UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

IN a letter to the *Times* of July 25, Mr. J. Parker Smith, M.P., describes the action that has been taken by Wykehamists with a view of commemorating the 500th anniversary of the opening of Winchester College by some permanent memorial. It was resolved last May that any fund which might be raised should be applied, first, to the restoration of the Founder's Chantry in the Cathedral, and secondly, to establishing a group of memorial buildings for the preservation of Wykehamical antiquities and the encouragement of art, archæology, natural history, and other sciences. Mr. Smith is the Chairman of the Executive Committee formed to administer the funds, and he says that the aims of the collection of archæology and art would be to illustrate and encourage the regular course of school study, and to furnish boys with interests outside that course. As to science, the idea is that the science collections should be a development of the present collection of the Natural History Society, which is good though not large. Mr. Smith thinks that special stress would doubtless be laid on the collection of local minerals, fauna, and flora. An attempt might also be made (as has been done at Harrow) to imitate the admirably instructive series of type forms exhibited in the Museum of Natural History at South Kensington; and it would be highly desirable to connect some moderate provision for elementary biological and botanical work with the natural history museum. Contributions to the fund will be received by the hon. secretary, Mr. Percy R. T. Toynbee, 109, Gloucester Terrace, Hyde Park, W.

THE sixth annual meeting of the National Association for the Promotion of Technical and Secondary Education was held on July 24. The Duke of Devonshire, who occupied the chair, said that public funds had been so rapidly secured for purposes of technical instruction that in some cases both county councils and municipal authorities were at a loss to decide upon the best means of administering them. He thought that it might be advisable for another Royal Commission to be appointed to inquire and report upon the progress made since 1881 in our own and in Continental countries. He was glad to see that the county councils of Staffordshire, Bedfordshire, and Manchester had sent their organising secretaries to the Continent to ascertain the latest developments of technical education abroad, and hoped that their example would be followed by others. Sir Henry Roscoe presented the report of the Society, and its adoption was moved by Mr. Mundella, and supported by Sir F. S. Powell. The officers of the Society were re-elected, with the addition of Sir W. Hart-Dyke as a vice-President, and Sir A. Rollit as a member of the executive committee.

AS an outcome of the Technical Instruction Act, a scheme was promoted, and plans subsequently adopted, for the erection of technical schools at Maidstone, and the foundation stone of the new buildings has just been laid. The schools, which are commodious and well adapted for the purpose for which they will be used, have received the sanction of the Science and Art Department, and comprise, on the ground floor, science, lecture, and class rooms—the former capable of seating from sixty to eighty-four students—large lecture hall, and a library, together with physical and chemical laboratories, and a wood-carving workshop. On the first floor is the art school, with painting and modelling rooms, and a life studio. The basement is designed for an electric installation and stores. There being a large available space in the vicinity of the Maidstone Museum, the new buildings will form an adjunct, and both in the science and art departments direct communication may be had with that institution, which will thus mutually further the objects of the whole group.

THE following alterations, among others, have been introduced into the programme of techniological examinations of the City and Guilds of London Institute for the session 1893-94. 1. An examination in cabinet-making and one in metal-work as a branch of manual training have been added. 2. The syllabus in boot and shoe manufacture has been divided into two grades, and separate practical tests are added to each grade. 3. The honours examination in photography is divided into two sections—(1) pure photography and (2) photo-mechanical processes—and the practical examination will be held in connection with the honours grades only. 4. The examination in cotton weaving in the ordinary grade is divided into two sections—(1) plain weaving and (2) fancy weaving. 5. An examination preliminary to that in the ordinary grade will be held in electric lighting and in typography; and the examination in typography in the ordinary grade is divided into two sections. 6. The syllabus in silk weaving is enlarged so as to include riband weaving. 7. The syllabuses in cloth weaving, flax spinning, hosiery, goldsmiths' work, brickwork, and in other subjects have been revised.

DR. DENDY, who for the past five years has held the position of demonstrator and assistant lecturer in biology in the University of Melbourne, has been appointed lecturer in biology at the Canterbury College, in the University of New Zealand, and will enter upon his duties there in February next. At present Dr. Dendy has sole charge of the biological department during the absence of Prof. Spencer in England.

MR. STANLEY DUNKERLY, M.Sc., has been appointed assistant-lecturer in engineering at the Walker Engineering Laboratories, University College, Liverpool.

LAST year the Staffordshire Technical Education Committee sent a number of teachers to Leipzig for a course of manual training in wood-work, iron-work, &c., at Dr. Gotze's Institute. The plan is again being followed this year, not only in Stafford but by other counties that have come to recognise its usefulness.

SCIENTIFIC SERIALS.

American Journal of Science, July.—The following are among the papers appearing in this number:—Studies of the phenomena of simultaneous constrast colour; and on a photometer for measuring the intensities of lights of different colours, by Alfred M. Mayer. The photometer was constructed in such a manner that the two tints to be compared were reduced to the same by the effects of contrast. Two discs, 13cm. in diameter, and having half of their surface removed in the shape of eight equidistant sectors, were made of thin Bristol board. Between them was placed a circle of white translucent tracing paper, and the discs were clamped together with the open sectors coinciding. The compound disc was mounted on a rotator and placed opposite two silvered mirrors inclined at an angle of 150°. The plane of the disc bisected the angle formed by the mirrors, so that the surfaces of both sides could be seen simultaneously. On rotating the disc while illuminated by daylight on the one side and by lamplight on the other, the side illuminated by daylight appeared white tinted with yellow, the other appeared white tinted with blue. A compound disc of red lead, of chrome yellow, and of white cardboard was placed on the daylight side, and an ultramarine, emerald green and white disc on the lamplight side. The greenish-blue produced by the latter combination made the light blue on the lamplight side appear faintly orange-yellow by contrast, while on the other side of the ring the orange-yellow disc had diminished the orange-yellow tint of the ring to the same feeble orange-yellow as seen on the other side.—On the ammonium-lead halides, by H. L. Wells and W. R. Johnston, and on the rubidium-lead halides, and a summary of the double halides of lead, by H. L. Wells. The authors are of opinion that not one of the many complicated ammonium-lead halides described by André really exists, but that the bodies obtained by him were mixtures. They themselves succeeded in preparing five salts representing three different proportions of ammonium and lead.—A one-volt standard cell, by Henry S. Carhart. This is a calomel and zinc chloride cell adjusted to an E.M.F. of one volt by a proper concentration of the zinc chloride solution. In the bottom of the tube is pure mercury in contact with platinum wire; then follows a paste of mercurous chloride and zinc chloride held in position by a cork diaphragm; and finally an amalgamated zinc rod immersed in zinc chloride solution of density 1·391 at 15°C. The cell has a small positive temperature coefficient.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 8.—"The Influence of Exercise on the Interchange of the Respiratory Gases," by W. Marcet, M.D., F.R.S.

The following is a summary of the contents of this paper:—

1st. It was shown that in three persons out of four who

submitted to experiment there was a great tendency to an uniformity of figure for the oxygen *consumed* under similar physical circumstances (food, temperature, &c.), so that, if the CO_2 expired fell, the oxygen absorbed rose, and *vice versâ*; this was accounted for by assuming that an increase of CO_2 in the blood in the state of repose is produced at the expense of the O absorbed. The fourth person experimented upon exhibited no such tendency, the CO_2 expired and O absorbed rose and fell together, which was ascribed to the fact that he was still growing.

2nd. Experiments were made on the influence of exercise on respiration, which showed that if stepping exercise (stepping at the rate of sixty-eight times per minute) is taken after a period of rest, there occurs for a few minutes an accumulation of CO_2 in the blood; of course the storage of CO_2 after exercise must be controlled by the normal amount of CO_2 produced in repose, and the kind of exercise taken; this storage would in the cold winter weather, and between one and two hours after food, continue for about eighteen or twenty minutes. In my case the volume of CO_2 retained in the blood amounted to a mean of 500 c.c. while stepping sixty-eight times per minute. The CO_2 in store is next given out in the form of a wave, which is renewed after a certain lapse of time, so that there does not appear to be in respiration under exercise a fixed relation between the CO_2 expired and the CO_2 left in the blood With practice and training this relation would probably become more and more uniform.

The storage of CO_2 in winter and after food was found to exhibit a certain relation to the excess of CO_2 expired under exercise over the CO_2 expired in repose; but eighteen or twenty minutes after exercise had been commenced this relation failed to show itself any longer.

The ratio in question was the same with two different persons; but further experiment is required to determine whether this ratio can be looked upon as general; the mean relation found is shown by the figure 0·123; therefore, so far as the present inquiry goes, by multiplying this figure 0·123 by the excess of CO_2 given out per minute under exercise over the CO_2 expired in repose during the same lapse of time, the result will show the volume of CO_2 absorbed in the blood per minute.

3rd. After the exercise adopted in this inquiry had been followed by a complete repose of ten minutes, the CO_2 expired had returned to the normal in repose, but the volume of O absorbed per minute had considerably fallen, apparently owing to the blood having charged itself with oxygen during exercise, so that the first few minutes after rest was taken, the blood was in a condition to supply oxygen for tissue-changes without taking it from the air breathed at the time. After half an hour's perfect rest following exercise the respiratory changes had returned to their normal state of repose, or nearly so, the oxygen absorbed still occasionally showing signs of being a little lower than before exercise had been taken.

June 15.—"On a Graphical Representation of the Twenty-Seven Lines on a Cubic Surface." By H. M. Taylor, Fellow of Trinity College, Cambridge. Communicated by A. R. Forsyth, F.R.S.

The converse of Pascal's well-known theorem may be stated thus: if two triangles be in perspective, their non-corresponding sides intersect in six points lying on a conic. An extension of this theorem to three dimensions may be stated thus: if two tetrahedrons be in perspective, their non-corresponding faces intersect in twelve straight lines lying on a cubic surface. This theorem may be deduced from the equation

$$xyzu = (x + a\mathrm{T})\,(y + b\mathrm{T})\,(z + c\mathrm{T})\,(u + d\mathrm{T}),$$

where $\mathrm{T} = \alpha x + \beta y + \gamma z + \delta u$; and $a, b, c, d, \alpha, \beta, \gamma, \delta$ are constants. The equations of twelve lines on the surface are evident.

This paper shows how the remaining fifteen straight lines on the surface may be obtained by means of nothing higher than quadratic equations, and determines which of these lines intersect each other.

The paper then proceeds to give a graphical method of representing all the intersections of the twenty-seven lines on a cubic surface by means of a plane diagram, which admits of many interesting transformations.

By the help of such diagrams some of the known relations of the twenty-seven lines to each other are deduced, and some theorems with respect to the lines which it is believed are new are established; for instance, the number of closed quadrilaterals, pentagons, and hexagons on the surface is determined, as well as the number of ways in which nine triple tangent planes can be drawn to pass through all the twenty-seven lines, and the number of ways in which twelve of the lines can be chosen, so that they are the intersections of two tetrahedrons in perspective.

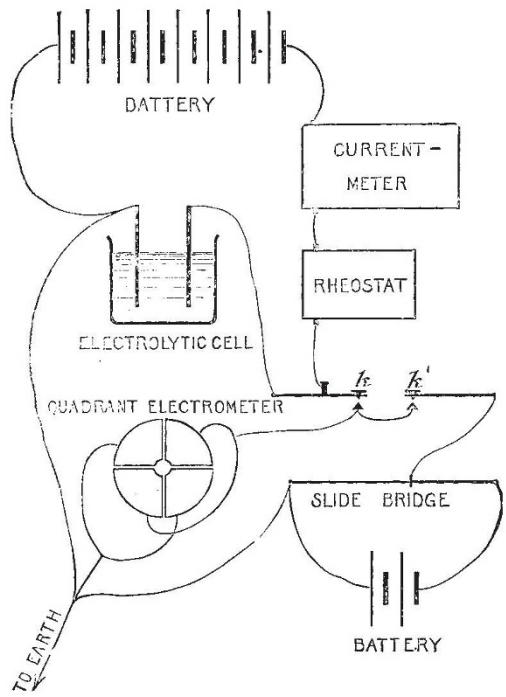
"Polarisation of Platinum Electrodes in Sulphuric Acid." By James B. Henderson, B.Sc. Communicated by Lord Kelvin, P.R.S.

This investigation was begun about the beginning of February, 1893, at the instigation of Lord Kelvin, and was conducted in the Physical Laboratory of Glasgow University. The object of the investigation was to obtain the difference of potential between two platinum electrodes immersed in a solution of sulphuric acid immediately after the stoppage of a current which had been electrolysing the solution, and to find how this difference varied with a variation in the intensity of the current or in the strength of the solution.

Former experiments by Buff and Fromme have given for the maximum polarisation with platinum wires of very small surface in the electrolysis of dilute sulphuric acid 3·5 and 4·6 volts.

Dr. Franz Richarz says of the above:—"In these experiments the polarisation is calculated from measurements of the intensity of the galvanic current during the electrolysis, tacitly assuming that the resistance of the decomposition cell is independent of the intensity of the galvanic current. The correctness of the supposition has not been proved." By employing a different method he found values for the polarisation never greater than 2·6 volts with small wire electrodes, and also got the same maximum with large platinum plates.

The electrodes in the present investigation were rectangular plates of platinum foil 7 cm. long by 5·5 cm. broad, and were immersed in the solution to a depth of 5 cm., having their planes parallel, and about 1 cm. apart. There were thus 55 sq. cm. of surface of each plate wetted. To find the polarisation one of Lord Kelvin's Quadrant Electrometers was used. The method used can be best understood from the diagram. By means of



the key k the breaking of the electrolysing current circuit and the switching of the electrodes on to the terminals of the electrometer were done simultaneously. Before switching as above, however, the needle of the electrometer was deflected by keeping the key k' down, thereby making a difference of potential between the pairs of quadrants equal to that between the slider and the earthed end of the high resistance slide bridge, and this

deflection was adjusted by trial and error, so that when *k* was pressed no further deflection took place. To secure this, at the beginning of an experiment, the slider was placed so that when *k* was momentarily pressed, the deflection of the electrometer needle was increased impulsively. The amount of this impulsive deflection was noted, and the slider moved so as to increase the steady deflection nearly up to the point on the scale reached by the impulsive one, and then another trial was made. In this way, by watching the point reached by each impulsive deflection, and then increasing the steady one almost up to that point, the latter was increased until the former vanished—that is, until the potential of the quadrants was that of polarisation. The magnitude of this deflection was then noted and the polarisation calculated from it.

All the results point to the polarisation being constant with large electrodes, being independent of the strength of the solution and the intensity of the current. The results of one series of experiments are given in the accompanying table. The variations in the figures do not occur in any order, and are all such as might be expected in experimental results of this nature. Some of the greatest variations were obtained in exactly similar experiments performed at different times.

Percentage strength of solution.	Strength of current in ampères.	Time the current had been passing.	Polarisation in volts.
		h. m.	
30	0·2	3 25	2·066
,,	0·5	0 45	2·060
,,	1·0	0 35	2·060
,,	1·0	0 45	2·124
20	0·1	3 22	2·126
,,	0·5	1 25	2·139
,,	1·0	0 25	2·090
,,	1·0	0 35	2·124
10	0·1	17 40	2·139
,,	0·5	1 19	2·066
,,	1·0	0 44	2·066
5	0·1	18 30	2·116
,,	0·5	1 36	2·078
,,	1·0	1 0	2·083
,,	1·0	3 15	2·054

Mean polarisation = 2·09 volts.

"On the Displacement of a Rigid Body in Space by Rotations. Preliminary Note." By J. J. Walker, F.R.S.

Having been led to study more particularly than, as far as I am aware, has hitherto been done the conditions of the arbitrary displacement of a rigid body in space by means of rotations only, the results arrived at in the case of the single pairs of axes seem to me of sufficient interest and completeness to warrant their being recorded.

A comparison of these results with those arrived at by Rodrigues in his classic memoir "Des lois géométriques qui régissent les déplacements d'un système solide dans l'espace . . . ." Liouville, vol. v. 1840, at once suggesting itself, it may be proper here to recall the substance of the latter, and show how far they fall short of the object I propose to myself. The case of displacement by successive rotations round a pair of axes is discussed in § 13 (pp. 395–396), where it is shown that (p. 390), "Tout déplacement d'un système solide peut être représenté d'une infinité de manières par la succession de deux rotations de ce système autour de deux axes fixes non convergents. Le produit des sinus de ces demi-rotations multipliés par le sinus de l'angle de ces axes et par leur plus courte distance, est égal, pour tous ces *couples* d'axes *conjugués*, au produit du sinus de la demi-rotation du système autour de l'axe *central* du déplacement, multiplié par la demi-translation absolute du système."

Then (p. 396) the converse of this theorem is affirmed, viz., that "*Tout déplacement . . . peut toujours provenir, d'une infinité de manières, de la succession de deux rotations autours de deux axes non-convergents* pourvu que *le produit*. . . ."

In this conversion of the theorem above, it is strangely overlooked that a displacement is not defined by the direction of axis, and amplitude, of the resultant rotation, together with the magnitude of the component of the corresponding translation along that direction (for in this form the proof is given, the axis being drawn through one end of the common perpendicular to the particular couple in respect of which the theorem is demonstrated), since these elements are common to an infinity of displacements.

These being premised, the laws connecting pairs of axes by successive rotations round which a given displacement of a rigid body in space may be effected are as follows:—

If the first axis is taken parallel to a given vector, ζ', there are four directions, to any one of which (ζ) its conjugate may be parallel, viz., the sides common to two quadric cones, the constants of which are functions of ζ' and the vectors defining the displacement.

One of these cones, whatever the direction of ζ', passes through the vector which is the axis of resultant rotation for the origin, or, in other words, which is parallel to the *central* axis for the given displacement. The other cone (K) passes through a vector covariant with ζ', say ζ_1.

The direction ζ' and any selected one of the four vectors ζ being taken for a pair of axes of rotation, the corresponding amplitudes are thus determined, viz. that of the second rotation is double the angle between the planes of the vectors ζ, ζ' and ζ, ζ_1. And as, ζ being fixed, ζ' lies on two cones, one of which, K′, contains a side (ζ'_1) corresponding to the side ζ_1 of K, the angle of rotation round the first axis is double that between the planes of the vectors ζ', ζ and ζ', ζ'_1. The planes of ζ, ζ_1 and ζ', ζ'_1 meet in the vector parallel to the central axis.

The directions of the axes being fixed in accordance with the above conditions, the locus of either axis is a plane, the places of the axes in which are so related that the connector of the feet of perpendiculars on them from any fixed point generates a ruled quadric surface.

As regards the *reality* of the conjugates (ζ) corresponding to an arbitrary direction (ζ') assumed for the first axis, it may suffice here to state that one real conjugate, at least, is insured by taking as ζ' any side of the quadric cone which is defined by replacing ζ in the cone K with the vector parallel to the *central* axis. The two cones, whose common sides are directions of the corresponding conjugate, then both passing through that vector, will meet in at least one other real side.

PARIS.

Academy of Sciences, July 17.—M. de Lacaze-Duthiers in the chair.—On the discovery of the comet *b* 1893, by M. F. Tisserand.—Expression of the resistance offered by each ponderable molecule to the vibratory motion of the ambiant ether, by M. J. Boussinesq.—On the generalisation of a theorem of Euler relating to polyhedra, by M. H. Poincaré.—Experiments on the resistance of air and diverse gases to the motion of bodies, by MM. L. Cailletet and E. Colardeau. The experiments previously made on the resistance of air to the motion of falling bodies, and performed at the Eiffel Tower, led to varying results according to the pressure of the atmosphere. In order to determine the influence of the pressure upon the resistance, and also that of the nature of the gas, the apparatus was enclosed in a cast-iron receiver of 300 litres capacity, into which air or other gas could be pumped up to pressures of 8 or 10 atmospheres. The apparatus consisted of a paddle-wheel set in motion by a weight suspended by a string wound upon the shaft. A double cock, with intermediate reservoir, permitted the introduction of a known quantity of shot into the cylindrical hollow of the driving weight, so as to increase the weight without affecting the pressure. A key, worked from the outside through a stuffing-box, enabled the experimenters to replace the weight as often as desired without loss of compressed gas. The downward motion of the weight became uniform as soon as the resistance of the gas equalled the driving weight. An electric contact inside the receiver connected with a bell outside indicated the rate of rotation of the paddle-wheel. The resistance opposed by any gas to the motion of a plane was found to be proportional to its surface, the square of its velocity, and the pressure and density of the gas. If two planes are placed one behind the other at a distance equal to their breadth, the total resistance is about 1·1 times that offered to a single plane. Placing two planes 0·15 m. broad 1 m. apart, the sum of their resistances did not come up to twice the resistance of each.—Observations of the new comet Rordame, made with the great equatorial of the Bordeaux Observatory, by MM. G. Rayet and L. Picart.—On a relation which exists between the formulæ of Coulomb (magnetic), Laplace, and Ampère, by M. E. H. Amagat. It is shown that W. Weber's method of arriving at the values of the constants of Ampère's

formula is incorrect. M. Amagat hopes shortly to obtain some more accurate results.—On glycolysis in normal and diabetic blood, by MM. R. Lépine and Métroz. In diabetic blood the absolute loss of sugar *in vitro*, although quite perceptible, is very much less than it would be if the glycolytic energy were normal; it is, therefore, evident that the glycolytic energy must be lowered.—On the new comet *b* 1893, by M. Quénisset.—Observations of the new comet, *b* 1893, made at the Paris Observatory (west equatorial), by M. G. Bigourdan.—On studies of the discharge of vapour through orifices, by M. H. Parenty.—On the simplicity of samarium, M. Eug. Demarçay. From experiments upon solutions of samarium salts it appears that the suspicions entertained as to its elementary nature were unfounded.—On cyclic condensations of carbon, by M. Gustave Rousseau. M. Rousseau succeeded in preparing artificial black diamonds by the decomposition of calcium acetylide in a current of moist gas in a Ducretet electric furnace. Some of the grains obtained were 0·5 mm. in diameter.—On aminobutenediamide and butanonediamide, by M. R. Thomas-Mamert.—On the saturation of the nitrogens of nicotine and on an acetyl nicotine, by M. A. Étard.—Rotatory powers of quinic acid derivatives, by M. S. G. Cerkez.—Derivatives and constitution of rhodinol and essence of roses, by M. Ph. Barbier.—Laws of evolution of digestion; their interpretation, by M. J. Winter.—Does the elasticity of the muscle diminish during contraction? by M. N. Wedensky.—On the mechanism of the production of light in the *Orya barbarica* of Algiers, by M. Raphael Dubois.—On the pelagic fauna of the lakes of the French Jura, by MM. Jules de Guerne and Jules Richard.—On a parasitic fungus of *Cochylis*, by MM. C. Sauvageau and J. Perraud.

GÖTTINGEN.

Royal Society of Sciences.—The *Nachrichten* from January 18 to April 12 contain the following papers of scientific interest:—

January 18.—E. Riecke: Thermodynamics of tourmaline, and the mechanical theory of muscular contraction; a criticism of Müller's hypothesis. H. Weber: Researches in the theory of numbers in the domain of elliptic functions, I.

January 25.—A. Peter: Contributions to our knowledge of the *Hieracea* of Eastern Europe. I. The *Piloselloidea* of the Moscow district. P. Drude: The relation of the dielectric constants to indices of refraction. The following theorem is obtained: "The difference between the dielectric constant and the square of the refractive index is equal to the sum of the polarisation-constants of the molecular groups whose free vibrations lie in the ultra-red." W. Voigt: Observations on the torsional rigidity of rocksalt prisms. W. Voigt: Observations on the tensile strength of rock crystal and fluorspar. F. Klein: The composition of binary quadratic forms. H. Weber: On the theory of invariants. D. Hilbert: On the transcendency of the numbers e and π.

February 8.—E. Ritter: Automorphic algebraic forms of arbitrary species.

AMSTERDAM.

Royal Academy of Sciences, June 24.—Prof. van de Sande Bakhuyzen in the chair.—Mr. Kamerlingh Onnes gives the results of some experiments made in the Leyden Laboratory (1) by Dr. Kuenen, on the surface of v. d. Waals for mixtures. One of the phases observed by Wroblewski in compressing air with CO_2, and by Prof. Dewar in compressing CS_2 with CO_2 is due to insufficient mixing. (2) By Dr. Siertsema, on the magneto-optic dispersion of oxygen. The apparatus used is like that of Kundt and Röntgen, but the polariser and analyser are Nicols', and the coil is magnetised by a dynamo of 8 h.p. The magnetic rotation of the plane of polarisation diminishes regularly as the wave-length increases.—Mr. J. A. C. Oudemans communicated some remarks concerning Sir John Herschel's second method of calculating the most probable orbit of a binary star, (Mems. of the R.A.S., vol. xviii.). The apparent orbit is here determined analytically by applying the method of least squares to the solution of the equations

$$\alpha x + \beta y + \gamma x^2 + \delta xy + \epsilon y^2 + 1 = 0,$$

where α, β, γ, δ, ϵ are the unknown quantities, x, y the co-ordinates given by the normal places. Sir John gave these equations equal weights, whereas the speaker proved that the weight of each equation $= p = \frac{1}{P^2 + Q^2}$, P being $= \alpha + 2\gamma x + \delta y$, and $Q = \beta + \delta x + 2\epsilon y$. In the example given by Sir John (the orbit of γ Virginis) p varies from the single to the treble. If the weight of a normal place is estimated, from other considerations (*i.e.* the power of the telescopes, the number of observations, &c.), $= p'$, the weight of the corresponding equation is to be taken $= pp'$. Mr. Franchimont asserts the possibility that glucose, being aldehyde and alcohol together, would, by the known interaction of these two functions, *i.e.* an addition, give in some circumstances derivatives of a tautomeric form, an oxide, whenever this does not exist in the free state. In such a tautomeric form (the most probable is 1·2) there is one asymmetric carbon atom more than in the aldehydic form, and he inclines to consider the two pentacetates as the stereoisomeric derivatives of this carbon atom. The two pentacetates (also the tetracetate chloride of Colley and the pentabenzoate of Skraup) have no properties of aldehyde, neither of alcohol. They cannot be compared with oxides, such as ethylenic-oxide. nor with the lactones (olides). They differ in melting-point, solubility, and optical activity. Both are dextro-rotatory, but the power of rotation of the one is very small, that of the other very great. In association with Mr. Lobry de Bruyn he could not find any difference in the chemical behaviour, so that no reason exists to admit that they are structural isomeric. With ammonia they seem to produce acetamide and the same product that is given by glucose itself, isomeric with glucosamine and isoglucosamine. The pentacetate with the higher melting-point can be transformed in that with the lower by heating with zinc-chloride, the presence of a solvent as xylene being favourable but not necessary. The above considerations on the tautomeric form of glucose can be applied on other aldols (olals) and throw new light on their peculiar behaviour in some circumstances.

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