

whorl collapsed. Only slight fracturing was observed in inner whorls. In places, the outer whorl was completely closed, the shell being flattened on top and bottom. In other specimens, chomata (internal structures) acted as a brace, preventing total flattening. At several places where the shell is particularly badly crushed, another fossil is in surface contact with the fusulinid. As compaction proceeded, grain-to-grain contacts (where stress was localized) changed to those along a surface; strain was realized by brittle failure of the fusulinid. No pressure solution took place. The major compressional stress, oriented normal to bedding, led to horizontal stresses away from the center of each fusulinid; extension cracks and buckling of the wall near the polar ends resulted. Most other fossils and the micrite matrix had sufficient strength to withstand later compaction, in part because of early submarine cementation. However, individuals belonging to this one fusulinid genus were selectively crushed during limestone compaction because of inherent weaknesses in the structural architecture of the shell. *Pseudoschwagerina*? was a large fusulinid with a thick, heavy wall; outer whorls were inflated, making it comparatively hollow. Septa which supported the wall were thin, straight (unfluted), and widely spaced.

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Petroleum Engineering-Geology Synergism: Key to Discovering Large Reserves in Mature Basins

No abstract available.

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Kef Anticline—Box Folding in Tunisian Atlas, Clue to Regional Tectonic Style

Near Le Kef, Tunisia, Triassic gypsum and supratidal carbonates with subordinate terrigenous clastic rocks and metabasites (so-called ophites) form the highly deformed core of a northeast-southwest anticlinal structure. The competent enveloping strata, chiefly massive limestone and marlstone, range in age from Aptian-Albian to early Tertiary. The Triassic rocks are multiply deformed and so dismembered as to be best described as tectonic breccia. The Kef anticline, as well as numerous analogous features in the northern Tunisian Atlas, commonly has been interpreted as a diapiric structure emplaced into the younger cover rocks during the early deformation phases of the Alpine orogeny (i.e., Late Cretaceous to Paleogene) and partly reactivated during the Neogene (late Alpine). Our detailed mapping and structural analysis of the Kef structure suggest modifications of this model involving the following major elements: (1) local or regional unconformity between Triassic and Cretaceous strata, (2) regional decollement gliding in part localized within the Triassic evaporite-rich sequence, and (3) late-phase box folding of both the highly deformed Triassic assemblage and the more competent cover rocks.

The unconformity between Triassic and Cretaceous rocks is preserved only locally, for late brittle faulting along the margins of the anticline and local bedding-plane thrusts between the competent cover and the incompetent core are common. However, where well-preserved, a distinctive bedded sedimentary carbonate breccia overlies the Triassic assemblage. This sedimentary breccia is in turn conformably overlain by Aptian-age rocks and, thereby, indicates major pre-Aptian uplift and erosion prior to the main phase of deformation in the Tunisian Atlas. The nature of this uplift is problematic, but pre-Aptian diapirism is a viable hypothesis. According to this model, diapirism was restricted to pre-Aptian time, whereas compressive buckling and associated lateral shortening are Neogene deformation mechanisms superimposed on earlier halokinesis.

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Geologists and Politics—A Matter of Survival

In 1976, legislation to decontrol natural gas failed by four votes in Congress. In 1978, legislation to permit federal exploration in the Arctic Wildlife Range failed by two votes. Also in 1978, a proposal to consider the Natural Gas Policy Act separately from other parts of the National Energy Plan failed by the vote of 206 to 205. Many times energy legislation is approved or disapproved by very narrow margins.

Geologists, with some notable exceptions, are largely inactive in the political process. What a waste, as no one has greater potential to be effective. No one understands the occurrence, distribution, discovery, and production of oil and gas better than geologists. In the meantime, domestic supplies of oil and gas decline in the face of increasing federal intervention.

AAPG has recognized the necessity for becoming active in politics and has created the Committee of Strategic Affairs. Other geologic organizations are similarly active. A compelling argument can be made that all geologists should mobilize in a massive assault on energy issues in an attempt to arrest the decline. Changing just a few votes in Congress would do the job.

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Radiolaria—Present and Past Indicators of Distance from Shore, Water Depths, Currents, Water Masses, Upwelling, Eutrophy, and Tectonism

Certain living radiolarian species and taxonomic groups identified in plankton tows from North Atlantic, Gulf of Mexico, Caribbean, Pacific, and Antarctic waters are useful biologic indicators of physical oceanographic parameters. Changes in dominance and diversity of these radiolarians may signal: (1) distance from shore or position on shelf; (2) relative depths (e.g., above and below seasonal and permanent thermoclines); (3) direction, strength, and provenance of cur-

rents; (4) specific water masses; (5) conditions of preservation; (6) presence and strength of upwelling onto shelves and under boundary currents; (7) eutrophic conditions; and (8) tectonic events (isolating radiolarian populations).

These biologic indicators and their related forms are useful in determining similar parameters in the fossil record. Studies of radiolarians from Neogene Deep Sea Drilling Project and onshore samples indicate: (1) relative distance from continents; (2) relative paleodepths; (3) strengths and directions of paleocurrents; (4) presence and degree of paleo-upwellings; (5) origin, development, and presence of paleowater masses; (6) paleoeutrophic conditions; and (7) paleotectonic activity. These biologic indicators may provide a framework for paleo-oceanographic interpretations of Mesozoic and perhaps even Paleozoic radiolarian-bearing sediments.

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#### Coal in Antarctica

Coal has been reported from numerous locations in Antarctica beginning about 70 years ago. Only since about 1960, however, have data become available on petrologic and analytic studies. Nearly all Antarctic coal deposits are in the Transantarctic Mountains of East Antarctica, that portion of the continent lying mostly south of Africa, Asia, and Australia. All appear to be of Permian age, and most have been altered by contact thermal metamorphism; they range in rank from low-volatile bituminous to semianthracite. The coal beds generally lack marine deposits and underclay. In addition to those in the Transantarctic Mountains, coal deposits have been reported from the Prince Charles Mountains. Coals in the Prince Charles Mountains mostly are unaffected by thermal metamorphism and have a rank of high-volatile bituminous. Most coal deposits in Antarctica have very limited horizontal extent; beds range to 3 or 4 m in thickness, but are generally thinner. Except for some deposits in the coastal parts of the Transantarctic Mountains and those in the Prince Charles Mountains, coal is found mainly in the interior of the continent. The location of most coal poses a major transportation problem for potential mines. Some coal could possibly be mined and used locally as an energy source for heating or power production. Another potential problem, yet to be resolved, is the matter of territorial claims, which might dictate the ownership of mineral deposits.

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#### Origin of Gases Adsorbed in Near-Surface Sediment Identified by Carbon Isotopes

No abstract available.

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#### Carbon Isotopes—New Tool in Hydrocarbon Correlation and Exploration

The recently developed isotopic type-curve technique is based on the  $^{13}\text{C}/^{12}\text{C}$  ratios of saturates, aromatics, heterocyclics, asphaltenes, and kerogen. This technique has been applied to problems of correlation of oil with oil and oil with source rocks, and has also been used to identify bacterial degradation in crude oils. Correlation of gas with source rock is essentially related to the determination of the carbon isotope ratio of methane. The ratio links the gas to the type and maturity of its organic source material. This technique was applied to head space analyses of canned drillhole samples. The type and maturity of source rocks can be evaluated as shown by isotope-depth profiles from different basins. Migration of gaseous hydrocarbons from deep sources to higher strata becomes evident.

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#### "Giant" Mudflow Deposits in Submarine Trenches; Hellenic Basins and Slopes in Eastern Mediterranean

Mud rather than sand is the predominant sediment type in submarine trenches, and most studies attribute fine-grained layers to pelagic and hemipelagic mechanisms or to turbidity-current and slump emplacement. Analysis of 28 piston cores in the eastern Hellenic Trench (eastern Ionian basin) in the eastern Mediterranean Sea sheds light on thick muds that form a major component of late Pleistocene-Holocene trench lithofacies. Several 600-cm-long core sections consist entirely of clayey silt that in X-radiographs appears structureless or displays vague lamination or subtle graded bedding. Size analysis reveals an upward increase in the relative percentage of the clay fraction. The sand-size fraction, generally less than 2%, includes planktonic and benthonic forams, shell fragments, and terrigenous components (light and heavy minerals, mica and plant debris). Carbonate content ranges from 20 to 40%, and that of organic matter from 3 to 5%. A 3.5-kHz subbottom survey of the region reveals discontinuous, acoustically transparent layers in trench basins and locally on slopes and depressions that bound the Hellenic Trench. A mudflow-turbidity-current origin is proposed, and is substantiated by radiocarbon dates showing rapid emplacement.

It would appear that "giant" mudflow deposits of this type are a particularly characteristic component of the typical trench lithofacies. Transport in many cases involved displacement of 1 cu km (e.g., a 10-m-thick layer covering 100 sq km). However, it should be noted that comparable or even greater volumes of mud have been displaced by single-event processes such as turbidity currents in almost all large basins of the Mediterranean such as the Algéro-Balearic, Ligurian, and Tyrrhenian basins on the west and the Ionian, Sea of Crete, and Herodotus basins in the eastern Mediterranean. The marked thickness of mudflow deposits in the Hellenic Trench and other trenches primarily reflects ponding in structurally mobile and topographically restricted de-