and the lower Lodo, Media Aqua Creek) are known to be of Paleocene age. However, the bulk of both the foraminiferal and nannoplanktonic assemblages collected from several geographically distinct areas throughout the Coast Ranges represent the Penutian (West Coast lower Eocene) and/or Ulatisian (West Coast middle Eocene) Stages.

Moreover, the foraminiferal faunal change which characterizes the Penutian-Ulatisian boundary, as well as the nannoplanktonic faunal change found to correlate widely with this foraminiferal change on the West Coast, occur within or close to the Poppin Shale of the Santa Barbara Coast and several of its Coast Range correlatives.

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THE SURF-BREAK: KEY TO PALEOGEOGRAPHY?

The most important element in paleogeography, and perhaps the most difficult to locate, is the shoreline. Specific indicators are rare, faint, or easily destroyed. Nevertheless, we require a "key" which will permit us, tentatively at least, to identify ancient coasts.

River sands placed on modern beaches are modified in a systematic way. The distribution below a critical diameter is filtered to provide a new, distinctive, size curve. The result is an inflection so located in many samples that it does not appreciably affect the standard deviation. The inflection, or "break," which results from surf action may not be an absolute indicator, but it appears to be fairly good. This has been verified observationally (studying near-shore sands) and experimentally (placing fluvial sands in the breakers).

Under wave action, the "surf-break" starts in the "fines" and moves into the coarser sizes. The rate at which it moves is a measure of wave energy level; hence its position depends on both wave energy and duration-of-working. The "surf break" should be common in sands worked by low to moderate energy waves; along coasts having moderate to high energy breakers, the inflection may be missing due to an absence of material coarse enough to record it.

Shorelines of interior seas, such as ancient seaways, are generally marked by low to moderate wave energy levels. Hence the "surf break" may be a widely useful, although not foolproof, device.

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THE USE AND DETECTION OF FLUORESCENT SAND TRACERS

Two recent developments, fluorescent tracers and a fluorescent particle counter, hold promise as practical means to the quantitative evaluation of littoral drift and sediment transport in rivers. Unlike radioactive material, luminophores present no health hazard or storage problems, offer a wider range of applicability, can be recovered in samples, and are more economical to use. The fluorescent tracers have been employed in studies of such specific problems of sediment migration as beach erosion, inlet stability, dune processes, and artificial beach nourishment.

Fluorescent dyes and thermosetting plastics have been combined to coat sand in a process designed to produce the tracer material, so that the physical properties of tracers and the sediments are nearly identical. Of the several materials and techniques tested, urea-formaldehyde resin, fluorescing organic dyes, and a catalytic procedure imparted the best chemical and physical characteristics to the tracer grains.

The application of tracers to sand transport studies became practical only with the invention of the fluorescent particle counter. This instrument provides a rapid and accurate method of frequency determination of tracer particles in sand samples, and therefore affords a much needed statistical treatment of sediment transport. The particle counter has been built on the principles of optics, electronics, and threshold decision logic, to differentiate simultaneously for four tracers, the fluorescent colors of which have been established through spectrophotometric measurements. Tracers in samples with concentrations varying from 10^{-7} to 10^{-2} are counted, tabulated, and recorded at the rate of 20,000 particles/second.

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ORIGIN OF PISOLITES

The Permian pisolites of the Guadalupe Mountains of southern New Mexico and west Texas have been widely accepted as being a by-product of algal activity in the shallow lagoonal area behind the platform margin of the Delaware Basin. If this interpretation were correct, one would expect to find smooth pisolite laminations formed by the algae and not the crenulate laminations seen in some of the pisolites. One would also expect to see developed stratification, and interlayering with stromatolites and other algal deposits. Evidence of pisolites being formed by algae somewhere in the world today would be anticipated.

Evidence shows that such conditions are not applicable to the Guadalupe Mountain pisolites. The field relationships suggest that the pisolites developed in porous and permeable calcarenites by a weathering-soils process. The area behind the platform margin was periodically subaerially exposed. The climate was arid with occasional wet periods. The downward migrating surface waters leached calcium carbonate from the upper layers and concentrated it in the lower layers as films or laminae about nuclei. These dense concentrations are the pisolites; they compare very favorably with caliche deposits in the area.

The environment can be completely misinterpreted if the pisolites are thought to have formed in a shallow sea when they actually formed in the soil of an arid climate.

Knowledge concerning the factors which produced the pisolites in the Guadalupe Mountains should be applicable in studies of pisolites elsewhere.

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GEOLOGY, GEOPHYSICS, AND THEIR COMMON GROUND

During the past ten to fifteen years many subjects for papers and topics for symposiums have hinged about pleas for closer cooperation between geologists and geophysicists. The popularity of the subject reflects the increased effort required to find new oil reserves and suggests the possibility that one group of professionals suspects the other of not doing all they can to make the job easier. This polite but definite pointing of the finger is a natural and human reaction to the necessity of facing an unexpected and unpleasant situation.

Any altercation between a geologist and a geophysicist can literally and figuratively be described as a family fuss—for a family we are. We feed from the same trough, we are subject to the same management, and we have exactly the same objectives, i.e., the discovery of more oil at less cost. In certain areas, we use the same tools and speak exactly the same language, but from the center lobby of subsurface interpretation, each of our two professions has built an extensive network of specialized branch structures between which there are few connecting hallways. We have in the oil industry, however, just one large building and if the geophysicists set fire to their end, your end will burn, and vice versa. If one group makes improvement in its part of the structure, the equity of the other group is equally enhanced, but no great stride forward will be possible until the whole structure is modernized.

The greatest weakness in our common structure is our lack of control of the basic plan. We geologists and geophysicists have been so engrossed in scientific endeavor, in gloating over our successes, or in crying over our failures, that we have abandoned exploration planning. We have shoved aside this responsibility and left it to the accountants, the bankers, the mathematicians, the graduates of the School of Business Administration, or to conclusions drawn from data fed to electronic computers. Consequently we should not be surprised to find exploration programs defined now in terms of dollars instead of ideas, budget allocations determined by the size of the district office staff instead of program merit, and that a "deal" submitted by an outsider is more attractive to management than our own program because the outsider's deal can be fitted neatly into a fixed quarterly budget.

If we want a better building, then we must help design it. We may even be surprised to find that management will welcome our help.

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Silurian and Devonian Arenites of the Franklinian Eugeosyncline

The Franklinian eugeosyncline, mobile from the late Precambrian or Cambrian to the late Devonian or early Mississippian, is exposed mainly in northernmost Axel Heiberg and Ellesmere Islands. The Silurian and Devonian arenites consist of the following genetic groups:

1) Lower Silurian calcareous lithic arenite: post-tectonic marine shelf deposits produced by Ordovician(?) uplift of metamorphosed limestone off northern Ellesmere Island.
2a) Late Middle and early Upper Silurian lithic and volcanic, partly graded arenites: early syntectonic deposits, related to Caledonian movements, composed of sediments as in (1) with contemporaneous keratophyric pyroclastics.
2b) Upper Silurian and Devonian quartz-chert arenites: marine and nonmarine syntectonic and post-tectonic sediments, produced by Caledonian uplift of quartzose sandstone, chert, etc., with some contemporaneous pyroclastics in the upper part.
3) Devonian graded volcanic arenites: early syntectonic turbidites related to a major late Devonian orogeny derived from Silurian keratophyric rocks, to contemporaneous volcanism, or both.

Most of the inferred source rocks seem to have recognizable equivalents in the pre-Devonian (mainly pre-Ordovician) eugeosynclinal succession. The Silurian and Devonian arenites, then, originated partly by contemporaneous pyroclastic volcanism but mainly by uplift, erosion, and rapid redeposition of strata deposited earlier in the mobile belt itself. Turbidity current deposition seems to be confined to syntectonic phases. Sandstones with more than 10% of clay matrix are relatively sparse.

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Origin of Sodium-Rich Triassic Lacustrine Deposits, New Jersey and Pennsylvania

Successive Stockton arkose, Lockatong argillite, and Brunswick mudstone, nonmarine basin deposits, contain abundant sodium derived from Na-feldspar-rich source rocks that lay to the east.

Lockatong lacustrine deposits (3,750 feet thick), in cycles averaging 15 feet thick, accumulated at a rate of about 0.2 mm. a year. Detrital cycles consist mainly of mudstone containing abundant Na-feldspar, illite (and muscovite) and chlorite, and calcite, but very little quartz or K-feldspar. They are composed of abundant Na_2O (4.0%), K_2O (5.2%), and MgO (3.8%), and only about 49 per cent SiO_2. They accumulated in an open lake with estimated low salinity, Eh 0 to -2.5, and pH 7 to 8.

Chemical cycles consist mainly of colloidal-chemical mudstone containing abundant analcime, Na-feldspar, dolomite and calcite, and illite and chlorite; quartz is absent and K-feldspar is very rare. The rock is composed of K_2O (3.3%), abundant MgO (4.0%), very abundant Na_2O (6.4%), and only 49 per cent SiO_2. Cr, V, Ni, and Co approach or exceed concentrations in marine mud. These cycles accumulated when the lake was closed; gray deposits in an environment of estimated moderate salinity, Eh -1 to -3, and pH 7.5 to 8.5, and grayish-red deposits in an environment of somewhat higher salinity, Eh -0.5 to 1.5, and pH 7.0–8.5.

Lockatong detrital and chemical cycles shared a common physical (lacustrine) environment. But detrital cycles and fine-grained Stockton fluvial facies shared a rather similar geochemical environment, as did chemical cycles and lowermost Brunswick mudflat facies.

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Submarine Fan Deposits and the Transition From Turbidite to Shallow Water Sediments in the Upper Carboniferous of Northern England

The Shale Grit and Grindslow Shales lie between the Mam Tor Sandstones (turbidites) and the Kinderscout Grit (nearshore or coastal plain sediments). These Upper Carboniferous formations crop out in the central Pennine Basin of northern England. The Shale Grit contains two main sandstone facies: (1) interbedded parallel sided sandstones and mudstones interpreted as turbidites and (2) thick (5 to 100 feet) sandstones without mudstone partings interpreted as very proximal turbidites. Individual thick beds characteristically show signs of a multiple origin. There are also three mudstone facies, silty mudstones, pebbly mudstones, and thinly laminated black mudstones. The Grindslow Shales contain sandy mudstones, burrowed silty mudstones, parallel bedded silty sandstones and carbonaceous sandstones. There are also some horizons of normal and proximal turbidites, especially near the base of the formation.

The sequence of the Shale Grit facies indicates that distal turbidites are more abundant below, and proximal turbidites are more abundant in the upper part of the formation. In the Grindslow Shales the facies become sandier upward, with horizontal burrows restricted to the uppermost part of the formation. The two forma-