In the rubber-gathering industry, which is at once the wealth and bane of this part of the world, the implements in use are of the most primitive kind, but the average earnings can easily be three pounds per day during the dry season, and the facility of earning so much money with little exertion makes the inhabitants unwilling to engage in more arduous labour.

A narrow path leads from the hut on the water's edge into the forest from one rubber-tree to another, the path eventually returning to the hut. The trees are cut on the morning round, and the rubber is gathered in the afternoon. As soon as it arrives at the hut a fire of oily palm-nuts (*Attalea excelsa*) is lighted, and the thin sap thickened in the smoke For this purpose a paddle is used, on to which the sap is poured with a small earthenware or tin vessel. The smoke soon thickens it, and a new layer is poured on until the well-known flat cakes of india-rubber have been formed.

Owing to the rise of the river during the rainy season most of the huts have to be abandoned, and it can easily be imagined how comfortless they are. Nearly all of them are built on piles, and most of them are thatched with palm-leaves. There is hardly any attempt made to cultivate the soil, such as it is, but everything is imported. The s.s. *Cametense*, in which the surveying party went out, was laden with cabbages, onions, and potatoes, part of which went as far as Iquitos in Peru.

Chiefly owing to this want of provisions, and to the generally careless mode of life, the mortality among india-rubber gatherers is very great.

Everything Bates and Wallace have said of this region remains as true as it was forty years ago, and hardly anything new can be added to their description of the general features of the Amazon valley; but the town of Manaos has completely changed its character since it was made the capital of that region in 1853. A town quite European in its features has arisen in the midst of the forest, and to the benefits of rapid transport, to which it has owed so much, there is now added the characteristic lever of modern progress, the annihilator of space and time—electrical communication.

NOTES ON CLOUDS.[1]

THERE are two points connected with clouds on which I wish to make a few remarks. The first is on the classification of clouds, and the second on the manner in which certain forms of clouds are produced. It may be as well to remark at the outset that the observations are those of an "outsider," being in a department of meteorology to which I have given but little attention, and they have been written with a view of calling the attention of specialists, and getting their opinion on the subject.

It appears to me that in classifying clouds they ought first of all to be divided into two great classes. In the one class should be placed all clouds in the process of *formation*, and in the other those in the process of *decay*. The two classes might be called *Clouds in Formation* and *Clouds in Decay*. We may take Cumulus clouds as an example of the former, and Nimbus of the latter. My observations made on the clouds themselves have shown that there is a difference in the structure of these two classes of clouds. In clouds in formation the water particles are much smaller and far more numerous than in clouds in decay; and while the particles in clouds in decay are large enough to be seen with the unaided eye when they fall on a properly lighted micrometer, they are so small in clouds in formation that, if the condensation is taking place rapidly, the particles cannot be seen without the aid of a lens of considerable magnifying power. In the former case the number of particles falling per square millimetre is small, while in the latter they are so numerous that it is impossible to count them.

It appears that one good end might be served by adopting this classification. It would direct the attention of observers more to looking on the processes going on in *decay* for an explanation of many of the forms observed in clouds. In most books on clouds, when describing the different shapes of clouds, it is almost always assumed that they are in process of *formation*, and the whole explanation of the shapes taken by the clouds is founded on this supposition. Now, it is very evident that very many clouds are in the process of decay, and their forms can only be explained by the processes going on under these conditions.

This brings me to the second point in this communication, namely, the manner in which ripple-marked cirrus clouds are produced. The explanation which has generally been accepted of the formation of this form of cloud is, that the ripple markings are due to the general movements of the air giving rise to a series of eddies, the axes of the eddies being horizontal, and roughly parallel to each other. It is very evident that the air revolving round these horizontal axes, that is, in a vertical plane, will at the lower part of its path be subjected to compression, and at the upper part to expansion. The result of this will evidently be, supposing the air to be nearly saturated with moisture, a tendency for cloudy condensation to take place in the air at the upper part of its path, and it is this cloudy condensation in the upper part of the eddies that is supposed to produce the ripple-like cirrus; each ripple mark indicating the upper part of an eddy. One objection I have always felt to this explanation is, that it is difficult to imagine that the small amount of elevation and consequent expansion and cooling could give rise to so dense an amount of clouding as is generally observed. Any clouding produced in this way one would expect to be extremely thin and filmy. I have for the last few years made frequent observations of these clouds, and I have to admit I have never once seen them in the process of formation, or seen one appear in a clear sky. In all cases that have come under my observation, these ripple clouds have been clouds in decay. They are generally formed out of some strato-cirrus or similar cloud. When we observe these strato-cirrus clouds in fine weather, it will be found that they frequently change to ripple-marked cirrus clouds before vanishing. The process of their formation would seem to be: the strato-cirrus gradually thins away till it attains such a depth, that if there are any eddies at its level, the eddies break the stratus cloud up into parallel or nearly parallel masses, the clear air being drawn in between the eddies. It will be observed that this explanation requires the eddies, but not to produce the clouding, only to explain the breaking up of the uniform cirrus cloud into ripple cirrus.

One thing which supports this explanation is, that lenticular-cirrus clouds are frequently observed with ripple markings on one or more sides of them just where the cloud is thin enough to be broken through by the eddies. If we watch these lenticular-formed clouds under these conditions, we frequently see the ripple markings getting nearer and nearer the centre as the cloud decays; and at last, when nearly dissolved, the ripple markings will be seen extending quite across the cloud. It seems probable that "mackerel" and other cloud forms may be produced in the same way.

The shapes which these ripple cirrus clouds assume are much more varied than is generally supposed. I lately observed a most interesting form in the south of France while the mistral was blowing strongly. There were a few cirrus clouds in the sky at the time, and one of these was rapidly being broken up into irregular ripple forms, but at one point there was formed a most perfectly cylindrical-shaped piece, its length being about twenty times its diameter. The whirling effect of the eddy was very evident by the circular streaking of the clouding. Further, this cloud was evidently hollow, that is, the interior was filled with clear air as the cloud was thinnest along the axis, and it had all the appearance of a revolving tube of cloudy air.

It is not contended here that ripple clouds are never produced in the manner which has generally been accepted, only that so far as my observations go they have never been observed forming in the manner supposed. It is hoped that others will put the explanation here offered to the test of observation, and it is principally with a view of getting others to repeat the observations that this has been written.

[1] Paper read by John Aitken, F.R.S., to the Roy. Soc. of Edin. on May 4.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—In the Mathematical Tripos List published on June 16, Mr. W. G. Fraser, of Queens', is Senior Wrangler, Messrs. Barnes, Carson, and Wilkinson, all of Trinity, are bracketed for the second place, and four members of St. John's, Messrs. Edwardes, Houston, Cook, and Turner, follow in two brackets, fifth and seventh. Miss Longbottom, of Girton, has the twelfth place.

In Part II. seven names appear in the first division of the first class, beginning with Mr. Bromwich, of St. John's, the Senior Wrangler of last year.

Mr. A. C. Dixon, of Trinity College, has been approved for the degree of Doctor of Science, in consideration of his mathe-

matical works. Mr. Dixon was Senior Wrangler in 1886, and is Professor of Mathematics at Galway.

A lectureship in Hausa is about to be founded, in virtue of a benefaction by the Hausa Association. The language ranks with Arabic and Suaheli as one of the most important West African tongues used within the British sphere of influence.

The General Board propose that a Professorship of Mental Philosophy and Logic, with a stipend of £700 a year, should be forthwith established. Prof. Sidgwick has generously offered to accept a diminished stipend of £500 a year for the next six years in order that funds may be available for this purpose.

The Tyson Medal for Astronomy has been awarded to Mr. E. T. Whitaker, of Trinity.

Mr. W. Mather has received the thanks of the University for a valuable gift to the Engineering Laboratory of an experimental steam-engine and dynamo.

A Latin letter of congratulation to Lord Kelvin on the jubilee of his Professorship at Glasgow was approved at the Congregation on June 11, and was ordered to be sealed with the Common Seal of the University and presented to him by the University delegates to Glasgow.

The Syndicate on Women's degrees was appointed without opposition, and have already held their first meeting. Their report will not be issued until next Term.

THE following appointments have been made in the Northern Polytechnic Institute, Holloway:—Mr. Hubert A. Garratt, Senior Lecturer in Engineering, University College, Bristol, to be Head of the Engineering Department; Mr. V. A. Mundella, Assistant Lecturer in Physics and Electrical Engineering, Durham College of Science, Newcastle, to be Head of the Physics and Electrical Engineering Department; Dr. Thomas Ewan, Assistant Lecturer in Chemistry, the Yorkshire College, Leeds, to be Chief Assistant in the Chemical Department. Other recent appointments are:—Dr. G. Frege to be Professor of Mathematics at Jena; Dr. Lickfett to be Director of the Hygienic-bacteriological Institute at Danzig; Dr. Scholl to be Extraordinary Professor of Chemistry in the Technical High School at Karlsruhe. Mr. E. A. Gardner, formerly Director of the British School at Athens, to be Yates Professor of Archæology in University College, London; Dr. Paul Eisler to be Extraordinary Professor of Anatomy at Halle; Dr. L. Joubin to be Professor of Zoology, and Dr. H. Prous to be Extraordinary Professor in Lille University; Dr. Theobald Smith to be Professor of Comparative Pathology in Harvard University.

THE Technical Instruction Committee of the North Riding County Council some time ago substituted a system of individual instruction in cheese and butter making at the farm-house of any farmer who desired it, for the more commonly adopted travelling dairy school. In addition to this method of instruction they have agreed to a scheme whereby a permanent dairy school will be opened at Helmsley in the course of the present month. The school is being built by the Earl of Feversham, and is to be placed at the Committee's disposal, who are making themselves responsible for the proper fittings and apparatus. It is confidently anticipated that the school, which will be styled the "Ryedale Dairy School," will be much used and greatly appreciated.

ON Thursday evening last it was resolved by 332 votes to 83, that boroughs of not less than 20,000 population should form separate educational authorities. This will mean, as the Vice-President of the Council pointed out in his speech on this amendment, that in addition to the 128 authorities which there would have been as the Bill originally stood, we are to have 241 more authorities added, that is, provided the amendment passes the House of Lords. Further, since there is no doubt populous urban districts will claim to be treated like municipal boroughs, and it seems only reasonable to suppose that such will be granted similar powers, forty-nine more authorities will be brought in, making a total of 418 separate centres for the Education Department to deal with. In some cases the result will be extraordinary; for example, in Lancashire there will be some forty-two different educational authorities. The extent to which the work of the County Councils would suffer should this concession of the Government become law, can only be appreciated by those who know the spirit in which small local authorities approach any matters pertaining to secondary education.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, June 12.—Captain Abney, F.R.S., President, in the chair.—Mr. Campbell read a paper on the measurement of very large and of very small alternating currents. The author advocates the use of air-coil transformers for measuring voltages and currents which are either above or below the range of the instruments available. If an attempt is made to measure the current in the primary of an air-coil transformer by observing the voltage on an open circuit secondary, it is found that the readings depend on the frequency. In order to overcome this difficulty the author uses a closed secondary with a very high inductance. In this case the primary current is proportional to the secondary current, which latter may be measured by an ammeter. The author has also investigated the case of transformers with iron cores, and of which the inductance of the secondary is large. In the case of a ring transformer with a closed magnetic circuit, if the load on the secondary consisted solely of a Kelvin 100-ampere balance of very low resistance, the ratio between the primary and secondary currents is practically constant. With an open magnetic circuit transformer, however, this is not found to be so, as the ratio between the primary and secondary current varies considerably with the frequency. Mr. Blakesley said that the author's arrangement could only be used for measuring the *current* in the primary. He (Mr. Blakesley) had shown how to measure alternating currents by means of dynamometers, and without the necessity for any special apparatus. Mr. Griffiths exhibited and described his improved form of resistance box. This resistance box has many novel features: (1) It permits of all the coils being compared with one another, without the use of standard coils, and with great ease and rapidity. Hence it is sufficient at any time to compare any one of the coils with a standard to obtain the correction to be applied to all the coils. (2) The bridge wire can be calibrated by means of the box itself. (3) The temperature of the coils can be accurately determined, since they consist of bare platinum-silver wire wound on mica and immersed in an oil bath, which bath is kept stirred. (4) The resistance of the leads from the box to the object being tested is eliminated, as well as any error due to a change in this resistance with temperature. (5) The coils are arranged according to a binary scale, and the author claims that it is possible to measure resistances up to 105 ohms, to within 0·000001 ohm. (6) All the coils, after being adjusted, have been heated to redness and allowed to cool slowly, so that all strain has been removed from the wire. (7) By having a separate pair of blocks for each plug, it is impossible for the insertion of one plug to affect the fit of a neighbouring plug. The plugs themselves are so made that no part of the plug is wider than the top of the hole, and so it is impossible to wear a "shoulder" on the plug. Prof. A. Gray said that Mr. Griffiths had discovered and remedied all the weak points of the ordinary form of bridge. Lord Kelvin had ordered the paraffin to be melted off the coils of one of his resistance boxes, and it was found that the resistance of the coils altered considerably, owing, no doubt, to the strain to which the wire had been subjected, when imbedded in the solid paraffin. Lord Kelvin had made coils without paraffin, and was specially in favour of the use of the binary scale. Prof. S. P. Thompson said he considered the binary scale the weak point of the author's arrangement, since it did not permit of ratios other than 1 to 1 being employed. Mr. Campbell asked what current could safely be passed through the coils. The author in his reply said that he believed it to be a great mistake to employ any ratio for the arms other than 1 to 1. —Prof. S. P. Thompson read a communication on Röntgen rays. The author, after describing the various forms of tubes he had made with a view of discovering the best form for the production of Röntgen rays, gave an account of the experiments he had made to try and obtain some indication of polarisation. In this connection a large number of crystals have been tested, but the experiments have all given negative results. The author exhibited an electroscope with aluminium leaves and enclosed in a wire-gauze screen, to protect it from the influence of outside electric changes, by means of which he was able to show the discharge of a positively or negatively electrified body by means of the X-rays. A method of obtaining dust figures by the discharge of an electrified body by the X-rays