

APPENDIX

Conodonts from the Permian-Triassic boundary beds at Kap Stosch, East Greenland

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Six hundred eighty-eight identifiable conodont elements were recovered from 37 of 68 samples that were collected for this purpose in 1967 by TEICHERT & KUMMEL. All samples are from Upper Permian and Lower Triassic strata, and come from seven localities in the vicinity of Kap Stosch, the northernmost end of the Hold with Hope Peninsula, East Greenland. Samples are precisely located in sections that are described elsewhere by TEICHERT & KUMMEL (1976).

Conodont elements in the 37 productive samples studied represent the species identified and enumerated in Table I. The conodont species compose two distinct faunas, an older one with *Neogondolella rosenkrantzi* (BENDER and STOPPEL) and a younger one with *Anchignathodus typicalis* SWEET. I comment on the stratigraphic significance of these faunas separately in the following paragraphs.

***Neogondolella rosenkrantzi* Fauna**

The older of the two conodont faunas recognized is confined to Permian rocks and is dominated by *Neogondolella rosenkrantzi* (BENDER and STOPPEL) (Pl. 16, figs. 10, 11, 12, 13). Types of this species are from the *Posidonia* Shale of the Kap Stosch area (BENDER and STOPPEL, 1965); it is represented in three samples from that unit and in additional samples from the *Productus* limestone and *Martinia* shale. Five specimens of *N. rosenkrantzi* occur also in sample 68KC-30A, together with a single specimen of *Anchignathodus typicalis* and at a level about 1.5 m above the one at which the *A. typicalis* fauna is first represented in the section at Locality 2.1. The specimens of *N. rosenkrantzi* are etched, broken, and very much darker in color than are representatives of the *A. typicalis* fauna in this or adjacent samples, hence we suspect that they have been reworked from older beds.

It is not possible at the present time to attach very great biostratigraphic significance to the occurrence of *Neogondolella rosenkrantzi* in

the Permian of East Greenland, despite the fact that elements of this species are distinctive morphologically and are readily separated from those of any other species of *Neogondolella* known. The reason for this is that undoubted representatives of *N. rosenkrantzi* are known at present only from the Kap Stosch area Permian rocks under consideration here. Specimens from the Permian at Rupe del Passo di Burgio, Sicily, referred to *N. rosenkrantzi* by BENDER & STOPPEL (1965), and those from the upper Gerster Formation of Nevada assigned to this species by CLARK & BEHNKEN (1971) differ from each other and from the types of *N. rosenkrantzi* in details of outline, arching, development of free blade, and conformation of the posterior part of the undersurface. We are convinced that they do not represent *N. rosenkrantzi*.

Morphologically, elements of *Neogondolella rosenkrantzi* are broadly similar to those of *N. phosphoriensis* (YOUNGQUIST, HAWLEY, & MILLER) and *N. idahoensis* (YOUNGQUIST, HAWLEY, & MILLER), which are probably of Leonardian age, and BEHNKEN (1972) regards *N. rosenkrantzi* as a Guadalupian descendant of *N. idahoensis* (in which he also includes *N. phosphoriensis*). Unfortunately, however, no section has yet produced definite representatives of both *N. idahoensis* and *N. rosenkrantzi* in succession, and Permian neogondolelliform elements are erratic in occurrence and seemingly quite variable in the disposition and development of those morphologic features on which phylogenetic arguments must be based.

It should be noted that none of the numerous specimens of *Neogondolella* in my collections from post-Guadalupian Permian rocks very closely resembles *N. rosenkrantzi*. However, some elements of *N. serrata* (CLARK & ETHINGTON), which ranges through the type Guadalupian of Texas, are reminiscent of *N. rosenkrantzi* in outline, proportions, and development of at least the posterior part of the upper surface. It is thus conceivable that *N. serrata*, *N. rosenkrantzi*, and the Gerster specimens from Nevada assigned to *N. rosenkrantzi* by CLARK and BEHNKEN (1971) are representatives of a single stock of *Neogondolella* that was widespread in the Guadalupian but geographically and ecologically quite variable in morphology. Although such a suggestion can not, of course, be confirmed at this time, a Guadalupian age for *N. rosenkrantzi* and the rocks in which it occurs would not be inconsistent with the conclusions of others, which have been summarized by TEICHERT & KUMMEL (1972) and are discussed again elsewhere in this report.

***Anchignathodus typicalis* Fauna**

The younger of the two faunas represented in the Permian and Triassic of East Greenland is that of the *Anchignathodus typicalis* Zone, which "straddles" the Permian-Triassic boundary elsewhere in the world

and is approximately coextensive with the Changhsingian and Griesbachian stages (TEICHERT, KUMMEL & SWEET, 1973). Components of the *A. typicalis* fauna identified in samples from the Kap Stosch area (Table 1; Pl. 16, figs. 1–9, 14, 15) include *A. typicalis*, *Ellisonia gradata*, *E. teichertii*, *E. triassica*, *Neogondolella carinata*, and *Xaniognathus* sp. The *A. typicalis* fauna ranges in East Greenland from a level at least 10 m below that at which definite Triassic fossils first occur in sections at three localities (1, 2.1, 6.75) to a point some 90 m above a horizon with Triassic ammonoids in the section at Locality 6.75. An unknown thickness of rock separates the earliest representatives of the *A. typicalis* fauna from the youngest rocks with specimens of *N. rosenkrantzi*, although, as pointed out previously, one sample (68KC-30A), from Locality 2.1 has yielded an admixture of elements referable to *N. rosenkrantzi* and *A. typicalis*.

Late Permian and Early Triassic components of the *Anchignathodus typicalis* fauna are closely similar. The typical subspecies of *Neogondolella carinata*, which is the one represented in our collections from Kap Stosch, does not appear in northwestern Iran until a few meters below the top of the Ali Bashi Formation, and the Ali Bashi has yielded the youngest Permian conodonts thus far known (TEICHERT, KUMMEL & SWEET, 1973). Consequently, if any part of the *A. typicalis* fauna of East Greenland is Permian, it is likely that only the very latest part of that system is represented. In short, it is probable that our specimens of the *A. typicalis* association from East Greenland are mostly, if not entirely, from the upper (i. e., Griesbachian) rather than the lower (i. e., Changhsingian) part of the *A. typicalis* Zone.

References

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Table 1. *Distribution of Conodonts by Section and Sample*

Locality and Sample No.	Conodont species						
	<i>Neogondolella rosenkranzi</i>	<i>Xaniognathus</i> sp.	<i>Neogondolella carinata</i>	<i>Anchignathodus typicalis</i>	<i>Ellisonia triassica</i>	<i>Ellisonia teichertii</i>	<i>Ellisonia gradata</i>
LOCALITY 0							
68KA-2	1						
68KA-6	4						
68KA-9A	37	3					
T67-72 = 68KK-2							
LOCALITY 1							
68KB-1			1	4			
68KB-2			1				
68KB-5			6	1			
68KB-7			6	2			
68KB-8B			1	15			
68KB-9A			1	1			
68KB-10			1	2			
68KB-11A			8				
68KB-11B			1				
68KB-12			1				
68KB-16A			1				
68KB-16B			1	11	1		
LOCALITY 1.1							
68KC-1		5	47	13		4	9
LOCALITY 2							
T67-83 68KK-1	115						
LOCALITY 2.1							
68KC-28-29			25	4		1	1
68KC-30A	5*			1			
68KC-30B				5			
68KC-30D			1				
68KC-31		2	185	19			
68KC-32B			1				
68KC-32C			11				
68KC-33		1	44	19			
68KC-34		1	6	3	1?		
68KC-40A				2			
68KC-40B		1	2	7			
68KC-42A				2			
LOCALITY 6.75							
68KD-2			6	13	1	1	
68KD-10				3			
68KD-16				2			
LOCALITY 13.75							
68KE-2A	1						

* Reworked specimens.