his brother had had in Germany, and the fee was 47*l*. 13*s*. 9*d*. for a year. The explanation is given by the secretary of the London college, who pointed out in a letter to Mr. Holzapfel that "the continental colleges are endowed by the State, but in England they have to live on the fees of students for the most part, with a very small grant from the State in some cases and what they can raise voluntarily from the public." But it is evident that while the highest form of instruction in science can be obtained at so small a cost, there will never be a lack of properly trained men to look after the manufactures of Germany.

FULL particulars have now been published of the first annual conference of persons in the north of England concerned in primary, secondary, technical and other forms of higher education, which was announced in our issue for July 17. The conference will be divided into four sessions— two meetings on each· of the days January 2 and 3, 1903—presided over respectively by Mr. M. E. Sadler, director of special inquiries to the Board of Education ; Prof. H. E. Armstrong, F.R.S., Prof. Smithells, F.R.S., and Prof. L. C. Miall, F.R.S. There will be a reception by the Lord Mayor of Manchester of members of the conference on January 2, in the Municipal School of Technology, Manchester, where the meetings will be held, after which various papers will be read. Miss S. A. Burstall, head mistress of the Manchester High School for Girls, will take up the subject of the curriculum in different types of schools. Dr. Kimmins, at the afternoon meeting of the first day, deals with the coordination and delimitation of science teaching in various grades of schools. The methods of teaching experimental science in its early stages will be discussed on the morning of January 3, Mr. W. French, principal of the Storey Institute, Lancaster, taking up physics, and Mr. R. L. Taylor, of the Central School, Manchester, considering chemistry. At the last meeting, Mr. H. W. T. Wager will introduce the subject of methods of nature-study. Great care has been taken to encourage discussion at each meeting ; the names of well known teachers are included in the programme as having promised to contribute to the debates. In connection with the conference, there will be an exhibition of apparatus, preparations and diagrams, such as teachers themselves have prepared or which pupils have made, to illustrate methods of nature-study and the teaching of experimental science. A class-room, fitted up as a model of what it is desired should be provided for the teaching of physics and chemistry in their early stages, will form part of the exhibition. The admission to the conference will be free, by ticket, to be obtained from the honorary secretaries, Dr. H. Lloyd Snape, Director of Education to the Lancashire County Council, and Mr. J. H. Reynolds, Director of Technical Instruction for the city of Manchester and principal of the Manchester Municipal Technical School, which is the office of the conference.

SCIENTIFIC SERIALS.

Transactions of the American Mathematical Society, vol. iii. No. 4 (October).—G. A. Miller, on the groups of order p^m which contain operators of order p^{m-2}. It appears that if $p > 2$ and $m > 5$, there are two and only two such groups not containing either an invariant cyclic subgroup of order p^{m-2} or else an abelian subgroup of type $(m-2, 1)$. These two groups are conformal respectively with the abelian groups of type $(m-2, 2)$ and of type $(m-2, 1, 1)$.—C. A. Scott, (1) on the circuits of plane curves ; (2) on the real inflexions of plane curves.—J. Hadamard, on the theory of plane elastic plates.—E. J. Wilczynski, covariants of systems of differential equations, and applications to the theory of ruled surfaces. The system considered is $y'' + p_{11}y' + p_{12}z' + q_{11}y + q_{12}z = 0$ and another similar equation with z'' for y''. All covariants can be expressed in terms of three, together with invariants.—A. S. Gale, on the rank, order and class of algebraic minimum curves.—H. F. Blichfeldt, on the determination of the distance between two points in space of m dimensions. Without assuming the continuity and independence of the coordinates, but assuming that distance-relations exist, a series of axioms is laid down and possible forms deduced for the analytical expression for the distance between two points.—H. Maschke, on superosculating quadric surfaces.—E. H. Moore, a definition of abstract groups. —A. Emch, algebraic transformations of a complex variable realised by linkages.

American Journal of Mathematics, vol. xxiv. No. 4 (October). —M. Bôcher, on systems of linear differential equations of the first order. This contains proofs of some existence-theorems by a method of successive approximation.—T. M. Putnam, on the quaternary linear homogeneous group and the ternary linear fractional group. The determinant being unity, and the group being symbolised by substitutions, the canonical forms of the generators fall into eleven principal types, with various subdivisions. The periods of the substitutions are considered, and different commutative subgroups investigated.—A. N. Whitehead, on cardinal numbers. The results of this paper are all expressed in Peano's symbolism, on which there is an introductory section.—G. A. Miller, on a method of constructing all the groups of order p^m (p being any prime).—H. F. Stecker, non-Euclidean properties of plane cubics and of their first and second polars. This is a continuation of a former paper in vol. xxii. of the same journal.

Annals of Mathematics (2) vol. iv. No. 1. (October).—G. A. Bliss, on the geodesic lines on the anchor-ring. The author obtains explicit formulæ, involving elliptic functions, which define a doubly infinite family of geodesics. He also shows that, according to Mangoldt's classification, the points on the inner equator are of the first kind and all others of the second kind. Good illustrative diagrams are given.—H. F. Blickfeldt, proof of a theorem concerning isosceles triangles.—L. E. Dickson, an elementary exposition of Frobenius's theory of group-characters and group-determinants.—E. V. Huntington, on Mr. Ransom's mechanical construction of conics.

SOCIETIES AND ACADEMIES.
LONDON.

Chemical Society, November 19.—Dr. J. Emerson Reynolds V.P.R.S., president, in the chair.—The "dynamic isomerism" of thiourea and ammonium thiocyanate. When the ammonium salt is heated, there is formed a definite compound of this with 25 per cent. of thiourea formed from it ; further, melting-point curves of mixtures of these two substances show that other molecular combinations occur.—Isomeric partially racemic salts containing quinquevalent nitrogen ; part 8, resolution of the hydrindamine camphor sulphonates, by Dr. F. S. Kipping. The author has confirmed the theory proposed by him in 1899 to account for the existence of these salts by the resolution of the partially racemic salt into four isomerides.—The oxime of mesoxamide and some allied compounds, by M. A. Whiteley. A description of the disubstituted derivatives of mesoxamide, all of which possess the characteristic properties of furnishing yellow alkali salts and purple ferrous compounds.—Interaction of ketones and aldehydes with acid chlorides, by F. H. Lees. When methyl *n*-nonylketone is acted upon by benzoyl chloride, there is formed β-benzoxyundecylene ; this reaction has been extended to other ketones, and a series of benzoxyolefines so produced.—The synthesis of aa-dimethylglutaric acid, hydroxy-aa dimethylglutaric acid, and of the *cis*- and *trans*-modifications of aa-dimethylglutaconic acid, by Dr. W. H. Perkin and A. E. Smith.—A reaction of some phenolic colouring matters, by A. G. Perkin and C. R. Wilson. Potassium derivatives of a number of naturally occurring colouring matters have been prepared by interaction with potassium acetate.—Note on mixtures of constant boiling point, by Dr. S. Young. The composition of the mixture of carbon tetrachloride and methyl alcohol having the minimum boiling point is shown to contain 80 per cent. of the former.—The vapour pressures and boiling points of mixed liquids, part 2, by Dr. S. Young and E. C. Fortey. Part 3, by Dr. S. Young. An investigation of the formula proposed by the authors expressing the relation between the vapour pressure of the mixture and those of its constituents. Note on the condensation points of the thorium and radium emanations, by E. Rutherford and F. Soddy. When the emanations from thorium and radium compounds are passed through a copper spiral immersed in liquid air, they are condensed and retained in the copper tube and are volatilised when the temperature is raised to $-125°$ in the case of thorium emanation and to $-130°$ in the case of radium.—Note on the action of barium hydroxide on dimethylvioluric acid, by M. A. Whiteley. The principal product of this action is isonitrosomalondimethyl-amide.—The determination of strychnine and brucine in nux vomica, by E. Dowzard. The brucine is determined by colorimetric estimation of the tint produced by the solution of the alkaloidal residue in nitric acid.