of lactation. But few cows change one per cent from richest milk of last month before drying up to thinnest milk after calving.

The following is the record of six cows at the Experiment Station Farm that calved in the spring and were fed at the barn heavily with grain, hay, and ensilage, before and during pasturage, and also after their return to the barn until they dried up.

	April.	May.	June.	July.	August.	September.	October.	November.
Average monthly yield per cow, pounds	792	867	918	814	723	711	531	340
Ratio of different months, if June is 100	84	91	1 0	86	76	75	56	36
Average per cent of fat in milk	4.07	4.38	4.38	4.28	4.37	4 52	4.70	4.83
Ratio of different months, if June is 100	93	1 0	100	98	100	103	107	110
Average monthly yield of butter-fat per cow, lbs.	32.2	38.0	41.5	35.8	31.6	32.1	25.0	16.4
Ratio of different months, if June is 100	78	91	100	84	76	77	60	40

The influence of full feeding is seen most strongly during the months of April and May, which yield, with grain, one-third more milk and butter-fat than without. An influence after June is seen, but not so pronounced. Those having grain shrink in milk-flow only nine-tenths as fast as those not having grain, and have the advantage of only one-twenty-fifth in the shrinkage of butter-fat.

Of course, this is not a strict comparison of the effects of feeding grain on the total yield or of the financial side of the question, but merely of the effect the grain has of increasing the flow of the milk at once when the cow calves and of maintaining the milk-flow for a longer period in the latter part of lactation.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

An Unusual Aurora.

ON Saturday evening, July 15, there occurred an aurora which was unlike any the writer has ever seen, and a brief description of it may contribute something to the aggregate knowledge of those interesting phenomena.

The peculiar feature of this aurora was the movement of a series or succession of whitish flecks across the sky from east to west, resembling somewhat the waves of a body of water.

About 9.30, central time, my attention was first attracted to it. Flecks of white light were forming in the east at an altitude of about 45°, passing in regular succession westward, about 20° north of the zenith, and apparently accumulating in one larger band in the northwest, reaching at times from near the horizon to perhaps 80°. The white flecks or streaks were about 10° in length, strictly parallel north and south, and quite uniform in distance apart. They grew brighter and more distinct as they approached and passed the meridian. Their motion was very regular and quite rapid, — comparable to the swiftest apparent motion of light clouds. If they were as high as the electric theory would suggest, the velocity must have been enormous.

At times similar short bands, like strokes with a paint-brush, were stationary in the north, at about 45° altitude, for several minutes at a time.

A few minutes later a number, perhaps ten or twelve, white bands appeared north of the zenith, all converging towards a point some 10° south of the zenith, but vanishing before reaching the zenith. They remained only a few minutes. About 10 o'clock the moving flecks had disappeared, and one long, straight band extended from the northwest horizon, 50° or 60°, toward a point about 45° south of the zenith. Two or three other short flecks appeared parallel with the main band. About the same time the usual diffused glow appeared in the north horizon and continued till after 11 o'clock, but was not observable while the moving bands were seen. Many more gorgeous auroras have been seen in our latitude, but the rapidly-moving bands gave this one a new interest.

W. H. HOWARD.

Adrian, Mich.

Light-Shunners and Light-Seekers.

It is well known that in the main divisions of the animal world we find groups which normally withdraw from daylight and which form a very large minority of existing species. Some of these lovers of darkness dwell in caverns, in underground burrows or in the seas at depths where the light penetrates feebly or not at all.

We might, perhaps, expect that such creatures would feel annoyed, more or less, by artificial light and would withdraw from what to them must be an exceptional phenomenon. This, however, would be a mistake. The only nocturnal animals which seem to shun fire and light are the carnivorous mammals especially the cats. It has long been customary for travellers in Africa to keep lions, leopards, etc., aloof from an encampment by means of bonfires. As a rule the sleepers are safe as long as the fires are fed up.

The lemurs and loris are even more nocturnal than the cats, since they do not travel or prey by day. Whether they are repelled or attracted by a light is not sufficiently decided.

The bats are not purely nocturnal. They are sometimes seen hawking for insects in full daylight. But a light attracts them. Entomologists — I may mention Major Elwes, P. E. S. — who have hung out lamps in order to entice moths, have often found that bats come to the lights and secure a large share of the specimens.

Among birds there are few truly nocturnal species. The owl and the night-jar (absurdly called the goat-sucker) are the most common night fliers. The owls are attracted by a light, a fact which has given rise to a foolish superstition. They will often dash against the window of a room which is lighted up by night. If, as often happens to be the case, this is a sick-chamber, nurses of the old school pronounce such a visit a fatal omen. Some would-be wise men have gravely asserted that the owl scents the approach of dissolution and comes in the hope of feasting upon the corpse. Now, in fact, the owl feeds by preference on prey which it has just killed, and in captivity it rejects any food which is in the slightest degree tainted.

In Australia the emur, though not truly nocturnal, may be seen rapidly scudding over the plains by moonlight.

Many birds which are perfectly diurnal, in their ordinary habits, fly by night when migrating, and are then attracted by a light. Numbers of various species dash themselves against the windows of lighthouses and are killed by the shock. This is much to be regretted, since the majority of migratory birds feed on insects, and had they survived they would during the coming season have been hard at work ridding our crops of vermin.

The habits of reptiles vary greatly. The few European snakes, e.g., the viper, the asp, the Austrian adder, the grass snake and *Coronella lævis*, are rarely met with save in the brightest hours of the day. But of the African, Indian and Australian species it may be said:

"The snake that loves the twilight has come out, beautiful, still and deadly"—though they also bask in the sun. Nor are they scared away by lights or fire. One species, indeed, if it espies a fire in the forest, seeks to dash or drag the sticks away. Toads, newts and salamanders live very contentedly in the dark, but seem to regard a light with indifference.

The majority of fishes and other dwellers in the waters are decidedly attracted by lights.

It is well known in various countries that fishes swim up to a boat on a stream if a light is displayed on board.

An interesting spectacle is produced if a candle, or better still an electric glow lamp is brought near the glass sides of an aquarium. Fishes, aquatic larvæ and mullusca swim up and seek to come as near as possible to the light.

Numbers of nocturnal insects are attracted by flame. Moths, gnats, crane-flies and many other diptera are noted for their propensity to commit suicide in our lamps and candles. Many of the smaller moths are found sitting on the glasses or the iron frame-work of street-lamps. I have known an old lady made ill with fright because a death's-head (*Acherontia atropos*) had flown against her candle and put it out.

But we must now glance at the main question, that is, the meaning of the behavior of nocturnal animals in presence of a light. The alarm of many species is not hard to understand. A bright light is a phenomenon which does not fall within the limits of their experience and seems to them, therefore something to be avoided. But to see nocturnal, abysmal or cave-dwelling species flocking to a light is perplexing.

It has been suggested that the moth thinks the flame an outlet through which it may escape. But why should it seek to escape from a condition which to it is as normal as is sunlight to the butterfly or to the bee? It has again been suggested that nocturnal insects and fishes are able to preceive the faint phosphorescent light apparently given off by many flowers, and by aquatic worms, etc. Hence the moth rushes to the lamp mistaking it for a flower. On coming nearer he is bewildered by the intensity of the light and "loses his head." This same supposition explains why mosquitoes are less attracted by a lamp than are most other insects. They are not accustomed to find their food in phosphorescent flowers, hence the lamp has to them little attraction.

True, this hypothesis fails to show why birds should dash themselves against the windows of a lighthouse. Their normal food is not phosphorescent. Nor, to our knowledge, are their eyes capable of perceiving a faint phosphorescent light.

Probably no single hypothesis will meet all the cases of the attraction of animals to light.

J. W. SLATER.

London, England.

The Aurora.

The contradiction in certain statements of mine with reference to the possibility of tracing the relation of the aurora to disturbances upon a particular part of the sun in certain years which Professor Ashe thinks he has detected and which he puts into italics at page 9 of *Science* for July 7 amounts to simply this: In one sentence which he quotes I am giving the reason why the relation in question comes out distinctly in years of minimum, namely, because the disturbances are well separated from each other, and, taking 1879 as an example, show by a table that this was the case in that year, in which both auroras and sunspots were so very few that the numbers to be employed were so extremely small that it might justly be doubted whether they show anything, and yet, in spite of this disadvantage, namely, the smallness of the numbers, the relation was plainly apparent. In another sentence, referring to the matter from this point of view, namely, the size of the numbers to be employed, I state that in 1880 the relation in this respect would be much more distinct, this also being a year of comparative minimum in which the disturbances were well separated from each other, so that the conclusion with reference to this year contained in the sentence which Professor Asche quotes would be fully justified, i.e., "the numbers would be larger and the relation in every way more distinct." The only reason for the publication of the table for 1879 was to show what would appear in the year in which we might suppose the relation exceptionally difficult to trace and yet in which it was distinctly apparent in spite of the smallness of the numbers. It was simply picking out the worst possible case, as we would naturally suppose, instead of the best possible case, and it is to its discussion that the sentences which Professor Ashe quotes, refer.

M. A. VEEDER.

Lyons, N. Y., July 13.