

on this subject is either very brief or non-existent.

At a site some few miles north of Inuvik, I observed during the 1971 summer field season an example of patterned ground formed beneath black spruce forest that had been exposed as a result of a recent fire (probably within the past 5 to 6 years as deduced from the initial stage of vegetational regeneration) and this is shown in Fig. 1.

Although Tedrow's extensive work in arctic soils clearly indicates that podzolization processes are at work in soils of regions northward of the continental forest borders, he indicates that very often these are not as clearly apparent as in the forested regions simply because of the absence or minimal development of the light coloration of the A₂ horizon characteristic of well-developed northern forest podzols. That such minimal coloration is not without exception is demonstrated by the soil profiles shown in Figs. 2 and 3; the first from an area about 12.9 km. inland (toward the northeast) at the north arm of Pelly Lake (66° 02'N., 101° 07'W.) some 400 kilometres or more north of the forest border at the present day⁵; the second from Winter Lake (64° 29'N., 113° 10'W.) at the northern edge of the forest/tundra ecotone about 200 kilometres northeast of Yellowknife, Northwest Territories.

These observations demonstrate clearly that patterning is not exclusively a property of tundra soils nor is podzolization (with a light-colored A₂ horizon) an exclusive property of northern forest soils. Much remains to be learned about both processes in the forest, forest/tundra ecotone, and tundra regions, but it is clearly apparent that soil characteristics cannot be taken alone as definitive or conclusive evidence of the former existence of forest or tundra vegetation (i.e., as basis for inferences concerning past climates from data employed in paleoclimatological interpretation). In such instances it is apparent that at least corroborative evidence in the form of macrofossils of tree species or arctic plant species of good climatic indicator value³ should also be used.

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The Isotopic Composition and Concentration of Strontium of the Brine From Tuborg Lake, Ellesmere Island

Tuborg Lake is at 81°N., 76°W. at the head of Antoinette Bay in northern Ellesmere Island, Northwest Territories. It trends in an east-west direction and is separated from the fjord by a glacier at its western margin. The lake is 20 km. long and about 3 km. at its widest¹. An active glacier at the eastern end calves occasional small icebergs into the lake. In June 1963, the level of water in the lake was 10 to 12 m. above sea level.

The lake is markedly density-stratified; the salinity is less than 0.5‰ to a depth of more than 46 m. below its surface¹. The salinity rapidly increases below this depth, and at a depth of 57 m. it is 25.594‰. Hattersley-Smith and Serson¹ attribute the saline water at the bottom of the lake to sea water trapped by the advance of the glacier across the fjord. The depth of the halocline at 50 to 55 m. (thus 40 to 45 m. below sea level) and the fact that the present level of the lake is about 10 m. above sea level both suggest a complex history of the lake.

Recently, the isotopic composition of strontium, conveniently expressed as the ⁸⁷Sr/⁸⁶Sr ratio, has been used to indicate the source of dissolved salts in Lakes Vanda and Bonney, southern Victoria Land, Antarctica^{2,3,4,5} and of Great Salt Lake in Utah⁶. The ⁸⁷Sr/⁸⁶Sr ratio of surface water depends on the Rb/Sr ratios and ages of the rocks exposed in the drainage basin. Water in lakes and rivers on the Canadian Precambrian shield is significantly enriched in radiogenic ⁸⁷Sr, which is produced in the rocks by decay of naturally-occurring ⁸⁷Rb⁷. The isotopic composition of strontium in sea water is constant (⁸⁷Sr/⁸⁶Sr = 0.7093)² and can therefore be useful in identifying marine strontium.

The isotopic composition of strontium was determined on a sample of the brine from Lake Tuborg. This sample was collected 22

June 1967 at a depth of 90 m. below the surface of the lake. At the sampling site the maximum depth of the lake was 130 m. and the depth of the halocline was 60 m.; salinity of the sample is 26‰⁸. The strontium was separated from the brine using ion exchange chromatography and the isotopic composition was determined by mass spectrometry. Details of the procedures are given elsewhere².

The ⁸⁷Sr/⁸⁶Sr ratio for the brine at 90 m. depth of Lake Tuborg has a value of 0.7096 ± 0.0005 (1 σ), which is in satisfactory agreement with the accepted value for modern sea water. This suggests that the brine at the bottom of the lake could be sea water. However, this is not conclusive, because the dominant bedrock in the region consists mainly of marine carbonates of Early to Middle Cambrian age. The ⁸⁷Sr/⁸⁶Sr ratio of these rocks probably does not differ greatly from this value⁹. We analyzed one specimen of limestone of Middle Cambrian age from the Nelson Formation of the Neptune Range, Pensacola Mountains, Antarctica, and obtained an ⁸⁷Sr/⁸⁶Sr ratio of 0.7093.

The concentration of strontium, determined by isotope dilution using a spike enriched in ⁸⁶Sr, was 6.239 ppm and is somewhat less than that of normal sea water, which has a strontium content of approximately 8 ppm. Using the established relationship between salinity and chlorinity in sea water¹⁰ and a salinity of 26‰, we find a chlorinity of 14.4‰ for the brine sample. Accordingly, the Sr/Cl ratio of this brine is 0.43. Riley and Tongudai¹¹ obtained an average value of 0.42 ± 0.02 for this ratio for a large suite of sea water samples. The Sr/Cl ratio of the brine from Lake Tuborg is similar to this value, which also suggests that the brine could be sea water.

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Devon Island Programs 1971

INTRODUCTION

From April to October 1971 the Arctic Institute's research base on the northeast coast of Devon Island (75°40'N., 84°40'W.) was