

## A Reply. A History of Structural Concepts of the Trondheim Region

ERIK ROHR-TORP

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*E. Rohr-Torp, Norges Geologiske Undersøkelse, Oslo-kontoret, Eilert Sundts gt. 32, Oslo 2, Norway.*

When Wolff in his comment on my note 'A major inversion of the western part of the Trondheim nappe' (Rohr-Torp 1972), sums up a history of structural concepts, this seems to be rather a waste of space and time, as he refers to Wolff (1967) and Roberts (1967) for similar historical reviews. What is more regrettable, however, is his definitely wrong statement: '... Bugge (1954) regarded the Trondheim Region supracrustal rock pile as autochthonous'. This statement, along with some other misunderstandings in his comment, necessitates a reply.

The model of Carstens (1920) is much the same as the later model of Wolff (1964), an anticlinal fan fold; a simple model which resembles Bugge's (1954) model only in its central anticlinal structure.

The old models of Svenonius (1885) and Reusch (1890) are more interesting, as they somewhat resemble the model of Bugge (1954). There are, however, clear differences between these old models and that of Bugge, differences so evident that I unfortunately did not find it necessary to stress them in my note (Rohr-Torp 1972). The differences are clearly seen by reading Bugge (1954: 68–70). The old models of Svenonius and Reusch are similar to the 'Embryonale Falten' described on p. 68, which were developed in the 'archipelagic stage'. Bugge's model is further developed through the 'geanticlinal stage', and finished through the 'period of overfolds and overthrusts'. About this period he writes (p. 70): 'The anticlines developed into large, gliding folds, which were pushed far over the Ordovician sediments'. The Ordovician sediments comprise *inter alia* the 'Røros-Hovin division' (p. 68). Thus Bugge was the first to introduce a mushroom-shaped model which involved large recumbent isoclinal fold nappes and overthrustings.

I prefer to regard it as a new model, but certainly it is a matter of discussion whether or not it is an adaption of an old model to modern concepts of orogenic structures. To avoid misunderstanding I therefore should have written: 'Fig. 3a shows the mushroom-shaped model as first proposed by Bugge (1954)'.

Although Roberts (1967, 1968) proposes a central anticlinal structure, this view is far from confirmed, as claimed by Wolff. In fact, at Institutt for Geologi,

Universitetet i Oslo, the large scale folding nappe (fig. 3b, Rohr-Torp 1973) is favoured by those who work within the Trondheim Region.

In my note I never intended to give a historical review of the geology of the Trondheim Region. It is thus rather surprising that Wolff stresses: 'The alternative interpretation has for several decades been the 'synclinal model' (Kjerulf 1871, 1883, Tørnebohm 1896, Bugge 1910, Vogt 1940), and not the model depicted in Rohr-Torp's fig. 3b'. This synclinal model has been abandoned for some 20–30 years, and I clearly start my discussion at this point by saying: 'At present there are two basic models for the main structures of the Trondheim nappe', thus ignoring the abandoned synclinal model.

Wolff in his sentence: 'Moreover, this alternative (a fold nappe rooting far to the west) was discussed by the present author in a lecture in Norsk Geologisk Forening (9th April 1970); and it was then taken up by I. J. Rui in a lecture in Norsk Geologisk Forening (25th February 1971)', makes it sound as if Rui has picked up his ideas on this structure from the lecture given by Wolff. This is certainly not correct, as Wolff was advocating the 'mushroom-shaped' model, and only mentioned the fold nappe model in passing. Rui's model is based on his own observations from the Trondheim Region.

Neither is it correct when Wolff says that Wegmann (1925) was the first to suggest a model of this kind, as Wegmann suggested this model only for the Gula schist group, not for the entire Trondheim nappe.

Wolff's next paragraph has no bearing whatsoever on my note, as I have not discussed this problem, only his statement, as already mentioned, that Bugge (1954) regarded the Trondheim Region as autochthonous is definitely wrong. This should be demonstrated clearly enough by what I have cited above (Bugge 1954: 68–70).

Lastly, I did not refer to Åm, Oftedahl & Sindre (1973), but to the lecture by Oftedahl and Åm in Trondheim (28.4.1972), when it was said that the gravimetric picture obtained by the 'Horg syncline' was most easily interpreted as an anticlinal structure. If the 'Horg syncline' actually represents an anticline, this implies that the stratigraphy must be inverted. I agree that my reference here is partly misleading. However, G. Grønlie and I. J. Rui (pers. comm.) put forward the opinion of an inverted anticline on this structure. Their interpretation is based on the same gravity data as the model of Åm, Oftedahl & Sindre (1973).

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