the angular velocity of rotation and the mutual velocity, and dependent on the angle between them. Previous heat-conduction measurements in wide tubes had given a third-power mutual friction of the Gorter–Mellink type associated with turbulence in the superfluid, and it was suggested that this turbulence took the form of a confused tangle of vortex lines, mutual friction being due to collisions between normal fluid excitations and the vortex lines. A calculation based on this mechanism leads to a cubic mutual friction of the right order of magnitude with a collision diameter for roton–vortex line collisions of about 10 A., but a number of difficulties arise in attempting to derive a complete theory. It now appears that different results obtained at Yale with a similar experiment can be reconciled with the present observations.

The theory of vortex lines is again used in explaining the results of experiments by Dr. H. E. Hall (Cambridge), in which measurements are made of the forces producing angular acceleration and retardation of helium II contained between closely spaced disks. For an angular velocity of 1 rad./sec. the amount of angular momentum collected on stopping the rotation has the full classical value, but for smaller angular velocities it falls progressively below this, the missing angular momentum corresponding to a persistent current which is probably irrotational and has a lifetime of more than 0·25 hr. The simplest mechanism for the generation of such persistent currents is the removal of vortex lines by the Magnus effect, but the actual mechanism is probably more complicated. Comparison of the frictional forces observed using spacers of different diameters between the disks suggests that at an early stage in the retardation process the superfluid becomes turbulent with an irrotational mean flow. At superfluid velocities less than a critical value turbulence decays on the disk surfaces and retardation stops.

Following the success of this first discussion day, plans are going forward for a second meeting, which will be concerned with low-temperature distillation, and will take place early in the present year.

D. F. Brewer

THE TEACHING OF METEOROLOGY IN SCHOOLS

In the past, the teaching of meteorology in British schools was largely a matter of climates and trade winds, with but little study of the actual weather outside the windows or much relevance to the future lives of most of the pupils. The October 1956 number of the Royal Meteorological Society's magazine *Weather*, which has the teaching of meteorology as its main theme, gives evidence of the coming of a more vivid, physical and realistic approach.

A group of H.M. Inspectors of Schools contribute the main article, "Meteorology in Secondary Schools", which deals with the reasons for studying physical meteorology as well as geographical climatology in schools and provides an outline course of study. The group points out that the weather may be of vital importance to some pupils after they have left school and will at least be of interest to all. Apart from future use of knowledge of the processes of weather, study of them provides illustrations of important physical principles and, in simple observing work, an introduction to scientific accuracy and method. The outline course opens with the basic physics of radiation, condensation, relation of wind to pressure, etc., and goes on to properties of air masses and fronts and methods of observation. It is stressed that the teacher should correlate his lesson on air-masses by reference to the weather of the day but does not mention the interpretation of the broadcast forecasts. The latter is the most obvious omission in the course and is regrettable because weather forecasts will be used to greater or lesser degree by all the pupils in adult life. An amusing note is provided by the examples of awkward questions which pupils might ask on matters not understandable without more advanced physics or mathematics.

Mr. J. B. Rigg describes the meteorological studies at Watford Grammar School. These begin at the age of 11 years with the making of simple rain-gauges. In the sixth form the geography students, who include many also taking physics and mathematics, carry out much practical work with the comprehensive collection of instruments.

A number of publications, such as the "Observer's Handbook", are mentioned in the articles. Reference might also have been made to the Ministry of Agriculture pamphlet, "Weather and the Land", written by the Agriculture Branch of the Meteorological Office, which gives admirable guidance in the interpretation of the broadcast weather forecasts to meet local conditions.

An editorial discusses whether it is likely to be possible to teach any of the more recently gained knowledge in meteorology in sixth forms. It considers that there is a great opportunity for physics teachers to show the operation of basic physics in the weather, but little possibility of modern dynamical meteorology being taught because in their honours courses most mathematics teachers have not learnt real hydrodynamics with vorticity and viscosity.

UNUSUAL UPPER-AIR REFRACTION PHENOMENON

The optical phenomenon of 'looming' which occurs when the air temperature increases very markedly with height is well known at low altitudes, especially in the polar regions. The rays of light from distant objects are then much more strongly curved in an arc convex upwards than usual, so that distant objects are apparently raised and multiple images successively upright and inverted are seen. This is the effect opposite to the mirage associated with a very steep fall of temperature with height, in which the rays become convex downwards and the sky is seen on looking along the ground.

The August number of the *Meteorological Magazine* contains an account by C. S. Durst, G. A. Bull and E. J. Sumner of 'looming' of distant clouds seen from a Canberra aircraft of the Royal Air Force flying north-east at 45,000 ft. some 200 miles off the west coast of Norway at lat. 66° 20′ N., long. 2° 30′ E., at midday on November 29, 1955. The crew, Flying Officers E. E. Kortens and F. P. Fraser, saw a cloud like a bowler hat protrude upwards above the cirrus cloud before and ahead of them. It expanded vertically and sideways. Then another cloud lump appeared at the top of the first one and also spread sideways and vertically. Next a mushroom-like top appeared and finally another lump on top of the