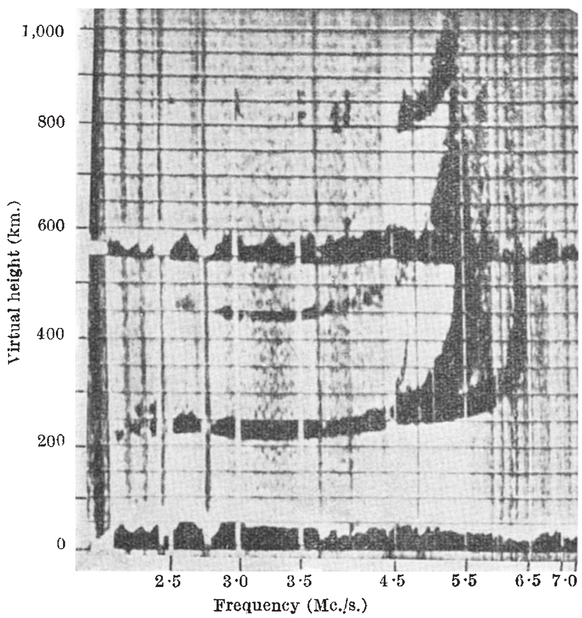


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[1] Scott, J. C. W., *J. Geophys. Res.*, 55, 65 (1950).

## Reflexion Coefficient of Radio Waves from Frozen Terrains

DURING the period January–February 1952, measurements were made in northern Canada in order to determine the reflexion coefficient of radio waves for normal incidence from deeply frozen land or sea. The frequency used was 1,600 Mc./s.

The method of measurement was to transmit a linearly polarized pulse signal vertically downwards from an aircraft flying at heights between 10,000 ft. and 20,000 ft. and to receive the signal re-radiated from the ground on a suitable receiver in the aircraft. Attenuation was inserted in the aerial lead of the receiver to maintain a constant received signal strength as the reflexion from the ground varied. The loop gain of the equipment was checked periodically to confirm that the performance of the equipment remained unchanged during the measurements. In addition, the signal was compared, whenever possible, with reflexions from open-water leads in Hudson Bay or the Great Lakes shortly before or after the measurements over the terrain in question. This was used as a standard for comparison.

It had been believed that the smallest reflexion coefficients likely to be met would not be lower than that from dry desert sand. This had already been checked over the shifting sand dunes of the Sinai Desert and also in desert areas in North Africa. The measurements agreed quite well with figures quoted previously by other authorities.

The reflexion coefficient from frozen muskeg and from the barren gravel areas north of the tree line in Canada was found to be roughly equal to that from dry sand. The frozen ice on Hudson Bay also gave a similar result. The ground temperatures were below − 35° F., and the ground and sea were frozen to a depth of several feet.

When flying over deeply frozen land where the land was heavily wooded, the land being covered with loose snow several feet deep and the trees thickly covered with snow and ice, a reflexion coefficient appreciably less than that from muskeg was observed. This was checked in two or three different areas, and the same figure was obtained on each occasion.

The figures of received signal power as compared with a sea reflexion were − 13 db. for sand, frozen muskeg or gravel, etc., and − 20 db. for frozen snow-covered forest. The accuracy of measurement was not worse than ± 2 db. The reflexion coefficient of sea water has been measured by other observers and is 0·83. Using this figure, the reflexion coefficients for various frozen terrains have been calculated and are as follows:

| Terrain | Reflexion coefficient |
|---|---|
| Sea | 0·83 |
| Deep ice on sea | 0·20 |
| Frozen muskeg or barren gravel | 0·20 to 0·25 |
| Frozen lakes | 0·25 |
| Frozen snow-covered forest | 0·08 |

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## Light Scattering by very Stiff Chain Molecules

VERY precise light-scattering measurements by B. H. Bunce[1] on several thymonucleic acid preparations have shown that the scattering function of these gigantic macromolecules—the molecular weights are between 2·6 and 6·7 millions—differ remarkably from that of a random coil. The angular dependence of the reciprocal reduced intensity $1/P = I(0)/I(\vartheta)$, for all samples, reveals that the molecules are not perfectly coiled. The experimental points are situated between the curves for a random coil and that for a stiff rod.

Therefore it seemed worth while to compute the scattering function for a thread-like molecule of finite length with variable flexibility. In some previous work on viscosity and sedimentation[2] of such relatively short molecules, the usual 'pearl-necklace' model was chosen. By variation of the valency angle $\alpha = 180° - \beta$ between two consecutive links and the length of link $b$, all kinds of flexibility from the stiff rod ($\cos \beta = 1$), to the quite soft thread ($\overline{\cos \beta} = 0$), can be represented. This model is not very suitable for the consideration of light scattering; it can be replaced by the 'thread' model with continuous mass distribution and curvature introduced by Kratky and Porod[3] in the theory of X-ray scattering.