

Mr. H. O. Forbes's Discoveries in the Chatham Islands.

REFERRING to my former note (*supra*, p. 101) I cannot find that I have been guilty of even "a slight confusion of dates," as Mr. Forbes says (*supra*, p. 126). On his last visit to Cambridge he told me he had forgotten the name I had before written, and asked me to renew my suggestion. I thank him for the kind terms in which he speaks of me, but I must be allowed to disclaim the opinion "that the Chatham Island form was nearer to *Aphanapteryx* than the latter was to *Erythromachus*."

ALFRED NEWTON.

Magdalene College, Cambridge, June 10.

Linnean Society Procedure.

AT the anniversary meeting of the Linnean Society complaint was made that the attendances at the evening meetings were greatly falling off, and fellows were urged to remedy this. The bad attendance is, I think, largely attributable to the lamentably unbusinesslike routine into which the Society's proceedings have fallen, and is not likely to be remedied until *that* is first remedied. Permit me to indicate what appear to me four primary defects in the Society's proceedings.

(1) The actual scientific business of the evening is frequently disposed of in an hour; so that fellows, who attend, sacrifice their evening for very inadequate reward.

(2) In the agenda no intimation is given as to whether the papers to be read will be *really read* by their authors, or whether merely a few sentences will be rattled through by the secretary in order that the paper can be marked as "read." It may thus happen that fellows who attend specially to hear some particular paper read and *discussed* get nothing for their pains. For instance, a short time since, some of us came up specially to hear a paper by Dr. Plowright on the *Acidiomycetes*, but instead of being treated to a biological paper, followed by a discussion, all that we heard was a few sentences from the introduction read by the secretary! Naturally this sort of thing militates against regular attendances.

(3) Even when an important paper is intended to be read, it may not be reached at all, or if reached may be hurried over and not discussed for want of time. Why is this? Simply because the Society allows "exhibitions" to be intercalated between the formal business and the papers. These exhibitions are often of much interest, often, again, very trivial, but anyhow are quite secondary in importance to the papers, and clearly should be deferred *until the papers* have been disposed of, instead of taking precedence. These exhibitions are not advertised in the diaries of Societies; and it is rather hard that fellows, who have attended to hear an important paper on some new discovery, should go away disappointed because some inconsiderate visitor possibly is allowed to prose about a trifling exhibition for half an hour!

(4) A very grave defect is the confusion of heterogeneous subjects in one evening. If, for instance, alternate meetings were devoted entirely to botanical and zoological papers respectively, probably the attendances would be increased; but the botanists cannot be expected to display much interest in a new genus of earthworms, nor the zoologists in a monograph of *Dianthus*.

If the Council could see their way to adopting these simple reforms that I have suggested, I believe that the attendances would be much increased.

F. H. P. C.

THE GERMAN MATHEMATICAL ASSOCIATION.¹

THIS is the Catalogue of the Exhibition that was to have been held last year in the picturesque old town of Nürnberg; but in consequence of the state of health in Germany, the meeting of the German Mathematical Association and the exhibition were postponed; and they are now to be carried out this year at Munich, in the month of September.

The last exhibition of a similar kind was that held in London in 1876, the catalogue of which shows that a large collection of apparatus, much of it of a great historical interest, was brought together.

¹ "Catalogue of Mathematical and Mathematico-physical Models, Apparatus, and Instruments." Edited, in conjunction with numerous colleagues, by Walther Dyck. Munich, 1892.

In the present collection the objects of historical interest are comparatively few in number; but, on the other hand, the various models and apparatus intended to illustrate mathematical principles and ideas show what great advances have been made in this branch, so much neglected in our own country.

Prof. Armstrong has recently described in these columns the superiority of the systematic manner in which chemical science is carried out in Germany; and the present Catalogue will show how much we have to learn in the principles of object teaching and illustration in Mathematics.

The Catalogue is divided into two parts. The first part consists of a collection of short and interesting articles.

I. "Geometrical enumeration of the real roots of algebraical equations," by F. Klein, in connection with which No. 47, the plaster model of Sylvester's Amphigenous Surface (constructed by Prof. Henrici) for showing the relations for a quintic equation, may be considered.

II. "Equidistant curve-systems on surfaces," by A. Voss.

III. "Elementary discrimination of singularities of algebraical curves," by A. Brill; illustrated by instructive diagrams.

IV. "On the constructive postulates of geometry of space, in their relation to the methods of descriptive geometry," by G. Hauck; an article of great interest to students of Euclid's axioms, and of their modern developments.

V. "Historical studies on the organic description of plane curves, from the earliest times to the end of the eighteenth century," by A. v. Braunmühl; in this article the mechanical methods of the construction of curves, which are perpetually being re-invented, are traced back to their original sources, with interesting historical references.

VI. "On the methods of theoretical Physics," by L. Boltzmann, is a humorous article, describing the former antiquated methods of teaching Natural Philosophy in Germany, apparently not very different to what many of us remember in this country, until Maxwell's vivifying influence made itself felt.

Prof. Boltzmann gives with wonderful clearness Maxwell's ideas about the use of models in Physics; contrasting the views introduced by him with those held before. This article of Prof. Boltzmann is in course of translation and publication by the Physical Society.

VII. "Mechanical integration," by A. Amsler; this gives a complete account of the theoretical principles which underlie the action of Planimeters; it is illustrated with carefully-drawn diagrams.

VIII. "Instruments for Harmonic Analysis," by O. Henrici.

The Catalogue proper begins with the second part; this again is divided into three sections.

The first section contains instruments relating to Arithmetic, Algebra, Theory of Functions, and Integral Calculus, such as Arithmometers, of which the collection and illustrations appear very complete; Galton's Quicunx, illustrating the laws of probability of error; instruments for the solution of equations, Galton's Trace-computer, models of Riemann sheets by Prof. Schwarz, of functions of a complex variable by Prof. Dyck, and a very complete and profusely illustrated collection of Planimeters and Harmonic Analysers of all descriptions. The Rev. F. Bashforth's pioneering description of a Harmonic Analyser, read before the British Association in 1845, deserves especial attention. The elegant little planimeter of Messrs. Hine and Robertson, of New York, might well find a place in the exhibition. In this instrument the record of area is made by the sidelong movement of a sharp-edged wheel

on its axle, and not by the rolling motion, so that all slipping of the wheel on the paper is done away with.

The great number of slide-rules is surprising. Mr. Stanley alone has sent more than a dozen.

Among the Arithmometers is the circular form of Mr. Edmondson, and one of great novelty by Prof. Selling, in which the *carrying* is performed continuously and without jerks. The instrument works in consequence with great smoothness and rapidity.

The same section contains instruments and models referring to Geometry, such as angle dividers, ellipsographs, Galton's pantograph, and several perspectographs. Pepys writes in his diary, April 30, 1669:—"This morning I did visit Mr. Oldenburgh, and did see the instrument for perspective made by Dr. Wren, of which I have one making by Browne; and the sight of this do please me mightily." If this instrument can be found it would be welcome at Munich; perhaps Mr. Penrose could help in this matter.

The models for instruction in elementary geometry are very complete, and there are interesting illustrations of polyhedra and space dissection, the subject to which Prof. Alexander Herschel has devoted considerable attention. No. 150 is a collection of six tables on the "Lines of Beauty," to which Hogarth gave great attention; this exhibit should be of interest to artists.

Under the head of Algebraical Surfaces we find among familiar models a pair of Prof. Henrici's confocal deformable hyperboloids, constructed of a number of straight sticks, tied together at the crossings. Darboux's application of these linked bars to the description of spheres and planes, and the mechanical illustration of the motion of a body under no forces, *à la Poinsot*, noted on p. 327 of the Catalogue, may be instanced here.

The plaster models of the confocal quadric surfaces designed and carried out by Prof. H. A. Schwarz and E. R. Neovius with mathematical accuracy should now form part of the apparatus of every teacher of solid geometry; the complete series are obtainable for a moderate price through Brill, of Darmstadt.

Surfaces of the third, fourth, and higher degree, Kummer's and Steiner's surfaces, minimum and deformable surfaces, and others too numerous to mention here, are profusely illustrated in the catalogue.

Prof. Dyck's models of surfaces representing the real and imaginary parts of a function of a complex variable at and near a singular value should be studied by every reader of Mr. Forsyth's new book on the Theory of Functions. Of the curious complexity of even the simplest kinds of *essential singularities* a clearer idea is obtained by a glance at these models than by a long study of the analytical expressions.

The third section is devoted to Applied Mathematics, including Mechanics, Mathematical Physics, and instruments required in geodesy and navigation.

The mechanical models illustrate the parallelogram of forces; the laws of falling bodies, including an arrangement exhibited by Mr. F. R. Barrell of University College, Bristol; models of Saint Venant's torsion prisms, and so forth.

Mr. A. B. Kempe has supplied a complete account of his Linkages; and Prof. Reuleaux's well-known collection of kinematical models is profusely illustrated here.

In mathematical physics we find apparatus for the illustration of wave motion and sound vibrations, refraction of light, interference, Mr. Boys's bullet photographs, and Mr. Bashforth's chronograph. Prof. Alexander Herschel's models are given under the head of models of crystalline structure.

Under thermodynamics are found the thermodynamic surfaces of Gibbs and Van der Waals; and Profs. Oliver Lodge and Fitzgerald exhibit their mechanical illustrations of the laws of electro-dynamical action.

Some interesting apparatus are described and illustrated in the last section on geodetic, nautical, and meteorological instruments, including General Strachey's apparatus for the determination of the height and velocity of the clouds.

It would be impossible to give within reasonable limits a detailed account of all the novel and interesting objects described in this catalogue; but it is hoped that the present short sketch will show that the catalogue itself, apart from the exhibition, is a valuable work of reference, which should be in the hands of all interested in mathematical and mathematico-physical science.

It is expected that the postponement of the meeting to the coming September will give time for the collection of other objects of interest, which can be described and catalogued in an appendix.

A fresh manifesto has been issued by the German Mathematical Association inviting further contributions. Intending exhibitors in this country requiring information and advice, and instructions concerning packing and transport of instruments, are requested to communicate with:—

Prof. O. Henrici, Central Institution, Exhibition Road, W.; or Prof. A. G. Greenhill, Artillery College, Woolwich.

At the meeting of the Deutsche Mathematiker-Vereinigung at Halle, it was concluded to arrange for an exhibition of models, drawings, apparatus, and instruments, used in pure and applied mathematics, for the occasion of the proposed conference in Nürnberg in the autumn of 1892.

The proposal enjoyed, from the beginning, the support of the Royal Bavarian Government, by which, through special material assistance, as by increased funds which the Imperial Ministry of the Interior liberally provided, the undertaking was assured.

The proposal of the undertaking was received with universal interest in scientific circles, and so the plan of the exhibition seems to be a natural one. A large number of mathematical, physical, mechanical, and geodetic institutes of our own universities and technic high schools, and those outside of Germany, placed the models in the institutes, as well as those of historical interest, to the disposal of the project. Announcements of participation were received from museums, private collections, and individual men of science, at home and abroad.

Besides Germany, America, France, Italy, Austria-Hungary, Holland, Norway, Russia, and Switzerland joined in the project, and especially in Great Britain a committee was composed, with Profs. Lord Kelvin, Greenhill, and Henrici at the head, to send to the exhibition the most prominent articles from the Government, as well as from private collections. Practically all the more important mechanical workshops that are particularly engaged in the production of mathematical apparatus and instruments, and also publishing-houses interested, agreed to share in the scheme.

All initial steps were taken and preparations made. An extensive catalogue was compiled, through the cooperation of numerous men of science, with a minute description and numerous illustrations of the particular objects, together with a series of comprehensive sketches of its contents; this shows to what extent the various preparations were made.

The condition of the public health of Germany made the postponement of the meeting of the Deutsche Mathematiker-Vereinigung, and consequently the exhibition, which was almost in readiness, inevitable. The directors of the Deutsche Mathematiker-Vereinigung, however, at once concluded to realise their project in 1893.

In Munich, the place selected for the next meeting of the Deutsche Mathematiker-Vereinigung, the extensive rooms of the Polytechnic have already been kindly placed at the disposal of the directors. On account of the proportions that the exhibition has assumed, it will last longer than at first proposed. It will be open from September 1 to 30, as the session of the Mathematical Society, which lasts from September 4 to 10, will be immediately followed by that of the Society of Natural Science in Nürnberg, from September 11 to 15.

In this case, too, we rejoice in the support of the Royal Government, and hearty assurances of intentions to participate in the exhibition have been given by various scientific circles.

Again, therefore, and with confidence, do we turn to our fellow scientific men, to the various mathematical institutes in

this and other countries, to publishing-houses and mechanical workshops, with the wish that, through their hearty cooperation, the project may be furthered. We add the plan and more minute information, for the successful realisation of the exhibition.

The exhibition lasts from September 1 to 30, 1893, inclusive, and comprises models, drawings, apparatus, and instruments used in pure and applied mathematics, either for purposes of instruction or investigation.¹

The Deutsche Mathematiker-Vereinigung will take charge (free of cost) of the fitting of the rooms, the providing of tables, putting in of partitions, &c., as well as the unpacking and re-packing of all articles intended for the exhibition. Moreover, the society will assume control of the articles while on exhibition, and will take particular care to preserve them, and will carry an insurance against fire. However, it can assume no responsibility against injury or loss.

Exhibitors who desire their various displays to be exhibited under closed cases must provide them at their own expense.

The expense of shipment to Munich, and, if desired, insurance, must be borne by the exhibitor. For the return the same inducements are held out as last year, viz. free freight over the chief German lines.

A comprehensive detailed catalogue of the mathematical exhibition, according to the announcement made last year, has appeared.²

The first part (142 pages) contains a number of essays, of general nature, having reference to problems, results, and methods of presenting geometrical concepts.

The second part (300 pages) contains, according to the suggestion given below, the enumeration and exact description of the articles intended for the Nürnberg exhibition, and gives, with numerous illustrations, a comprehensive view of the general plan of the undertaking, and a statement of what has already been accomplished.

The catalogue will also give the plan of the preparations of the present year; a detailed supplement will be added, in which we hope to perfect the non-completed parts of last year's catalogue.

As far as possible all technical explanations of the articles will be undertaken by the committee.

The committee will attend to all sales and buyings (which are in view by various mathematical institutes of our Hochschulen), and give all desired information.

During the exhibition the sold articles must not be removed from the exhibition rooms, except with special permission of the committee.

The intention to participate in the exhibition may be given by the use of the "Exhibition Announcement" until July 1.

Address: "Herrn Prof. Dr. Walther Dyck,
München, Polytechnicum."

At the same time all papers and scientific notices for the catalogue respecting woodcuts (clichés) for illustration must be sent to the same address.

The editors reserve the right of all abbreviation and change in the notes of Part II. of the catalogue that uniformity may require.

All articles proposed for exhibition must be forwarded from August 15 to 31 under the address: "Mathematische Ausstellung in München (Polytechnicum) zu Handen Herrn Prof. Dr. W. Dyck."

The return of all articles will be effected within two weeks after the close of the exhibition.

In order to more minutely define the extent of the exhibition, we give, in accordance with the arrangement of the catalogue which has already appeared, the following division of groups:—

I.—ANALYSIS.

Calculating apparatus (calculating machines, slide rules); apparatus for the solution of equations and construction of functional relations; models and drawings in algebra and theory of functions; curvometers, planimeters; other instruments for mechanical integration.

¹ From the field of applied mathematics only those models, apparatus, &c., will be accepted whose chief interest lies in the field of pure mathematics.

² The catalogue can be obtained direct from Prof. W. Dyck (München, Polytechnicum) at the price of M. 9.80 (including postage).

II.—GEOMETRY.

Drawing apparatus; models for elementary instruction in plane and solid geometry, trigonometry, and descriptive geometry; polyhedra (division of surfaces and spaces in polygons and polyhedra); analysis situs; plane curves; algebraic surfaces; transcendental surfaces; curves in space and developable surfaces; models in line geometry; models to illustrate theory of curvature; singularities of curves and surfaces.

III — APPLIED MATHEMATICS.

Mechanics.

Models used in elementary instruction; apparatus and models for the demonstration of the laws and principles of dynamics (equilibrium and movement of a material point; Poinsot motion of a rigid body; apparatus for representing precession and nutation; dynamical tops; gyroscopes; models and articles showing the effect of tension, compression, flexion and torsion of solids; representation of various phenomena in hydro-dynamics); models and apparatus in kinematics with regard to their application in practice.

Mathematical Physics.

Apparatus and models to illustrate the laws of the propagation of waves; models for the explanation of crystal structure; models to illustrate the optical, elastic, and electric properties of crystals; drawings and models in thermodynamics; models and apparatus for the mechanical illustration of electro-dynamic phenomena.

Various Technical Applications.

It is to be understood that exhibitors must declare their willingness to submit to the present rules and further dispositions ordered by the committee for the interest of the exhibition.

For all further information please address the undersigned delegate of the committee. PROF. DR. WALTHER DYCK.

RELATIONS BETWEEN THE SURFACE-TENSION AND RELATIVE CONTAMINATION OF WATER SURFACES.

IN a recent paper (NATURE, vol. xvi, p. 419) I have suggested a method for measuring the relative contamination of an anomalous water-surface in my adjustable trough without fearing an error caused by incomplete separation of the surfaces by the partition. It consists in observing not the displacement of the partition itself, but that of a floating wire laid across the surface, which follows every motion of the superficial water particles.

By this method I have now tried to find a relation between the relative contamination and the decrease of tension which begins at that relative contamination, which we will call unit.

The surface-tension was measured by the separating weight of a ring of thin wire, which had a circumference of 114 mm. and was cleaned by ignition, so that it could be afterwards entirely moistened with water. The ring was attached to a balance with a sliding weight. In this manner the normal surface-tension of water was determined to be 80 mg. per cm. at a temperature of 15° C. The values obtained by experimenters on this subject differing considerably from each other, I shall express the tensions not in absolute measure, but in fractions of the normal surface-tension of water taken as unit. Thus, I found the surface-tension of a saturated solution of camphor 0.72, and that of a strong solution of soap 0.37.

On several occasions, when fast working was required, the tension was not observed directly with the wire-ring, but with the small balance used in my former experiments, the tension corresponding to each separating weight being previously determined by comparison with the large balance.

The observations were made as follows:—A slight trace of oil was communicated to the surface of the trough by