recently collected, will provide a more secure paleontologic basis for correlation with type-Villafranchian ecology.

Although no materials suitable for radiometric dating of type Villafranchian has been found, volcanic rocks associated with the correlative Etouaires fauna near Issoire, France, have yielded a K/Ar date of 3.4 m.y. The nearby younger Villafranchian fauna of Roca Neyra is 2.5 m.y. In beds from a zone between these two faunas is the fossil flora of Boissac, of perimediterranean type dominated by deciduous trees and containing bamboo.

The oldest geological indications of cold climate that have been dated in the Auvergne of France are at Coupet (solifluction), 1.9 m.y., and Vazeills (crioturbated earth), 1.8 m.y. Coupet also has a fauna, thought by Bout to be mid-Villafranchian.

The oldest glacial deposit dated from the Northern Hemisphere (Sierra Nevada) is 2.7 m.y., whereas the oldest evidence of Pleistocene cold climate in the Southern Hemisphere (New Zealand) is slightly older than 2.5 m.y.

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GEOLOGIC QUANTIFICATION: DESCRIPTION → NUMBERS → SUCCESS RATIO (THE NUMBERS GAME, OR EVALUATING OUR WORK WITHOUT ACTUALLY USING DICE)

Continually increasing emphasis on the economic aspects of risk/return ratio is essential in a successful oil-exploration program. Such an economic analysis attempts to predict the ultimate financial return from the original investment based on (1) various estimated, largely dimensional parameters, and (2) the assumption that the wildcat test will be a discovery. In the past, probability of success, *the* fundamental element in any drilling decision, commonly has been determined subjectively by the geologist. His means of making such a determination has been based largely on his "feel" for the area, his experience, and perhaps a desire to take advantage of an element of luck where positive supporting evidence is lacking. The geologist rarely recommends a prospect with a risk factor less than 1 in 4, or 1 in 5, yet statistical results of domestic wildcat drilling, considering only those tests in which technical advice has been used, are about 1 in 8. This poor record in prediction, based on subjective factors, must be supplanted by some system of estimation in which descriptive geology is translatable into numbers that may be converted into a measurable probability of success.

An exploration prospect check list is presented to illustrate the evaluation method. This list is organized into three primary classes of fundamental geologic data essential to any prospect. The absence of favorable development of any one of these ordinarily results in a wildcat failure. Each primary class is subdivided into categories, some of which are separated further into sub-categories. The ultimate division in the classification is a check list of 210 geologic elements. Up to 38 elements are considered in the evaluation of any prospect. Translation of geologic description to numbers is accomplished by relating the geologic details with each of the above elements that is pertinent to the objective. From careful consideration of the check list, the expected condition of development of each element that is essential to the prospect is compared with what might be considered optimum development of that element for the area. The sum of the percentages of optimum development of all pertinent elements under each of the primary classes of data is a measure of the probability of optimum development of any major trapping factor. According to the probability theory, the percentage chance of geologic success is the product of the percentage chance of development of the three trapping factors. Examples taken from actual case histories, considering the state of knowledge prior to drilling, demonstrate how percentage probability of success and risk is determined.

If the geologists' largely descriptively oriented profession is to survive as a provider of significant technical advice to the highly competitive and cost-conscious domestic oil industry, the geologist must seek to translate his determinations into tangible terms more suited to comprehension by a non-geologically oriented management. Quantification, as presented here, is one approach toward that end. It is hoped that this approach will stimulate continued improvement of the system, or provide the impetus for the spawning of others, which may result in substantial improvement in the selection of prospects which result in economic successes. If the present domestic 1 in 8 discovery-to-dry-hole ratio is reduced to the desired 1 in 5, exploration costs would almost be cut in half; this might result in a complete rejuvenation of our domestic oil industry.'

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SILICA: SOURCE AND DISTRIBUTION IN SOUTHEASTERN ALASKA

The area of investigation lies between lat. 56°–59° N. and long. 134°–137° W. This coastal region consists of a complex of fiords, estuaries, channels, and straits. Samples from standard hydrographic depths were collected from 50 stations occupied every 2 months during 1965-1966. Cores and grab samples also were retrieved to study the lithologic character and interstitial water composition. Samples from major rivers and streams were also collected.

The period of collection included two seasons when blooms of diatoms were noticed in the inlet waters. Silica concentration between blooms varied at different depths with the maximum at the surface and minimum at the bottom. The silica-salinity ratio diagram indicated fresh water as a minor source for silica during summer months. However, during winter months, the silica seems to recycle from deeper waters to replenish surface silica removed by siliceous organisms.

Approximate estimations of silica utilization during diatom blooms were made by silica-salinity ratio diagrams. The removal of silica during the September, 1965, bloom appeared to be 12 per cent of the total amount of silica present in the system during the month of November, 1965 (low biological activity).

The vertical distribution of silica in glacially-fed areas such as Glacier Bay showed a homogeneous mixing with no sharp halocline throughout the year. Chatham Strait, on the other hand, was stratified during the summer, and there was no sharp halocline during the winter months.

The silica concentration in interstitial waters showed a higher concentration in basins with finer sediments and lower concentrations in basins located near the source with coarser detrital sediments. No relation between silica and major ion concentration in interstitial waters was observed.