This communication has run on to so great a length that I am unable to touch upon other points in which I find myself totally disagreeing with Prof. Williamson. I cannot, however refrain from expressing my astonishment at the persistence of the histological views implied by the description of the "cambium," or growing cellular tissues of plants, as "some protoplasmic element," or again as "some protoplasmic layer." Similar expressions were used by Nehemiah Grew about 200 years ago, and employed for some time by writers subsequent to him. At the present I imagined their interest was wholly historical.

W. T. THISELTON DYER

THE points at issue between Prof. Williamson and myself remain in the same position as at first. He has not yet answered one of my objections. He still holds that in Lepidodendron we have a vascular medulla, outside which is a series of fibrovascular bundles which are not closed, but go on forming new tissues by means of a cambium layer like a dicotyledonous stem. From my own observations, and from the study of recent Continental authorities, I have no hesitation in stating that the central "medulla" of Prof. Williamson consists of the united closed fibro-vascular bundles, while the investing cylinder is the modified primitive tissue which increases in diameter by means of the *meristem* layer of Nägeli. If Prof. Williamson will refer to Sachs' Lehrbuch, Ed. 2, p. 397, he will find good reasons given for the statement there made, that *Isoëtes* contains *no cambium* in the stem ; but that the stem increases in the same way as *Dracæna*, *i.e.* by a meristem layer in the primitive tissue. As long as Prof. Williamson believes in a central vascular medulla in these Lycopodiaceous stems, all his other conclusions must likewise be false.

W. R. M'NAB

Royal Agricultural College, Cirencester, Oct. 21

[*⁎* We would suggest that this controversy be now closed, until the publication of Prof. Williamson's new material.—ED.]

Blood-Spectrum

IN the account of the Progress of Science in Italy in NATURE for October 12, Mr. W. Mattieu Williams says that Prof. C. Campani has shown that the spectrum of an ammoniacal solution of carmine is undistinguishable from that of blood, and that perhaps I should be able to tell whether any difference can be distinguished by more minute examination. In my first paper on this subject, so long ago as 1865*, I alluded to this similarity, and in subsequent papers † I have shown how the colouring matter of blood can be distinguished from that of cochineal, and even a small quantity recognised when mixed with a relatively considerable quantity of that dye. I have always argued that in such inquiries we must not rely on the spectrum, but compare the action of various reagents. On adding a little boric acid to an aqueous solution of blood, no change takes place in its spectrum, whereas that of cochineal is completely altered. This effect is not produced in the case of carmine suspended in water, but the absorption-bands of blood are at once removed by deoxidising the solution with a ferrous salt, which, on the contrary, has no effect in the case of carmine or cochineal. Weak acids decompose hœmoglobin into hæmatin, which gives entirely different spectra, but they do not cause any permanent change in the colouring matter of cochineal or carmine. In my opinion there is no more probability of an experienced observer mistaking these substances for blood, because the ammoniacal solutions give nearly the same spectrum, than of a chemist confounding aluminium bronze with gold, because they are of nearly the same colour.　　H. C. SORBY

Broomfield, Sheffield, Oct. 23

Are Auroras Periodical?

THE following note on auroras is transcribed from the *Iowa Instructor and School Journal* for April, 1866. As it suggests a hypothesis similar to that proposed by Mr. Wilson, in your journal for September 7, it may not be destitute of interest.

DANIEL KIRKWOOD

Bloomington, Ind., Oct. 4

" *The Aurora Borealis of February* 20, 1866
"Those who witnessed the grand auroral display of the 20th

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* *Quat. Journ. of Science*, vol. ii. p. 208.
† *Medical Press and Circular*, New Series, vol. xii. p. 67 ; *Monthly Micros. Journ.*, vol. vi. p. 15.

inst., and especially those who have kept a record of similar exhibitions, may have remarked the frequency with which the phenomena have occurred about the same epoch, viz., from February 15 to February 23. Some of the most brilliant that have occurred at this period during the last century are the following :—

1773	February	17	1848	February	20
1784	,,	23	1851	,,	18
1794	,,	15	1852	,,	18
1838	,,	21	1866	,,	20

Besides the February epoch, any extended list of auroras will indicate two or three others, the most remarkable of which is that of November 13—18 (See Olmsted's paper in the ' Smithsonian Contributions,' vol. viii.) Fifty-three brilliant auroras have been observed since 1770. Of these, an accidental distribution would assign but *one* to the interval between the 13th and 18th of November ; whereas *eight* of the number have actually occurred at that epoch. Are such coincidences accidental, or do they warrant the conjecture that, as in the case of shooting stars, there are particular periods at which the grand displays of the phenomenon most frequently occur ? "

Forms of Cloud

THE form of cloud represented by Prof. Poëy in his figure *a*, in this week's NATURE, is very similar to that described by the Rev. C. Clouston, LL.D., in his "Explanation of the Popular Weather Prognostics of Scotland," published by A. and C. Black in 1867, and also in Dr. Mitchell's paper "On the Popular Weather Prognostics of Scotland," Edin. New Phil. Journal, Oct. 1863.

Dr. Clouston says that, "when properly developed it was always followed by a storm or gale within twenty-four hours. It is called ' pocky cloud ' by our sailors."

He gives a sketch from which, as he says, "it will be seen that this is a series of dark, cumulus-looking clouds, like festoons of dark drapery, over a considerable portion of the sky, with the lower edge well defined, as if each festoon or ' pock' was filled with something heavy, and generally one series of festoons lies over another, so that the light spaces between resemble an Alpine chain of white-peaked mountains. It is essential that the lower edge be well defined, for a somewhat similar cloud, with the lower edge of the festoons fringed, or shaded away, is sometimes seen, and followed by rain only."

Dr. Clouston concluded his notice by saying, "this cloud is well known, and much dreaded by Orkney sailors."

ROBERT H. SCOTT

Meteorological Office, London, Oct. 20

Elementary Geometry

IT is scarcely worth while for an anonymous writer to defend his opinions ; but since a sentence in my letter of September 21 still continues to elicit remarks, I may be allowed to add an explanation of my meaning. I stated that "no child is capable of taking in a subject, especially if it involves logical thought, except by very slow degrees ; and must at the beginning commit much to memory which he does not comprehend." And I called this "a fact." Mr. Wormell says in reply, that the purpose which geometry serves is not the exercise of the memory, and that it is useless if not understood. I entirely agree with him, and my words, if fairly interpreted, do not convey the contrary opinion.

In your last issue Mr. Cooley writes, that my principle, that "a child must of necessity commit much to memory which he does not comprehend," appears to him totally erroneous, and not entitled to be called a fact. But surely the order of Nature with children is to possess themselves of empyrical knowledge by the exercise of memory, and subsequently to get to comprehend what they have thus acquired. Would Mr. Cooley wait until he had made a child comprehend the principles of the decimal scale, before he taught him to add up two rows of figures, and to say, " five and seven are twelve ; put down two, and carry one " ? If he condescends to the usual course of a " hearer of lessons " in this one instance, he acts upon the admission of my principle.

To apply this to geometry (and perhaps I may be borne with if I use Euclid in illustration) : I fancy that many a boy *at the beginning* understands the three first propositions, but not the whole of the fourth. My plan would be, not to keep him at it till he did, but to let him learn it fairly well by rote, and go on, applying the results of the fourth by an act of faith. The second time he went through the book, if he had been decently taught,