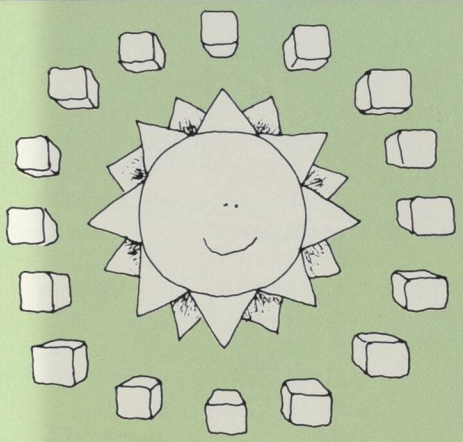
Cubic halo

We live beneath an ocean of air. It hides the stars in daytime, colours our sunsets, and frequently rings the sun or moon with bands of light called 'haloes.' These haloes come from tiny ice crystals high in the atmosphere, through which lunar or solar light refracts. The well-known geometry of most of these crystals explains the different angles of most types of halo with high precision, but one rare halo has long puzzled metorologists. Scheiner's halo, named for the 17th-century astronomer who first reported it, has been seen only a handful of times in the last



350 years. The angle between the centre of the sun and the inside of this halo is 28 degrees — an angle which no naturally-occurring crystal of ice seemed able to explain satisfactorily.

Now Dr. Edward Whalley of NRC's Division of Chemistry believes he has solved the puzzle. According to Whalley, the crystals which refract solar light to form Scheiner's halo could comprise a radically different kind of ice, one till now believed to exist only in the laboratory. Scheiner's ice, in Whalley's view, is "cubic ice," whose water molecules stack up during their freezing process in a unique way. One result of this, Whalley thinks, could be large-scale crystals of cubic ice high in the atmosphere that refract sunlight to the exact angle of Scheiner's halo.

(More details in a feature-length article, next issue.)

The big icebox

Time of year: July. Conditions: driving snow, freezing temperatures, high winds. A blizzard is in the making.

An unusual summer? Not really. It's all happening at NRC's new Climatic Engineering Facility, located at a site near Ottawa's Uplands International Airport. The cold chamber simulates severe climatic conditions, everything from freezing rain conditions to blizzards (a combination of high winds, low temperatrues, and snow). Temperatures can range from -45°C to +50°C, the effect of winds of up to 65 km/h can be provided by fans, and snowfall rates can reach 3 cm/h. The chamber is the ideal place to do research on engineering problems arising from low temperatures, ice, and snow.

The installation, which is big enough to handle a railway car — even a locomotive — is the largest cold chamber in Canada, the second largest in North America. Tanks, transports, railcars, track vehicles like those used in open-pit mining, or large sections of aircraft, can now be tested under carefully controlled conditions at any time of the year. Canadian manufacturers will no longer have to go to the United States or as far away as Vienna to test their huge rolling stock.

Testing the performance of equipment and vehicles under extreme conditions isn't restricted to seeing if the engine can start in cold weather. Will the brake system freeze? Can the streetcar maintain passenger comfort? Is the windshield kept clear in freezing rain? Does the air conditioning work in hot weather despite high temperature and humidity? It's also important that insulated compartments transporting goods, food for example, maintain their temperature. Those potatoes being shipped across Canada will be ruined if they freeze.

The new installation is made up of machinery rooms, a control room, and a cold chamber. Built at a cost of $1.8 million, it replaces the old chamber at the Montreal Road Labs, which was only large enough to handle cars and trucks.