Table 1. Effect of irradiation on acetate-C^{14} incorporation into liver glycogen and fatty acids

No. of animals	Dose (r)	Starvation period (hr)	Liver glycogen (%)	Total counts	Liver fatty acids (%)	Total counts
8	0	0	3.4	66	3.7	220
8	0	48	0.5	79	3.8	45
8	1500	48	3.4	203	4.2	410
7	1500	24/24*	2.7	95	3.7	217
8	1500	48/24†	3.7	176	3.7	151

* Animals fasted 24 hr before and after irradiation.
† Animals fasted 48 hr before and 24 hr after irradiation.

Table 2. Effect of irradiation on incorporation of acetate-C^{14} into liver lipid fractions

No. of animals	Dose (r)	Starvation period (hr)	Liver phospholipids (mg)	Total counts	Liver neutral fat (mg)	Total counts
6	0	48	187.1	50	112.1	69
8	1500	48	185.3	51	113.8	142

liver glycogen was found by McKee (*6*) to be higher than in fasted controls. This effect was first ascribed to retarded glycogenolysis. Fasting preliminary to x-ray exposure indicated, however, that the high levels might be the result of glycogen formation. Our studies have pursued this line and have further employed the incorporation of labeled acetate to compare the metabolic activity in irradiated and normal animals.

Coniglio *et al.* (*7*) found an increase in the incorporation of intraperitoneally administered C^{14}-acetate into liver fatty acids of x-rayed animals. Since Neve and Entenman (*8*) observed increases in blood phospholipids, which might be a reflection of liver synthesis, the liver lipids of two groups of animals were fractionated into phospholipids and neutral fat. Thus in these studies interest was also centered on the particular lipid fraction into which acetate incorporation occurred.

Female albino rats weighing 175 ± 15 g were given a single dose of 1500 r with a G.E. Maximar x-ray and were fasted 24 or 48 hr. They were then fed 0.02 mg of sodium acetate-1-C^{14} (0.2 μc) dissolved in 0.5 ml of water. After 2 hr the animals were sacrificed. The livers were isolated, weighed, and immediately placed in hot potassium hydroxide. After the mixture was heated 5 hr the glycogen was obtained by successive precipitation with 60-percent ethanol. The liver fatty acids were extracted with ethyl ether from the acidified ethanol supernatant. The results of these analyses are shown in Table 1.

Significant increases in the percentage of liver glycogen can be seen in all fasted irradiated animals as compared with fasted controls. In the last group, in which the starvation period would have reduced the values comparable to the controls (0.5 percent), the glycogen value of 3.7 percent obtained 24 hr postirradiation could best be explained by synthesis of glycogen. This does not support Denson (*2*) and others who attribute the increased glycogen to a retardation of glycogenolysis but does support McKee's suggestion that liver glycogen after irradiation is produced by glyconeogenesis. Increased synthesis could result from the utilization of fragments released by the cellular breakdown that accompanies x-irradiation.

An accelerated metabolism caused by a greater supply of glycogen-forming intermediates would also explain the increased C^{14}-incorporation into glycogen in the animals fasted 48 hr before irradiation. Hughes and Tolbert (*9*), administering amino acids and carbohydrates, and Morehouse and Searcy (*10*), feeding lipids, have shown that greater amounts of C^{14}-carbon dioxide are expired from irradiated animals than from normal animals. Further investigations are planned to determine the rates of release of C^{14}-carbon dioxide after labeled-acetate feeding.

The total fatty acids of the liver show that irradiation increases the incorporation of C^{14} some tenfold over that of the fasted controls. This could be caused by a net synthesis of fatty acids from acetate, even though the amounts are not sufficient to be seen in increased weight of fat.

In two more groups of animals, the lipid fraction that incorporated the greatest amount of C^{14} was determined. These animals were treated as before, except that the livers were extracted for total lipids. This total lipid was divided into neutral fat (acetone soluble) and phospholipids (acetone insoluble). The results are shown in Table 2.

No differences in the incorporation of the label or in the absolute amounts of phospholipids isolated from the two groups of animals can be seen. Thus it does not appear that irradiation has appreciably affected the synthesis of phospholipids from fatty acids in the liver during the period studied. Although the amount does not increase significantly, the incorporation of C^{14} into the neutral fat of the irradiated animals is about twice that of the normals. This result is consistent with that found for the total fatty acids and could possibly also be explained by a somewhat greater net synthesis of the fatty acids in the neutral fat. The magnitude of the synthesis could be too small in the period studied to be reflected in an increased weight which might further be kept constant by the needs of metabolic processes. From these results it is concluded that irradiation affects the incorporation of labeled acetate into the neutral fat fraction more than into the phospholipid fraction.

Further work is contemplated to give substantiation and elucidation to these observations.

MARGARET G. MOREHOUSE
RONALD L. SEARCY
Department of Biochemistry and Nutrition, University of Southern California, Los Angeles

References and Notes

1. This research was supported by a grant from the U.S. Atomic Energy Commission, contract AT(11-1)-113, project 6, and conducted through the laboratory facilities of the Allan Hancock Foundation.
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9 February 1955

Aerial Blobs

Twinkling of the stars has its origin in the temporary fading of their light and in lateral excursions of their images. These variations in light intensity and position of the stars are caused by disturbances in the earth's atmosphere.

In this paper attention is called to

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).

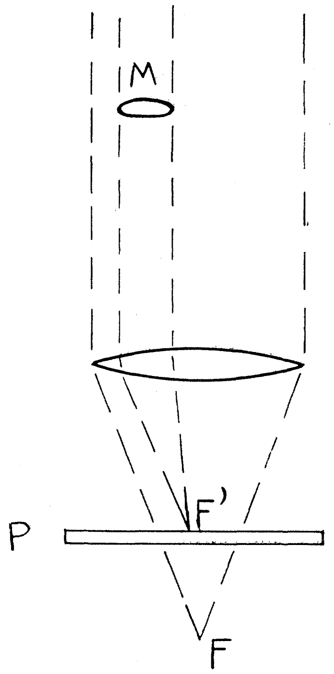

Fig. 1. The combined optical action of the aerial blob *M* and a telescope lens (or mirror) focus parallel starlight at *F'* instead of at the ordinary focus *F* for an undisturbed atmosphere. *P* is the photographic plate.

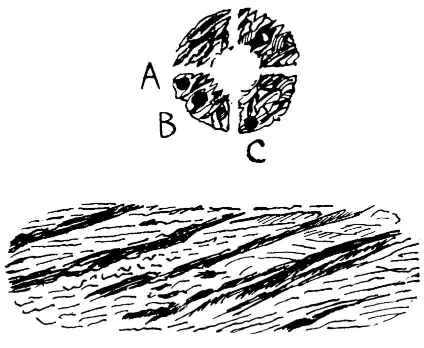

Fig. 2. (Top) Possible structure of extrafocal stellar image of the 200-in. telescope with sharp focused star images at *A, B, C,* which are due to the combined optical action of the 200-in. mirror and aerial blobs approximately 20 to 30 in. in size. (Bottom) Drifted extrafocal image.

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.

F. Zwicky

Mount Wilson and Palomar Observatories, Pasadena, California

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."

George Winchester

110 North 6th Avenue,
New Brunswick, New Jersey

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