some striking features of the stellar scintillations and excursions that are due to what I propose to call *aerial blobs* (*1*). Although many atmospheric disturbances refract, diffract, scatter, or absorb light from distant celestial and terrestrial sources in an irregular manner, aerial blobs are volumes of air of locally altered density, temperature, and water content that possess remarkable optical properties. Blobs in combination with the mirrors or lenses of a telescope often bodily displace the images of stars or focus them in points in front or behind the regular focal surface, as is shown in Fig. 1.

Figure 2 (top) depicts the structure of a typical extrafocal stellar image as obtained from an instantaneous exposure with the 200-in. telescope. The extrafocal image shown is composed of a network of dark and bright patches and lanes. (The inner circle is due to the obstruction offered by the observer's cage.) Notice the distinct points *A, B, C*; these are good stellar images resulting from the combined optical action of the telescope and various aerial blobs traveling through the cylindrical beam of light from a given star falling on the 200-in. mirror. If, instead of taking a still picture, the photographic plate is moved in a plane normal to the axis of the telescope, the points *A, B, C* will produce sharp striations. These will be inclined as shown if the blobs have any velocity component normal to the motion of the plate (Fig. 2, bottom).

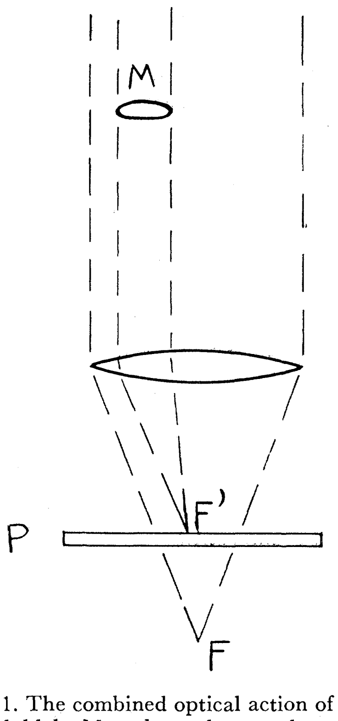

Fig. 1. The combined optical action of the aerial blob *M* and a telescope lens (or mirror) focus parallel starlight at *F'* instead of at the ordinary focus *F* for an undisturbed atmosphere. ***P*** is the photographic plate.

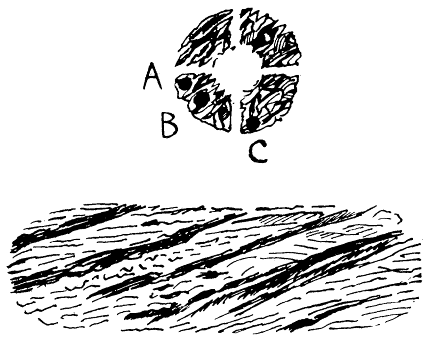

Fig. 2. (Top) Possible structure of extrafocal stellar image of the 200-in. telescope with sharp focused star images at *A, B, C,* which are due to the combined optical action of the 200-in. mirror and aerial blobs approximately 20 to 30 in. in size. (Bottom) Drifted extrafocal image.

Linear dimensions of aerial blobs have been observed ranging from millimeters to many meters. Blobs may be globular, lenticular, or cylindrical in shape, thus producing sharp pointlike or linelike extrafocal images of stars. Often hundreds of blobs are quite regularly spaced and drift with the winds at various altitudes up to 50 km or perhaps higher. Methods for the determination of the physical characteristics of aerial blobs, of their velocities, and of the altitudes at which they are found have been discussed in another place (*2*).

A most amazing feature of many aerial blobs is their durability and stability; some of them preserve their shapes for hours. The lifetime of blobs can best be observed through the partial or total condensation of their moisture content. Such condensation occurs, for instance, in the regions adjoining the vapor trails caused by jet planes.

It is often thought that the continued state of commotion is one of the most conspicuous features of the atmosphere. Individual disturbances such as eddies, shock waves, and other local fluctuations of density, pressure, and temperature are commonly pictured as fleeting and short lived. On closer inspection it will be noticed, however, that stationary cloud formations represent an important aspect of the atmosphere. In particular, semiperiodically distributed globular and striated Cirrus clouds may be intrinsically of the same nature as the afore-mentioned aerial blobs.

The reasons for the durability of aerial blobs are not yet well known. The suggestion may be ventured that their stability is related to the thermal, caloric, and electric phenomena that governs and regulates the water content of the blobs. For instance, heat flowing in and out of a blob will cause some of its moisture to evaporate or to condense. The resulting absorption or release of the heat of vaporization of water tends to stabilize the temperature within the blob at a constant differential relative to the surrounding air. Also, the droplets or ice crystals are positively and negatively charged. The whole swarm of condensed particles thus possesses a negative potential energy, which helps to maintain the physical conditions within the blob.

The simple optical tests discussed here promise to produce a wealth of information on all the important disturbances in the earth's atmosphere. The study of extrafocal images of bright stars, as well as the analysis of drifted spectra (*2*), are particularly useful and are well within the reach of instrumental equipment available to many meteorologists, amateur astronomers, and photographers, who should therefore be encouraged to lend a hand in the exploration of phenomena important for meteorology, to the art of forecasting, and to the study of the physics of the atmosphere.

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References and Notes

1. During my lectures in Paris and Göttingen in the summer of 1954, I used the expressions *mollusques d'air* and *Luftmollusken*, since no good direct translations for the word ***blob*** are available.

2. F. Zwicky, *Publ. Astron. Soc. Pacific* **62**, 150 (1950); *J. Am. Rocket Soc.* **23**, 370 (1953).

15 March 1955.

Prizes and Awards

In reading the editorial in *Science*, 13 May 1955, I was rather astonished by the statement ". . . and the fact that one in seven of them have since received the highest honor that can come to a scientist. . . ."

In 1907 Michelson was awarded the Nobel prize and also the Copley medal. I asked him which he prized the most. He replied, "The Copley medal by all odds. It is awarded by my peers. At the same time I am glad to be able to remodel my house."

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