these radiated from near *a* Lyræ, or from a point at R. A. 274°, D. 37+. The following are the details:—

Date.	Time.		Beginning. R. A.	Beginning. D.	Ending. R. A.	Ending. D.
April 19	9.28	1st mag. *	295°½	46°+	316°	51°+
,, ...	10.31	2nd mag. *	305	38 +	309	37½+
,, ...	10.43	3rd mag. *	277	36½+	278½	35 +
,, ...	10.50	4th mag. *	256½	17 +	254	13 +
April 20	9 10	3rd mag. *	266	17 +	264½	13 +
,, ...	9 50	3rd mag. *	319	45 +	329	45 +
,, ...	11.4	2nd mag. *	282	22 +	285	16 +
,, ...	11.13	2nd mag. *	264½	16 +	261½	9 +

The other four showed a well-marked radiant point at R. A. 221°½, D. 20 + in Bootes. The observed paths of these were as under:—

Date.	Time.		Beginning. R. A.	Beginning. D.	Ending. R. A.	Ending. D.
April 19	9.58	2nd mag. *	307°½	43°+	285°	33°+
April 20	9.9	3rd mag. *	247	28 +	258	29 +
,, ...	9 54	1½ mag. *	244	53 +	268	67 +
,, ...	10.55	1st mag. *	225	19 +	246	16 +

The brightest meteor seen was one that appeared at $9^h\ 28^m$ on April 20. It diverged from the radiant in Lyra, and was about equal in brilliancy to *a* in that constellation. This meteor left a train which remained visible about 1½ sec. after the disappearance of the head.

Bristol, April 21 WILLIAM F. DENNING

I SEND the following observations of the shooting stars of the April period, viz., the 19th and 20th. On the 19th I began to watch at 10^h, but saw no more until 11 45. I then watched them until $3^h\ 15^m$. I found they seemed to come in the region of the heavens about Corona, so I confined my observations to that part as I had not a situation where I could see the opposite side as well By 10 o'clock Hercules was quite above the buildings, so there may have been some meteors visible earlier, when these consteilations were too low for me to see. The first night they were all comprised in a triangle, which would be formed by a line stretching from Vega by way of Ophiuchus to Mars, and thence up to Arcturus and by Corona back to Vega. They were pretty equally distributed over this region. The next night they were much more concentrated in Ophiuchus and Hercules and towards Libra. I was not able to determine the radiant, so I confined myself to reckoning them accurately in intervals of fifteen minutes, which time I had conveniently marked for me by the church clocks, and only observed their tracks approximately. On the second night I noted the position and direction of each which shows their concentration about the part named. On the nineteenth there were 25—15 horizontal, 10 vertical. On the 20th from 9.45 to 2.45 there were 33—22 vertical and 11 horizontal. Those I call vertical by distinction were almost all just half way between horizontal and vertical, *i.e.* at an angle of 45°. It was curious how this angle predominated. It was also curious that the first night the horizontal ones predominated, and the second night the vertical. I do not know if I am wrong (1) in assuming that we pass through the node of the orbit of the meteors at this time, and (2) in inferring from this assumption that the angle at which they principally appear to us would be a guide to the inclination of the node. Would the fact of their being horizontal be any proof that the inclination of their orbit is small, and their being vertical a proof that it is much greater, and of a somewhat similar angle? But this would not explain the fact of the majority being horizontal the first night and the majority at a greater angle the next night. One seen on the 20th was intermittent, it ran for a long distance, and became visible at intervals of a few seconds a little way further on. Only a few were of any size, and the first night all but two were extremely small and very faint, with very short tracks. The next night they were not only greater in number but larger, brighter, and with longer tracks. A few left tracks lasting a second or two. One only moved very fast. The first night there was one quite vertical *upwards*. This was the only instance. The majority were from E. to S. or E. to W. on both nights; and the only two of any length on the 19th were one running out of Corona and one running into it. It seemed curious to me how these should be so much longer than all the others and yet lie so close to the point of apparent divergence of them all. The following is a list for the two nights of the number in each 15 minutes: April 19.—From 11.45 to 12, 2; 12.15, 5; 12.30, 2; 12 45, 2; 13, 1; 13.15, 5; 13.30, 1; 13.45, 0; 14, 3; 14.15, 2; 14.30, 0; 14.45, 1; 15, 1; 15 to 15.30, 0; Total: 25.

April 20.—From 9.45 to 10, 1; 10.15, 3; 10.30, 1; 10.45, 0; 11, 5; 11.15, 2; 11.30, 2; 11.45, 1; 12, 0; 12.15, 1; 12.30, 1; 12 45, 1; 13, 2; 13.15, 4; 13.30, 2; 13.45, 2; 13.45 to 14.30 0; 14.45, 5; Total: 33. P. B.

Bath

Instinct

A Mechanical Analogy

MR. DARWIN, in his article on "The Origin of certain Instincts," in NATURE, of April 3, appears inclined to think that what we may call the instinct of direction in animals is of the same kind as the faculty by which men find their way: and he instances the power of the natives of Siberia to find their way over hummocky ice. He afterwards, however, raises without discussing the question "whether animals may not possess the faculty of keeping a dead reckoning of their course in a much more perfect degree than man, or whether this faculty may not come into play on the commencement of a journey when an animal is shut up in a basket." I wish to point out that this peculiar power of animals is one that cannot be explained as a higher degree of any power that man possesses. What man can do is to find the third side of a triangle after travelling the other two sides *with his eyes open*. Animals can do the same after travelling the two sides *with their eyes shut*. The former power does not in any degree involve the latter. Moreover, the power of man here spoken of depends on the careful use of his powers of observation. This does not appear to be the case with animals. Among the many instances of animals finding their way home after being conveyed away without any opportunity of seeing their way or taking their bearings, there must in all probability be many in which the animal slept on the journey: and if so, the mental or organic process whereby it was able to know its way back must have gone on during sleep. There is nothing in man's mind similar to such a process as this. It can be made conceivable only by a mechanical analogy, if at all.

If a ball is freely suspended from the roof of a railway carriage, it will receive a shock sufficient to move it, when the carriage is set in motion: and the magnitude and direction of the shock thus given to the ball will depend on the magnitude and direction of the force with which the carriage begins to move. While the carriage is in uniform motion the ball will be relatively at rest; and every change in the velocity of the motion of the carriage, and of its direction, will give a shock of corresponding magnitude and direction to the ball. Now, it is conceivably quite possible, though such delicacy of mechanism is not to be hoped for, that a machine should be constructed, in connection with a chronometer, for registering the magnitude and direction of all these shocks, with the time at which each occurred; and from these data—the direction of the shock indicating the direction of the motion of the carriage, the magnitude of the shock indicating its velocity, and the interval of time between two shocks indicating the time during which the carriage has run without change of velocity or direction—from these data the position of the carriage, expressed in terms of distance and direction from the place from which it had set out, might be calculated at any moment. The automatic register of the journey may be conceived as exactly resembling the records of the velocity and direction of the wind produced by one of Robinson's or Beck's self-registering anemometers, where one pencil-mark indicates the direction of the wind, at any past hour, and another its velocity.

Further, it is possible to conceive the apparatus as so integrating its results as to enable the distance and direction of the point where the journey began to the point it has reached, that they can be read off, without any calculation being needed:—a hand on a dial pointing to the direction expressed in degrees of the circle, and the distance being shown in figures expressing miles and decimals of a mile.

Now, I suppose such an integrating process as this (though of course not by any similar mechanism) to be effected in the brain of an animal unconsciously, and that the animal has the power of reading off the result—that is to say, bringing it into consciousness when wanted. JOSEPH JOHN MURPHY

Old Forge, Dunmurry, co. Antrim, April 11

Sense of Orientation

YOUR article on this subject in the issue of March 20, insists very properly on the objection to Mr. Wallace's theory that "it it be solely by the aid of this memory of smells that the dog is