2. *Very slow sediment accumulation rates.*—This is apparent in several ways: occurrence of manganese nodules and crusts on bedding planes; very thin but complete stratigraphic sections representing long time intervals; and cosmic spherule abundances in the rocks. Average sediment accumulation rates on the order of 0.1 to 2.0 cm./10^3 years are suggested by rough calculations; however, it is evident that the actual rates changed considerably within the time intervals considered.

3. *Solution effect.*—Solution of all or nearly all calcium carbonate minerals produced the radiolarian chert as an insoluble residue; this is believed to be analogous with certain areas of the present deep-sea floor below the depth of complete $CaCO_3$ dissolution. In other parts of the Jurassic section, aragonitic skeletal parts (ammonite shells) were dissolved; calcitic parts (ammonite aptychi) are well preserved. The latter situation is believed to be analogous with certain present deep-sea areas where dissolution of aragonitic pteropods occurs at shallower depths than calcite dissolution.

4. *Subsidence rates.*—This can be fairly well established for the Triassic Period in the Austrian Alps because the total thickness of the shallow-water Triassic deposits (reefs, evaporites, *etc.*) is indicative of total subsidence. If projected unchanged into the Jurassic Period, this rate establishes at least minimum depths during the Jurassic and indicates that subsidence rates greatly exceeded sedimentation rates. Other evidence suggests that the subsidence rate actually increased during Jurassic time, at least in the beginning.

Together these criteria suggest maximum water depths of 4,500–5,500 meters in the northern Limestone Alps during Jurassic time.

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FLORAL SUCCESSION IN A PENNSYLVANIAN COAL SWAMP AS INDICATED BY PALYNOMORPHS

Distribution of palynomorphs in segment samples taken in six outcrop sections of the Iron Post coal (Desmoinesian) of eastern Oklahoma shows prominent successional aspects. The variety of palynomorphs is small in the underclay and basal third of the coal, but is great in the top of the seam at all sections collected.

Underclay of the Iron Post coal contains a mircoflora dominated by *Calamospora*. Subordinate associations include *Lycospora* and *Laevigatosporites*. The spores *Lycospora* and *Calamospora* are dominant in the overlying basal third of the coal seam, everywhere except in the sections near the pinch-out of the coal. *Granulatisporites* and *Triquitrites* are locally important subdominants within this level.

The middle third of the coal seam is marked by a decline in *Lycospora* and the dominance of *Laevigatosporites*. A section located near the southern pinch-out of the coal is dominated at the same stratigraphic level by the saccate forms *Wilsonites* and *Florinites*. The upper third of the coal seam is everywhere characterized by a dominance of *Triquitrites* and *Verrucosisporites*.

Roof shale yields microfloras similar to those of the lower coal intervals except that there is a general decrease in most spore groups. This decrease is associated with a relative increase in saccate spores.

Palynomorph distributions within the Iron Post coal suggest that most spore groups were derived from plants indigenous to the swamp. However, palynomorph variety plotted with respect to position in the seam indicates that succession within the Iron Post coal swamp is somewhat irregular. A major decrease in microfloral variety at the base of the upper third portion of the seam indicates that some important event harmful to floral succession had occurred at the time represented by this level. It is suggested that relatively major fluctuations in palynomorph variety may be useful in stratigraphic correlation.

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QUANTITATIVE ANALYSIS OF PROSPECT TO DETERMINE WHETHER IT IS DRILLABLE

Thirty-one models were constructed in an attempt to represent all conceivable types of structural, stratigraphic, and structural-stratigraphic traps. Combinations of 52 parameters constitute these traps and define their proximity to hydrocarbon accumulation.

A trap is defined with 100 per cent certainty where all parameters necessary for its constitution can be demonstrated. Where only a part of the total parameters can be demonstrated, the per cent chance that a trap is present is reduced in a linear manner according to equations and graphs prepared by the writer. The same relation applies in defining the chance that a hydrocarbon accumulation exists, provided a trap is present.

The Composite Chance Factor (CCF) is the product of the Percentage Chance for a Trap and Percentage Chance for Hydrocarbon Accumulation. It is mathematically related to economics by the following formula:

$$\left\{\begin{array}{l}\text{Number of wells that must be drilled}\\ \text{for any particular Composite Chance}\\ \text{Factor, to eliminate statistically all}\\ \text{but 1 per cent chance for failure as a}\\ \text{result of bad luck, and find profit-}\\ \text{able amounts of hydrocarbons}\end{array}\right\} \times \left\{\begin{array}{l}\text{Absolute}\\ \text{minimum}\\ \text{desired}\\ \text{return}\\ \text{on}\\ \text{investment}\end{array}\right\} = \left\{\begin{array}{l}\text{Profit}\\ \text{to}\\ \text{Risk}\\ \text{Invest-}\\ \text{ment}\end{array}\right\}$$

A graph was prepared showing the interrelations of the parameters in the above formula.

The statistical number of wells that must be drilled to find at least one economically successful prospect for a particular CCF, based on the minimum desired return, was calculated using probability equations and tables.

A summary sheet was designed to record all the data pertinent to the analysis of a prospect. A formula on this sheet yields a numerical prospect grade. These grades can then be used to select objectively the required number of drillable prospects commensurate with the allocated drilling budget.

By using the proposed system, the user can reduce considerably the monetary speculation when prospecting for oil, and he can invest, fully expecting to realize at least the desired minimum return on his investment.

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SEDIMENTARY FACIES AND THEIR IMPORTANCE IN OIL FINDING

In today's search for oil, industry has become increasingly aware of its need for information that will permit more accurate prediction of porous and permeable facies. Such information is important in exploring for both structural and stratigraphic accumulations.

To obtain the data desired, research geologists have directed their efforts to modern ocean basins and contiguous land areas where both sedimentary facies and the environments that produced them can be studied