but falls. The inability of insects to crawl up against the points of the hairs I have often tested in the most satisfactory manner" (*Trans. Linnæan Society*, vol. xii.). I have again and again released blue-bottle flies after they have been trapped, and have never yet found them act in any way that would suggest an intoxicating property in the secretion which they had fed upon—this is contrary to the information of "W. C. M.," who says:—"After feeding upon the secretion for two or three minutes they [the insects] become quite stupid, unsteady on their feet, &c." To prevent the pitchers being injured by the large number of insects which are lured into them, we find it necessary at Kew to fill the mouths of the pitchers with cotton-wool; this prevents the insects from falling in. Before this precaution was taken many of our finest pitchers were lost, owing to the decay which was caused by the rotten mass of insects which had accumulated in the bottom of the pitchers. "W. C. M." will be surprised to hear that, in spite of this cutting off of the supply of insects to the pitchers, the plants were in no way affected as regarded growth or vigour, but that the length and general health of the pitchers were more satisfactory after the insects were not allowed to enter them, than before. The concluding sentence in his remarks is rather startling, as, so far as investigations conducted by physiologists have gone hitherto, the *Sarracenia* are not known to be carnivorous. Mr. W. H. Gilbert, of the Quekett Microscopical Club, says:—"The pitchers contain fluid, but nothing corresponding to a digestive fluid has been detected in them; so that, if the insects which perish in the pitcher are of any value to the plant and afford any nutriment, it must be simply by maceration, and the glands can be regarded as absorbent only." Of course it may be said that *Sarracenia* would not have been constructed with what appears to be a view specially to catching insects, if the insects were not to serve some useful purpose in the economy of the plant. Anyhow, at present it is only safe to say of *Sarracenia* that they allure and ultimately destroy insects, but we do not yet know that they obtain nourishment from them. Certainly under cultivation there is abundance of evidence to prove that these, and in fact all those plants which are considered to be distinctly carnivorous, grow and thrive at least as well when insect food is not allowed them as when it is.

Kew

W. WATSON

Colourless Chlorophyll

IN his elaborate "Contributions to the Chemistry of Chlorophyll" (*NATURE*, vol. xxxi. p. 117), Mr. E. Schunck rightly observes that the explanation given by Mr. Tschirch for the curious fact discovered by Mr. Church is not based on sufficient proof. Indeed it could hardly be admitted that the action of metallic zinc is a process of reduction, since a similar result may be arrived at when zinc oxide is used instead of the metal. (A fact that I stated in 1869).

But quite recently I have had the opportunity to convince myself that the reaction that takes place when a chlorophyll solution is treated by metallic zinc and an organic acid is of an utterly different nature. Through the agency of nascent hydrogen generated in the reaction, *chlorophyll* is actually reduced, the resulting substance being not of a green colour, but perfectly colourless, and presenting no traces of the characteristic chlorophyll spectrum or fluorescence. It is only on coming in contact with the air that it gradually acquires both its green colour and specific optical properties. It is highly instructive to watch the phenomenon in a test-tube placed before the slit of a spectroscope and observe the first appearance and subsequent growth of the dark bands, the colourless substance regaining in the mean while its original splendid emerald green.

The physiological importance of this fact will be obvious to all botanists interested in the subject; for my part I consider that the discovery of this colourless modification of chlorophyll brings additional proof in favour of an hypothesis that I proposed in 1875 concerning the chemical nature of chlorophyll—viz. that the green colour of this substance is due to the presence of iron in the state of a FeOFe_2O_3 compound. In fact, all the changes that this substance undergoes, its production, its destruction, the action of acids, of metallic zinc and zinc oxide, might be easily accounted for by admitting this simple and very plausible hypothesis.

But whatever may be the ultimate fate of this "provisional" hypothesis, the fact just stated will lose nothing of its importance. Its chief interest lies in the establishment of the existence of a colourless substance, acquiring by oxidation all the optical

properties of chlorophyll. It is evident that chlorophyll is generated in this case by a process similar to that which takes place in the living plant. (The existence of such a substance has been often announced, but continues to be a subject of doubt). At the same time we may see the reason why, admitting that chlorophyll undergoes a process of reduction when CO_2 is dissociated through the agency of light (this supposition is highly probable), this transformation may not be attended by a visible change of its colour, and other optical properties—the produce of reduction being colourless and having no dark lines in the spectrum. However, the change of colour that M. Sachs observed in a great number of leaves on exposing them to direct sunlight, and which is generally attributed to a migration of the chlorophyll grains, might, partly at least, be due to this process of reduction.

C. TIMIRIAZEFF

Moscow, July 15

July Meteors

BETWEEN July 8 and 14, 111 shooting stars were recorded here in 11¼ hours of observation. The paths of these, reproduced upon an 18-inch celestial globe, enabled me to fix the radiant points of 12 showers with considerable distinctness:—

No.	Epoch. July.	Radiant.	Notes.
1 ...	13-14 ...	11° + 48°	Meteors long, swift with streaks.
2 ...	8-13 ...	245° + 52°	Slow, yellow, max. July 8.
3 ...	13-14 ...	255° + 37°	Slow, faint, near π Herculis.
4 ...	9-13 ...	265° + 63°	Slow, faint, near ζ Draconis.
5 ...	9-14 ...	271° + 21°	Slow, faint. In Cerberus.
6 ...	9-13 ...	280° - 14°	Very slow, long paths.
7 ...	13-14 ...	285° + 42°	Very swift and short, near α Lyrae.
8 ...	9-13 ...	289° + 31°	Swift, faint, near γ Lyrae.
9 ...	8-13 ...	290° + 60°	Slow, bright, near ϵ Draconis.
10 ...	8-13 ...	303° + 24°	Swift. In Vulpecula.
11 ...	13-14 ...	314° + 47°	Very swift, short, bright, near α Cygni.
12 ...	9-14 ...	329° + 36°	Swift, reddish streaks. S. of Lacerta.

Nos. 1, 7, 8, 9, 11, and 12 were well observed by Zezioli in 1867-68, and form Nos. 93, 90, 88, 89, 99, and 98 of the catalogue of radiants derived by Schiaparelli from his observations.

Generally the meteors observed here during the past month were small, but three were estimated as bright as Jupiter. The first of these appeared on July 8 at 12h. 1m., shooting rapidly along a course of 27 degrees a little west of ζ , η , θ Draconis. It left a brilliant streak, enabling the path to be very accurately noted. This meteor belonged to the radiant at 11° + 48°, and soon afterwards, at 12h. 10m., another fine one was seen pursuing a greatly foreshortened path near δ Draconis and throwing off a dense train of yellowish sparks. Its motion and appearance prove it to have been a Draconid and a member of the display from 290° + 60°. On July 9, at 13h. 50m., I recorded a fine meteor shooting upwards, just east of Altair, from a centre at 304° - 15° near α and β Capricorni; but I have not included this position in the list, as I only saw one other shooting star with a conformable direction during the period included by my observations.

On July 31 a few fine and early members of the August Perseids were seen, and on August 1, between 9h. 45m. and 9h. 50m., I noted three others, two of which were unusually brilliant, and projected vivid streaks upon their long, graceful flights through the Milky Way west of Aquila. This conspicuous and early appearance of the Perseids would seem to predicate a bright maximum on the night of August 10.

Bristol, August 2

W. F. DENNING

The August Meteors

LAST night at 9.32 a brilliant meteor crossed Cassiopeia's Chair from W. to E. parallel to the horizon. Its trail was visible for twenty-six seconds after the bursting of the meteor. During a five mile walk, lighted by many meteors, the summer lightning incessantly flashed from the northern horizon, but its brightness was never comparable to that of this meteor. It resembled most a magnesium rocket in the Crystal Palace fireworks. But even this comparison is hardly adequate.

Chatham, August 12

H. B. JUPP

A Possible Windfall for Science

Is not the better course for immediate action that the departments in England and the United States should first combine?

Let each apportion a part of the calculation, and then print it in an agreed form. The stereotype plates would be interchanged, and what a private firm does the Government can effect. In this way the English-speaking marine, including many Dutch and German captains, will be at once supplied, and part of the proposed economy and benefit be obtained without waiting for negotiations with France and Germany. HYDE CLARKE

Electrical Phenomenon in Mid-Lothian

I HAVE observed in a daily contemporary a communication quoted from your journal with reference to this occurrence on the 23rd ult.

For the information of those of your readers who are interested in such matters perhaps you will kindly allow me to observe that I also witnessed a similar, or the same, phenomenon that evening.

When driving home from a professional visit in the country, and a mile south of this town, about ten o'clock I was suddenly startled by a peculiar sensation or slight shock, and immediately perceived, ten yards in front, on the road, a bright opalescent luminosity which travelled deliberately away in a northerly direction. This cloud or wave of light covered the whole breadth of the road, and was distinctly visible for some seconds. It seemed to rest entirely on the ground, and in character reminded one somewhat of the illumination resulting from the electric light. I should imagine it was travelling at the rate of twenty miles an hour, as it was going much in the same direction I was, but of course much faster. The part of the road where it showed itself is lined by high trees on both sides in full foliage. I heard no thunder and saw no lightning or meteor to account for the strange and weird-looking light.

The interesting question then arises, What was the nature of this phenomenon?

It will be remembered that the thermometer was for several days at that time above 80° F. in the shade. Might it not be possible, therefore, for a certain volume of air to become electrified, and then, perfectly insulated by the dry surrounding atmosphere, show its existence in this manner as a luminous cloud rushing along the ground?

I may mention in conclusion that my groom, who was driving me at the time, also witnessed the occurrence.

Dalkeith, N.B., August 10, 1885

ROBERT LUCAS

On a Radiant Energy Recorder

A FEW weeks ago I wrote a short article for NATURE under the above title, describing an instrument for the measurement of radiation in heat units which was based upon the principle of the integration of temperature by the distillation of water in vacuo. Since then Mr. Edward Vivian, M.A., has kindly written me a very interesting letter, in which he says that he had several forms of an instrument based upon essentially the same principles, made for him by Messrs. Negretti and Zambra many years ago, and that some of them are still in use in his garden at Torquay. Mr. Vivian's instruments were shown at the British Association (*B. A. Report*, 1856, p. 48) and at the Royal Institution of Great Britain (*Journal R. I.*, 1857, p. 438), but no description of them appears to have been printed, which probably accounts for their not being more generally known.

University College, Liverpool

J. W. CLARK

Our Ancestors

THE number of "Our Ancestors" since "the time of the Norman Conquest," mentioned in your last issue by $\left(\frac{1}{2}\right)^n$, and the consequences to be deduced therefrom, have been very interestingly discussed already by Mr. Grove in his presidential address to the British Association at Nottingham, 1866.

Freiburg, Badenia, August 8

N.

THE INSTITUTION OF MECHANICAL ENGINEERS

THE Institution of Mechanical Engineers held their summer meeting at Lincoln last week, under the presidency of Mr. Jeremiah Head, who, in his inaugural address, treated of the relative advantages of iron and steel for the various purposes for which these metals are

employed. The reasons why steel rails are now used almost to the exclusion of iron are that they can be produced more cheaply, can be manufactured of equally good quality by either the Bessemer or Siemens process with either acid or basic-lined vessels and of almost any iron ore, and they can better withstand abrasion, disintegration, or crushing under heavy rolling loads; for the same reasons steel tires are now almost universally employed. For ship-building steel is superior to iron, as, owing to its greater ductility, ships built of the former metal are able to outlive collisions and minor accidents that would be fatal to iron ships. As is well known, owing to the superior tensile strength of steel, Lloyd's Committee agreed in 1877 to allow a reduction of 20 per cent. in weight of scantlings over iron, and in the thickness of plates; Mr. Head argues that, considering a ship's plate is a broad girder, its strength diminishes as the square of the thickness, and that, therefore, although a steel ship would be superior to an iron one of equal weight, an iron ship is likely to retain its form better than a steel one built 20 per cent. lighter. As regards bridges and roofs, the employment of iron or steel depends mainly upon the size of the structure; for light edifices, owing to its greater cheapness, iron has hitherto been used, whilst for large spans, where the weight of the structure itself is an important function, steel has been employed in the erection of bridges of spans which could not have been attempted if the engineer had been dependent on iron alone. For boilers, except in the matter of corrosion, in which authorities seem to differ as to the resisting power of iron and steel, but appear to be rather favourable to the former, steel is much more advantageous than iron, both on account of its being as cheap, and on account of a steam boiler of the same weight being able to withstand much higher pressures if made of steel than if made of iron; hence boilers, and marine boilers particularly, are now scarcely ever built of iron. The President recommended the application of metal in the construction of the frames of rolling stock and for railway-sleepers. As regards the continued use of wooden sleepers, there can be no question that "it is a form of waste that should be reprehended in the public interest, just as should the use of coal for ballasting or other obviously wasteful purpose. The same timber which would become useless for sleepers in, say, nine years, would last at least a century in the roof or flooring of a house." Another argument advanced, and a most important one, is that the substitution of iron and steel for timber railway-sleepers would not only give an enormous impetus to these industries while the substitution was being effected, but would permanently maintain a population of 100,000, or 3 per cent. of the whole population of the country, for renewals.

Leaving special branches of industry, to refer to special forms in which iron and steel are supplied, the President drew attention to *bar-iron* still maintaining its position, because wherever implements are *made* they come sooner or later to the village blacksmith to be *repaired*, and these find steel harder to work, more difficult to weld, and requiring more care to smith; and therefore the original manufacturer has to adopt a material and construction within the compass of the ideas and resources of the rural repairer.

As regards *castings*, an urgent need has long existed for a material which could be cast in a mould, and which should yet have the toughness and tenacity of wrought iron; and steel, exactly supplying this want, has come very generally into use, more particularly as the cost of steel castings has been greatly cheapened latterly by the employment of the Bessemer and Open Hearth processes; still, steel castings are much dearer than iron ones, because the molten metal is dearer, and the higher melting point of steel compared with iron necessitates more costly moulds. But in a majority of cases in which cast