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# Dinoflagellate cyst taxonomy of the Late Cretaceous Smoking Hills Formation (Horton–Anderson Plains, NWT)

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## Summary

The Late Cretaceous Kanguk Formation in the Canadian Arctic, and time-equivalent strata in circum-Arctic areas, contain exceptionally abundant, diverse and well-preserved dinoflagellate cysts (dinocysts). This study details ongoing taxonomic work on the highly diverse dinoflagellate cyst assemblages of the Smoking Hills Formation, a Santonian to Campanian shale unit considered time equivalent to the middle part of the Kanguk Formation in the Sverdrup Basin. This work constitutes a first step towards detailed biostratigraphic and paleoenvironmental studies of Late Cretaceous strata in the region.

## Method

Previous studies of Cretaceous strata from the Canadian Arctic Islands and Northwest Territories have identified 591 dinocyst taxa (291 of which are formally established taxa; 300 are informally named), and 90 other algal microfossil taxa (e.g., McIntyre, 1974, 1975; Brideaux & McIntyre, 1975; Doerenkamp et al., 1976; Brideaux, 1977; Davies, 1983; Bujak & Scott, 1984; Nuñez-Betelu, 1994; Nohr-Hansen & McIntyre, 1998; Fensome, 2016). McIntyre (1974) reported 79 dinocyst taxa along with 10 other algal microfossil taxa from surface sections of the Smoking Hills and Mason River formations (previously informally called “Bituminous zone” and “Pale shale zone”, respectively) along the Horton River. In summer 2018, the Geological Survey of Canada (GSC) revisited these sections (and others) for the first time since the late 1960s (Bringué et al., 2018) and carried out high-resolution sampling (every 1.5 m vertical; twice the stratigraphic resolution of McIntyre’s 1974 study) for detailed palynological analyses.

Palynomorphs were extracted using the standard preparation technique for Mesozoic samples, including acid (HCl, HF) digestion, oxidation with Schulze’s solution and staining using Safranin O. Residues were mounted with liquid bioplastic, and palynomorphs were identified using a Zeiss Axio Imager M2 under transmitted light, differential interference contrast, phase contrast and autofluorescence at 630 to 1000× magnifications. Images were acquired using an Axiocam 305 colour camera coupled with Zen 2.5 software. Dinoflagellate cyst nomenclature conforms to the most recent update of the Lentin and Williams Index (Fensome et al., 2019).

## Results

Preliminary results indicate excellent palynomorph preservation, low thermal maturity and high species diversity. Ongoing taxonomic work focusses on the gonyaulacacean genera

*Florentinia*, *Oligosphaeridium*, *Spiniferites* and *Hystrichostrogylon*, the ceratiaceaen genus *Odontochitina*, and the peridiniacean genera *Alterbidinium*, *Laciniadinium*, *Chatangiella*, and *Cerodinium*.

The research being conducted will help establish the age equivalence of Cretaceous strata from the Smoking Hills area with that of the Sverdrup Basin (Isachsen, Christopher and Kanguk formations), which currently constitutes the reference framework for Canadian Arctic stratigraphy. Future work will develop dinocyst-based paleoenvironmental reconstructions to resolve oceanographic changes associated with the influence of Western Interior Seaway (Smoking Hills area) compared to the late post-rift stage of the Sverdrup Basin.

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