for the Long Vacation, will be held in Cambridge during April next, probably towards the end of the month. A large concourse is expected.

Science states that the late Franklin Baldwin, of North Grafton, Mass., has made the following bequests, to take effect on the death of his wife:—Wellesley College, 50,000 dollars to found a chair in Mathematics in memory of his daughter, Katie Emma Baldwin; Smith College, Northampton, 12,000 dollars for scholarships; the University of Vermont, 10,000 dollars for scholarships; Dartmouth College, 6000 dollars for scholarships. The residue of the estate (some 20,000 dollars) is left to Clark University. It is also stated that Mrs. E. G. Kelly, of Chicago, will erect a chapel, at a cost of 100,000 dollars, for the University of Chicago, as a memorial to her brother.

THE following are among recent appointments abroad:—Dr. C. A. Strong to be Lecturer on Psychology in Columbia College; Prof. L. S. Luther to be President of Kenyon College, Gambier, Ohio; Prof. Theodore von der Goltz to be Professor of Agriculture in the University at Bonn; Dr. Dock to be Professor of Pathology and Bacteriology at Jefferson Medical College, Philadelphia; Prof. W. I. Blake to be Professor of Geology and Mining in the University of Arizona; Dr. Hüfner to be Professor of Physiological Chemistry at Strassburg; Dr. H. Rubens, Privat-docent in Physics in the Physiological Institute at Berlin, to be Extraordinary Professor; Dr. L. Neumann, Extraordinary Professor of Geography at Freiburg, to be Ordinary Professor; Dr. Max Le Blanc to be Extraordinary Professor of Physical Chemistry at Leipzig; H. F. Wiebe and Dr. K. Feussner, of the Charlottenburg Reichsanstalt, to be Professors; Dr. A. Weiss to be Assistant in the Mineralogical Institute of Greifswald University. Among recent nominations are: Dr. Otto Mügge to the chair of Mineralogy at Königsberg; Dr. Klemenčic to be Professor of Physics at Innsbruck.

ONE of the best products of the Technical Education movement is the *Journal* of the Essex Technical Laboratories—a monthly bulletin issued by the Technical Instruction Committee of the Essex County Council. The current number contains short descriptions of tuberculosis in cattle, the influence of various manures on pasture, the pruning of trees, the growth of plants, and other subjects, most of them instructively illustrated. A note at the end of the *Journal* announces that "The resources of the County Technical Laboratories are always at the disposal of correspondents as far as such services do not interfere with the regular work of the classes. Such work as testing germinating power and purity of seeds, identification of grasses, weeds, &c., examination of diseased plants and injurious insects, bacteriological examination of milk, &c., may be cited as the kind of help hitherto rendered to inquirers." By affording such opportunities for the acquisition of knowledge, and by the encouragement to observation and exact work offered in the *Journal*, the Essex Technical Instruction Committee is doing work which will benefit the county and the nation.

A MOVEMENT was started last year to secure greater facilities at the University of Paris for such prolonged study with the acquisition of learned degrees as hitherto has attracted English and American students chiefly to Germany. The *Times* correspondent at Paris now calls attention to the promulgation, a few days ago, of a decree reforming the Licence ès Sciences. Partially owing to the greater liberty permitted in the choice of studies, the possibility of moving from one University to another, and the privilege of being examined when they wish, English and American students have hitherto patronised almost exclusively the German Universities. The new decree will permit France to offer, at least as far as the scientific faculties are concerned, attractions equal or superior to those of Germany. As compared with the old regulations, the important provisions of the new decree are as follows:—First, the principle of election is introduced into the groups of studies chosen by the student; secondly, the student may migrate from one institution to another; and, thirdly, he may pass his examinations as he chooses, either singly or *en bloc*. After taking the Licence, the student may secure the doctor's degree upon presenting a satisfactory dissertation. Under the German system the candidate submits his thesis first and passes his examination afterwards, the doctorate being the only recognition he receives. In France, on the contrary, the student by passing his examination first will secure a certificate for every subject which he takes up, and will receive the Licence when he has completed the whole group, regardless of whether he ever takes the doctorate or not.

THE annual general meeting of the Association of Technical Institutions was held on Friday last. The Right Hon. A. J. Mundella, M.P., was elected president for the year, in succession to Mr. W. Mather. In his presidential address, Mr. Mundella referred to the systems of technical education abroad, and said that England was suffering from her past neglect and from over-confidence. As a consequence of the industrial training which the people of Switzerland had received, that country had exported a greater proportion of manufactured articles per head of her population than any other nation in the world. This he attributed wholly to education, the country being without coal and iron. German manufacturers also had the great advantage of employing a body of highly-disciplined men, who thoroughly understood the technique of their occupation. He held that if this country wished to make further progress in technical education there must be co-operation by employers. Elementary education should also be improved, and children should remain a longer time at school. The Association of Technical Institutions existed for the purpose of developing industrial education, but he warned them against becoming mere grant-earners. In a discussion that followed, upon the new syllabus for practical chemistry, regret was expressed that the Department of Science and Art still requires students in the elementary stages to have had practice in qualitative analysis. The alternative scheme for the award of grants based upon attendances as well as examination was discussed, and several alterations in the conditions of the scheme were suggested. Other subjects which were considered by the Association were the standard of success in the Department's examinations last May, and the Report of the Royal Commission.

SCIENTIFIC SERIALS.

American Meteorological Journal, January.—The audibility of fog-signals, by Prof. H. A. Hazen. The recent grounding of a passenger steamer on Great Gull Island in a dense fog, within five thousand feet due west of a second-class siren which was sounding at the time, calls attention to several points referred to in a paper by the same author in the journal for October last. This siren has been heard to a distance of twenty miles under favourable circumstances; but the captain of another steamer, which approached the island from the west at the time of the accident, states that his look-out was unable to hear any sound as they approached the island, whereas, after passing, the whistle could be plainly heard.—Atmospheric phenomena in the Arctic regions in their relation to dust, by Prof. W. H. Brewer. The author states that none of the fogs in high latitudes are so white and opaque as those seen south of lat. 50°, and that it is rare that they are so opaque that large dark objects cannot be seen at a distance of two hundred feet. In the Greenland seas the fogs were, as a rule, very much wetter. Often when the fog was so transparent that objects could be seen for half a mile or even a mile from the ship, the water would drip like rain from the rigging. On returning to the south, where the fogs were very dense and objects could not be seen at a ship's length, there was a marked contrast in their wetness; the air did not appear as if entirely saturated. The dust particles in the air over the southern waters were ample to collect all the moisture, while in the Greenland fogs condensation went on as if there was not nearly dust enough in the air to supply the demand.

Bulletin de l'Académie Royale de Belgique, Nos. 9-10.—At the request of M. Spée, astronomer at the Royal Belgian Observatory, a sealed packet was opened which had been deposited by him on January 8, 1887, and contained the description of an apparatus to enable astronomers to obtain the spectroscopic conditions of a total solar eclipse for the observation and photography of the corona and prominences. It is best described as a body generated by the revolution of a longitudinal section of a direct-vision spectroscope about its longer side, thus producing a series of cones and cylinders. This body is used for the spectroscopic analysis of a cylindrical beam of light proceeding from the chromosphere, and obtained by means of a circular slit of diameter equal to that of the sun's image suitably inserted in the telescope. The less highly refractive glass may also be replaced by a liquid, thus leading to considerable simplification, or the whole may be replaced by a circular grating. It should be noted that an apparatus very similar to this was described by Mr. C. Zenger in 1893.—Does a net impede the

passage of winged insects? by Felix Plateau. The difficulty experienced by insects in passing through a net with meshes three or four times their own size has been variously explained. Some attribute it to the resemblance to a spider's web, others to the apparent multiplicity of obstacles. Experiments made with nets of various shapes and materials show conclusively that the peculiarity of insects in this respect is due to the construction of their eyes, which are more adapted to the perception of motions or changes in surrounding objects than to the perception of form. When flying, insects are incapable of distinguishing a net from a continuous translucid surface, and it is therefore only very rarely that an insect will fly straight through it. It must strike the meshes or alight on them, and will then pass through as it would through any hole of the same size.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 16.—"The Rotation of an Elastic Spheroid." By S. S. Hough, Isaac Newton Student in the University of Cambridge.

Recent researches on latitude-variation have brought to light the phenomenon of a periodic motion of the earth's axis of rotation in a period of 427 days. This period being in excess of the theoretical period of 305 days hitherto accepted, Prof. Newcomb has proposed to account for the extension by the failure of the old theory to take into consideration the flexibility of the solid parts of the earth. The author gives an analytical investigation of the motion of a solid body when slightly disturbed from a motion of simple rotation about a principal axis, taking into account elastic distortions due to variations in centrifugal force; the results are found to agree in the main with those obtained by Prof. Newcomb from geometrical considerations. The analysis deals with the case of a homogeneous spheroid of revolution, the ellipticity being such that the body is free from strain when rotating uniformly. Such a spheroid, if of the same size and mean density as the earth and rotating with the same angular velocity, would oscillate in a period of 232 days if perfectly rigid; it is shown that this period would be extended to 335 days in virtue of elastic distortions if the rigidity were equivalent to that of steel. In the case of the earth the period would be still further prolonged in consequence of variations in density, and the period which corresponds to the above degree of rigidity is estimated at about 440 days; whence it is concluded that the observed period may be accounted for by supposing that the earth is capable of elastic deformation, and that its effective rigidity is slightly in excess of that of steel.

Physical Society, January 24.—Captain Abney, President, in the chair.—Mr. Campbell Swinton exhibited some photographs which he had taken by Prof. Röntgen's method. These included several of metal objects inside wooden and cardboard boxes, and a very clear and sharp photograph of the bones of the hand.—Mr. E. Scott showed some geometrical instruments invented by himself and Signor Monticolo. The instrument designed by Signor Monticolo is intended for drawing arcs of circles of such large radius that compasses cannot be employed. It can be used to trace arcs of circles of which the radii vary from 50 cm. to infinity. The second instrument exhibited was a modified form of hatchet planimeter, which Mr. Scott has devised with a view of avoiding some of the defects of the ordinary form of instrument; thus, to avoid the cutting of the paper, which occurs when the knife-edge is sharp, and the side-slip, which occurs when the knife-edge is blunt, the author uses a wheel with a sharp edge. To avoid the inclination of the instrument to one side, which may easily occur with the ordinary form, a flat celluloid plate with a dot at the centre is used as the "tracing point," this plate being kept pressed flat on the surface of the paper. A small wheel with a recording disc is attached, and may be used to measure the distance between the first and last position of the knife-edge. Mr. Scott also described a form of planimeter which he had invented, and in which the l c and cylinder movement is used to perform the integra on. Mr. C. V. Boys said that an instrument designed by Mr. Clarkson had been exhibited before the Royal Society, which was capable of drawing arcs of circles of large radius. This instrument only drew an approximation to a circle, but the approximation was so close that it nowhere was more than the thickness of a thin ink line away from the truth. It would be interesting to hear from the author whether Signor Monticolo's instrument drew a rigorously exact circle or not. The upright position of the hatchet planimeter might be secured by using two wheels in place of one. The planimeter described was really a modified form of one he (Mr. Boys) had described before the Society in 1881. Mr. Blakesley gave a short geometrical proof showing that the curve traced by Signor Monticolo's instrument was rigorously an arc of a circle. Mr. Blakesley also drew attention to the fact that the instrument in its present form cannot be used to trace the arc on both sides of the zero line.—Dr. C. V. Burton described an idea for an instrument for drawing circular arcs, which had occurred to him, depending on the use of two wheels of different radii connected by an axle carrying a tracing-point. In the absence of the author, a paper by Prof. J. D. Everett on resultant tones was read by Dr. Burton. The author, after giving a short summary of the Helmholtz theory of the production of resultant tones, goes on to discuss his objections to this theory, and to elaborate a theory of his own. This theory depends on the consideration that, if you analyse into a Fourier series a periodic curve which is compounded of two simple harmonic motions of frequencies n and m, then only two terms are obtained. If, however, some error has been originally made in adding the two simple harmonic motions together, this error being repeated for each wave, then in addition to the two terms of frequency n and m there will be obtained, when the curve is analysed, a term of frequency f, where f is the greatest common measure of n and m. This term of frequency f the author calls the common fundamental of the tones n and m. The "error" in the production of the compound curve the author supposes to be produced during the transmission of the sound by the ossicles of the ear. In support of his theory the author finds that in the violin where the sound-post, like the ossicles of the ear, transmits the vibrations from one portion of the instrument to another, it is easy by sounding two strings in conjunction to obtain combination tones which agree in frequency with those required by this theory. Thus, when the major sixth (3 : 5), the major second (8 : 9), or the minor seventh (5 : 9) are sounded, the fundamental (1) is clearly heard and also felt by the hand holding the instrument. The author has also succeeded in picking out and strengthening this resultant tone by holding a Helmholtz resonator in contact with the body of the violin.—Dr. C. V. Burton, after explaining several portions of Prof. Everett's paper, said that he (Dr. Burton) considered that the author's view in many ways seemed to fit in with the observed facts better than the accepted theory, but still did not appear itself quite free from objection. Prof. Everett supposes that the first term in a Fourier series is always the most important, and although in most cases which occur in practice this may be so, it hardly seems legitimate to take this as a characteristic of a Fourier series.—The thanks of the Society having been given to Prof. Everett and Dr. Burton, the meeting adjourned to February 14.

Chemical Society, December 19, 1895.—Mr. A. G. Vernon Harcourt, President, in the chair.—The following papers were read: The liquefaction of air and research at low temperatures, by J. Dewar.—Researches on tertiary benzenoid amines. (1) Derivatives of dimethylaniline, by Miss C. de B. Evans. On heating dimethylaniline with chlorosulphonic acid only the para-sulphonic acid is formed; fuming sulphuric acid must be used in order to obtain the meta-sulphonic acid. The bromination and nitration products of these sulphonic acids are described.—Experiments on the formation of the so-called ammonium amalgam, by J. Proude and W. H. Wood. Solutions of phenols in aqueous ammonia contain ammonium salts because they give ammonium amalgam on addition of sodium amalgam; no mercurial froth is obtained from ammoniacal aqueous solutions of several inorganic salts, so that these contain no ammonium salts. Ammonium salts, when fused or dissolved in anhydrous solvents, cause no swelling of the sodium amalgam; the presence of water seems essential to the formation of ammonium amalgam.—The molecular volumes of organic substances in solution, by W. W. J. Nicol. The atomic volumes of the various elements may be accurately determined from the molecular volumes of organic substances in solution; the constants thus obtained differ somewhat for different solvents.—2 : 1 β-naphthylaminesulphonic acid and the corresponding chloronaphthalenesulphonic acid, by H. E. Armstrong and W. P. Wynne. The 2 : 1 β-naphthylaminesulphonic acid is converted, by the Sandmeyer method, into 2 : 1-β-chloronaphthalenesulphonic acid of which a number of derivatives are described; 2 : 1 : 4′-δ-naphthylaminedisulphonic acid is ob-