maintaining the steady-state rotation, by virtue of the combined spin at the particle. The application of these principles to the understanding of the quantization of angular momentum deserves some attention.

Finally it is interesting to note that the observed geometry is such that a disk remains a disk under steady state rotation.

Note added in proof. Essen has courteously shown me his reply; the Lorentz frames in my treatment are permanent, only the co-existence (or coincidence) is fleeting.

R. C. JENNISON

Department of Physics,
University of Manchester.

[1] Essen, L., *Nature*, **202**, 787 (1964).
[2] Jennison, R. C., *Nature*, **199**, 739 (1963).
[3] Synge, J. L., *Nature*, **198**, 679 (1963).

DR. JENNISON quotes only a part of my conclusion and it seems to me that he does not answer any of the points I raised.

In paragraph (1) of his communication it is stated that any point in the system can be considered to exist instantaneously in a Lorentz frame. In the experiment, however, the absorber is continuously accelerated and Jennison's assumption is therefore not in accord with the experimental conditions.

His definitions of 'instantaneously' and 'elementary locality' are both strange and variable. In his paragraph (1) the duration and extent are sufficient for local time to be established. For this the procedure described by Einstein must be adopted. A light signal is sent from the local clock to the distant clock and back again. The time is thus that of the double journey—which is double the time occupied in the actual experiment under discussion—and the 'elementary locality' includes the absorber and emitter. In (2), on the other hand, it is stated that for a distance exceeding the 'elementary size of a Lorentz locality' the absorber and emitter are in different frames. In (5) the elementary locality is called 'vanishingly small'. The assumptions in (2) and (5) thus contradict those in (1). Those in (1) cause the acceleration to be neglected while those in (2) and (5) enable the effects to be attributed to the acceleration. This is the very weakness in Einstein's argument to which I directed attention.

Later in his communication Jennison uses the practice so popular in discussions on relativity of propounding an imaginary experiment and of stating the result obtained. Although this artifice may occasionally have some illustrative value, it is in general useless and misleading. It is useless because an imaginary experiment cannot yield any information, and misleading because it appears to provide experimental support for what are mere assumptions. Jennison, for example, discusses the results observed in his experiment. In imaginary experiments there are neither observers nor observations and the use of such expressions is simply a misuse of language. Scientific theories, if they are to be of value, must be based on the results of actual experiments.

L. ESSEN

50 Wensleydale Road,
Hampton, Middlesex.

Scattering and Attenuation due to Snow at Optical Wave-lengths

THE narrow beam-widths obtainable with coherent light permit one to examine forward scattering caused by atmospheric effects in some detail. For example, it is found that inhomogeneities of refractive index in the otherwise clear atmosphere give rise to considerable broadening of a narrow beam. However, when heavy snow is falling, scattering and the ensuing attenuation of the optical wave are caused predominantly by the flakes; this also holds true in propagation through droplets of fog and rain.

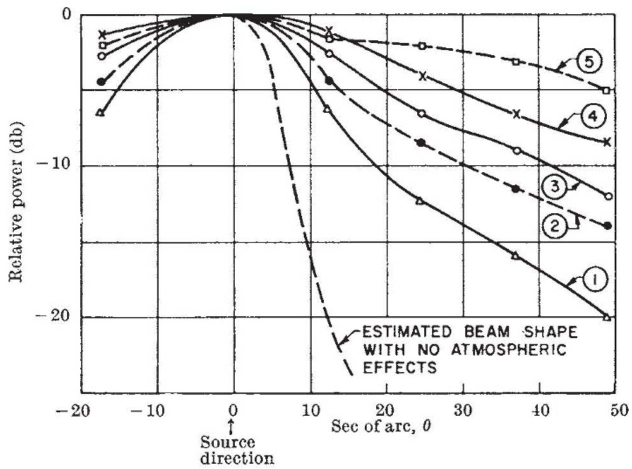

Fig. 1. Beam broadening due to snow: λ, 0·63μ; path-length, 2·6 km. Data of 2/10 and 2/11/64. Excess attenuations in curves 1–5 are 3·5, 5·0, 13·6, 15·6 and 17·9 db/km respectively, corresponding to increasingly heavy snowfalls. The attenuations are measured at dead reckoning, that is, with the receiving aperture on the maximum of the beam pattern ($\theta = 0$)

Fig. 1 shows beam patterns measured at a wave-length of 0·63μ over a path 2·6 km in length. The source consists of a helium–neon optical maser operating in several modes, and a cassegrainian telescope of 3·5 in. in diameter; the receiver is a 2-in. telescope with a photomultiplier. If the intervening path were vacuum, this combination would produce a half beam-width at the −5 db points of about 5 sec of arc as indicated by the narrow dashed curve. The broadening shown in curve 1, where the snowfall and corresponding attenuation are quite light, is due mainly to refractive effects, that is to say, it does not differ much from beam patterns measured during clear weather. However, as the rate of snowfall and attenuation increase, the beam-width does likewise, as indicated by curves 1–5. The patterns are normalized at $\theta = 0$. In curve 5, corresponding to an excess attenuation of about 18 db/km, the −5 db point of the pattern has increased to almost 50 sec of arc and the beam appears quite flat.

Although beam-broadening due to snow is a readily measurable effect, its onset occurs when the attenuation is fairly high. On the other hand, in the case of rain, broadening effects are observable at much lower attenuations; this is because raindrops are more efficient than snowflakes in forward scattering, the latter suffering from poor geometry and, more often than not, random orientation. Unfortunately, consistent data on beam-broadening due to rain are not obtained as readily as those of snow because of the time variability and inhomogeneity in rainfall along a given path.

D. C. HOGG

Bell Telephone Laboratories, Inc.,
Crawford Hill Laboratory,
Holmdel, New Jersey.

Effect of Precompression on the Critical Tension of Liquids

A PRIOR application of pressure may alter the properties of a liquid when subjected to tension. Harvey[1] found that precompression of water up to a pressure of 1,000 atm. increased its ability to withstand tension. In his experiments the tension was generated by means of a hammer blow, that is, the liquid was subjected to stressing under 'dynamic' conditions. In our work we have applied tension under 'static' conditions and have investigated the effect of precompression using the Berthelot tube method described by Temperley and Chambers[2].