regarding the transmission eastwards of barometric movements, and in which he likewise alludes to simultaneous affections of the barometer. Speaking of these latter he says: "As to the cause of the widely distributed simultaneous movements of the barometer . . . I have no evidence of any value. The most natural idea is that a connection direct or indirect may be traced between them and changes in the state of solar energy. . . . I have not a sunspot curve for the years under consideration, and cannot therefore make the necessary comparisons."

I may mention that simultaneous affections of atmospheric pressure were first observed by the late John Allan Brown, and that I have compared his instances with sunspot records. The results of this comparison were published last year in the *Proceedings of the Literary and Philosophical Society of Manchester*. I have not the volume here with me, but if my memory does not deceive me an increase of pressure was found to be associated with increasing sunspots and a decrease of pressure with decreasing sunspot.

BALFOUR STEWART

Devonshire, August 17

Dreaming

INSTANCES have lately been described in *NATURE* of remarkable formation or perversion of dreams at the instant of waking. Allow me to offer you the following, which was vividly impressed on my mind, and which I still remember with the utmost accuracy:—

In the summer of 1822, when an undergraduate of Trinity College, Cambridge, I was permitted to reside in College rooms during the summer long vacation. As fires were not wanted in our sitting-rooms, it was customary for each resident's bedmaker or other officer to carry his water-kettle for breakfast and tea to the College kitchen, and bring it back with water boiling. On one occasion I had overslept my usual hour, and I dreamed a dream. I was at the gate of a country farmyard well known to me, and there came a long procession of horses, asses, oxen, hogs, sheep, and all the animals usually to be found in a farmyard, followed by a north-country drover with his plaid or maude crossed over his shoulder, who walked up to me and said, "Sir, I have brought your cattle." In an instant I perceived and actually heard (so intimately were the auditory sounds and the intellectual interpretation intermixed) that my bedmaker was at my chamber door calling to me, "Sir, I have brought your kettle." The hearing had been confused; there had been no reasoning; but there had been instantaneous vigour of creative imagination.

An admirable instance of the same kind is described in the last chapter of Scott's "Rob Roy." Scott appears to have been in some measure a student of dreams. I refer with pleasure to the description of FitzJames's dream, after a day of labour and an evening of excitement, at the end of the first canto of "The Lady of the Lake."

A. B. G.

August 18

Thunderstorms and Auroræ

I WOULD like to ask if any observer has ever suggested a possible connection between thunderstorms and the aurora? Last evening a very heavy shower, accompanied by much lightning, passed to the north of this place. Other black clouds were seen to the south and west, and at nine o'clock flashes of lightning might be seen darting across the clouds in nearly all directions. It was evident that the air was heavily charged with electricity. Just before retiring, about midnight, I looked from my window to see if a shower was still threatened at this point. I found the heavens quite clear except in the north, where a dark mass of clouds still hung. At the eastern extremity of this cloud-bank a rift several degrees wide commenced and extended nearly to the north-western horizon. Frequent flashes of lightning lit up the edges of this rift, while beyond the clouds the clear sky was seen to be brightly illumined by a steady auroral glow. The glow continued nearly unchanged during the several minutes which I watched it, and it was quite evident that it was a genuine aurora, and not a reflection of the lightning flashes. Is it not probable that the same electrical state of the atmosphere which produces the thunderstorms may also cause the aurora, and that the two phenomena may often occur together?

Lewiston, Maine, U.S.A., July 6 E. R. CHADBURN

"Elevation and Subsidence"

QUOTING Prof. Geikie's "Text-book," Mr. Starkie Gardner says: "Strata of sedimentary origin which have accumulated to

thousands of feet in thickness, may be depressed deep beneath the surface and brought within the influence of metamorphosis. . . ." He continues: "This is an absolute admission that at some depth, relatively not great, pressure converts solid into viscous or fluid strata." A few lines further: "If the mere pressure of overlying strata can anywhere or at any depth render rocks molten or fluid, they will become molten or fluid wherever the required pressure occurs." But is not the supposition the exact reverse of what is really the case, viz. that not only does pressure *not* liquefy rocks, but actually *prevents* their melting at a temperature at which they *would* melt were the pressure removed? Mr. Gardner himself admits this in the case of the nucleus, i.e. when we come to very extreme pressures; how then can pressures of an intermediate order of magnitude have the opposite effect? This is surely not the view of Prof. Geikie. The passage quoted by Mr. Gardner from his work refers to the fusion of rocks by the *high temperature* found at great depths.

If Mr. Gardner means to imply, as some of his expressions strongly suggest, that the *cause* of the high temperature of the interior of the earth is the pressure of the superincumbent rocks, it would be interesting to know how he reconciles his theory with the principle of the conservation of energy. Heat is energy, pressure is force. Force can only give rise to a manifestation of energy by acting through a finite distance, the energy manifested, or "work done," being the product of the force and the distance through which it acts. If either factor be zero, the other not being infinite, the product is also zero. The application to the case in hand is too obvious to require statement.

Trinity College, Cambridge, August 4

F. YOUNG

Insects and Flowers

HAVING this morning received the last number of the *Proceedings of the Linnean Society* containing Mr. A. W. Bennett's and Mr. Christy's observations on the constancy of insects in their visits to flowers, it occurred to me, after reading only the first page, to see how insects behaved in my own garden, where there is a great variety of plants. I had not read the conclusions of either author, and had no preconceived opinion on the subject. The results were noted at once, and were as follows:—

1. *P. rapæ* (small white butterfly) on a bed containing white and rose-coloured double and single stocks also, scarlet pelargoniums and pink phlox; visited single white stocks only, going all round the circle in which they were planted; then flew off, made a dive at a white phlox, but did not alight, hovered about some little time without alighting, and finally went out of sight.

2. Same species; two individuals on a bed of scarlet pelargoniums edged with sulphur-coloured pansy (? *Viola lutea*, var.). One butterfly kept to the pelargoniums, paying repeated visits; the other did the same with the pansies.

3. Same species on a bed of dark purple pansies with bright yellow eye, crossed and edged with orange French marigolds. Two individuals visited both plants promiscuously, but the marigolds oftenest. A *P. napi* (green-veined white butterfly) did the same. *Vanessa urticae* (small tortoiseshell butterfly) on the same bed visited only the marigolds. This species seems remarkably partial to yellow.

4. *P. rapæ* on a bed of scarlet pelargonium and pale blue pansy with dark centre and pale yellow eye intermixed. Visited the pansies very often; the pelargoniums once only during observation.

5. Same species on *Lythrum salicaria* remained a long time visiting different spikes, then flew round, neglecting all other flowers till it found another plant of the same kind, which it continued on as long as I watched it.

Bombus lucorum. This bee was very abundant, both workers and females. I watched them on a mixed bed which contained *Pentstemon barbatus* (dull scarlet), African marigolds (yellow), *Antirrhinum majus* (crimson), pansies, both dark purple and yellowish white, and mignonette. The favourite plant was the pentstemon, especially with the ♀. They got at the nectary by inserting the proboscis in a hole cut near the base of the corolla. The next favourites were the marigolds. One individual confined himself exclusively to the antirrhinum. In one case only did I observe a bee to change from one kind of flower to another, though I looked out especially to see if they did so. This was a bee which went from a crimson petunia to an antirrhinum of very nearly the same shade of crimson.

Apis mellifica (hive bee) on the above bed confined itself to the mignonette. This remark applies to several individuals.
Chester, August 17 ALFRED O. WALKER

A Meteor

A BEAUTIFUL meteor was seen from this place on Sunday evening, August 19, at 10.3 precisely. Owing to the brilliancy of the moon, stars of the first magnitude were but faintly seen. I should say the size and brilliancy of the meteor was greatly in excess of the planet Venus at its best. It was visible as far as I could conjecture about three seconds, and pursued a course of probably 45 or 50 degrees, proceeding from a point a few degrees to the eastward of, and higher than, the north star. It moved almost in a straight line downwards with an inclination to the left. When it had got about half of its whole visible course, it seemed to get blue in colour, and threw off a mass of red sparks, and continued for the rest of the distance, when it appeared to burst, and the disjected fragments were red and visible for a few moments. The colour for the most part was very much like that of Venus, indeed, for the whole of the course, except where it seemed to turn blue.
A. TREVOR CRISPIN

Lansdowne Road, Wimbledon, S.W., August 21

I SAW a very brilliant meteor from the promenade here last night (Sunday, August 19), at 10.3 p.m. It passed along the eastern sky and vanished over the summit of the Little Orme. The meteor was, I think, more brilliant than Venus at her brightest, though the full moon was shining not far off and very few stars were visible. The path was northward, nearly horizontal, inclined a little downwards, about 10° or 12° above the horizon, apparently much foreshortened, for the motion was very slow—not faster than that of balls falling from a rocket; white light, slightly tinged with blue. The meteor divided, and left one large and I think several smaller portions behind it, all vanishing together. It should have been seen overhead towards the coast of Yorkshire.
ALBERT J. MOTT

Llandudno, August 20

Animal Intelligence

A CIRCUMSTANCE exceedingly illustrative of the sagacity of the horse was witnessed by myself in the neighbourhood of Nottingham. I had been out for a stroll by way of recreation, returning home across some fields by the Trent side, and when nearly opposite Clifton Grove I stopped a short time to watch a man angling in the river, when suddenly my attention was drawn to a mare with her foal, not many yards distant from where I was standing, open two gates which were *vice versa*, closing with a strong spring. Her *modus operandi* was to place her nose in between the two gates and force one gate open with her side, while she had no little difficulty in opening the other for the purpose of getting through. I have learnt that the animal had not been trained to do this, but taught by natural instinct, and so cleverly was it done that man could scarcely have performed the action better. Thinking this instance of sagacity might be interesting to some of our naturalists, I take the liberty of forwarding same in order that you may insert it in your valuable paper.

9, Charlotte Street, Nottingham

F. WELCH

MR. H. CECIL'S communication respecting the cat and the chicken, at p. 320 of your present volume, reminds me of an instance of the attachment of a cat to its natural prey which is still more remarkable, as there was no "maternal *stoppy*" in question.

Some years ago we had a young emascuolated tom cat. When it was nearly full grown we had two young white rabbits brought in which had lost their mother. These were kept in the kitchen, and fed by pouring milk into their mouths with a spoon. They were placed in a basket at night and covered up to protect them from the cat, which was in the habit of catching wild rabbits. One morning the cover was found to have been removed by the cat, which was lying in the basket with the little rabbits. From that time he took charge of them, teaching them to lap milk and watching over them like a mother, even to the extent of driving them home when they grew older and rambled out from the kitchen. The friendship continued till the rabbits grew up, when we lost them by disease.
ALFRED O. WALKER

Chester, August 17

"Birds and Cholera"

IN reference to "H. M. C's." letter in this week's NATURE (p. 366), it is interesting to recall how the traveller Jackson, speaking of the plague that occurred in West Barbary when he was there, says, "The birds of the air fled away from the abodes of men." Thomas Moore, in "Paradise and the Peri," refers to this fact.
E. S. T.

August 18

LIQUID FILMS AND MOLECULAR MAGNITUDES

SIR WILLIAM THOMSON'S lecture on "The Size of Atoms," which has recently been published in NATURE, will undoubtedly increase the interest felt in measurements which throw any light upon the values of molecular magnitudes.

We have for some time been engaged in investigating the properties of very thin liquid films, and in our last communication to the Royal Society (of which only an abstract has been hitherto published, but which will appear in a forthcoming number of the *Philosophical Transactions*) we have described two independent methods by which we have obtained concordant measurements of the thickness of soap films in the last stage of tenuity, viz. when exhibiting the black of the first order of Newton's rings.

The paper had not been sent in to the Royal Society at the time when Sir Wm. Thomson's lecture was delivered, but, on receiving the abstract, he has been good enough to express his approval of our methods and interest in our results, and to raise some questions as to the relation between the observations of Newton and ourselves, the further discussion of which he thinks would be interesting to the readers of NATURE.

We propose therefore briefly to discuss the facts which bear upon the points raised by Sir Wm. Thomson, and to describe our methods of experiment so far as may be necessary to make the discussion intelligible.

For thicknesses greater than those which correspond to colours of the first order, the tint displayed affords to a practised eye (when combined with a knowledge of the angle of incidence and refractive index) a very accurate measure of the thickness of a film. In some experiments of our own, in which on more than 500 occasions two independent but simultaneous measures were made of film-thicknesses by means of two beams of light, incident at different angles, we found that the two values obtained agreed to within 1 per cent. in 52 measures out of every hundred, to within 2 per cent. in 84, and to within 3 per cent. in 95. All these observations were made in the second and higher orders. The colours of the first order vary from point to point too slowly to enable trustworthy estimates of the thickness to be made, and when the black of the first order is reached the eye informs us only that the thickness must be less than a certain value, but affords no further indications as to what it really is. The fact that it is extremely small, and the possibility that it may be related to the magnitude of the so-called "radius of molecular attraction," invest the problem of the determination of this thickness with special interest. We have succeeded in solving it by two methods. In each an assumption has to be made for which there is no direct experimental evidence. In each case, however, the assumption is different, and the fact that the mean results obtained by the two methods are in close accord is sufficient to show that, although there is still room for further inquiry, the mean thickness of the black soap films examined was correctly determined to within a fraction of a millionth of a millimetre.

The first method consisted in measuring the electrical resistance of a cylindrical black soap film, and deducing the thickness from Ohm's law, on the assumption that the