laid on the supposed identity of the Sequoia couttsiæ *of Bovey with that of the Hamstead beds.*" (*Hempstead?*) Now in Mr. Pengelly's paper *Sequoia couttsiæ* occurs in the Hempstead list, but so far from special stress being laid on it, it is not referred to again. The correlation is shown not by the evidence of a single species, but by converging lines of argument all bearing on the same point.

"*The mistake having been made by such 'heroes of geology' as Heer and Pengelly, is extremely hard to eradicate.*" The mistake referred to is the recognition of *Sequoia couttsiæ* at Hempstead. If mistake it be, it is one for which Pengelly could not be held responsible, as it was eminently a case in which he could only rely on a specialist in botany. There is, however, no proof that Pengelly made any mistake in correlating the Hempstead and Bovey beds. What he did was this: suspecting the Hempstead beds to be on about the same horizon as Bovey, he commissioned Mr. Keeping, who made the excavations at Bovey, to collect fossils at Hempstead. The evidence of these fossils confirmed Mr. Pengelly in the belief that the Hempstead and Bovey beds were of the same age, but whether Eocene or Miocene, depended upon where the line of demarcation was to be drawn. This disputed point, about which English and French geologists had long been at issue, did not affect Pengelly's argument, as his object was to show the contemporaneity of Bovey and Hempstead, not to define the boundary between Eocene and Miocene.

Geologists will await with interest Mr. Starkie Gardner's proofs that the Bovey beds are not lacustrine.

Prof. Boyd Dawkins well describes Pengelly as one of the old heroes who laid the foundations of geological science. Pengelly's papers are models of scientific writing, with every fact tested, quotation verified, authority cited, and argument polished, to the utmost of the author's ability.

Two extempore interjections of Pengelly will suffice to reveal the cause of his strength, and his springs of action. On one occasion the present writer, seeking to turn a discussion which was getting wide of the mark, said: "That fact is unimportant." Pengelly instantly broke in with: "*No* fact is unimportant." On another occasion a member of the Devonshire Association, when on the platform replying on a paper, incautiously used the words "I think." Pengelly at once ejaculated, "We want to hear what Mr. X. *knows*, not what he *thinks*."

Taken seriously these pithy comments lie at the very root of all sound research, and of every paper worth printer's ink, which many are not. A. R. HUNT.

Torquay, April 14.

A Fine Aurora Australis.

ON February 25 one of the finest displays of auroral light seen in Australia for many years took place. It was seen first at Balranald at 8.30 p.m., and latest at Albury at 11.30 p.m., Albury, 190 miles east of Balranald, being the farthest east of reporting stations, and the last display being seen in the east.

At Adelaide Observatory, the farthest west, the latest time given is 10 p.m.; the range in longitude between these places is 8° 30′, the point farthest north is Wilcannia, latitude 31° 35′, and the farthest south in New South Wales was Deniliquin, 36° 10′; it is however, reported to have been seen in Melbourne also. In Sydney it was not visible, the night being very cloudy. At Deniliquin it was first seen at 9.30 p.m., presenting the form of an intense crimson arch from south to south-west, which lasted until nearly 11 p.m., when streamers of crimson and yellow were observed. The highest point reached was 30° above the horizon, and it was partly obscured by black clouds all the time. The postmaster at Balranald, who gives the best account of it, says: "An intensely brilliant aurora began here at 8.30 p.m.; it was by far the most extensive ever seen here. The display commenced at 8.30 p.m. with a dull red flush in the south, which disappeared at 9 p.m. At 9.50 the whole sky from a few degrees east of south to west-north-west, and almost up to the zenith, suddenly flashed into brilliant crimson. At intervals of a few minutes intensely bright steely shafts darted quite up to the zenith, and these changing gradually through phases of yellow to deepest red. At 10.40 p.m. the display trended more to eastward, and terminated with several very remarkable broad streaky and variegated flashes of dazzling brilliance, which shot up from east-south-east about 11.50 p.m."

March 17. H. C. RUSSELL.

Lepidosiren paradoxa.

PROF. HOWES says in NATURE, April 19, that the villi of the pelvic fins of this fish were "referred to" by me in NATURE of April 12. I think it is desirable to correct this inaccuracy. The villi in question were not "referred to" by me, but were *described and figured* by me on March 20 (published April 12). The description and figures were sent to NATURE a fortnight before the meeting of the Zoological Society at which Dr. Günther exhibited his specimens and mentioned the fact that Prof. Ehlers had "referred to" their existence in a recently published number of the *Göttingen Nachrichten*. I have not yet seen Prof. Ehler's remarks on the subject. My specimens were purchased from a well-known London dealer; and I know nothing of Dr. Bohl or the "signification of his intentions" as to specimens collected by him.

Prof. Howes is correct in his statement that six specimens of *Lepidosiren paradoxa* have been authoritatively recorded before the appearance of several in the market during the present year; but the arrival of these specimens tends to the conclusion that his statement in NATURE (vol. xxxviii.) to the effect that this species is "rapidly approaching extinction" is due to imagination, and does not correspond with the facts. E. RAY LANKESTER.

Oxford, April 23.

[The communication from Prof. Lankester was received on March 22. Proofs were sent to him on March 31 and April 2. The proofs were returned by him for press on April 6.—ED. NATURE.]

Are Birds on the Wing Killed by Lightning?

I CAN answer the question put in NATURE (of April 19) by "Skelfo," not only from several authentic records in my possession, but from personal observation. Many years ago I was standing on the steps of a woollen mill stair (outside) in the village of the Haugh, Ayrshire, in the company of others, some of whom are still alive, watching a terrific thunderstorm over the fields adjoining the river Ayr. What was then familiarly termed "forked lightning" was playing in the valley with great brilliancy. A lurcher puppy dog chased some ducks from behind an old gas-works building. One bird rose in the air, and with the characteristic cry of fright flew over the millrace in the direction of a corn-field. When on the wing it was struck by lightning and killed "like a shot." I remember examining the dead bird, but do *not* remember if it really "smelt villanously of brimstone." I think not.

G. W. MURDOCHS.

Kendal, Westmorland, April 19.

P.S.—One of the reasons why so few birds are killed by lightning on the wing is because during a thunderstorm they are in shelter, and take to it before the storm comes on.

G. W. M.

A Remarkable Meteor.

YESTERDAY evening, Sunday, April 22, a very fine meteor was seen to traverse the sky, from near the zenith to near the horizon, in an easterly or south-easterly direction. It is reported to me as having appeared about 7.25 p.m., when twilight was strong, and before any stars had come out. It threw off sparks like a rocket, and was followed by a bright train. No noise was heard after the explosion.

Haslemere, Surrey, April 23. R. RUSSELL.

AFFORESTATION IN THE BRITISH ISLES.

THE question of extending the woods of the United Kingdom has recently been brought forward in the press, and questions have been asked in Parliament as to the willingness of Government to assist in furthering a scheme for stocking certain of our waste lands with trees. Now, afforestation may be required owing to those indirect advantages it affords to the climate and soil of a country, which have been described in detail by Dr. Schlich,[1] and again quite recently in NATURE, by Dr. Nisbet,[2] or merely to increase the national wealth in

[1] "Manual of Forestry," vol. i. p. 25-58.
[2] "Climatic and National Economic Influence of Forests," NATURE, January 25.

forest produce. In our case, forests are certainly not required merely to reduce the air and soil temperatures, or to increase the atmospheric humidity; they may afford useful shelter against the strong westerly gales, or cutting east winds, and in our more mountainous districts they may assist in preventing denudation of the soil, which on a large scale has proved so destructive to agriculture in the Rhone Valley and other regions, but is not very much to be feared in our islands.

The chief use of forests with us is, therefore, for our timber supply, and to render us more independent than at present of imports of this valuable and bulky material, the inland transport of which is so costly. Our mild moist climate is admirably adapted for producing oak, ash, beech, and other broad-leaved timber, as well as larch, silver fir, Scotch pine and spruce; and were the land stocked with trees whenever experience shows that it cannot be profitably used for agriculture, our wealth would be considerably increased, and so would be the demands for agricultural labour.

Exclusive of an import of £3,000,000 worth of teak, mahogany, and other tropical woods, which we cannot grow ourselves, we also import annually £12,000,000 worth of oak, ash, and coniferous timber, all of which we might grow at home. Dr. Schlich[1] has estimated that if 6,000,000 acres of our waste lands were planted, they would eventually yield sufficient timber to render these latter imports unnecessary. It is even probable that a smaller area would suffice, were the productiveness of our existing woodlands increased by better management.

This extension and improvement of our woodlands is the more urgent, as the forests of Canada, Scandinavia and Russia, from whence most of our timber imports come, are not sufficiently well managed to secure the production of a steady supply of timber for export. The markets for their timber are also extending in France, Italy, the Netherlands, the United States, South Africa, and other insufficiently wooded countries. The following table, comparing the ratio of the woodland area in 1892 of our own and other European countries, with their total area, places us at the bottom of the list:—

Name of country.	Area of forests per 1000 acres.	Remarks.
	Acres.	
Austria-Hungary	343	
Russia	342	Area of forests less by 102,000 acres since 1872.
Germany	257	
Sweden and Norway	250	
France	159	
Italy	145	Countries importing more timber than they export.
Belgium	143	
Holland	72	
Denmark	60	
British Isles	39	

If our present area of woodlands, 3,000,000 acres, were increased by 6,000,000 acres, as proposed by Dr. Schlich, we should still have only 117 acres of woodland per 1000 acres total area, and should stand between Belgium and Holland on the list.

These 6,000,000 acres would chiefly be taken from our unenclosed mountain and heather land, which, in the agricultural returns for 1892, is given as 12,117,000 acres for Great Britain, figures for Ireland apparently not being available. But as in 1880 there were 4½ million acres of waste land in Ireland, it is probably within the mark to estimate the total area of unenclosed mountain and heather land for the United Kingdom at 15 million acres.

[1] "Manual of Forestry," vol. i. p. 65.

Much of this land is at present used for pasturing sheep, and leased in the Highlands of Scotland at from one to four shillings an acre, according to quality. Large areas of it are also let as deer forests, the rent being fixed at about £25 for each stag which may be shot; and as 2500 acres will support about 25 deer, five only of which are mature stags, the rent of average deer forests, exclusive of the buildings on them, cannot be more than one shilling an acre. It is the poorer lands at high altitudes, where sheep pasture does not pay, which are generally let as deer forests.

The cost of planting or sowing varies considerably according to circumstances, and is given in Brown's "Forester" (1882) as varying between £3 and £10 an acre, according to the nature of the fencing and draining required, which are the chief items. In calculating the returns from a plantation, the initial cost of planting must be reckoned at 2½ per cent. compound interest up to the date of felling, and this sum deducted from the proceeds of the felling. Any intermediate proceeds from thinnings will of course be added with interest allowed up to the date of the final felling.

Before a landowner would venture to plant his land on a large scale, he would have to answer the following questions:—

Is the land suitable for the successful growth of any particular forest species; and if so, what are these species, and how should they be grown? Will the sale of the timber be more profitable than the present rent of the land? As a rule, most of these rough pasture lands, except in their moister depressions, are only fit for conifers, and in many cases only for Scotch pine. A large part of the area also is at present stocked with game, and although forest growth may be compatible with pheasants, black game, capercailzie, or a moderate number of deer, it certainly cannot be expected to thrive where rabbits abound; so that the value of the land as a game-preserve will also intervene.

Experiments might certainly be made to plant up the extensive tracts in the Midlands and elsewhere, which are now encumbered with shale and slag from abandoned ironworks, and which may be bought for an old song. Ash and maple grow well on heaps of slag in the Ardennes, and these species, and probably some others, might certainly be planted on similar areas in our Black Country. It is true that the cultivation of trees will not prosper within a certain distance from factory chimneys belching out sulphurous and other noxious fumes, but means may be adopted to fix the sulphur within the factory, and to prevent the air from being contaminated; whilst much of the shale and slag is already sufficiently distant from the obnoxious chimneys.

As regards the increased demands which an extended area of woodlands would afford to labour, Dr. Schlich has calculated that if 6,000,000 acres of our waste lands were planted up at the rate of 300,000 acres a year, this would employ annually some 15,000 labourers, and that eventually, once the forests had been grown, about 100,000 labourers would find in them steady employment, besides the large number of hands required by the special forest industries which this large forest area would certainly call into existence.

Such an industry already exists in the chair-making business of Buckinghamshire. The forests on the Chiltern Hills supply thousands of people with beech-wood, 500,000 cubic feet of which are worked up annually into chairs in the town of High Wycombe and the surrounding villages. Some of these beech forests are getting thin and unproductive, owing to excessive felling and other bad management; but wherever a moderate amount of care is taken not to overcut the woods, as much as 20*s.* an acre per annum is obtained, without any expenses for planting, as the beech reproduces itself naturally. The poor dry soil above the chalk, on which the beech

thrives, would, if the forest were rooted up and the soil limed at considerable expense, only yield a rental of 12*s.* an acre as farm-land. Evidently here we have a district where forestry is more productive than agriculture, and where planting might be extended; and the same may be said of the large area of heather land above the Bagshot Sands in Surrey, Berkshire, and Hampshire, which might all be stocked with conifers were sensible measures adopted to stop the progress of the annual heath fires.

When it is remembered that we import 70,000 tons of pit-props every year, chiefly from the cluster pine forests near Bordeaux, and that in the Belgian Ardennes, at a distance of 80 miles from the coal mines, 40-year old Scotch pine, used for pit-wood, can be sold standing for £55 per acre, exclusive of the value of thinnings, which would pay for the cost of producing and tending the forests, and this means an annual profit of 16*s.* an acre, including an allowance for compound interest at 3 per cent., there can be no reason why we should not grow our own pit-props on waste land unsuitable for agriculture.

Many farms on heavy land are at present either going out of cultivation or paying very badly, and as an example of the successful forest treatment of similar land on the London clay, the Princes Coverts, near Esher, in Surrey, may be cited.

Leopold of Saxe Coburg, the consort of our Princess Charlotte, and afterwards King of the Belgians, about seventy years ago united several small woodland areas, by planting up the land of two farms, in which they were situated, with hazel and ash coppice and oak standards. The present extent of the coverts is 868 acres, and their yield, after deducting all costs of management, amounts to at least 16*s.* an acre per annum, and probably more; but Messrs. Clutton, the agents of the Crown lands, in which these woods are at present included, might supply the correct figures. The coppice is felled every ten years, and yields supports for fruit and ornamental trees, bean- and pea-sticks, clothes-props, kindling fuel, &c., which are largely in demand for gardens, orchards, and laundries around London; while the oaks, which in seventy years attain a girth of about five feet, are readily sold standing at 1*s.* 6*d.* and 2*s.* a cubic foot, according to quality.

Whilst, however, the work of planting up our waste lands must necessarily be chiefly left to private agency, the State should bring the Crown forests into a high state of productiveness, and render them examples of good forest management. Forestry is eminently a practical business, and when a landowner wishes to plant, he should be able to see the ideal way of dealing with different localities on economic principles in our Crown forests. This at present is far from being the case. Very large sums of public money were spent in planting up the Crown forests in 1813–25, when there was a fear of our running short of timber for the Navy. It is true that our Navy now depends on teak and iron, rather than on oak and pine; but oak and pine are still valuable commodities, and the present condition of the Crown plantations, made about seventy-five years ago, is certainly not satisfactory, owing to the want of underwood, and the excessive nature of the thinnings to which they have been subjected. Over an extensive area in the New Forest the Scotch pine mosses have been allowed to outgrow the oaks they were intended to shelter temporarily. The fact is, a forester is wanted at the head of our Crown forests, who will see, among other things, that they are properly underplanted, and that all blanks are restocked; but in order to do this successfully, the rabbits, which now swarm in some of the woods, must be kept down. This was not the case twenty years ago; but their increase of late has been prodigious, and they not only eat every natural seedling which appears, but also threaten the existence of the older trees by barking them in the winter.

It should be noted that the Crown forests are managed by the State, and their proceeds go into the Treasury, but that the sporting rights in some of them are vested in the Crown. Surely the Royal sportsmen might be contented with a moderate number of rabbits, and with pheasants, which do no injury to the woods, and not require the enormous multiplication of rabbits, which no continental prince would suffer in his forests.

It may be objected that by treating our Crown forests for economic forestry, as is the case with the Crown woodlands in other European countries, we should introduce uniformity, and spoil much of their picturesqueness. There are, however, 5000 acres in Epping Forest, 4000 in Windsor Park, and extensive tracts in the New Forest, which might be reserved for the lovers of the picturesque, and even then 100,000 acres might be found n the Crown forests which could be made into models o f good forest management, which are at present not to be found anywhere in Britain. W. R. FISHER.

NOTES.

IT is stated that the Emperor of Austria has just made a graceful recognition of the important services which the Geological Survey of India has rendered to science, by the presentation of gold medals to the two senior members of the Survey, Dr. W. King and Mr. C. L. Griesbach. Surely for the Emperor of Austria we should read Empress of India.

THE next annual meeting of the Museums Association is to be held in Dublin, beginning on the 26th of June, and lasting four days. Dr. Valentine Ball, C.B., F.R.S., is the President-elect, and a strong local committee has been formed, with Dr. R. F. Scharff and T. H. Longfield as honorary secretaries. There will be a reception of the members on Tuesday, June 26, at the Zoological Gardens, and on the following Thursday an excursion will be made to the Wicklow Mountains. Last year's meeting o f the Association in London, under the presidency of Sir William H. Flower, resulted in the accretion of a considerable number of new members, and the Association has now become a strong and successful body.

THE sixty-sixth annual meeting of German scientific and medical men will be held this year at Vienna, from 24th to 30th September. This function is still more all-embracing than the British Association, maintaining as it does the true brotherhood of natural and physical sciences with the branches of medicine. If all accounts be true which we hear of the section work at the recent Medical Congress in Rome, the best-meant efforts at organisation may sometimes fall short of their mark at a very large meeting. But no city knows better than Vienna how to entertain and, at the same time, to keep work going on smoothly. Active preparations have already been begun for the September meeting, and the programme of arrangements will be issued in the beginning of July.

A COMMISSION, nominated by the physical section of the Amsterdam Society for the Advancement of Physics and Medicine, and consisting of Profs. Gunning, van't Hoff, Polak, van Deventer, and Lobry de Bruyn, has made arrangements for the celebration of the centenary of the death of Lavoisier on May 8. Prof. Gunning will deliver a commemorative address, and Dr. van Deventer will describe the apparatus of the Dutch physicist van Marum, by means of which he has repeated the experiments of Lavoisier on combustion. The apparatus, constructed like Lavoisier's, but improved by van Marum, are contained in the museum of Teyler's Society at Harlem. Some of the works, portraits, and letters of the French investigator will also be exhibited at the coming celebration.