such as electricity, driven off unequally from parts of the sun's surface, and in directions radiating from points either on or beneath the surface.* If only a small portion of the sun's surface, such as that covered by sun spots, sent out such streamers, the appearance might exactly coincide with that of the corona; for these streamers, when seen projected on to the plane of the sun's limb, might in some places appear to overlap so as to form a continuous corona, whereas in others they might appear to be separated by gaps.

So far as the appearance is concerned, it would be the same whether the emission consisted of matter or was electricity; there are, however, other indications of its being of the latter kind.

The action which the sun exerts on terrestrial magnetism shows it to be in an electric state, and the observations of Stewart and others have established a connection between the variations in its electric condition and the changes in the sun-spots and red flames, and the observations on the recent eclipse have connected the red flames with the brighter parts of the corona. Here then we have a distinct and independent reason for assuming that the electric condition of the sun's surface is partial and unequal, and for connecting the corona with this electricity.

As I have already ventured to explain the solar corona, as well as comet's tails and the aurora, to be a kind of electric brush, I now offer these remarks on the radial appearance of the corona in confirmation of my views.

Owens College, May 8 OSBORNE REYNOLDS

A few more Words on Daylight Auroras

IN NATURE for December 29, 1870, there is a letter from Dr. G. F. Burder in reply to a previous correspondent,† who had sent a description, with an illustration, of a Daylight Aurora observed by him, wherein he made the following statement:—

But auroral arcs, as far as I know, never appear in the east, and the conclusion, therefore, is unavoidable, that the object observed was nothing more than a remarkably symmetrical form of cirrus cloud."

He then states his convictions that all records of so-called daylight auroras are "errors of observation."

As assertions like these might have an undue influence on the minds of those who read my letter on "Aurora by Daylight" (NATURE, May 4, 1871), I am induced to say a few more words on this subject, especially to prove the fallacy of such reasoning.

It is well known that the aurora borealis assumes innumerable shapes; some of the most remarkable were given by me some time ago in these pages;‡ and that they appear, at times, actually in the *east*, but more often in the north, north-west, and stretching to the south. A writer of some excellence in the last century § says:—

"Sometimes the aurora appears like arches, nearly in the form of a rainbow, reaching from one point of the horizon to another. The arches always cross the meridian at right angles, *tending to the east and west point of the compass.*"

The correspondent whom Dr. Burder is so hard upon, most probably saw the arc in a position nearer to this, than directly *facing* him, with his back to the *west*, and as the illustration sent by him shows only a segment of the arc, I am inclined to think that the extremities were nearly in the east and west.‖ The "cirrus cloud" hypothesis is simply untenable, when it is known positively that on several occasions the aurora was seen against an azure background, with no form of cloud in the field of view, as for instance that mentioned by me, where a faint arc was seen before sunset in the east (possibly N.E.) against a cloudless sky.¶ His other assertion, from which I must dissent, was: "A comparison of the auroral light with the light of other objects whose visibility can be more easily measured, tends strongly to confirm the view I have advanced." He then instances the invisibility of Donati's comet by daylight. He might have instanced the invisibility of the stars, although they can be seen in broad daylight when the observer is placed at the bottom of a deep pit; but this need not be done, for daylight does not always mean bright sunshine; and with diffused light, Venus is often seen before the sun has actually gone below the horizon. This, so far, may appear mere assertion, but the following will, I hope, be sufficient to show that the view he holds requires some kind of modification.

"A.D. 678.—This year the star (called a comet) appeared in August and shone like a sunbeam every morning for three months" (Anglo-Sax. Chron.).* By every morning I take to mean daylight, because in these months the mornings would invariably be very light, especially the few moments before the comet actually disappeared.

With regard to all the record of daylight auroras being mere "errors of observation," I am sure no one will continue to entertain such an opinion after carefully examining all that has been said upon the subject in these pages. As it may be useful to those who are interested in this question, I have made a summary of all the daylight auroras recorded in this and other publications, which do not admit of doubt.

A.D. 1122. A phenomenon appeared like a great and broad fire, and lasted till it was quite light. (Anglo-Sax. Chron.)

A.D. 1467. A *most probable day aurora*, described as "horsemen and men in armour rushing through the air."† (Ingulf. Second Cont.)

A.D. 1788. May 5 at 11 A.M. an auroral display seen, consisting of "whitish rays ascending from every part of horizon." Observed by "three different people." (Trans. Royal I. Academy for 1788, quoted by Rev. T. W. Webb in NATURE, May 11, 1871.

A.D. 1827. "Aurora Borealis seen in the day-time at Canonmills" at 4.30 P.M. Described in "Jameson's Journal" and NATURE for May 4, 1871. (Arcana of Science and Art for 1828.)

A.D. 1849.—In September an aurora seen, consisting of "three slightly diverging beams of light on the eastern horizon. One might have taken them for beams from a setting sun . . . had it not been that they did not emanate exactly from the spot where the sun had set; that they had an evident motion to the southard, and that two of them extended to the zenith, and finally down to the eastern horizon." ‡ (Mr. J. Langton, in NATURE, April 27, 1871.)

A.D. 1870.—September 4, about 4.30 P.M., an aurora observed "in the form of thin reddish streaks." ("S. B." in NATURE, October 13, 1870.)

A.D. 1870.—October 25, at 4.30 P.M., a brilliant aurora seen in the *east*, and fully described with illustration of it. (NATURE, December 8, 1870.)

A.D. 1870.—December. A *probable* auroral display, which was observed a "little before sunset," and developed as the evening advanced into a brilliant aurora borealis. The day phenomenon, however, not sufficiently described to make the record trustworthy. (J. Langton, in NATURE, April 27.)

A.D. 1871.—April 10, about 4.30 P.M., a whitish arc seen, almost east, against a cloudless azure sky. On the previous night there was a magnificent aurora borealis.§ (Mentioned by me in NATURE, May 4.)

These form the whole of the most reliable records, which are certainly few, for the period embraced between the earliest and present date; but I am inclined to believe that the occurrence of daylight auroras is not so rare as is here shown, but that they have been seen and actually recorded in the works which I have here and elsewhere quoted, but for the want of the statement of the time of day or night, one cannot tell to which the appearance belongs. Often a display which can be said to have been seen in the night, might as easily be said to belong to the day, so far as the actual wording of the record goes. It will follow from this that the scanty records we have of daylight auroras referred to phenomena of extraordinary magnitude and magnificence. JOHN JEREMIAH

The Conservation of Force

I HAVE been endeavouring to understand what is meant by the Conservation of Force; and as it is one of the most interesting subjects I have studied, I send you the result of my labours.

* We are of opinion that there is still another explanation.—Ed.

† NATURE, Dec. 8, 1871. ‡ Ibid, Dec. 29, 1871.

§ "Compendious System of Astronomy," by Margaret Bryan. London: 1797, p. 132.

‖ For evidences of night auroras being seen in the east, consult the letters in NATURE for 1870.

¶ NATURE, May 4, 1871, p. 8.

* This is confirmed in Beda, Flor. of Wor. (under A.D. 677) and Chronicum Scotorum (under A.D. 673 in error for 677).

† See also Pliny, Bk. II. c. lvii.

‡ This very singularly explains the following passage in Pliny:—"Round about the sun there was seen an arch when Lu. Opinius and Q. Fabius were consuls" (about B.C. 123). This was not an ordinary halo, for he says further:—"and a *circle* when L. Porcius and M. Acilius were consuls." (Bk. ii. c. xxix.)

§ It appears curious that the majority of the displays occurred at or about 4.30 P.M., in the autumn, winter, and spring months. Cases of magnetic disturbances during this hour are not rare, accompanying the aurora. It may prove of some value to note this.