of trilobite and brachiopod associations. The Elgenchak horizon is comparable with the Llanvirnian on the basis of graptolite associations, and is comparable with the Whiterock Stage and probably a part of the Marmor Stage of North America on the basis of the brachiopods. The Lachug horizon corresponds to the Llandeilian; it definitely is comparable with the Krivoluk Stage of the Siberian platform and is conditionally compared with Ashby Stage of North America. The Lachug horizon is characterized by rich graptolite, brachiopod, ostracod, and trilobite associations. The Kharkindzha horizon unites heterofacies deposits and corresponds to the lower and middle Caradocian of England, the Mangaseya Stage of the Siberian platform, and conditionally to the Porterfield Stage of North America. The base of this zone is the most distinctive faunal boundary in the Ordovician of northeastern Asia and is characterized by the appearance of rich graptolite faunas of the *Nemagraptus gracilis* zone and by numerous ostracod, brachiopod, and trilobite associations. The Omuka horizon correlates with the deposits corresponding to upper Caradocian and Ashgillian. The upper part of the Omuka horizon definitely is comparable with the Ashgillian on the basis of graptolite associations, and with horizon 5b of Norway on the basis of corals and brachiopods.

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Two Stochastic Models Useful in Petroleum Exploration

What probability law characterizes the *spatial* distribution of oil and gas fields in a petroleum province?

How does the probability that a wildcat well will find a reservoir change (if at all) as the history of a basin unfolds?

The answers to these questions are important inputs to any model of the process of exploring for oil and gas. Some attention has been devoted to the latter question by Arps and Roberts and Kaufman. Bradley and Uhler and Griffiths have touched on aspects of the former. There are deficiencies in each of these treatments.

Our objective here is two-fold: first to posit a reasonable model of the spatial distribution of petroleum reservoirs that conforms to a number of empirically observed facts about such distributions; second, to examine a simple first-order model of the exploration process that allows one to test empirically the hypothesis that at an early stage in the exploration of a basin the process behaves like sampling without replacement.

We have examined some Canadian data as examples of applications. The techniques of inference are useful in predicting properties of an unexplored region.

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North Canada Rift System

The North Canada rift system, 3,000 mi long, is a dormant incipient branch of the Mid-Atlantic Ridge. It penetrates northwestward into the North American continent, splits into 2 branches at the head of Baffin Bay, and then fades out into the Canadian Arctic Islands.

This system was the locus of continental drift, as Greenland and Canada rotated apart to form intervening seaways. The location of the system resulted from the interplay of subcrustal forces and the anisotropy of the Precambrian and younger crust.

The adjacent continents were deformed passively in the drifting process, by faults and joints occurring in upper levels merging to flow at greater depths. Two phenomena thereby resulted from and facilitated drift. *Continental stretching* occurred where the crust was extended or stretched more or less equally in all directions. *Continental bending,* observed only on a large scale, occurred when the coast was stretched very much more than nearby inland regions, mainly by faulting.

The North Canada rift system illustrates in an arrested state, the first 4 stages of rift ocean development. They are (a) extension failure (many examples), (b) rift valley (Nares Strait), (c) proto ocean (Baffin Bay), and (d) incipient ocean (Labrador Sea). Each stage contains in its sedimentary record the remains of the earlier stages.

The system probably began to form in latest Triassic or Early Jurassic, with the initiation of a rift valley along the site of the present Labrador Sea. Important movements were still occurring as late as Oligocene. It is now essentially dormant, having weak seismicity that indicates only minor adjustments.

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Stratigraphic and Tectonic Development of Cook Inlet Petroleum Province

The Cook Inlet basin in south-central Alaska is an intermontane half-graben about 200 mi (323 km) long and 60 mi (95 km) wide. The basin contains roughly 20,000 cu mi (82,000 cu km) of Tertiary sediments estimated to have at least 1.5 billion bbl of recoverable reserves by present production techniques; and 5 Tcf of proved gas reserves in place, possibly 70% recoverable.

This paper discusses the more extensively explored northern part of the basin.

The stratigraphic and tectonic development of the basin includes 3 Mesozoic cycles of marine sedimentation and 2 Tertiary cycles of estuarine to nonmarine sedimentation. Each cycle is closed by an orogenic episode accompanied by a major geographic shift in the depocenter for the succeeding cycle and generally by some increase in the relative land area to produce progressively more extensive land areas and a more restricted basin of deposition. The stratigraphic succession in the basin includes a cumulative total of over 40,000 ft of Mesozoic rocks and up to 30,000 ft of Tertiary strata.

The structural trend of the basin approximates N30°E between its confining mountain borders. The enclosed Tertiary sediments are deformed into *en echelon* anticlines with more northerly trends diverging from the basin margin about 15°. The folds are concentric and contain Mesozoic sedimentary and volcanic rocks in their cores. They have essentially a universal westward asymmetry, except along the northwest margin of the basin where the structural development is influenced by the basin-bounding Castle Mountain fault system which has good evidence for a strong right-lateral component of movement. Northwest-directed continental underthrusting along the Aleutian trench could be an adequate mechanism to account for the structural shortening evident in the basin.