A detailed application of Rayleigh's theory of molecular scattering of light to the problem of day-sky illumination was made many years ago by L. V. King\(^1\) who obtained results which in their main features were borne out by the observations of the Smithsonian workers. Gruner\(^2\) in a series of papers extended the application to include not only low angles of the sun above the horizon but also considered early twilight, when the sun is a few degrees below the horizon. He also made actual observations of the changes in colour of the various parts of the sky during twilight. Ramanathan\(^3\) made calculations of the intensities of different parts of the sky, for a high level station (Simla, 7000 ft. above sea level) and for early twilight based on the assumption that the phenomenon of twilight is due to the scattering of sunlight by air molecules and the results agree as well as may be expected with Dorno's observations of sky brightness made in clear weather in Switzerland.

Recently Fessenkoff\(^4\) and Link\(^5\) have extended the application a step further and tried to connect the measured brightness of the zenith sky when the sun is below the horizon, with the density of air at different levels in the upper atmosphere. More recently, Hulbert\(^6\) has made a similar attempt to derive the distribution of air density with height by photometric measurements of the brightness of the zenith sky and the luminous flux across a vertical plane from the twilight horizon.

In 1937 a simple photometer was developed at the Colaba Observatory, Bombay, in order to carry out measurements of the intensity in the visual region of the zenith sky during twilight. An account of the work done is given below; and a tentative distribution of temperature with height in the upper atmosphere is deduced assuming the scattering at the time of twilight to be mainly primary scattering.
Fig. 1

W—Wall
D—Dome
B—Stone pillar
T—Wooden tube
T'—Metal tube
P—Reflecting prism
S—Screen coated with magnesium oxide
A—Aperture in the dome
M—Metal cylinder
X—The position of the eye of the observer
C—Black cloth
F—Colour filter

Experimental

Fig. 1 shows a diagrammatic sketch of the experimental arrangement set up for making visual photometric measurements of the zenith sky. A is a rectangular hole in the top of the dome D, through which the scattered light from the zenith sky is let into the dark room. After passing down the two tubes T' and T, it is reflected in a horizontal direction by means of a right-angled prism P so that the observer, with his eye at X, could view a portion of the zenith sky and follow the gradual changes in its brightness. The details of the photometer are shown in Fig. 2. A small electric lamp run on a six volt accumulator illuminates the screen S, coated with magnesium oxide and supported by means of thin wires in the centre of the tube T. The current in the lamp can be varied continuously, so that the illumination