

highly irregular in time and space, commonly was accompanied by penecontemporaneous tectonic disturbances and hence anomalies in sedimentation, such as reworking, condensation, and gravity sliding. These complicating and potentially distorting factors usually have not been considered by those few authors who based their descriptions on material newly collected from measured sections rather than on material already existing in some museum collections. As a result, knowledge of the true vertical range of persistent and characteristic species, which would lead to the recognition of suitable index forms, is lacking.

3. Partly because of the two reasons just stated, the taxonomy of ammonite genera and species of this province is in need of revision. Many misidentifications and erroneous generic interpretations have to be corrected, particularly in the families Dactyloceratidae and Hildoceratidae, both characteristic of the Mediterranean province.

Encouraging contributions to a clarification of the situation have come recently from studies of sections in Morocco, Portugal, and southwestern France. As a result of these studies, the two faunal provinces do not appear to be as distinctive as was previously assumed. In some of these sections, the provinces overlap, particularly in the Domerian Substage, thus making it possible to correlate a Mediterranean zonation based on hildoceratids with the established northwest European zonation based on amaltheids.

WINDER, C. GORDON, University of Western Ontario, London, Ontario

#### CONODONT ZONES AND STRATIGRAPHIC VARIABILITY IN UPPER DEVONIAN OF ONTARIO

A 259-foot section of the Upper Devonian Kettle Point Formation in a cable-tool-drilled well is almost a complete section of the formation. Species of platform-facies conodonts occur in a sequence which correlate with zones defined by Ziegler (1958, 1962) and indicate that almost the entire Upper Devonian is present. Certain zones can not be recognized because the specimen yield is too low; correlation with the standard Upper Devonian ammonoid zones is cited.

The rock is black shale, but the section can be divided into four parts on the basis of the presence or absence of gray silty shale. The stratigraphic distribution of mineralogical and paleontological entities is noted and the following seem to have a common association: (1) black shale, pyritized sponge spicules, *Tasmanites* Newton 1875, and pyritized Radiolaria; and (2) black and gray shale, euhedral pyrite, and abundant conodonts; worm burrows, *Lingula* Bruguière 1797, and fish scales occur in the lower sequence of gray beds but not in the upper.

The sequence is interpreted as representing deposition in a basin with gradually increasing water depth. The stratigraphic variation of the conodonts and their apparent inverse relation with Radiolaria suggest that the conodont-bearing animals lived in the shelf areas of the sea. Conclusions based on a single drill hole are tentative.

YOUNG, KEITH, The University of Texas, Austin, Texas

#### RELICT LYELLICERID FAUNA OF TEXAS AND NORTHERN MEXICO

Lower Cenomanian ammonites have been described from the Pawpaw Formation, the Main Street Lime-

stone, the Grayson Formation, the Del Rio Claystone, the upper part of the Georgetown Limestone, and the Buda Limestone of Texas and northern Mexico. The fauna of the Buda Limestone, in particular, is dominated by a distinctive group of lyellicerid ammonites of the genera *Faraudiella* and *Budaiceras*.

The greatest number of lyellicerids in Texas consists of 13 species from the Buda Limestone (zone of *Budaiceras hyatti*). These species occur with *Mantelliceras* sp. cfr. *batheri* Spath, *M.* sp. cfr. *hyatti* Spath, and *M. cantianum* Spath (= *M. budaense* Adkins), all of which have been collected from the Buda Limestone. They represent the *cantianum* zone and probably the upper part of the *martimpreyi* zone of western Europe.

In Europe lyellicerids (*Stoliczkaia*) do not range above the *martimpreyi* zone, and *Faraudiella* is said not to range higher than the Albian. There are mantellicerid species common to Texas and Europe, but there are no Cenomanian lyellicerid species common to Texas and Europe. If the *Mantelliceras* species are used for correlation, the *Budaiceras* fauna of Texas and northern Mexico would seem to represent a relict lyellicerid group that lived in the restricted environment of that area after lyellicerids had disappeared from the rest of the world.

YOUNG, ROBERT G., Grand Junction, Colorado

#### DIFFERENTIATING SHELF AND MARINE SANDS FROM DELTAIC AND BRACKISH-WATER DEPOSITS USING MODERN TECHNIQUES

The common occurrence of oil and gas in sandstone within stratigraphic sequences composed of interstratified marine and non-marine sediments, formed in environments at or adjacent to a shoreline, is well known to most geologists. Such gross relations are ascertained readily, but the nature and mode of origin of individual sandstone bodies generally have been of little concern. It is probable that these sequences must include sandstones of both marine and non-marine origin. Marine types to be expected include beach, shoal, and shelf sandstone; whereas, non-marine types include deltaic, estuarine, paludal, and lagoonal sandstone. Knowing the mode of origin of sandstone in a petroleum-bearing sequence should be of considerable importance. One type may never contain oil; some sandstone types may contain petroleum in predictable, more permeable zones; some types may be long and sinuous and others broad and sheet-like; some may parallel old shorelines whereas others may be at right angles to them.

Positive determination of the genesis of a sandstone, either at the outcrop in the subsurface, is difficult, but can be done with some assurance by using multiple criteria—no one of which is entirely diagnostic and only a few of which may be ascertainable for a particular sandstone body. Parameters of value in determining origin include geometry of the sandstone body, sedimentary structures, log characteristics, composition, nature of boundaries, and composition of surrounding or enclosing sediments.

ZIEGLER, WILLI, Geologisches Landesamt, Krefeld, Germany

#### CONODONT ZONATION OF UPPER DEVONIAN IN CENTRAL EUROPE

Conodont investigations in the German standard

Upper Devonian sections resulted in establishing a conodont zonation. Altogether 26 conodont zones and subzones have been recognized. The conodont succession was obtained mainly from known ammonoid zones beginning with the uppermost Middle Devonian cephalopod zone of *Maenioceras terebratum* and extending through the entire Upper Devonian into the *Wocklumeria* Stage. To determine the regional constancy of conodont succession, more than 100 Upper Devonian sections from Germany were studied.

The same Upper Devonian conodont succession, recognized in much of Europe, as detailed investigations have subsequently proved. These zones have been found in eastern Germany, Carnic Alps in Austria, Montagne Noire and northern Massif Central in France, Pyrenees and Cantabria in Spain, and Moravia and Bulgaria in southeastern Europe. In addition, in the Belgian Upper Devonian, where the sediments were laid down in a different environment, similar zonal associations and successions coincide with others.

Results of studies in the Upper Devonian outside of Europe (mid-western and northern Africa) support the opinion that conodont succession in the Upper Devonian is the same as that in Europe. Presently known deviations are caused by peculiarities within the local geological sequences (breaks in sedimentation, slow deposition, reworking, redeposition, etc.).

A recent study of the ammonoid-bearing Upper Devonian sequence of northwestern Australia carried out by Glenister and Klapper indicates that the European conodont zonation also can be applied effectively in this region.

Conodonts can be used to zone the Upper Devonian in greater detail than the standard cephalopod succession. Recent studies reveal that boundaries between some ammonoid stages are inexactly defined or that there are gaps in the ammonoid succession. By means of conodonts such gaps may be bridged with the result that the best and most complete biostratigraphic subdivision of the Upper Devonian at present is based on conodonts.

#### PACIFIC SECTION 41ST ANNUAL MEETING, LONG BEACH, CALIFORNIA, MARCH 24-26, 1966

The Pacific Sections of The American Association of Petroleum Geologists, Society of Exploration Geophysicists, and the Society of Economic Paleontologists and Mineralogists will hold their 41st annual meeting at the Municipal Auditorium in Long Beach, California, March 24-26, 1966. Social events will be held in the nearby Lafayette Hotel.

The convention theme is "Offshore Oil," honoring the 70th anniversary of the first offshore oil produced from the old Summerland field, Santa Barbara County, California. The technical program will include more than 50 papers on offshore and onshore exploration and exploitation. The meeting will close with an onshore field trip through the oil fields near Long Beach and an offshore cruise from Long Beach Harbor to Huntington Beach and back on Saturday, March 26.

In addition to an outstanding technical program, activities at the Lafayette Hotel include the joint A.A.P.G.-S.E.G.-S.E.P.M. annual luncheon on Thursday with a speaker from the Department of the Navy discussing the *Sealab II* project. A cocktail party will be held on Thursday afternoon and the S.E.P.M. dinner on Thursday evening. Alumni luncheons will be on Friday and a dinner-dance is planned for Friday evening.

Ladies' activities for both days are being planned and include a tour and shopping in Ports of Call. A hospitality room will be available for the ladies.

More than 50 years ago, on October 2, 1915, a small group of geologists gathered in Tulsa, Oklahoma, for dinner and discussion. This was a time of tremendous expansion of the application of geology to petroleum exploration and the group recognized the great need for discussion and exchange of ideas in the fledgling but rapidly growing science. They adopted as a name the Southwestern Association of Petroleum Geologists. The name of the organization was changed in 1917 to The American Association of Petroleum Geologists and the first *Bulletin* was published. Since that time the Association has become international

with members in nearly 80 countries. Total membership is more than 15,000. At present there are 59 local or regional societies affiliated with the Association and Orlo E. Childs of Golden, Colorado, is the national president for the 1965-1966 term.

The geographic distribution of membership throughout the United States led to the establishment of four regional sections: Eastern, Mid-Continent, Rocky Mountain, and Pacific. The oldest of these, the Pacific Section, was organized in 1925 and has more than 1,050 members. The president of the Pacific Section is Eugene R. Orwig, of Mobil Oil Company, who will relinquish his gavel to the new president at the conclusion of the convention.

The objectives of the A.A.P.G. are to advance the science of geology, especially as it relates to exploration, development, and exploitation of petroleum and natural gas, and to foster research and the exchange of ideas. The publication of the monthly *Bulletin* and special volumes, and the Distinguished Lecture Program by outstanding speakers who visit more than 50 affiliated societies and universities each year, implement the achievement of these objectives. The annual conventions, both regional and national, provide occasions for geologists to gather and exchange experiences, ideas, and information in an informal atmosphere of scientific comradeship.

The S.E.G. program will include 15 pages with emphasis on digital recording and processing of offshore exploratory information. Abstracts of these papers have not been included.

#### ABSTRACTS OF PAPERS

ADSHEAD, PATRICIA C., Micropaleontology Laboratory, Allan Hancock Foundation, University of Southern California, Los Angeles, California

#### TAXONOMIC SIGNIFICANCE OF PSEUDOPODIAL DEVELOPMENT IN LIVING PLANKTONIC FORAMINIFERIDA

Axopodial development in the Foraminiferida is of prime importance taxonomically. Classification revi-