Zone Management Act, the OCS Lands Act Amendments, the Marine Sanctuaries Act, and the Alaskan (D-2) land withdrawals, brings the magnitude of these attacks on our resource base into sharp focus.

Potential federal land and sea withdrawals, currently under consideration, total over 600 million acres (240 million ha.), an area larger than the states of Arizona, California, Colorado, Idaho, New Mexico, North Dakota, Utah, and Wyoming combined. This is equal to about one quarter of the entire land mass of the lower 48 states.

As earth scientists we have an obligation to alert the public to this threat and the very serious consequences it poses for our nation. In addition, we should make a concerted effort to increase our elected representatives' and agency administrators' awareness of this acute problem.

CAYCE, P. W., and BYRL D. CAREY, JR., Tenneco Oil Co., Houston, Tex.

Regional Hydrocarbon Source Rock and Thermal Maturity Evaluation of Ogaden Basin, Ethiopia

Maturity-level analyses utilizing vitrinite reflectance techniques on samples from several wildcat wells drilled in the Ogaden basin of Ethiopia showed a well-defined oil floor roughly coincident with the top of the Pliensbachian stage of the Lower Jurassic. Reflectance values obtained above and below this horizon show a marked increase. The sedimentary section within the proper thermal maturity range for oil has a thickness of 11,900 ft (3,570 m) in the Tenneco 1 Bodle wildcat in the southwestern part of the basin.

The best oil source rocks are within the Upper Jurassic Uarandab shales and Upper to Lower Jurassic Hamanlei carbonate rocks and evaporites. Oil source rocks occur locally in a clastic section near the base of the Lower Cretaceous.

CERNOCK, P. J., Geochem Labs., Inc., Houston, Tex.

Source Rocks in Gulf Coast Area—Their Identification and Exploration Significance

No abstract available.

CHIMAHUSKY, JOHN S., and DAVID N. LUMSDEN, Memphis State Univ., Memphis, Tenn.

Dolomite Nonstoichiometry; Its Relation to Carbonate-Rock Fabric

Nearly 300 samples of carbonate rocks representing all pre-Tertiary periods (except Cambrian) were analyzed for their dolomite stoichiometry by X-ray peak displacement. These samples represent a wide variety of fabric types (0 to 100% micrite, and boundstone), and a wide variety of depositional environments (shelf edge, subtidal shelf interior, shore zone, and deep marine). The percent calcium carbonate in the dolomite lattice ranged from 48.67 to 57.93, and was fairly uniformly distributed over the range 50.0 to 56.0%. There does not appear to be any clear relation through time and over wide geographic areas between the percent calcium carbonate in the dolomite lattice and (1) facies; (2) total percent dolomite; (3) degree of recrystallization; (4) spar-crystal size; (5) total fossil content; (6) percentages of gastropods, brachiopods, bryozoans, and echinoids; (7) percent insoluble residue; and (8) percent visible porosity (in thin section). There does appear to be a trend to more nearly stoichiometric dolomite (50% calcium carbonate) with increasing age, but this generalization has many exceptions. Results from samples of geologically related suites do show systematic facies-related patterns, but the trends vary and even reverse from suite to suite. We conclude that dolomite nonstoichiometry may be a useful parameter in facies analysis of geologically related (time and space) sets of samples, but it shows no unambiguous facies-related trends over the geologic record.

CHOQUETTE, PHILIP W., Marathon Oil Co., Littleton, Colo., and RANDOLPH P. STEINEN, Univ. Connecticut, Storrs, Conn.

Mississippian Non-Supratidal Dolomite, Ste. Genevieve Formation, Illinois Basin

In a subsurface area of 140 sq km along the La Salle anticline, southeastern Illinois, a 5 to 12-m sequence of shallow-marine, subtidal carbonate mudstone and wackestone in the upper Ste. Genevieve Limestone (Meramecian) has been altered in patches to porous (25 to 40%), oil-productive, microcrystalline dolomite. Information from about 150 wells (46 cored) shows the dolomite to occur in lens-shaped bodies up to 12 m (38 ft) thick, 0.5 to 2.5 km across, by 1 to >5 km long, in places probably interconnected, and markedly oriented east-west to northeast-southwest. The dolomite interfingers with carbonate mudstone/wackestone, which it closely resembles in primary and bioturbate structures, preserved and inferred megafossils, and clay and detrital silt content (<7%). Muddy calcareous sediments were the precursors. There is no direct evidence of either deposition or dolomitization under supratidal conditions.

Typical dolomite consists of sharply terminated, clear, 5 to 20-μm rhombs. In cathodoluminescence these have roundish, dully luminescing cores with successive dark and bright, rhomb-shaped overgrowth zones which clearly indicate fabric evolution and progressive reduction of porosity. Bulk isotopic compositions are relatively heavy (mean δC^{13} and δO^{18} are +2.3 and +2.4 parts per thousand versus PDB); Sr^{++} is 100 to 350 ppm. A later generation of coarse, iron-rich dolomite has similar δC^{13} but much lower δO^{18} (mean −6.0 parts per thousand) and locally filled molds, fractures, and veins.

Dolomite and carbonate mudstone/wackestone underlie a swarm of elongate lenses of ooid grainstone and sandy ooid-pellet packstone/grainstone that have similar orientations and areal dimensions. Many dolomite lenses directly underlie carbonate-sand bodies. Muddy parts of carbonate sands are commonly altered to microcrystalline dolomite with similar fabrics, isotopic and Sr^{++} compositions, and cathodoluminescence.

These observations suggest that dolomitization may have begun in marine pore water, but continued in a hydrologic system of partly meteoric origin. Dolomiti-

zation began early in the burial history, after some compaction, ending before stylolites could develop. Hydrology may have been influenced by recharge areas in the northeast, but groundwater flow was mainly through carbonate-sand bodies; these bodies mainly controlled dolomitization patterns. Later dolomite was precipitated from warmer waters expressed through many of the same conduits. Ste. Genevieve dolomites may be early-stage, high-porosity analogs of many sequences of coarser saccharoidal dolomites.

CLANTON, UEL S., Natl. Aeronautics and Space Admin., Houston, Tex., and EARL R. VERBEEK, U.S. Geol. Survey, Denver, Colo.

Faults Offsetting Land Surfaces in Southeastern Houston Metropolitan Area, Texas

Ninety-one faults with an aggregate length of more than 170 km have been mapped recently within a test area of 500 sq km in southeastern metropolitan Houston. Of the four oil fields in this area, three are associated with known salt domes and the fourth is thought to overlie a more deeply seated dome. Eighty-seven of the 91 faults are confined to two complex but well-defined curvilinear grabens that are closely related to the oil fields and underlying domes. A north- to northeast-trending graben connects the South Houston and Mykawa fields. A second graben, which trends southeast, intersects the first graben over Mykawa field, turns east to Webster field, then continues northeast to Clear Lake field and extends northeast beyond the map area toward Goose Creek field. The four faults that appear to be unrelated to the grabens include one fault extending northward into the mapped area from the Hastings dome, two faults that are probably regional growth faults, and one fault whose origin remains unexplained.

The pattern of faulting requires a genetic link between the faults and salt domes. Thus, the faults are natural geologic features, probably of Tertiary age. However, most offset of the present land surface appears to have occurred within the last half century. Although scarps in excess of 1 m exist today, only a few that have a 1-ft contour interval can be recognized on topographic maps that were surveyed in 1915-16. Although some allowance must be made for equipment and film, the number of faults that can be recognized on aerial photographs has increased dramatically since 1930 when large-scale coverage was first obtained. Moreover, present rates of offset on the 48 faults known to be active exceed the estimated average prehistoric rates by several orders of magnitude. Evidence that fault movement has increased sharply during the last few decades supports the hypothesis that recent withdrawal of subsurface fluids has triggered or accelerated movement along these ancient and natural planes of weakness.

CLARK, GEORGE R., II, Kansas State Univ., Manhattan, Kan., and RICHARD A. LUTZ, Yale Univ., New Haven, Conn.

Pyritization in Shells of Living Bivalves

Several specimens of *Mercenaria mercenaria* and *Guekensia demissa* collected alive in early August from tidal marshes on St. Catherines Island, Georgia, were found to have a prominent brass-yellow material on part of the outer surface of their shells. On some individuals this may occur as a surficial coating, for a portion flaked off one specimen revealed an apparently unaffected outer shell surface. In another specimen, however, thin sections and sections examined by scanning electron microscopy (SEM) showed the material extended into the shell, following planes of weakness, such as growth lines and microborings, and replaced aragonite.

In thin section, the material is opaque to transmitted light and appears much like framboidal pyrite under oblique reflected light. Studies by SEM reveal a massive outer region grading into loosely packed masses of spheroids about 0.1μm in diameter. Energy dispersive X-ray analysis identified iron and sulfur as the principal components of this material. Preliminary X-ray diffraction studies on mechanical preparations of the outermost region of the shell were hampered by the low concentration of the material relative to aragonite; despite this, the strongest pyrite peak (311) was detected in both diffractometer and powder camera results. No other iron sulfides could be identified.

These observations strongly suggest that we are observing the process of calcium carbonate replacement by pyrite in a modern sedimentary environment.

CLARKE, JAMES W., OSWALD W. GIRARD, JR., U.S. Geol. Survey, Reston, Va., JAMES A. PETERSON, U.S. Geol. Survey and Univ. Montana, Missoula, Mont., and JACK RACHLIN, U.S. Geol. Survey, Reston, Va.

West Siberian Basin

The West Siberian basin ($\sim 3.4 \times 10^6$ sq km) is one of the largest structural-sedimentary basins of the world. The basin was relatively undisturbed by post-Triassic tectonism and erosion and is little changed from its original form when Early Jurassic deposition began about 180 m.y. ago.

The large Khanty structural high in the central part of the West Siberian basin is nearly 1,000 km long and 400 km wide. The axis bears five large domes, separated by depressions. The Khanty arch was a structural entity throughout the Mesozoic and is quite clearly the locus of greatest oil occurrence.

Although the depositional history of the basin was one of continual incursion and retreat of the sea, three megarhythms are recognized in the sedimentary fill: Triassic-Aptian, Aptian-Oligocene, and Oligocene-Quaternary. Continental sediments predominate at the base of each megarhythm, and largely marine and nearshore sediments are present at the top. Megarhythms are made up of macro-, meso-, and microrhythms, each of which has its transgressive and regressive phases. The search for paleoshorelines and related stratigraphic traps seems to be yet in an early stage.

Three major productive areas are recognized in the basin. In the west, near the Ural Mountains, oil and gas are produced from Upper Jurassic sandstones that pinch out against basement blocks. Along the middle