it is desired to determine the true curve of diurnal variation of the wind velocity at any given station. In the case of proceeding by the ordinary routine of hourly sums and means, it will be found that the occurrence of a high wind or gale on a single day will vitiate the results for a considerable period of time.

If, on the other hand, instead of doing this, a drawing or photograph be made on one sheet of the daily curves for a few weeks, it will be found that the traces for the days free from storms will lie so fairly close together or upon one another, that little difficulty will be found in selecting or drawing through them a curve representing the general run of the group. Several sets of curves having been so treated, the typical curves must be in turn themselves superimposed, and through them another curve drawn, which will be still less affected by abnormal movements; so eventually the true curve of diurnal variation would be arrived at.

In the case of subjecting photographic traces, *e.g.* barograms, thermograms, electrograms, magnetograms, &c., to this treatment, it would be advisable to employ secondary impressions or prints from the original curves, in order that the composite produced might consist of dark lines on a white background; not the reverse, which would be comparatively useless for the purpose.

For the reduction of anemograms, rain, and sunshine curves by this method, it will be necessary to make drawings or tracings first from the curves, giving the hourly values separated, as is done in the diagrams published in the *Quarterly Weather Reports* of the Meteorological Office and in the Kew *Times* curves.

Another application of the method of composite drawing will serve to facilitate the acquisition of a knowledge of the general distribution of weather systems over large tracts of the earth's surface. To do this, a series of weather charts should be taken, and selecting certain prominent features, such as the centres of cyclonic and anticyclonic disturbances, day by day their positions should be marked off upon one chart. This being done in a sufficient number of cases and combined, a repetition of the process would enable a determination to be made of the average distribution of these systems for a given season.

The author illustrated his proposed applications of the method of composite portraiture by three examples, which were exhibited to the meeting of the Society. The data treated in every case were chosen at random, and therefore may be considered as indicating the applicability of the process to meteorological work in general.

In the first example the mean diurnal variation in the wind velocity at the Kew Observatory, Richmond, was determined for three months—August to October, 1879. Taking the hourly values of the rate at which the wind was blowing from the Meteorological Office publications, they were plotted down on a conveniently open scale, a fortnight's superimposed curves being on a sheet. Through the fourteen curves so drawn in pencil a mean curve was traced in red. This roughly represented the average daily variation during the fortnight.

The pair of fourteen-day curves being superimposed on a third sheet, a third trace drawn between them was assumed to be the mean trace for the month, and finally combining the three so derived months' traces, it became easy to draw the final curve showing the mean diurnal variation of wind velocity during the quarter in question.[1]

The second experiment was an attempt to obtain a monthly mean of the barometer directly by the graphic method. Taking advantage of a self-registering aneroid being on trial, its traces were utilised for the month January 8 to February 7, 1883. These were copied off on a sheet of tracing paper, ruled so as to comprise one day's curve only. The tracing paper was then folded vertically, so as to compress the curves, and the mean positions of the traces were drawn on the folds. After four foldings a point was readily fixed upon as the position of the mean of the month, and the value of this point referred to the scale of the instrument. The resulting value for the mean barometric pressure of the month very satisfactorily agreed with the value determined by calculation from the barometer readings taken daily at the Observatory.

The third series of illustrations represented the general positions of the centres and the contours of the areas of maximum and minimum barometric pressure over the Atlantic during January, February, and March, 1881. A number of blank charts were worked off by the chromograph, on tracing paper, to the scale of the international synchronous charts of the U.S. War Department Signal Service. Tracings were made on one sheet in blue pencil of the cyclonic centre for each day of the month, and then on another a similar set of tracings in red of the anticyclonic centres. Having from these drawn the prevailing positions and areas of the systems for the month, it was easy to draw another chart with the general distribution for the quarter. The diagrams were seen, on comparison, to differ materially from those drawn for the monthly means of the observations. In suggesting the composite method of treatment of meteorological data, the author is fully aware that a somewhat similar process has been already applied in the determination of the radiant points of shooting stars, and would also desire to state that the process is not by him considered as equalling or even approximating in accuracy that of employing the harmonic analyser in computing the periodical variations of the elements. As, however, that instrument is not at the command of many investigators, he is of opinion that the labour of reduction may in many cases be saved by making use of the graphic or composite, instead of the purely numerical, method.

[1] It must be remarked that a due proportion should be preserved between the scales of the ordinates and abscissæ, for unless this is done the combined traces may appear merely as a mass of confused lines. Such was the case in some experiments made by the author, when he attempted to derive mean curves directly from the zinc templates engraved at the Meteorological Office for the Quarterly Weather Reports, kindly placed at his disposal by Mr. Scott.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—Dr. Hans Gadow, Strickland Curator, has been approved as a Teacher of Comparative Anatomy; Mr. L. Humphry, M.B., as a Teacher of Pathology; and Mr. F. H. Neville as a Teacher of Practical Chemistry.

Messrs. J. W. Hicks, R. D. Roberts, and A. S. Lea are appointed Examiners in Natural Science in the Special Examinations for the ordinary B.A. degree.

The Examiners' Report on the Special Examinations in Natural Science states that there was no improvement in the book work, but the practical work was more intelligently done. The few candidates in Geology did well. Botany was ill done. In Zoology the candidates did well.

Mr. J. A. Lyon (Clare College) has been appointed to the new office of Superintendent of the Mechanical Workshops.

SCIENTIFIC SERIALS

Bulletin de l'Académie Royale de Belgique, November 3, 1883. On the anatomy and histology of a new species of derostoma (*D. benedenii*), by M. Francotte.—Report on the work still required to complete the geodesic survey of Belgium, by Capt. Delporte.—Observations on the periodic shooting stars made at Louvain in 1882-83, by M. Terby.—Influence of magnetic disturbances on the scintillation of the stars, by M. Charles Montigny. The paper is accompanied by various comparative tables showing the intensity of scintillation before, during, and after the magnetic disturbances in dry and wet weather.—Summary report on the researches undertaken at the Ostend biological station during the summer of 1883, by Edouard van Beneden. Amongst the remarkable objects fished up near this station were a torpedo of unusual size (*Torpedo marmorata*), a fine specimen of *Labrus maculatus*, an *Amphioxus lanceolatus*, and an unknown species of Scopelidæ, referred by Günther of the British Museum to the Odontostomus, or some allied genus.—On the observation of very rapid movements, especially when occurring periodically, by M. J. Plateau.—Analytical study of the volcanic ashes which fell at Batavia during the eruption of Krakatoa on August 27, 1883, by M. Renard. The author concludes that these ashes are formed by the pulverisation of a fluid igneous mass, whose particles, projected by the expansion of the gases, are subjected to rapid cooling during their passage through the atmosphere. Nothing was detected to indicate the direct action of vapour of water in volcanic disturbances.—On the perfect elasticity of solid bodies chemically defined. New analogy between solids, fluids, and gases, by W. Spring. Here are embodied some of the results of the researches conducted by the author for several years on the action of pressure on solids reduced to a powder. The main object of these researches was to ascertain by experiment whether it be possible by means of pressure permanently to diminish the volume occupied by a given weight of a solid body chemically defined. As a general result, a slight increase of density was obtained under a pressure of 20,000 atmospheres. But, this once realised, most bodies resisted all further perma-

nent diminution of volume. Some even retained their specific weight intact under extreme pressure.—Observations on M. van Beneden's last note respecting the discovery of fossil iguanodons at Bernissart, by E. Dupont. This communication closes the controversy.—Note on the literature of international law before the publication of Grotius's "Jus belli et pacis" (1625), part ii., by Alph. Rivier.—A literary study on the position of words in the Latin sentence, by J. Gantrelle.

Journal of the Russian Chemical and Physical Society, vol. xv. fasc. 8.—On dipropylacrylic acid, by A. Albitsky.—On the action of iodide of allyl and zinc on epichlorhydrine, by M. Lopatkin.—On an accessory product obtained during the preparation of diallyl carbinol, by W. Shestakoff.—On the action of iodide of allyl and of isobutyl on acetone, by A. Shatsky.—On the hydrocarbon C_8H_{14}, by S. Reformatsky.—On the refracting power of $C_{12}H_{20}$, by A. Albitzky.—Attempt of a theory of dissolutions, by W. Alexeyeff.—On $C_{21}H_{20}$ and the products of its oxidation, by W. Hemilian.—Analysis of a phosphorite from Nijni-Novgorod, by N. Lubavin.—On some phenomena of remanant magnetism, by P. Bakhmetieff.—On the changes in the galvanic resistance of selenium under the influence of light, by N. Hesehus. It depends chiefly upon allotropic dissociation of the molecules.—On the characters of the intramolecular force, by M. Bardsky, being a mathematical discussion of its dependence upon temperature.

Bulletin de l'Académie Impériale des Sciences de St. Pétersbourg, vol. xxviii. No. 4.—Demonstration of several propositions relative to the numerical function E(*x*), second paper, by V. Bouniakovsky.—Contributions towards palæontology, by M. Schmalhausen (with two plates); being a description of fossil plants of the Jura coal-basin of Kuznetsk, in the Altay (*Thyrsopteris prisca* and *Rhiptozamites gœpperti*), from North-West Mongolia, at the sources of the Yenisei, on the high plateau of the Ulu-khem (*Bornia radiata, Neuropteris cardiopteroides, Lepidodendron veltheimianum, Rhiptozamites gœpperti, Czekanowskia rigida*, and *Phœnicopsis angustifolia*), and from the Djün-khair-khan Mountains (*Asplenium argutulum* and *spectabile*, and *Czekanowskia rigida*).—On the sympathetic nervous system of the *Petromyzon*, by Ph. Owsiannikow.—On the camphor of the *Ledum palustre*, by M. Rizza.—Analyses of samples of water from thermal sources of Southern Altay (Byelukha-Rakhmanovka), and from a number of lakes and wells in the same region, by Prof. Carl Schmidt. Compared with thirty other thermal waters of Europe, Asia, New Zealand, &c. (the composition of which is given in a table), the Altay water shows a minimum of mineral substance.—Letter on natural history phenomena observed at the Lena Polar station, by Dr. Bunge.

Rendiconti of the Sessions of the Accademia delle Scienze di Bologna, March 14, 1883.—On a remarkable anatomical peculiarity observed in the eye of the swordfish (*Xiphias gladius*, L.) (one illustration), by Prof. G. V. Ciaccio.—Some observations on the *Mucor racemosus*, Fresenius, by Dr. F. Morini.

April 8.—A century of premature artificial births at the Lying-in Hospital of Bologna, by Dr. C. Belluzzi.—Chemical analysis of the meteorite which fell at Alfianello on February 16, 1883.—Researches on the *Phellandrium aquaticum*, by Dr. Leone Pesci.—Thermal and galvanometrical researches on the internal discharges of condensers, by Prof. E. Villari.—New studies on the polygenesis of crystallised minerals, by Prof. L. Bombicci.—Researches on the action of the magnet and of the thermal agents in hysterical hypnosis.—Observation on the series of functions, by Prof. C. Arzelà.—On the infinite products by analytical functions, by Prof. S. Piucherle.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, January 17.—"On the Electrolysis of Dilute Sulphuric Acid and other Hydrated Salts." By J. H. Gladstone and Alfred Tribe.

On March 1 last a communication was presented to the Royal Society by Prof. Frankland in which, among other things, the reactions the authors had described as taking place in the charging and discharging of secondary batteries were confirmed. Prof. Frankland expressed these reactions, however, by formulæ founded on the electrolysis, not of H_2SO_4, but of hexabasic sulphuric acid, H_6SO_6, in accordance with the views of Bourgoin.

The French chemist employed a divided cell, analysing the liquid in each compartment at the close of the experiment. He calls the increase of the acid in the positive compartment α, and concludes that 2α represents the amount of sulphuric acid electrolysed. This conclusion rests on the well-known theoretical views of Grotthuss, and, did his theory express all that goes on in the electrolytic processs, the method would readily discriminate between the actions represented by the following formulæ:—

	Before electrolysis		After electrolysis: Positive pole	After electrolysis: Negative pole
(1.)	SO_3H_2O	=	$SO_3 + O$	H_2
(2.)	$SO_3 3H_2O$	=	$SO_3 + O_3$	H_6
(3.)	$SO_3 nH_2O$	=	$SO_3 + O_n$	H_{2n}

But it was pointed out by Reuss, as far back as 1807, that, when electrolytic action occurs across a permeable diaphragm, a portion of the liquid may travel from the positive to the negative compartment of the compound cell by what is now called electrical endosmose. Daniell and Miller in 1844 pointed out that in electrolytic action there was also an unequal transference of the ions. Moreover, Daniell investigated the electrolysis of sulphuric acid of very different strengths by a similar method, and concluded that, for each equivalent of hydrogen liberated, the acid which passed across the diaphragm was not more than one-fourth nor less than one-fifth of an equivalent. Most of his experiments incline to the former. Did 2α, therefore, represent the amount of sulphuric acid electrolysed, it would appear from his results that *tetra-*, rather than *hexa-*, basic sulphuric acid was decomposed by the current. These discrepancies, both of observation and deduction, led the authors to make some experiments on the subject.

The apparatus employed consisted of a U-shaped tube of about 70 c.c. capacity, having a stop-cock in the centre of the horizontal part. The vertical parts of the apparatus were divided into millimetres, and the hole in the stop-cock packed with asbestos. The authors found that the closeness of the packing could be so nicely adjusted as to allow very little mechanical admixture of the fluids or electrical endosmose. In their experiments the current density was varied, and, unlike Bourgoin, they found that the increase of sulphuric acid in the positive compartment per equivalent of hydrogen set free decreased along with the decrease in the current density. The results are set out in the annexed table.

Current in milli-amperes	Time in hours	Increase of sulphuric acid in positive compartment for one part of hydrogen set free
32·8	20	9·17
33·4	6	9·5
72·3	2·5	10·3
72·7	2	9·4
106	2	11·0
117	2·5	10·5
215	1·5	12·05
220	1	12·04
229	2	12·31

It is necessary also to bear in mind the remarkable phenomenon called by the Germans "Wanderung der Ionen." Daniell long ago described an experiment in which he placed dilute sulphuric acid in the positive compartment and a solution of sulphate of copper in the negative. He found that when 15·5 grs. of copper had been deposited on the negative electrode there were 23 grs. of sulphuric acid in the same compartment. Now, as 15·5 grs. of copper are equivalent to 24 grs. of sulphuric acid, and as Bourgoin's formula allows for the formation of only half an equivalent of sulphuric acid, that is, 12 grs., it is evident that there was a considerable accumulation of that substance unaccounted for. In two similar experiments the authors obtained for 0·147 and 0·125 grm. of deposited copper 0·209 and 0·180 grm. of free sulphuric acid. The half equivalents would be 0·114 and 0·097 grm. respectively. If both compartments had been filled with sulphuric acid, some similar transference would doubtless have taken place, in addition to what is expressed in Grotthuss' chain of decomposition.

The authors conclude, therefore, that the method employed is incapable of determining whether it is H_2SO_4 or some hydrate which yields to the current.

Copper Sulphate

An examination of the chemical changes which accompany the electrolysis of a solution of copper sulphate appeared, how-