Royal Academical Institution, Belfast. In 1872 he became a student at Queen's College, Belfast, where he succeeded in winning several scholarships and also two Peel Exhibitions, one for general proficiency and the second for mathematics. In 1875 he was elected to an open scholarship at St. Peter's, and in October of that year he graduated B.A. at the Queen's University, subsequently proceeding M.A. On each occasion he obtained a first-class for mathematical science, and was awarded a gold medal. He has won several college prizes during his residence at Cambridge. Mr. Walker is a native of Durham, and was educated at Durham University, of which he is a Fellow, and proceeded to Queen's College in October, 1875. He has been a prizeman of the college for mathematics. Mr. Pearson was educated at University College School, and also under private tuition with the Rev. L. Hensley, of Hitchin. He gained an open scholarship at King's College in 1875, and has been each year college prizeman in mathematics.

A REPORT just published by the Swiss Statistical Board gives some information as to the state of primary instruction in the various cantons of Switzerland. Out of 21,875 recruits examined during the year 1877, 11·7 per cent. proved to have primary instruction quite insufficient, and were sent back to the primary military schools. The better educated cantons are those in which manufactures are more developed, namely, Basel (town), Geneva, and Zurich, Schaffhausen and Thurgau. The worst educated are those of Appenzell (land), Uri, Wallis, and Freiburg (Catholic). Primary education seems to have become worse during recent years, as the results for 1877 are far below those of 1876.

SCIENTIFIC SERIALS

Journal of the Franklin Institute, December, 1878.—From experiments here described by Mr. Jacques, it appears that currents of air of varying density, as in Tyndall's well-known experiment, not only diminish the *intensity* of a sound, but affect its *distinctness*. This holds good especially for the human voice, and for musical instruments with few overtones (as the flute). The effect on the voice is that of a repetition of each syllable several times in close succession. Sound-waves were traced out in the space of an auditorium in Boston, and their confusion shown on introducing air-currents. The good acoustic properties of the Baltimore Academy of Music are proved to be due to arrangements by which a large volume of air is conducted, in gentle current, across the stage and diagonally towards the roof. When, by closing certain valves, ventilation was arrested and currents of circulation generated, the sound was noticed to be "dead," or "confused and indistinct."—Dr. Dudley investigates the chemical composition and physical properties of steel rails, deducing some rules for guidance of the Pennsylvania Railroad Company.—Mr. Dupuy writes on the direct process of making wrought iron and steel,—Mr. Dumont on tests of boiler iron,—and Prof. Haupt on the use of the heliotrope in geodetic surveys.

THE *Archives des Sciences physiques et naturelles* (parts 251 and 252, November and December) contain the following papers of interest:—On ytterbina, a new earth contained in gadolinite, by C. Marignac.—On a transformation of dibromethylene into an acetone with four atoms of carbon, brought about by the action of hypobromous acid, by E. Demole.—A note on Dr. Heine's work on the formation of mountains, by E. Renevier.—On the geography and archæology of forests, by Dr. Asa Gray.—Recent researches in solar chemistry, by J. Norman Lockyer.—Observation of a case of migration of carps, by A. Bartholoni.—On a general method of continuous integration of any numeric function, applied to several theorems furnished by the mathematical analysis of the calculation of the curves of a new thermograph, by Raoul Pictet and Gustave Cellérier.—On the limnograph of Secheron, near Geneva, by Ph. Plantamour.—A note on the useful effect of magneto-electric machines and the production of electric light, by A. Achard.—On the reappearance of Encke's comet of short period, with a history of this comet, by Alfred Gautier.—Some remarks on the migration of carps by G. Lunel.—On the ophite of Spain, by M. Calderon.

Bulletin de l'Académie Royale de Belgique, Nos. 9 and 10, 1878.—This contains an account, by M. Dupont, of a recent important "find" of fossils in the Sainte Barbe, one of the coal mines of Bernissart (a village near the French frontier), consisting of five skeletons of large adult iguanodons together with tortoises, numerous fishes, and plant-impressions, constituting a fauna and flora wholly new for the country. The bones are unfortunately impregnated with pyrites, so that they are readily disaggregated on contact with air, but they have been carefully removed in plaster to Brussels, after precise noting of position, &c. The fossils were found at several different levels separated by layers of sterile clay. There is no indication of molluscs of any kind. The deposit is thought to be of the Wealdian horizon, and is remarkable, both in itself, and in its relations to the subterranean orography of the valley of Mons, and the lower cretaceous strata of Hainaut.—M. Plateau writes on a law of the persistence of impressions in the eye. With two disc having the same number of sectors, and the white sectors of the one being equal in angular width to the black discs of the other, the "times of apparent constancy," of the two impressions are to each other in inverse ratio of the brightnesses of the two grey tints producing these impressions. A complete impression, whether intense or weak, has no appreciable time of apparent constancy; and the time is longer, the more incomplete the impression. The degree of illumination of the object has but a weak and indirect influence on the time of apparent constancy.—M. Longchamps contributes further additions to the synopsis of the Gomphines; and M. Renard lithological researches on the phtanites of the carboniferous limestone of Belgium.—M. Montigny describes an experimental arrangement for the study of coloured stars.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, December 19, 1878.—"On the Torsional Strain which remains in a Glass Fibre after Release from Twisting Stress," by J. Hopkinson, D.Sc., F.R.S.

It has long been known that if a wire of metal or fibre of glass be for a time twisted, and be then released, it will not at once return to its initial position, but will exhibit a gradually decreasing torsion in the direction of the impressed twist. The best method of approximating to an expression of the facts has been given by Boltzmann ("Akad. der Wissensch. zu Wien," 1874). He rests his theory upon the assumption that a stress acting for a short time will leave after it has ceased a strain which decreases in amount as time elapses, and that the principle of superposition is applicable to these strains, that is to say, that we may add the after-effects of stresses, whether simultaneous or successive. Boltzmann also finds that, if $\phi(t)\tau$ be the strain at time t resulting from a twist lasting a very short time τ, at time $t = 0$, $\phi(t) = \frac{A}{t}$, where A is constant for moderate values of t, but decreases when t is very large or very small.

The glass fibre I examined was about twenty inches in length. The glass from which it was drawn was composed of silica, soda, and lime; in fact, was glass No. 1 of my paper on "Residual Change of the Leyden Jar" (*Phil. Trans.*, 1877). In all cases the twist given was one complete revolution. The deflection at any time was determined by the position on a scale of the image of a wire before a lamp, formed by reflection from a light concave mirror, as in Sir W. Thomson's galvanometers and quadrant electrometer.

The first point to be ascertained from the results was whether or not the principle of superposition, assumed by Boltzmann, holds for torsions of the magnitude used.

The experiments indicate a large deviation from the principle of superposition, the actual effect being *less* than the sum of the separate effects of the periods of stress into which the actual period may be broken up.

They also appear to indicate the form $\phi(t) = \frac{A}{t^\alpha}$, α being less than, but near to, unity. If $\alpha = 0{\cdot}95$ we have a fairly satisfactory formula for the case in which the fibre was twisted two hours.

In the author's paper on "Residual Change of the Leyden Jar" that subject is discussed in the same manner as Boltzmann discusses the after-effect of torsion on a fibre, and it is worth remarking that those results can be roughly expressed by a formula in which $\phi(t) = \frac{A}{t^\alpha}$. For glass No. 5 (soft crown) $\alpha = 0{\cdot}65$, whilst for No. 7 (light flint) it is greater: but in the electrical experiment no sign of a definite deviation from the law of superposition was detected.

January 16.—"On the Effect of Strong Induction-Currents upon the Structure of the Spinal Cord," by William Miller Ord, M.D.