



Silurian palynomorphs from the Chester Bjerg Formation, Hall Land, western North Greenland

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Silurian palynomorphs from a single sample from the Chester Bjerg Formation, near Halls Grav, Hall Land, western North Greenland are of Wenlock or possibly early Ludlow age. Graptolites from the same sequence indicate a Pridoli (latest Silurian) age. The strata in question are the youngest known pre-Innuitian orogeny deposits in North Greenland. Possible reworking of the palynomorphs in the turbidite sequence is discussed.

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The sequence at Halls Grav, Hall Land, western North Greenland (fig. 1) is of note in having yielded the youngest pre-deformation faunas yet known from the mainly Lower Palaeozoic sequence of the North Greenland trough. The faunas are of particular interest in the evolution of North Greenland in that they place a lower age constraint on the timing of the deformation which produced the North Greenland fold belt, a continuation of the Innuitian orogenic system of adjacent arctic Canada. Discussion in the literature (see Dawes & Peel, this report) has suggested latest Silurian (Pridoli) or earliest Devonian ages for graptolite and vertebrate faunas collected from these sediments during Operation Grant Land 1965–66. The present examination of palynomorphs from the stratigraphically highest samples available represents an attempt to give a new dimension to this discussion.

Palynomorphs

Standard palynological techniques were employed to recover many moderately preserved acritarchs, and occasional chitinozoans and miospores from GGU 82738, a dark grey, brownish weathering, bioclastic limestone collected by P. R. Dawes at 'Observatory Bluff' (fig. 1). This sample is one of several from a c. 1 m thick bed of limestone which have yielded vertebrate remains after acetic acid digestion (Bendix-Almgreen & Peel, 1974; Bendix-Almgreen, 1976). Several similar beds of limestone or limestone breccia occur within the

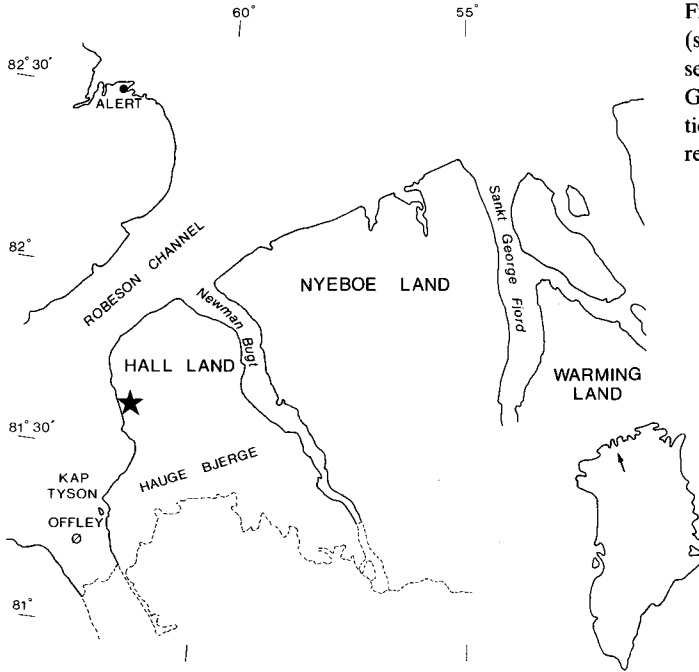


Fig. 1. Collection locality (star) for GGU 82738 at 'Observatory Bluff', near Halls Grav, Hall Land. This is section 2 of Dawes & Peel (this report).

thin-bedded, monotonous sequence of grey laminated mudstones, calcareous siltstones and darker, fine-grained greywackes which Hurst & Surlyk (1982) have subsequently assigned to the Chester Bjerg Formation. The acritarchs are brown in colour (Staplin Index 3) suggesting that the surrounding sediments have been heated to a maximum temperature of about 180°. The miospores (*Ambitisporites dilutus* (Hoffmeister) Richardson & Lister, 1969) are dark brown. Chitinozoans are black and include species of *Conochitina*, *Eisenackitina* and *Sphaerochitina*.

Acritarchs:

Ammonidium waldronense (Tappan & Loeblich) Dorning, 1981

Diexallophasis granulatispinosa (Downie) Hill, 1974

Diexallophasis sp.

Domasia limaciforme (Stockmans & Williere) Cramer, 1970

Domasia trispinosa Downie, 1960

Leiosphaeridia sp.

Micrhystridium sp.

Multiplicisphaeridium arbusculum Dorning, 1981

Oppalatala ramusculosa (Deflandre) Dorning, 1981

Salopidium granuliferum (Downie) Dorning, 1981

Tylotopalla wenlockia Dorning, 1981

Tylotopalla sp.

Veryhachium trispinosum (Eisenack) Cramer, 1964

Based on known acritarch ranges, particularly from sections in the Wenlock and Ludlow of the Shropshire type areas (Lister, 1970; Dorning, 1981), from Europe (Cramer, 1964,

1970) and eastern North America (Cramer, 1970, 1979; Cramer & Diez de Cramer, 1972), the presence of *Ammonidium waldronense* would indicate a Wenlock to early Ludlow age. *Domasia trispinosa* occurs commonly in the Llandovery–Wenlock boundary strata in the Welsh Borderland (Hill, 1974; Mabillard, 1981). *Tyloptalla wenlockia* ranges through the Wenlock, but is only rarely known from the lower Ludlow (Lister, 1970). *Diexallophasis granulatispinosa* was recorded from the lower Wenlock and older strata of the Welsh Borderland by Dorning (1981), while *Salopidium granuliferum* ranged from deposits of latest Llandovery to earliest Ludlow age. *Oppilatala ramusculosa* and *Multiplicisphaeridium arbusculum* both range from the Wenlock into the Ludlow in the Welsh Borderlands (Dorning, 1981).

The palynomorph assemblage therefore suggests a Wenlock or possibly early Ludlow age for this sample.

Discussion. Berry *et al.* (1974) referred graptolites from apparently lower in the strongly deformed sequence at Halls Grav to *Monograptus* sp. of *M. transgrediens* type, considered indicative of a Pridoli (late Silurian) age. A single specimen was identified as *M. cf. M. aequabilis*, suggestive of an earliest Devonian age. This graptolite has subsequently been redetermined by H. Jaeger (*in* Surlyk, *et al.*, 1980) as *M. cf. M. transgrediens*, probably of Pridoli age.

Bendix-Almgreen & Peel (1974) and Bendix-Almgreen (1976) examined vertebrate remains from a limestone bed at 'Observatory Bluff', apparently higher in the sequence than the graptolites identified by Berry *et al.* (1974) from nearby inland cliffs. A general late Silurian – early Devonian age was indicated, readily reconcilable with the early Devonian age suggested by Berry *et al.* (1974). The vertebrates and associated fauna (see Dawes & Peel, this report) were collected from the same suite of samples (GGU 82733–82738) as the sample processed here for palynomorphs. S. Turner (*in* Dawes & Peel, this report) compared thelodonts from the vertebrate fauna with assemblages from the Downtonian (= Pridoli) of western Europe, which agrees well with the revised graptolite determinations of Jaeger.

The Wenlock or early Ludlow age suggested by the palynomorphs is not in good agreement with the Pridoli ages suggested by the thelodonts from the same sample or the graptolites from apparently stratigraphically older deposits. The discrepancy in age may result from 'atypical' ranges of the palynomorphs and other taxa, since the material at hand is restricted and no embracive study of the deposits in question has been undertaken. Alternatively, fossil assemblages from 'Observatory Bluff' may be wholly or partially derived, which is quite possible when the turbiditic nature of the Chester Bjerg Formation is taken into consideration (Hurst & Surlyk, 1982). The palynomorphs, however, show no evidence in themselves of being a mixed assemblage; neither is there marked variation in colour or obvious abrasion. Solution of the problem clearly awaits better and more precisely located material.

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Plate 1

All specimens are from GGU sample 82738. MGUH denotes specimens in the type series of the Geologisk Museum, Copenhagen. Slide number is followed by the England finder coordinates of each specimen; all $\times 1000$.

- Fig. 1. *Ambitisporites dilutus*. 82738(2); V243; MGUH 16.532
- Fig. 2. *Oppilatata ramusculosa*. 82738(2); U301; MGUH 16.533
- Fig. 3. *Ammonidium waldronense*. 82738(2); R381; MGUH 16.534
- Fig. 4. *Diexallophasis* sp. 82738(2); P303; MGUH 16.535
- Fig. 5. *Tylotopalla* sp. 82738(2); H421; MGUH 16.536
- Fig. 6. *Salopidium granuliferum*. 82738(2); T290; MGUH 16.537
- Fig. 7. *Multiplicisphaeridium arbusculum*. 82738(2); C403; MGUH 16.538
- Fig. 8. *Domasia trispinosa*. 82738(3); K361; MGUH 16.539
- Fig. 9. *Ammonidium waldronense*. 82738(3); W470; MGUH 16.540
- Fig. 10. *Domasia limaciforme*. 82738(3); A310; MGUH 16.541
- Fig. 11. *Tylotopalla wenlockia*. 82738(2); S432; MGUH 16.542
- Fig. 12. *Diexallophasis* sp. 82738(2); P303; MGUH 16.543

