

An angled spectrum of curved course may also develop by progression through the middle zone, beginning below, and attaining its chief development in the upper half of that side, passing only a little way beyond the middle line above. In one case this was preceded by a transient angled star near the point of commencement, and its early stage was accompanied by inhibitory loss at the margin of the field, outside the region in which the discharge commenced.

Although discharge never occurs at the central point, it may occur around it, as a circular zigzag, surrounding a round object looked at—an instructive example of the fact that the discharge may be related to the central effect of actual retinal stimulation. Analogous to this “pericentral” spectrum, is one that takes the form of an arch above the central region, which may separate into two parts at the middle line. As an instance of the strong tendency there is to regard the spectrum as an objective thing, a member of the medical profession, when asked to draw that which he saw, sent a drawing of his eye surmounted by an angled corona. These forms again indicate disturbance in centres in which there is no half-field representation. Besides other forms, an angled spectrum sometimes appears near the outer temporal edge of the field, and extends outwards for a short distance and then curves downwards, never upwards. Such a peripheral spectrum always seems to the subject to begin at the extreme edge of the field and extend outside it. In one case it was drawn as attached to the junction of the upper and lower eyelids.

It cannot be doubted that, by the study of these subjective symptoms, much will ultimately be learned regarding the function and mode of action of the cerebral visual centres. Whatever the drawbacks to observation through the consciousness of another person, knowledge can be gained in no other way of the action of the higher centres of the brain, and the time must come when the physiological knowledge which can be gained only through the effects of disease and the disturbance of functional derangement, will receive more attention. The facts of these spectra, when studied in their detail, compel the conclusion that they occur in centres in which function is related to the conjoint fields, and in these to a central and a peripheral region and to a medial zone between the two; that the chief relations are central and peripheral; that outside the central region there is a one-sided relation, but that there is no distribution of function at all corresponding to the division of the fields at the medial line. The dominant relation is concentric, and the indications afforded by the absolute one-sided loss caused by destruction of one occipital lobe, has no reflection, positive or negative, in these results of spontaneous central activity.

#### HIGH-LEVEL METEOROLOGICAL STATIONS.<sup>1</sup>

ONE of the greatest drawbacks to a full understanding of meteorological phenomena is that the observations on which we base our knowledge are generally made close to the ground in the most restricted air-stratum; whereas the general atmospheric movements, both in velocity and direction, are much modified in the lower strata, and the air surrounding and in contact with the earth differs greatly both in temperature and humidity from the free air. The more strongly agitated upper strata react on the lower in many ways, and a knowledge of the movement of the moderately high atmospheric layers is of great importance for the theory of the general circulation of the atmosphere, and practically for our weather forecasts, since the forces which develop storms have their origin and sphere of action within two or three miles of the earth.

If the atmosphere were only in complete equilibrium, then the few irregular observations, as regards time and place, which have been made in balloons, would give some data on which to base general laws; but, in the actual condition of continual movements and changes in the atmosphere, this can never suffice, and the continuous observations required of all the elements, at all seasons and in all weathers, can only be made on mountains, even though the conditions there only approximate to those of the free air. In this way observations on mountains complete those of the usual low-level stations.

When the earth's surface rises in plateaux, the advantage of elevation above the sea—that is to say, the immersion in the upper strata—is almost entirely neutralised, because still our instruments are placed in air masses which are affected by

<sup>1</sup> Extracted from a paper, by Mr. A. Lawrence Rotch, read before the Boston Scientific Society.

contact with the earth. For this reason meteorological observatories should be located on high and isolated peaks. The erection of such stations and the discussion of their observations during the last fifteen years have contributed largely to the rapid progress of the science of meteorology.

The chief first order stations (those possessing self-recording instruments, or where observations are made on an extensive scale) which are located on mountain tops in the various countries, will now be briefly described.

The first summit station in the world was that established in 1870, jointly by the U.S. Signal Service and Prof. J. H. Huntington, on Mount Washington, N.H., 6280 ft. above the sea. Probably nowhere else in the world has such severe weather been experienced, the lowest temperature being here often accompanied by the highest winds, unlike the calms which prevail with intense cold at low levels. For instance, in February 1886, with a temperature of 50 degrees below zero, a wind velocity of 184 miles an hour was recorded on Mount Washington. The Government meteorological station on Pike's Peak, at an elevation of 14,134 ft., was for many years the highest in the world. Now both these stations are closed, so that there seem to be actually in the United States but two summit stations where meteorological observations are made throughout the year, viz.: The Lick Observatory, on Mount Hamilton, California—primarily astronomical—and the Blue Hill Meteorological Observatory in Massachusetts, situated at a very moderate elevation. Prof. S. P. Langley's important researches on the nature and amount of solar heat received by the earth were carried on in 1881 upon Mount Whitney, the summit of which is 14,500 ft. above the sea.

It is due to an American institution that the highest meteorological station in the world is now in Peru, where the Harvard College Observatory, several years ago, established an outpost at Arequipa. In 1893, Prof. Bailey succeeded in placing self-recording instruments on the summit of the neighbouring volcano of El Misti, 19,300 ft. high, when a former station on the side of Mount Chachani, near the snow-line, at an elevation of 16,650 feet, was abandoned. It is impossible for persons to remain at these stations, so they were provided with automatic instruments which should give a continuous record of the chief meteorological elements during two weeks. Several times a month one of the Observatory staff climbs the mountain in order to wind the clocks and change the register sheets, at the same time making a check reading of standard instruments. Breaks in the record occur, owing to unforeseen stoppage of the instruments, or inability to make the ascent at the appointed time.

France stands unrivalled in her superb chain of summit stations on the Puy de Dôme (4800 ft.) in Auvergne, on the Pic du Midi (9440 ft.) in the Pyrenees, on the Mont Ventoux (6250 ft.) in Provence, and on the Aigoual (5150 ft.) in the Cevennes, whose construction has cost the national and provincial Governments hundreds of thousands of dollars and years of time. They are generally defective in having no co-operating base stations, and their observations have not been published in detail. In 1890, M. Vallot, a devoted Alpinist and meteorologist, established several stations on and near Mont Blanc, from which records have been obtained each summer since. The highest of these stations, at the Rochers des Bosses, 14,320 ft., is provided with many self-recording instruments operating two weeks without attention, which are looked after by the owner or his guides each week or two during the summer. The Observatory of M. Janssen, sunk in the snow on the very top of Mount Blanc, 1460 ft. higher, is not yet in operation, but a meteorograph has been made for it in Paris, which will continuously record all the meteorological elements during a period of three months without attention. A similar instrument is being constructed at Blue Hill, by Mr. Ferguson, for Prof. Pickering's station on El Misti.

On the Eiffel Tower in Paris are instruments 980 ft. above the ground, which give more nearly the conditions prevailing in the free air than do any others permanently at this elevation. They record at the Central Meteorological Office, a quarter of a mile distant, side by side with similar instruments exposed near the ground.

Among the German and Austrian stations, that on the Sonnblick, a peak of the Austrian Alps, 10,170 ft. high, and the highest permanently occupied observatory in Europe, stands pre-eminent, having furnished very valuable results under Dr. Hann's direction.

Switzerland, which since 1873 had maintained stations in mountain passes, &c., has now on the Säntis (8200 ft.) in the canton of Appenzell, one of the best located and equipped summit stations in the world; and in Italy an observatory on Monte Cimone (7100 ft.) in the Apennines, near Lucca, has recently been completed.

On Ben Nevis, the highest mountain in Great Britain (4400 ft.), there is a remarkable station where during ten years an unbroken series of hourly observations has been maintained. There is a base station at sea-level, and the advantageous situation on the west coast of Scotland renders the results of the observations, which have been discussed by Dr. Buchan, of great value.

It is impossible to even enumerate all that has been gained from these high-level observations, but the chief results attained, or still sought, may be thus summarised: Determination of normal decrease of temperature and humidity with elevation; abnormal changes with elevation in cyclones (or areas of low pressure near the ground) and in anti-cyclones (or areas of high pressure near the ground); height to which these cyclones and anti-cyclones persist, and the circulation of the air around each at various levels.

### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—At the Encaenia, or Commemoration of Oxford Founders, held on June 26, the honorary degree of D.C.L. was conferred upon Sir W. H. Flower, Prof. Michael Foster, M. Edward Naville, the distinguished Swiss Egyptologist, and Sir A. W. Franks, President of the Society of Antiquaries.

SIR J. E. GORST has succeeded Mr. Acland as Vice-President of the Council for Education.

MR. HERBERT HANCOCK, Mathematical and Physics master in Bancroft's School, Woodford, London, has just been appointed to the headmastership of the Hipperholme Grammar School, an important science centre for the North of England.

At a Convocation of Durham University on Tuesday, June 25, the Sub-Warden announced that the new Charter had been received by which power is given to the University to confer degrees upon women in all faculties except Divinity. Among a large number of degrees conferred was that of Bachelor of Science on Miss Ella Mary Bryant, Durham College of Science, Newcastle.

In consequence of the shortly ensuing General Election, the annual meeting of the National Association for the Promotion of Technical and Secondary Education, and the Conference of representatives of Technical Education Committees, which had been arranged to take place in London on July 11, have been postponed.

ON Thursday last a very successful and numerously attended conversation was held at University College, London. The guests were received on the grand staircase by the President (Sir John Erichsen, Bart., F.R.S.) and Deans of Faculties. The various scientific departments of the College were thrown open, and many interesting exhibits contributed to the success of the evening. Among the latter were included the spectra of argon and helium, various electrical and physical experiments, living seaweeds and marine animals, new models of dividing nuclei, &c.

THE University of London has conferred the degree of Doctor of Science, without examination, on Mr. Th. Groome, Professor of Natural History at the Royal Agricultural College, Cirencester, in recognition of the merits of his original researches and published papers.

THE Berlin correspondent of the *Lancet* writes as follows:—"The publication of a rumour that the authorities intend to abolish the University of Jena, has caused a stir in the scientific world, the university being one of the oldest in Germany, and having often occupied a leading position. Financial reasons are said to have induced the authorities to arrive at this decision. The constitution of the University of Jena is somewhat peculiar. It is not under the jurisdiction of a single State, but belongs jointly to four States of Thuringia, viz., Saxe-Weimar, Meiningen, Coburg, and Altenburg. The Governments of those small States entirely control the affairs of the university. If, for in-

stance, a new professor is to be appointed they must all consent to his nomination. To put a stop to the further propagation of this rumour, the official journals of the four united Governments declare that the continued existence of this venerable university is assured both by public grants and by large donations recently made by old pupils and others. This communication has been received with general satisfaction, particularly in the town of Jena itself, which is entirely dependent upon the university."

### SCIENTIFIC SERIALS.

*The Mathematical Gazette*, No. 5 (May 1895).—This number opens with a paper read by Dr. C. Taylor at the annual meeting of the A.I.G.T. in January last, of which the title is "The Syllabus of Geometrical Conics." In it the writer passes in review what he has done in the subject since his first contribution to the *Messenger* in 1862. Amongst other reasons for writing at this date, Dr. Taylor states: "I have, as I think, arrived at something like finality in my own view of the way in which the subject should be approached." It is on this ground that we commend the author's paper to persons interested in the teaching of geometrical conics. They will derive profit from it. The second of the mathematical worthies noticed by Mr. Heppel is John Dee, noteworthy from his contributions to Billingsley's translation of Euclid. The notes, solutions of *Gazette* questions, solutions of examination questions, and questions for solution, which are all very useful for the readers addressed, are, with the enlarged form of the journal, greatly increased in number and variety. Several recent text-books are also the subject of judicious and discriminating criticism. The *Gazette* should certainly have a successful career.

*American Journal of Mathematics*, vol. xvii. No. 3.—On irrational covariants of certain binary forms, by E. Study, discusses the most important covariants of binary cubics and quartics and of some other special binary forms. After paying tribute to the methods of Cayley and Clebsch, the author gives his reasons for working the whole subject over again. By means of a carefully chosen system of notation, he presents his results, as he believes, in a form that will be useful to those who have to deal with the numerous applications of the binary quantics of the lowest orders. In some detail (pp. 185-215) he examines the cubic, and the quartic and octahedron, and points out several small numerical errors in previously obtained results. The same writer contributes an article on the connection between binary quartics and elliptic functions. This is an application of the theory developed in the previous article to elliptic functions. In it he compares the relations among the rational and irrational covariants of a quartic with the identities among the four theta-functions; by this means a new light is thrown upon the familiar formulæ, and at the same time a number of new results are derived, which make the theory in question, the author states, in a certain sense *complete*. Stress is laid upon the fact that all the results are obtained by means of *actual calculations*, and that no use is made of the method of indeterminate coefficients.—Semi-combinants as concomitants of affiliants, by H. S. White, opens up a new path apparently (pp. 234-265): "I consider all ground forms that are included in the conjunctive of the system, and those of them that satisfy invariant equations of suitable order, linear in their coefficients, I designate as *affilant* ground forms." The paper shows that not only is every semi-combinant ground form an affilant, but also every affilant ground form is a semi-combinant. Three short notes follow, viz.: Simplification of Gauss's third proof that every algebraic equation has a root, by M. Böcher, a note read before the American Mathematical Society (*cf.* NATURE, p. 189); note sur les lignes cycloïdales, by R. de Saussure; and note on lines of curvature, by T. H. Taliaferro.

### SOCIETIES AND ACADEMIES.

#### LONDON

**Royal Society**, April 25.—"*Acokanthera Schimperii*: Natural History, Chemistry, and Pharmacology." By Prof. Thomas R. Fraser, F.R.S., and Dr. Joseph Tillie.

Specimens of the wood from which the Wa Nyika, Wa Gyriama and Wa Nyika arrow-poison is prepared have been examined by us and referred to the genus *Acokanthera*, and