been described from different areas, mostly extracted from nodular limestones. Because of the lack of complete successions, besides the nearly complete ostracode-bearing section in Thuringia, the value of those ostracode assemblages is still unimportant for defining the Devonian-Carboniferous boundary.

3) Entomozoid ostracodes seem to be useful for biostratigraphic zonation within the Upper Devonian and lowermost Carboniferous. Because of their pelagic mode of life, they have a world-wide distribution within basin assemblages, but they are practically absent in shelf-deposits.

The regional and stratigraphical distributions of entomozoid ostracodes at the Devonian-Carboniferous boundary have been studied in detail on the USSR, China and Western Europe. Samples from the reopened trench af Stockum (Rhenish Schiefergebirge/Germany) demonstrate the existence of an additional entomozoid ostracode assemblage between the *hemisphaerica/latior* Interregnum and the *latior* Zone sensu RABIEN, 1960, but this assemblage has not been found elsewhere.

Eventually, a remark might be made on the first occurrence of *Richterina latior* in the U.S.S.R. During the meeting of the International Working Group on the Devonian-Carboniferous Boundary in Moscow (August, 1983), it has been stated by the Soviet ostracode specialists (TSCHIGOVA, POLENOVA, KOTCHETKOVA, DEMIDIENKO, STEPANAITES) that the First occurrence of this species in the Donbass, Southern Urals, northern regions of the Volga-Urals district and Mugodgar is «a little below the first appearance of *Siphonodella sulcata*», this in contrast to the experience in Northwestern Europe, where this ostracode only appears a little above the first appearance of *S. sulcata.*

WITHOUT REFERENCES

SPORE STRATIGRAPHY IN THE UPPERMOST DEVONIAN OF IRELAND AND THE «RHEINISCHES SCHIEFERGEBIRGE» GERMANY

K. HIGGS[1] M. STREEL[2]

Recent palynological studies of the Devonian-Carboniferous transition beds in the classic area of the «Rheinisches Schiefergebirge» in Germany are summarised. The LN/VI miospore biozonal boundary has been identified in two sections.

INTRODUCTION

The most complete and continuous miospore succession at the Devonian/Carboniferous boundary in Western Europe occurs in the extremely thick marine clastic sequences of Southern Ireland. Here a miospore zonation scheme comprising eight biozones has been described for the late Devonian-early Carboniferous (Uppermost Famennian or Strunian to Upper Tournaisian) interval.

The lack of diagnostic goniatite and conodont control in the southern Irish sections limits their value as possible Devonian/Carboniferous boundary stratotypes. Therefore the present study was undertaken in an attempt to apply the Irish spore zonation scheme to the considerably thinner but well dated marine sequences in the classic area of the northern Rhenish Slate Mountains in Germany.

The present authors have been studying the Northern Rhenish Slate Mountains sequences since 1979 as part of the I.U.G.S. Working Group project on the Devonian-Carboniferous boundary. Preliminary results were published in the field guidebook edited by PAPROTH & STREEL (1982).

PALYNOLOGICAL RESULTS

Geologically all the sections with the exception of Stockum are located on the northern flank of the Remscheid-Altena Anticline. The Stockum sections are located on the Ebbe Anticline to the South.

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A summary of the palynological results is given below.

At *Riescheid* in the far west of the area studied, the boundary between the LL and LE Biozones is located 10 m below the top of a green silty shale sequence (Hangenberg Schiefer equivalent). This level is also associated with a *costatus* conodont fauna. The uppermost metre of the shale succession is composed of black shale and just below the top of the black shale much younger HD Biozonal assemblage was obtained.

The absence of the LN and VI spore biozones indicates that there is either strong condensation or a non sequence in the lower part of the black shale. The presence of an *isostichia* — upper *crenulata* conodont fauna in the allodapic limestone above the black shale also indicates there is a non-sequence as several of the lower Hangenberg Kalk faunas are missing.

At *Hasselbachtal* there is a continuous section through the Wocklum Kalk, and succeeding Hangenberg Schiefer and Kalk. A LE Biozonal assemblage was recorded from the top of the Wocklum Kalk. Several LN Biozone assemblages have been obtained from the upper part of the overlying Hangenberg Schiefer. Detailed sampling at 0.5 cm intervals close to the top of the Hangenberg Schiefer has allowed fine resolution of the LN/VI Biozonal boundary which is placed at 14 cm below the base of the Hangenberg Kalk (the level with *Siphonodella sulcata*).

Further east at *Seiler, Oese,* and *Apricke* LL Biozonal assemblages have been obtained from the lower part of the Hangenberg Schiefer and LN assemblages from the upper part. However, at *Oberrödinghausen* LL Biozonal assemblages have been recorded throughout the Hangen-

berg Schiefer both from the type section and from a nearby borehole. The uppermost half metre of the Hangenberg Schiefer in this area has not yielded any spores. A HD Biozonal assemblage was obtained from the base of the Liegende Alaunschiefer. The palynological results from this area indicate a non-sequence at the top of the Hangenberg Schiefer with LE, LN, and lower VI Biozones missing.

At *Stockum* the most easterly of the Rhenish Mountain localities, two trenches have been investigated. In trench 1 the LN/VI Biozonal boundary has been recognised just below the Stockum Limestone (Level with *Acutimitoceras prorsum prorsum*) and close to the level with the upper *praesulcata* conodont fauna. The palynological evidence from trench 2 is unreliable due to reworking of some microfloras.

In conclusion, the study has shown that the Hasselbachtal section offers the most complete miospore succession at the Devonian-Carboniferous boundary. The presence of important conodont and goniatite faunal data in the section indicates Hasselbachtal to be the best systemic stratotype available in the Rhenish Slate Mountains.

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ON THE PRESENCE OF QUASIENDOTHYRIDAE IN ARTIC ALASKA

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The Devonian-Carboniferous *Quasiendothyra* zonal succession is well established in numerous basins of Eurasia and Australia. However, the microfauna is poorly documented in North America. This article reports the presence of thick, shallow-water carbonate successions in the western part of the De Long Mountains, Arctic Alaska. The Kugururok Formation and the uppermost part of the Baird Group (Misheguk and De Long Quadrangles) display two- to three-hundred meters of pelletoidal, *Girvanella* -rich grainstones containing the *Quasiendothyra lipinae, Q. communis* and *Q. kobeitusana* foraminiferal assemblages (Zones 4, 5, 6). They are associated with rare tournayellids. The «extinction» of the fauna coincides with a sharp facies change (deep-water spiculites). The microfauna is strikingly similar to that recently described from the Omolon Massif (Northeastern Siberia).

The Devonian-Carboniferous *Quasiendothyra* zonal succession is well established in numerous basins of Eurasia and Australia. For two decades, it has proven, in the Paléotethys, to be a useful tool in stratigraphic successions at the Devonian-Carboniferous boundary. The major drawback of the quasiendothyrids is the fact that they are poorly documented in North America. They are completely unknown in the American Midcontinent.

This short contribution reports the presence of thick, quasiendothyrid rich successions in the western part of the De Long Mountains, Arctic Alaska. The Kugururok Formation and the uppermost part of the Baird Group (Misheguk and De Long Quadrangles) display two- to three hundred meters of pelletoidal algal-rich grainstones containing abundant *Quasiendothyra* mixed with rare Tournayellidae.

The best successions are in the Avan Hills, with the most complete, although tectonized, sections along the Kagvik Creek. Additional localities are N.W. of Lik and in the upper part of the Kugururok River Valley. Other sections are also known in the Noatak-Siaktak Hills region, the best of which is in the lower Asikpak River.

The latest Famennian Zones 4 and 5 (MAMET, 1967) are recognized from the presence of *Quasiendothyra bella-Q. lipinae*, then *Q. bella-Q. lipinae-Q. communis communis* assemblage. These two Zones are known from the latest Famennian of the Tethys and in particular in the transition between the Devonian and Carboniferous of Northern France. Coined as early Tournaisian (Tn I a) by CONIL & LYS (1970) or by DURKINA (1981) (as *Eoquasiendotyra bella, Eoendothyra regularis, Eoendothyra* of the group *E. communis*) it is now considered late Famennian by the vast majority of the stratigraphers.

In Alaska, the early Tournaisian Zone 6 is recognized by the presence of *Quasiendothyra kobeitusana, Q. konensis* and *Klubovella*. This assemblage is similar to the *Quasiendothyra kobeitusana, Q. konensis, Q. kobeitusana grandis* fauna reported by DURKINA from the Timan-Pechora region (1981). Another similitude with the Russian Arctic material is the presence of *Quasiendothyra eokobeitusana* at the Zone 5/6 junction.

The stratigraphic position of Zone 6 is controversial. It is observed in the original Etroeungt Limestone of Northern France. It is usually considered early Carboniferous by many Russian foraminiferal workers (YUFEREV, 1979: see discussion in SIMAKOV, 1981), but for an opposite view refer to RAZNITZIN & ONUFRITSIN, 1982. Conodont workers would generally consider most of the level as Devonian