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 Dactilyoceratidae 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, particulary 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.

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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.

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RELICT LYELLICERID FAUNA OF TEXAS AND NORTHERN MEXICO

Lower Cenomanian ammonites have been described from the Pawpaw Formation, the Main Street Limestone, 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.

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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, estuarian, 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.

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CONODONT ZONATION OF UPPER DEVONIAN IN CENTRAL EUROPE

Conodont investigations in the German standard