

and upon it a soap-bubble blown from a pipe was thrown; the bubble was caught by the film, and held suspended midway or along the equator of the thin hollow sphere. The bubbles were then forced through and drawn through without rupture of the films. An orange was dropped, and glass rods and other solid objects, with wetted surfaces, were passed in like manner without rupture of the films.

The three experiments by Mr. Cromwell F. Varley were exhibited for the first time in public. Two of them were in illustration of some investigations into the nature of electric discharges through gaseous media, described in a paper read before the society in January. In a Geissler's tube, containing highly rarefied hydrogen, a small filament of talc was hung by a single horizontal fibre of silk. Two aluminium rings, separated an inch and a quarter, formed the electrodes inside the vacuum. This tube was placed longitudinally with and over the horizontal poles of a large very powerful iron horse-shoe electromagnet, made of a bar four inches in diameter and four feet in length, and wrapped with nearly 2 cwt. of thick copper-wire. A small induction coil sent electric discharges from one ring to the other, producing a brilliant blue light around the negative pole, the positive pole being dark. The moment the magnet was charged, by means of thirty cells of Grove's nitric acid battery, each cell containing twenty square inches of platinum foil, the electric luminosity in the tube, which beforehand was diffused, gathered up into an arch extending one and a half inches beyond each ring, forming altogether a well-defined arch about four inches in length. This luminous arch follows exactly the course of those magnetic rays which traverse through the negative pole. By shifting the tube the piece of talc can be brought at pleasure in or out of this luminous arch. Neither the electric action nor the magnet *per se* produce any motion upon the talc; but when the tube is so placed that the luminous arch strikes against the talc the talc is repelled as much as 30° from the perpendicular. The electric current is passing simply from one ring to the other inside the tube, but the luminous arch in question where it strikes the talc is on the other side of the ring and where no electricity is flowing.

Mr. Spottiswoode's musical vibration experiment consisted of the visible representation of the forms actually assumed by a musical string when producing a note or its harmonies. To show this it is required that the string should be kept in a perfectly uniform state of vibration. This was very ingeniously accomplished by means of tuning forks kept in vibration by electro-magnets, these forming their own breaks in cups of mercury.

The singular action of nuclei in promoting crystallisation has long been known, but recent experiments by Mr. Chandler Roberts, chemist of the Mint, have imparted additional interest to the subject. Minute traces of lead, antimony, bismuth, or arsenic, render the alloy of gold and copper known as "standard gold" crystalline, intensely brittle, and totally unfit for the purpose of coining. This remarkable effect is produced even when the amount of obnoxious metal does not exceed the $\frac{1}{1000}$ part of the mass of standard gold. Mr. Roberts exhibited beautiful specimens of crystalline standard gold and illustrations of the process of toughening brittle gold by means of chlorine recently introduced in the Mint, the adoption of which has afforded a satisfactory solution to a question of considerable importance connected with the manufacture of coins.

SCIENTIFIC SERIALS

THE *Mittheilungen der naturforschenden Gesellschaft in Bern* for 1869, published last year, contain many important papers.—M. E. Schär publishes a valuable contribution to the knowledge of some cyanogen compounds, and a memoir of considerable length on peroxide of hydrogen, and its relations to ferments.—M. A. Gruner communicates a short but interesting paper on the luminosity of the so-called "touchwood," in which he details several experiments, and comes to the conclusion that ozone is to be regarded as the principal cause of the phenomenon.—In geology we find some valuable memoirs by M. C. von Fischer-Ooster, especially a paper on the Rhætic stage in the neighbourhood of Thun, which includes an account of the beds, and a list of the fossils occurring in them, with descriptions of some new species, and many figures. The same author also contributes several smaller papers on the occurrence of a Liassic zone between the chain of the Moleson and the Miremont in the Canton of Freiberg, on the narrow Flysch zone from the Hongrin towards Jaun, on the geological age of the so-called Tavigliana Sandstone, and on the stratigraphical conditions near the Küblisbad.—M. J. Bachmann publishes some remarks in

opposition to M. Renevier's geological observations on the Alps of Central Switzerland compared with the Vaudoise Alps, and M. A. Rytz a notice on the erratic formations in the Kanderthal.—M. Theophil Studer notices the occurrence of Foraminifera in the Alpine chalks, detected by the examination of thin slices, and also describes a new Swiss form of the genus *Tropidonotus*, for which, however, he does not venture to propose a specific name.—Dr. R. Henzi reports upon the attempts made by him to cultivate *Saturnia Mylitta* and *S. yama maya*, and M. G. Hasler describes and figures an apparatus for giving telegraphic intimation of the height of water in reservoirs, &c.—The Proceedings of the society also contain short notices upon various subjects.

THE *Atti della R. Accademia delle Scienze di Torino* for the first six months of the year 1870 (vol. v. parts 3—7) contains numerous papers on various branches of science, but principally on subjects connected with physics. Of zoological memoirs we have a notice of some new and little-known species of birds collected on the voyage of the *Magenta* by MM. Giglioli and Salvadori, the new species being *Acridotheres leucocephalus* and *Leptoptila chlorauchenia*; a paper by Dr. Giglioli on the phosphorescence of the sea, with notices of the various animals observed by him to be luminous, and descriptions of two new species of the genus *Noctiluca* (*N. omogenea* and *N. pacifica*); descriptions of new species of birds by M. Salvadori, namely, *Saxicola allo-marginata* from the Sahara, *S. Brehmii* from Nubia and Abyssinia, *Brachypus arostictus* from the Philippines, and the type of a new genus allied to *Malacopteron*, *Homochlamys luscina* (Finsch MS.) from the Philippines or China; and a critical revision of Antinori's descriptive catalogues of birds collected by him in North Central Africa.—M. Cavalli, in a memoir on a gunpowder uninjurious to cannon, maintains the superiority of large grains, especially if made spherical and more regular and hardened at the surface.—A new form of mercurial barometer is described by M. Faà di Bruno, and the barometric formula of Count Paolo de Saint-Robert is discussed by Prof. Dorna, who also presents what he calls a loghypsometrical table for use in applying the barometric formula worked out by him in the determination of altitudes.—Prof. Govi describes a new method of obtaining sensitive flames, consisting in the application of a wire net with meshes about one millim. square to an ordinary gas jet, and lighting the gas after its passage through the meshes. The same author also publishes a note on the influence of sonorous vibrations upon cold and ignited gas jets.—Prof. Boccardo notices the fall of an earthy shower at Genoa on the 14th February, 1870. He gives an analysis of the material, which consisted chiefly of sand with oxide of iron and carbonate of lime, and contained 6.611 per cent. of nitrogenous organic matter. Under the microscope, it was found to contain frustules of Diatomaceæ and fragments of other simple Algæ. No windstorm had occurred immediately before the fall of the shower, which the author considers to have probably come from Egypt.—Prof. Dorna has a note on the scientific importance of Soperga and the Sacra di San Michele to the Observatory of Turin, and upon their respective differences of level.—M. Richelmy communicates some notes on the construction and operation of toothed wheels.—In a paper on nitroglycerine, nitromannite, and pyroxyline, Prof. Sombrero vindicates his title to be regarded as the discoverer of the first of these compounds, and notices the properties and mode of preparation of the other two. M. L. F. Menabrea furnishes some explanations of his views on the principles of elasticity, which are disputed by MM. A. Parodi and G. Barsotti. M. Codazza describes an apparatus devised by him to act as an electrical indicator to give notice of the attainment of the maximum or minimum limits of temperature between which it is required to keep any substance. Prof. Denza describes an aurora borealis observed in Piedmont on the 5th April 1870.—Prof. Govi indicates that Thenevot was the inventor of the spirit-level with a bubble of air. The same author communicates a paper by Prof. Chiò on a barometric formula.—M. Gastaldi notices a collection of stone weapons and instruments from the neighbourhood of the Baltic, and also some ancient weapons and instruments of stone, bronze, or brass, from Egypt. Several of these are figured; one of them, a long, chisel-shaped, bronze instrument, is attached obliquely to a mallet-shaped handle, in such a manner as to serve as a small axe.—Prof. Luvini publishes a long paper on the adhesion between solids and liquids.—M. Genocchi notices some papers ascribed to A. Cauchy.—Prof. Dorna describes the instruments and methods employed at the Observatory of Turin for the measurement of time.—M. A.

Gras communicates a paper on some botanical synonyms. The plants referred to in the last-mentioned paper are *Lindernia palustris* Crantz, anterior to *L. pyxidaria* Linn., and identical with *Anagalloides procumbens* Krock.; *Scirpus quinqueflorus* Crantz; *Stellaria graminea* Linn.; *Galeopsis setetum* Neck.; *Euphorbia squieriana* Neck.; and *Statice cordata* Linn., said to be distinct from the species so named by Gussone, which is here noticed as *Statice Gussonii*.

THE Proceedings of the Bohemian Society of Sciences contain several papers by M. Emil Weyr on subjects belonging to the higher mathematics, the titles of which it would be useless to give here. One of his papers, however, is on the curves of maximum and minimum electro-magnetic action.—Dr. A. Grünwald also communicates a paper on some differential equations with variable coefficients, and Prof. Blagek a short notice on the tri-axial ellipsoid. The titles of several natural history papers are given; one by Dr. Schöbl on the termination of the sensitive nerves in newly-discovered terminal corpuscles in the wing membrane of the chiroptera, and on the minute structure of the membrane is printed in full. This paper has appeared with illustrations in Siebold and Kölliker's "Zeitschrift für wissenschaftliche Zoologie."—A short notice is given of a lecture by M. Wocel on the significance of stone and bronze antiquities in the primitive history of the Slavonic tribes, founded on the study of a large collection of casts of such objects from the Ural, Altai, Caucasus, &c.

THE Verein für Erdkunde in Dresden published last year its sixth and seventh annual reports, including its proceedings for the sessions 1868-69, and 1869-70. The abstracts of proceedings contain a multitude of short notes upon the results of travels made by members of the Society, and a report upon the doings of the sections of the Society in furtherance of its objects. Besides these, we have in an appendix three memoirs of some importance, namely, contributions to the knowledge of the Hottentots, by M. T. Hahn, relating especially to the language of the "Nama" tribes, but containing besides much interesting matter; a geographical sketch of the Murray and Darling district in Australia, by Dr. H. Beckler; and a curious contribution to the history of geography during the latter half of the Middle Ages, giving an account of the maps and charts of the seafaring peoples of Southern Europe up to the first printing of Ptolemy's Geography, by M. Heinrich Wuttke.

SOCIETIES AND ACADEMIES

Royal Society, March 9.—"Results of Seven Years' Observations of the Dip and Horizontal Force at Stonyhurst College Observatory, from 1863 to March 1870." By the Rev. S. J. Perry.

The object of the present paper is to bring further evidence to bear upon an important question of terrestrial magnetism.

The existence of a sensible semi-annual inequality in the earth's magnetic elements, dependent on the position of the sun in the ecliptic, was deduced by General Sir Edward Sabine from a discussion in 1863 of a continuous series of the monthly magnetic observations taken at Kew. A previous reduction of observations made at Hobarton and at Toronto had first suggested the idea, and a new confirmation of the results has lately been obtained by Dr. Balfour Stewart from subjecting a second series of Kew observations to the same tests as before. The observations, which form the basis of the present discussion, extend over the period from March 1863 to February 1870, during which time the same instruments have been in constant use. These are a Jones unifilar and a dip-circle by Barrow, both tested at Kew, and a Frodsham chronometer. Sir Edward Sabine, who made the Stonyhurst Observatory one of his magnetic stations in the English survey in 1858, greatly encouraged the undertaking of monthly magnetic observations, and the Rev. A. Weld procured in consequence the instruments still in use. Only occasional observations were made with these instruments for some years, and it was only in 1863 that a continuous series of monthly determinations of the magnetic elements was started by the Rev. W. Sidgreaves. He observed regularly until September 1868, when I returned to my former post at the Observatory, and have continued the same work ever since.

A stone pillar was at first erected for the magnetic instruments in the open garden, and this remained in use from 1858 until the beginning of 1868, when a most convenient hut of glass and wood was built for the instruments in a retired corner of the

College garden. This alteration was rendered necessary from the placing of iron rails in the vicinity of the old pillar; and although it introduces into the results a correction for change of station, it has the great advantage of securing immunity from disturbance for the future.

Considering the object in view in drawing up this reduced form of the dip and horizontal-force observations, I have judged it advisable to adhere strictly to the tabular forms in which the matter has been presented in previous discussions of a similar nature. Each element is the subject matter of these tables. In the first are the monthly values of the element, the deduced mean value, and its secular variation. Next in order comes the calculation of the semi-annual inequality. The residual errors, and consequent probable weights of the observations and results, compose the third and last table.

The yearly mean values of the horizontal force are found to vary progressively from 3.5926 to 3.6178 in British units, the mean for Oct. 1st, 1866, being 3.6034, with a secular acceleration of 0.0042. Calculating from the monthly tables the mean value of the horizontal force for the six months from April to September, and for the semi-annual period from October to March, we find the former to be 0.0005 in excess over the latter, showing that this component of the intensity is greater during the summer than during the winter months. Treating the dip observations in a precisely similar way, we obtain 69° 45' 21" as the mean value of this element for October 1st, 1866, subject to a secular diminution of 1' 49" 2; the extreme yearly means being 69° 48' 47" and 69° 37' 52". The resulting excess of 10" for the winter months in the computed semi-annual means is so small, that the observations tend mainly to show that the effect of the sun's position is not clearly manifested by any decided variation in the dip. Deducing the intensity from the above elements, we obtain for the summer months the value 10.4136, whilst that for the winter months is 10.4128. The intensity of the earth's magnetic force would thus appear to increase with the sun's distance, but the difference is not large enough to have more than a negative weight in the question under discussion. This weight, moreover, is lessened by the slight uncertainty arising from the probable disturbing causes at the first magnetic station.

It is hoped that a second series of observations at the new station will throw greater light on the fact of the sun's influence on terrestrial magnetism, by either confirming the results obtained above, or by adding fresh weight to the conclusions arrived at by the President of the Royal Society.

"Preliminary Notice on the Production of the Olefines from Paraffin by Distillation under Pressure." By Dr. Thorpe and John Young.

"Contributions to the History of the Opium Alkaloids. Part I.—On the Action of Hydrobromic Acid on Codeia." By C. R. A. Wright, D.Sc.

Mathematical Society, March 9.—Mr. W. Spottiswoode, F.R.S., president, in the chair. Mr. C. R. Hodgson, B.A. Lond., was elected a member: and the following gentlemen were proposed for election:—The Hon. J. W. Strutt, Major F. Close, R.A., and Mr. James Stuart, Fellow and Assistant-Tutor of Trinity College, Cambridge. Two models of surfaces were exhibited by Prof. Henrici, which had been exhibited and described at previous meetings of the society. Prof. H. J. S. Smith, F.R.S., read a paper on "Skew cubics." The secretary (Mr. Tucker) then read a communication from Prof. J. Clerk Maxwell, F.R.S., entitled "Remarks on the Mathematical Classification of Physical Quantities." The classification referred to was founded on the mathematical or formal analogy of the different quantities, and not on the matter to which they belong. Thus a finite straight line, or force, or velocity of rotation, &c., are quantities, differing in their physical nature, but agreeing in their mathematical form. The two methods of classification, the one just referred to and the obvious classification founded on that of the sciences in which the quantities occur, may be distinguished by calling the first a mathematical and the second a physical classification of quantities. The secretary afterwards read a "Note on the History of certain Formulæ in Spherical Trigonometry," communicated by Mr. I. Todhunter, F.R.S., in which the formulæ usually known as Gauss' Analogies were claimed for Delambre. Dr. Hirst presented ten "Memoirs by M. Chasles" to the library of the society.

Entomological Society, March 6.—Mr. A. R. Wallace, president, in the chair. Baron de Selys-Longchamps was elected an honorary member, the Rev. T. A. Preston an ordinary