciscan rocks from Vizcaino Bay against Salinian-block potassium-rich plutons at the back side of the Sierra Nevada batholith. At the end of the Miocene, the East Pacific rift jumped east and established the present plate boundary, which is detaching continental rocks only from the Gulf of California to Cape Mendocino.

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Geology and Geothermal Energy Development at Coso KGRA

The Coso geothermal area, located east of the Sierra Nevada about 150 mi (240 km) north of Los Angeles, is in an oval structural basin 25 to 28 mi (40 to 45 km) across that is defined by arcuate faults. The basin is underlain by fractured Mesozoic granitic rocks that have been intruded and partly covered by late Cenozoic basalt, dacite, and rhyolite. A partly molten silicic magma body <1 m.y. old is interpreted to underlie the central part of the basin. Fumaroles are associated with the youngest volcanics (~ 0.3 m.y. old) which occur along the upfaulted north-trending Coso Range in the center of the basin. Snow melt patterns along the Coso fault zone, east of the range, indicate high heat flow. Measured heat flow values in exploratory wells indicate >10 HFU in a 11.6 km^2 (30 km^2) area within the basin. Several young faults cut Pleistocene lavas and offset Holocene alluvium by as much as 10 ft (3 m). The principal structural controls of subsurface fluid flow are fractures, dominantly of north-south, but also of northwest and northeast trend. Maximum measured temperature of surface water is 96.7°C. Compositions of test well fluids indicate reservoir temperatures as high as 250°C and suggest the presence of an extensive chloride-rich hot water system. Development of the geothermal power-generating potential of 3,000 acres (1,215 ha.) within the 72,640 acre (29,400 ha.) Coso KGRA by California Energy Co., under contract with the Department of the Navy, was begun with the siting of four wells in early 1981. The initial exploratory drilling phase will be completed by the 2d quarter of 1982. Commercial power production is anticipated by 1985.

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Recent Regional Studies in Central Eromanga Basin Area in Southwestern Queensland, Australia

Interest in the petroleum potential of the central Eromanga basin area has been simulated by recent discoveries of oil and gas in the Eromanga and Cooper basin sequences in southwestern Queensland.

The Bureau of Mineral Resources, in cooperation with the Geological Survey of Queensland, is assisting in petroleum exploration of this area by providing new regional information on the structural and depositional history of the Eromanga and underlying Cooper, Galilee, and Adavale basins. Several regional seismic reflection traverses up to 186 mi (300 km) long are being recorded over major structural features in the Eromanga basin, over the eastern margin of the Cooper basin, the southwestern Galilee basin, and the underlying Adavale basin. The seismic surveys are tied to existing seismic data to provide good quality structural and stratigraphic information. Seismic refraction, gravity, and magnetic, and magneto-telluric surveys are providing additional information on both sedimentary and basement structures; Landsat imagery studies are providing new perspectives on many regional features; and geochemical and source rock maturation studies are providing a basis on which a sound assessment of the petroleum prospectivity of the areas can be made.

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Seismic Reflection and Mineral Prospecting

Prospecting for minerals becomes increasingly difficult when targets lie at depth, or where basement expression is masked by thick sedimentary cover. Geophysical techniques such as gravity and magnetics are generally used as aids in reconnaissance, but rarely yield unambiguous solutions, while electrical methods suffer because the often highly conductive overburden limits current penetration. Recent advances in extending the resolving power of the seismic reflection method suggest that it is ap-