

CSA
Abstracts with Programs
from 1969
Part 7

WITH PROGRAMS FOR 1969, PART 7

TOPOGRAPHY IN THE EASTERN PACIFIC OCEAN
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pronounced north-south lineation were JOIDES Site 10 near 14°N, 140°W. The km wide, bounded by narrow V-shaped individual hills are 20-50 m high, and to the larger groups. Magnetic anomalies topography. with an air gun and a 3.5kHz echo sounder transparent sediment up to .015 sec thick, lent layer .10 sec thick. Closely spaced upper layer is an unfossiliferous zeolitic from slopes and ponded in troughs. The --siliceous ooze of Upper Oligocene

THE NORTH ATLANTIC
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ridges have been delineated in the North bathymetric data and seismic reflection sedimentary features are several km. thick . These sedimentary plumes have been found Ireland, east of, and parallel to, the 0°N and 53°N, southeast of the tip of continental margin of eastern North America (er ridges). These sedimentary features and are all associated with strong bottom mechanism for the formation of theseigma, but their association with sediment ocean currents must hold the key to their

PT: A VEHICLE FOR SECONDARY LEVEL EARTH

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concept, developed by geologists working in has merit as a vehicle for introduction the methods of the historical geologist. of methodological uniformitarianism is comparison of a modern depositional system iation in the geologic record. of the stratigraphic record consists of genesis of strata within a sequence such lex of New York can be more readily under- from the perspective of modern deltaic ges of utilization of the depositional vel earth science instruction are: (1) The ial consideration of environmental nal system to study of spatial (strati-

graphic) relationships that are three-dimensional and relatively complex, (2) Level of generalization in presentation can be adjusted to the amount of time available in the curriculum for instruction in historical geology, as well as to the needs and ability of the student, (3) The approach is integrative in that by the very nature of its reliance on converging lines of evidence it brings together many aspects of earth science.

Such an approach may seem reactionary in this age of student investigative discovery, but it serves to focus student attention on the one feature that makes geology unique among the sciences - its historical perspective.

METAMORPHIC ALTERATION OF THE ROBLES FORMATION, SOUTH CENTRAL PUERTO RICO

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The Robles Formation of South Central Puerto Rico is composed primarily of andesitic lavas and pyroclastic rocks which have been subjected to up to 4000 meters of burial. As a result the mineralogy has systematically readjusted. The degree of alteration in the Robles rocks is proportional to permeability; phases appear in greater quantities in porous pyroclastics. In lavas, plagioclase phenocrysts, olivine phenocrysts, and groundmasses have developed a series of alteration phases which are dependent on temperature and pressure conditions. The generalized sequence of appearance of secondary phases from low to high rank is as follows: 1) Analcime, chlorite, sericite, and heulandite, 2) laumontite, celadonite, and albite, 3) prehnite, 4) pumpellyite, 5) epidote, and 6) actinolite. Assemblages containing analcime, heulandite, celadonite, and laumontite belong to the zeolite facies (Coombs et al., 1959). Remaining assemblages belong to the prehnite-pumpellyite facies (Coombs, 1960). Comparison with other regions of similar metamorphic rank indicate that zonation of such sequences on the basis of individual mineral occurrences, especially epidote, is justified only for local regions where the behavior of volatiles was uniform. The transformation in mineralogy of the Robles Formation was an equilibrium process. During alteration two major thresholds were crossed. First, calcium-aluminum silicates formed from materials released by decomposition of calcium feldspar. Second, clinopyroxene was decomposed, a process that added considerable mafic material to the reacting system, and made the bulk rock compositions approximately equivalent to the composition of the reacting system.

THE HUDSON BAY MOUNTAIN MOLYBDENUM DEPOSIT, SMITHERS, BRITISH COLUMBIA, CANADA

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Molybdenite is believed genetically related to a rhyolite porphyry plug and a quartz monzonite stock, apophyses from a common pluton. Weakly mineralized zones derived from each intrusive overlap to form a "porphyry molybdenum" ore body.

The flow-banded plug apex, 3,500 feet below the surface, is capped by an intense stockwork of pre-molybdenite quartz veinlets. An inter-

mineral breccia, and post-breccia but intermineral porphyry dikes, are also plug-related. The buried stock (K-A age 67 ± 5 m.y.) truncates the plug at depth and is the source of a sub-radial swarm of intermineral porphyry dikes.

Country rocks, regionally and thermally metamorphosed prior to propylitic alteration, are Mesozoic Hazelton Group volcanics and Bowser Group sediments; a large, buried, wedge-shaped intrusive sheet possibly occupying a thrust fault; and minor basaltic dikes. The granophytic, locally porphyritic, irregularly layered sheet averages granodiorite in composition.

The ore body, 1,500 feet below surface, consists of weak stockworks and strong sub-parallel swarms of gently inclined quartz-molybdenite veinlets within, and largely paralleling, the granodiorite sheet. Associated minerals are pyrite and minor scheelite-powellite, chalcopyrite, pyrrhotite, magnetite, K-feldspar, amphibole, biotite, chlorite, sericite, carbonate and gypsum. Coarse-crystalline veinlets cut fine-crystalline, often banded, veinlets but age reversals occur and textures are locally gradational.

A surface quartz-molybdenite zone covers three square miles and grades outward into pyritic and base-precious metal zones. Veins and fractures form pronounced concentric, and subordinate radial and domal patterns, relative to a center of intrusive doming, block faulting and mineral zoning above the stock.

EXPERIMENTAL STUDY OF SULFUR ISOTOPE FRACTIONATION BETWEEN COEXISTENT SULFIDE MINERALS

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Isotopic fractionation of sulfur between synthetic sulfide mineral pairs (FeS_2 -PbS, ZnS-PbS, and FeS_2 -ZnS) was investigated as a function of temperature (150°-630°C.) and time (up to six months) of reaction.

The coexistent mineral pairs were prepared from elements in sealed evacuated glass tubes with excess sulfur present. The results reveal that the fractionation factor among these pairs decreases with the increase in temperature of synthesis, and that the enrichment of the heavy isotope (S^{34}) is found to be in the order of FeS_2 (pyrite) > ZnS (sphalerite) > PbS (galena), similarly to what is observed in natural specimens.

Isotopic equilibrium seems to be attained in a comparatively short period among these sulfide phases. For example it takes less than 70 days at 150°C. and only a few days at 630°C. The equilibrium constants for the isotopic exchange reactions, 1) $\frac{1}{2} \text{FeS}_2(32) + \text{PbS}(34) = \frac{1}{2} \text{FeS}_2(34) + \text{PbS}(32)$ and 2) $\text{ZnS}(32) + \text{PbS}(34) = \text{ZnS}(34) + \text{PbS}(32)$, were determined as follows: 1.0071(1) and 1.0052(2) at 150°C., 1.0057(1) and 1.0045(2) at 200°C., 1.0048(1) and 1.0038(2) at 230°C., 1.0034(1) and 1.0023(2) at 350°C., 1.0025(1) and 1.0016(2) at 430°C., 1.0016(1) and 1.0012(2) at 520°C., and 1.0012(1) and 1.0008(2), at 630°C. The data are found to be fairly close to the values predicted by theoretical consideration (Sakai, H., *Geochemical Journal*, Vol. 2, pp. 29 to 49, 1968).

LATE NEOGENE (LATE MIOCENE TO RECENT) STRATIGRAPHY OF THE OUTER MARGIN OF THE BLAKE PLATEAU

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Micropaleontological and lithologic cross-correlation of seven deep-sea cores of foraminiferal ooze from the surface of the Blake Plateau at

about 27° and probably the late based on elsewhere stratigraphic tuses occur and 0-1.5 cross-correlation three years within the induced during per latitude of deposit Neogene expanding fluctuating fluctuating causes of

SIGNIFICANT SAMPLES

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An analysis of carbon and oxygen isotope analyses of gas chromatography to series of important approach separate Inter on comparison The most cambrian Analytic chondritic carbon demonstrate meteorite

SEDIMENTS

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Potomac River Formation two income includes: