

libratory motion, or to slew upwards towards the main stream, and therefore perpendicularly to their length.

Nothing could suggest to the mind more strongly the idea of converging streams of infinitely minute particles of matter passing through space at a distance from the earth less than that of the moon, and at which the earth's aerial envelope may still have a density sufficient, by its resistance, to give to cosmic dust passing through it with planetary velocity that slight illumination which it possessed.

The rapid development of the luminosity of these streams on this occasion is evidenced by the fact that they were observed at the time of leaving church, namely, 8 P.M. to 8.20 P.M., by none of the several congregations of this town and Perth, but were observed by many persons from a quarter to half an hour after that time, so far as I have yet been able to ascertain by a rather extensive inquiry. On coming out of church I myself certainly looked round the whole visible horizon and the higher portion of the heavens, and I made to a companion some observations on the clearness of the stars and dark blue colour of the sky; but about twenty minutes after my exit from church these streams of light had attained their maximum of illumination.

Their apparent figure was that of a nearly circular (slightly flattened) arc of an amplitude of 15° or 20° , as viewed from the middle point of its chord. Both the brightness and the convergence of the streams towards the western horizon were more marked than those towards the eastern horizon.

Fremantle, West Australia, May 17 J. W. N. LEFROY

PS.—Since writing the above, in the Supplement of the *South Australian Register* of Thursday, May 20, I have found the following paragraph:—

"A beautiful lunar rainbow was visible in the western heavens on the evening of Sunday, the 16th inst., a few minutes after 8 o'clock. For a short time the arch was nearly perfect, but for upwards of fifteen minutes the limbs were very bright. The southern limb also appeared visible for some time after the upper portion of the arch had faded away."

Now, allowing for the difference of local time between Fremantle and Adelaide, I think it fairly assumable that this paragraph must refer to the same phenomenon which I have attempted to describe as above; and, if so, it clearly shows that it was *not* a lunar rainbow. I can find no allusion to it in any Melbourne paper yet received here, and which reach to the 19th inst. There the sky may that evening have been cloudy, and thus have rendered it invisible. All intelligent persons here who observed it, and with whom I have had opportunity of conversing since the 16th inst. to this day, concur in my impression that minor lateral streams or feathers of light on the north side of the main stream intervened between the earth and the moon, and one or more of them in its slow librations swept the surface of the moon and sensibly obscured its light.—J. W. N. L.

May 31

"Instinct" and "Reason"

A FEW facts came under my observation during the spring of this year that strikingly illustrate this subject. A pair of black-birds built a nest on the top of my garden wall, which is thickly covered with ivy and within three yards of the drawing-room window. When the young birds were about three parts fledged one of them by some mishap left the nest and fell into the flower garden. My cat (seven years old, and which has killed scores of small birds) immediately found it, and at the same time a kitten (about three months old, but not belonging to the cat) began to pay rather rude attentions to the young blackbird, and would have used it as kittens are wont, but the old cat would not suffer her to touch it. The cause of this was the old cock blackbird, being aware of the peril of its young, made a great noise and kept flying here and there around the scene of action, crying and scolding with might and main. It then became evident to me that the cat had two or three objects in view, and a purpose to gain. Firstly, not to allow the kitten to touch, or kill, or make off with the young bird. Secondly, to use the young bird as a decoy to entrap the old one. Thirdly, to make the young bird cry sufficiently from fear or pain to induce the parent's affection to overcome its discretion.

During the manoeuvres old Tom repeatedly made unsuccessful springs to catch the cock-bird, alternately running to give the kitten a lesson of patience, or self-denial, or impose a fear of punishment. The young bird repeatedly hopped out of sight amongst the flowers and stinted its cries; then anon the

cat touched it again and made it flutter about and cry again, which from time to time brought the old bird down with cries of terror, or wrath, or a blending of both emotions, and almost into the very mouth of the cat. Two or three times I thought old Tom was successful, but no, he missed his object most surprisingly. It became evident to me that the cat was using the young bird as a decoy to catch the old one. After I had watched some ten or fifteen minutes, it became too painful for me to witness, so I caught the young bird and put it again into its nest, which was about ten feet from the ground.

In less than an hour the young bird was again on the ground, the cat, kitten, and parent bird performing the same drama, with this difference in the acting: the cat lay down, rolled about, or sat at a convenient distance from the young bird, yet with eyes alert, though half shut, and otherwise giving an assurance that he did not intend to make another bound without succeeding to catch his prey. He was, however, disappointed, and made four without achieving his purpose. At this juncture the mother-bird came on the stage with cries of distress, but kept aloof on the branches of a tall cherry-tree that rises above the wall; and if her boldness were less than the cock-bird's, her discretion was greater, for she kept far aloft. Once it seemed to me that the cock-bird actually struck the back or head of the cat with his wing and mandible. This scene continued about seven or ten minutes, when I again caught the young bird and threw it over the wall, and the exhibition of animal thought, emotion, and passion ceased.

Here were manifested phenomena of a more remarkable kind than those seen in the cases cited by the Duke of Argyll in the *Contemporary Review* for July, in an article to illustrate "Animal Instinct in relation to the Mind of Man," for the cat showed an amount of reasoning which he probably never before exercised, because never before placed in the same circumstances. That he had used young sparrows, of which he must have caught scores, as decoys to catch the old ones is possible, but I am perfectly sure that no kitten ever was in the garden during his reign as "monarch of all he surveyed" in the shape of birds. Hence his authority over the kitten, which was full of life and eagerness to appropriate the young bird, the killing of which would have defeated the purpose of the cat in using the young bird as a decoy to catch the old one, was indeed remarkable, and disclosed a combination of mental forces of self-conscious reason of no trifling order, and, as it appears to me, conclusive that the difference—and only difference—between instinct and reason is one of degree.

JAMES HUTCHINGS

Banbury, Aug. 16

OUR ASTRONOMICAL COLUMN

DOUBLE STARS.—Dr. Doberck, of Markree Observatory, has published a first approximation to the elements of ζ Aquarii, on measures between 1781 and 1870, in which long interval, however, the angle of position has only changed 45° —a case where very great latitude must be allowed to any orbit that may be deduced. Dr. Doberck fixes the peri-astron passage to 1924.15, and assigns a period of revolution of upwards of 1,500 years. The latest measures we have met with are those of Nobile, taken at the Observatory of Naples in November 1873, giving the angle $335^\circ.5$, or $3^\circ.4$ greater than that calculated.—There appears now a probability that the smaller component of 44 Bootis has passed its greatest apparent distance from the primary several years since; if good measures of distance have been made this year, they ought to be sufficient to enable us to pronounce definitely upon this point. That this star forms a true binary there can be no doubt, though it is Sir W. Herschel's measures in 1781 and 1802 alone, that afford conclusive evidence of the physical connection of the components. Thus we might represent the measures between Struve's earliest in 1819 and the present time by the formulæ

$$\begin{aligned} \Delta \alpha &= -3''.4233 - [8.8968] (t - 1830.88) \\ \Delta \delta &= -1'.6979 - [8.3115] (t - 1830.88) \end{aligned}$$

But if we calculate from the same formulæ for Sir W. Herschel's epochs we find,

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|---------|----------|---------------|----------|----------|
| 1781.62 | Position | $156^\circ.1$ | Distance | $0''.75$ |
| 1802.25 | ,, | $214'.8$ | ,, | $1'.35$ |