the zone as well as the subzone level, with exception for the Upper *asymmetricus*-Zone which seems to be missing. However, distribution patterns are markedly uneven or discontinuous and ranges of some important species are reduced by later appearance or partly postponed with regard to the zonal scheme. Moreover, mature specimens are usually broken whereas complete specimens are often only juvenile forms.

On the other hand all the sections in this area are continuous with minor submarine erosional gaps truncating less than few cm of sediment, which are negligible in respect to the tickness of any subzone.

It is therefore assumed that this kind of reworking preserving the original stratigraphic polarity took place by repeated, frequent resuspension of a thin layer of unconsolidated sandy-silty carbonate material through the distal part of the shelf to the adjacent basin.

Perm-Conodonten in Slowenien (NW Jugoslawien).

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In den letzten Jahren wurden folgende fossilführende Oberkarbon- und Permschichten Sloweniens auch nach Conodonten untersucht: 1. die mergeligen Kalke mit gesteinsbildenden *Rugosofusulina alpina antiqua* (oberes Oberkarbon), 2. die unterpermischen Pseudoschwagerinenkalke mit der zahlreichen *Schwagerina carniolica,* 3. die Neoschwagerinenkalke mit gesteinsbildenden Neoschwagerinen, 4. die tiefsten Oberperm-Mergelkalke mit *Palaeofusulina nana* und einer reichen Brachiopodenfauna *(Linoproductus, Leptodus, Chonetes,* u. a.), 5. die Oberpermkalke mit sehr häufigen Brachiopoden der Gattung *Tyloplecta* und 6. die oberpermischen Bellerophonten-führenden Kalke. Alle diese Kalke erwiesen sich conodontenleer. Andererseits lieferten die Kalkeinschaltungen in den unterpermischen Argilliten westlich von Solčava in den Ostkarawanken eine gut erhaltene Conodontenfauna. Das Plattformelement ist durch zahlreiche *Gondolella slovenica* n. sp. vertreten; die ramiformen Elemente stellen enantiognathiforme, hindeodelliforme, ozarkodiniforme, ? pollognathiforme und prioniodiniforme Elemente und ein hibbardelliformes Element dar. Als Plattformelement kommt auch *Anchignathodus minutus* vor.

Ein hohes unterpermisches Alter der ganzen Schichtfolge, bestehend überwiegend aus dunkelgrauen Klastiten und charakteristischen verschieden farbigen Kalkeinschaltungen beweisen auch die hochentwickelten Pseudofusulinen, höchstwahrscheinlich *P. rakoveci.* Aus diesem Abschnitt des Unterperms sind bisher in Jugoslawien und in Südeuropa noch keine Conodonten bekannt.

Early Ordovician Fused Conodont Clusters from the Western United States.

By J. E. REPETSKI

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Excellently preserved fused clusters of conodonts from the Lower Ordovician in Nevada add new knowledge about the form, function, and taxonomy of these apparatuses. Clusters of euconodonts as well as protoconodonts were found, but occurrences of the latter are much more common. Several lines of evidence point to the conclusion that the fusion, by phosphate mineral(s), was diagenetic (probably very early post-mortem) rather than biologic. Fusion of externally secreted euconodont elements was necessarily post-secretion. Internal and external phosphate crusts vary in thickness from specimen to specimen and fusion may be between adjacent external crusts rather than between adjacent elements s e n s u s t r i c t o. These and other protoconodont clusters are from continental slope/rise sediments rich in diagenetic phosphate. One of the specimens is a partial apparatus of „*Prooneotodus*" *tenuis* (MÜLLER) in the „parallel reversed" orientation. Interfingering of individual elements in this cluster occurred before fusion, indicating that the elements were laterally discrete during life. Fused clusters of *Oneotodus* sp., *Proconodontus notchpeakensis* MILLER, and *Cordylodus lindstromi* DRUCE and JONES are the oldest known clusters of euconodonts. *C. lindstromi* is represented by three elements of the nominate form species that are juxtaposed laterally and form a nested series of straight, curved, and strongly curved bars. The basal plates are preserved and also are fused laterally. Remnants of probably three other oppositely tapering elements indicate that this partial apparatus was situated, and probably operated, in opposition to another one. The cluster also shows that bar curvature and exter-

nal shape of cusp are less important taxonomically, at least for these cordylodans, than shape of basal cavity and, probably, style of bar denticulation.

A Conodont Sequence over the Lower/Middle Devonian Boundary in the SW Lahn-Mulde/Eastern Rhenish Slate mountains.

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Crinoidal limestones 11.5 m thick have been investigated in 57 samples. The neritic or high bathyal fauna contains abundant *Icriodus* specimens and only sporadic *Polygnathus* index forms. However, the *Icriodus corniger* lineage and the particular variants of *Polygnathus linguiformis* indicate a stratigraphic range from *serotinus* to *partitus*-Zone. Within the latter zone five faunal levels can be recognized, comparable with levels in the Ardennian-Eifelian facies area. In deviation from the Eifelian standard sequence forms of *Icriodus corniger* cf. *retrodepressus* without the characteristic depression occur. Moreover, *Latericriodus beckmanni sinuatus*, a conodont of the Upper Emsian of the Barrandian, is also found. Although the conodont-bearing limestones overlie an Upper Emsian hiatus, there are no obvious signs that the *Latericriodus* specimens are derived. It is therefore presumed that ecological factors are responsible.

Utility of Conodonts in Determining Rates of Synorogenic Sedimentation and in Timing Antler Orogenic Events, Western United States.

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The extremely fine conodont zonations that have been developed for parts of the Paleozoic during the past decade provide a new and important tool for conodont biostratigraphers as well as for petroleum and structural geologists. This tool can be utilized to interpret the reservoir rocks, source rocks, and events of the Antler orogeny, which spans the Devonian-Carboniferous boundary in Nevada and Utah.

The 27 standard conodont zones of the Late Devonian permit its division into zonal time units, each having a span of about 0.5 m.y. Timespans of standard conodont zones of the Early Carboniferous are similarly calculated to be of about 1.5 m. y. duration. Using these timespans, rates of synorogenic sedimentation are calculated in m/m.y. as follows: Antler calcareous flysch, 267–400; Antler (Pilot) silty protoflysch, 32–160; bioclastic carbonate-platform sediments, 40–240; nonphosphatic basinal muds, 55; slope lime muds, 26–30; phosphatic starved-basin sediments, 4.5–9; and transgressive lag deposits, 1–3.

Applying the so-called Haug Effect, which states that times of major transgression are times of major orogeny, to the regional distribution and type of sediments and to conodont biofacies, a sequence of 11 important Antler orogenic, epeirogenic, eustatic, and erosional events can be interpreted for a time interval of from 16 m. y. before to 9 m. y. after the Devonian-Carboniferous boundary. These events and their duration are internally consistent regardless of any fluctuation in the radiometric placement of the boundary. The most significant structural interpretation is that emplacement of the Roberts Mountains thrust took 8 m. y., as determined by the age of the youngest allochthonous Devonian rocks and the oldest overlapping Mississippian rocks.

Silurian Conodonts from Southeast Alaska.

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The Triassic Conodonts from the Inner Dinarides of Yugoslavia.

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