a similar recurrence of vicissitudes of climate may possibly be detected in still earlier periods of the earth's history. These are questions of the highest interest; the forthcoming expedition may do much towards their solution, and it is to be hoped that those now directing the scientific arrangements will not neglect an opportunity of such rare occurrence.

There is nothing to be said against the appointment of a zoologist and botanist, provided geology be not neglected; but if a third addition to the scientific staff should be impracticable, it would appear preferable that a good geologist should be instructed to look after the few small plants which may be added to those already known, than that the opportunity should be lost of throwing light on a subject which is acknowledged on all hands to be shrouded in the greatest obscurity.

Birmingham SAMUEL ALLPORT

Upper Currents over Areas of Frost

HAVING been for many years engaged in the discussion of upper currents, I believe that I can contribute an item of information towards the solution of the question asked by M. De Fonvielle in NATURE, vol. xi. p. 193.

During many of the hardest frosts experienced in the West of Europe, moist southerly winds of mild temperature prevail on the extreme western coasts of the British Isles, and occasionally of France and Portugal; extensive areas of low pressure existing on the North Atlantic, and of high over Western and Central Europe; isobars running nearly S. and N., and gradients being steepest in the W. Under these conditions, often persistent for many days, cirrus-clouds travel almost invariably with upper currents from points between S. and W. in the extreme west, and commonly from points between S.W. and N.N.W. over the whole western portion of the area of frost.

A slight "backing" of the last-mentioned current is *commonly* one of the first *local* premonitions of the change of weather, and may often be detected by the observer before any apparent change has taken place in the atmosphere near the earth's surface, and even when the frost is temporarily becoming more intense.

But this rule is not invariable. I have several examples in which the upper current continued from N. or N.W. until the thaw had commenced; and in those instances the southerly wind, at each station as it reached it, appeared to spring up *first on the earth's surface*, and to be slowly communicated to the higher regions of the atmosphere.

And, on the other hand, the upper currents will occasionally "back," even to S.W. or S., when a local depression is advancing in the S.W. and about to pass to the S. of the observer; when, instead of a thaw, a fall of snow and an increase of frost will probably occur. Without the aid of telegraphic reports it is almost impossible beforehand to distinguish this occurrence from the advance of the general depression in the west.

On Jan. 1, 1875, the cirrus travelled from S.W. in the west, and from W. over England and France. Between this and the surface-wind were intermediate currents from S. points, of considerable velocity, and (as shown by the "silver thaw") of high temperature.

In frosts like that of Jan. and Feb. 1855, when the high pressures are in the north, cirrus travels almost invariably from W. or S. points over the area of frost.

It is remarkable that in no instance are cirrus-currents from easterly points accompanied by severe frost.

On the subject of the general laws of the upper-current circulation I cannot here enter; but I will mention, at the risk of a slight egotism, one out of many proofs of the utility of their study. Through the stormy summer of 1872, being constantly questioned by neighbours as to the probable coming weather, I posted a daily weather forecast on my door. In *no instance* did this prove incorrect, even as to the *hour* of a coming thunderstorm. And in all instances these forecasts were *principally* based on calculations derived from the observation of those upper currents which "weather prophets," *et hoc genus omne*, almost universally neglect. W. CLEMENT LEY

Ashby Parva, Lutterworth, Jan. 20

Decomposition of Iron Pyrites

THE "curious phenomenon" described by Mr. Frederic Case (NATURE, vol. xi. p. 249) is by no means an uncommon one. It is due to oxidation, and the conversion of a portion of the pyrites into soluble sulphate of iron. This decomposition is much aided by the presence of moisture; it is very doubtful whether it would occur at all in a dry atmosphere, and I suspect that the particular case in the Maidstone Museum, where the pyrites has thus crumbled, is near an outside wall, or otherwise exposed to humid influences. I have seen large heaps of pyrites thus decomposing at the foot of the troughs where coal-slack is washed before converting it into coke. The sulphate of iron used in the manufacture of Nordhausen sulphuric acid is commonly obtained by similar oxidation of pyrites, which is aided and economised in this case by previously roasting away a portion of the sulphur.

Mr. Case may easily test the above explanation by placing some of the crumbled pyrites in a small quantity of water, leaving it there for an hour or two, then filtering through blotting paper and evaporating the clear filtrate slowly to dryness. If I am right, he will find a residue of small crystals of sulphate of iron. A few drops on a strip of glass will be sufficient to show these crystals, if magnifying power is used; or the presence of a soluble salt of iron may be shown by adding a little ferro-cyanide of potassium to this filtered liquid.

W. MATTIEU WILLIAMS

WITH reference to a statement and inquiry put forth last week in your columns by Mr. Frederic Case, of Maidstone, respecting the decomposition of some iron pyrites, I beg to state that precisely the same effect took place with similar specimens exhibited in our museum many years ago. The cause is due, I understand, to the influence of air and moisture forming ferrous sulphate (green vitriol or copperas). In our case this salt appeared in abundant crystals, and was sufficiently strong to partially obliterate and destroy a contiguous manuscript.

Alnwick Mechanics' Institute GEO. LINGWOOD

ON p. 249, vol. xi. is a query by Mr. F. Case as to the spontaneous decomposition of iron pyrites. I would suggest that the sulphur and iron of the mineral have been oxidised at the expense of the oxygen of the atmosphere in the presence of moisture. Some years ago I collected specimens of fossil wood, &c., from the London clay found in a deep well at the corner of Colchester Garrison. After a time my specimens were crumbling to powder, and were covered with light, silky crystals, which upon analysis proved to be *sulphate of iron*. Upon examining the clay minutely it was found to contain numerous golden spangles, exceedingly small, of native sulphuret of iron or iron pyrites, and the conclusion arrived at was that these spangles had absorbed oxygen and produced the crystals, and also rendered the specimens friable. A. P. WIRE

Dunstable

OUR ASTRONOMICAL COLUMN

VARIABLE STARS.—(1). On the 19th of June, 1822, during the visibility of Encke's comet in the southern hemisphere, Rümker, who was then at Paramatta, N.S.W., compared the comet with a star which he judged to be between the fourth and fifth magnitude, but could not find in any of the catalogues. The sun set at Paramatta on this evening at 4h. 58m., and the comet was observed from 6h. 3m. to 6h. 46m. mean times, or from an altitude of 20° to 11°. An experienced observer as Rümker then was would not be likely to make any great error under these circumstances in estimating the magnitude of his comparison-star. Olbers in July 1824 first directed attention to it, as probably a remarkable variable star. He noted its occurrence in Harding's Chart as a seventh magnitude, and supposed it was inserted from an observation by that astronomer, who, as is well known, compared his maps with the sky; and further, he pointed out that it had been observed by Bessel in his sixty-third Zone, 1822, March 14, and then estimated also of the seventh magnitude. Rümker determined the position of his uncatalogued star, by reference to three neighbouring ones found in the "Histoire Céleste," and it agrees almost precisely with that given by Bessel's Zone. This object is No. 134 in Santini's Catalogue (Decl.—2°), where it is again estimated a seventh magnitude. It does not occur in Argelander's

"Uranometria," but we find it in the catalogue to Heis's Atlas as a 6·7. In the excellent chart of the seventh hour of R.A., by Fellöcker of Kremsmünster, forming one of the series prepared under the auspices of the Berlin Academy of Sciences, we find it marked only of 8·9 magnitude. There is consequently sufficient evidence upon record to justify the appearance of this star in our catalogues of suspected variables, even if it be not considered decisive as to variability. Yet the object seems to have been generally overlooked of late years. We are nevertheless able to state that in 1873 and 1874 small fluctuations of brightness could be detected, and may recommend it to the attention of observers who are more especially interested in the variable stars. The position for the commencement of the present year is in right ascension, 7h. 23m. 0s., and polar distance, 91° 39′. A star of 9·10 magnitude precedes it about 4 seconds in R.A., and about 1′ north. The colour is a full yellow or light orange.

(2). *Mira Ceti*, according to the formula of sines in the last catalogue of variable stars, issued by Prof. Schönfeld, will attain its maximum in the present year on February 24. The minimum determined in the manner adopted by this eminent authority will fall on September 30. The first maximum of 1876 is on January 17.

(3). β Cygni was indicated as variable by J. Klein, of Cologne, from a series of careful observations by himself, between July 1862 and November 1863, and Schönfeld includes the star in a provisional list prefixed to his catalogue of 1875, ascribing a variation between 3·3 and 3·9 mag. to the brighter component of this beautiful object. It is not the first time that variability has been suspected in one component only of a double star. We are able to state that last August, β Cygni, as a naked-eye object, certainly looked dimmer than we had often remarked it.

THE ZODIACAL LIGHT has presented itself on each clear evening since our last, but most conspicuously on the 31st ult. It was then distinctly traceable to π Arietis, and at best views a fainter offset appeared to extend very nearly to the Pleiades. The axis passed a few degrees south of λ Piscium. The intensity of light was certainly more than twice that of the Galaxy in its brightest part between the constellations Cassiopea and Cygnus.

ENCKE'S COMET.—The re-discovery of this body is not yet announced, but it will be strange if it is not detected with the larger telescopes before moonlight interferes in the evening. In 1842, when the perihelion passage occurred at the same time as in the present year, it was observed with the Berlin 9-inch refractor on Feb. 8th; much more effective instruments, however, are now common, and if the comet's constitution has remained unchanged, we might have expected observations in January.

HALLEY'S COMET.—In our "Astronomical Column," next week, we shall give the principal results of the late M. de Pontècoulant's calculation of the perturbations of this comet (so interesting, especially to English astronomers) during the actual revolution, and describe the path in the heavens which his work indicates for the year 1910.

ANNUAL REPORT OF THE WARDEN OF THE STANDARDS

THERE has been just issued by the Queen's printers the Eighth Annual Report of the Warden of the Standards, Mr. H. W. Chisholm, on the proceedings and business of the Standards Department of the Board of Trade.

When we remind our readers that the Standards deposited in that department have been the result of the labours of many men of science, including Davies Gilbert, Wollaston, T. Young, Kater, Baily, Sir J. Herschel, Earl of Rosse, Lord Wrottesley, Sir E. Sabine, and lastly, but most of all, W. H. Miller and the present Astronomer Royal, we need scarcely say there should be much in this Annual Report worthy of our notice. We confine our notice here to that part of the business of this department which is most likely to interest our readers, without referring to its various official or State duties.

One part of the business of this department appears to be the conducting of comparisons and other operations with standards of length, weight, or capacity, in aid of scientific researches or otherwise. Amongst such comparisons we note the determination of the lengths of two Russian pendulums for use in the Great Trigonometrical Survey of India, in ascertaining by combined astronomical and telegraphic observations the exact position of a number of fixed points on the earth's surface. Standards were also verified for the Governments of Canada and India, for special use.

Chemists and physicists are glad to rely on the accuracy of their measures or weights, as compared with our own or foreign standards, and to be assured of the constancy of the units employed in their researches. This part of the business of the Standards Department would appear therefore to be of practical use to those whose researches require such accuracy. To maintain uniform the weights and measures of our laboratories is not only aiding individual research, but facilitating the exchange of scientific experience.

Many additional instruments are stated to have been added to the valuable collection of comparing apparatus deposited in this department: one of these is the new powerful air-pump, by Deleuil, to be attached to a vacuum balance. During the preparation of new gold and silver standard trial-plates, elaborate experiments were made by the chemist of the Royal Mint, on gold and silver alloys, reference to which is made in the special Report of the Warden of the Standards appended to the Report. These experiments are referred to more particularly in the paper by J. Norman Lockyer, F.R.S., and W. Chandler Roberts, read before the Royal Society on Nov. 20, 1873, on the quantitative analysis of certain alloys by means of the spectroscope.

Attention is called in this Report to the teaching of weights and measures in schools. There is no doubt that a large number of obsolete and unnecessary weights and measures are used in school text-books. The teaching of the metric system of weights and measures is now abandoned in schools under the authority of the Education Department.

The use of the mirror and electric lamp has been so eloquently demonstrated by Professor Tyndall, that our readers will be glad to see appended to the Report a paper on the employment of a mirror and a ray of light for indicating differences in standard weights, or in measures of length. This paper is a translation of a paper by C. A. Steinheil, read in 1867 at the Imperial Academy of Sciences at Vienna, and is a valuable record of the work of one who spent his life in scientific research.

Also appended to this Report is a short table for the reduction to 0° C. of readings of barometers with metric graduations on their glass tubes, based on those coefficients of the expansion of mercury and glass adopted in standard measurements, viz. :—

Cubic expansion of mercury .	0·00017971 for 1° C.
Linear expansion of glass . .	0·00000886 „

As an instance of the precision with which measurements are now made, we may refer to p. 40 of this Report, from which it appears that the value of a micrometer was determined at two different periods to be 0·00003181 and 0·00003183 inch respectively; showing a difference of only 0·00000002 inch. Such precision may appear to be scarcely necessary except in particular researches. As, however, any error in the production of a direct copy of