engineers and men of science have been sent not only to India, but to Manila, Italy, and other places. One set of instructive reports refers to destruction and shattering produced by movements closely approximating to those of actual earthquakes given to a platform on which masonry and other structures had been erected. This platform is in no sense a toy, but a large piece of apparatus actuated by powerful machinery. To say that these investigations have during the last ten years cost the Government of Japan 50,000*l.* is a modest estimate. The return for the same is seen in the new types of structures which are growing up in Japan, replicas of which have been adopted in British possessions and other places, the meaning of which is that danger to life and property resulting from seismic disturbances, if not averted, has been markedly mitigated.

Add twenty volumes issued by the Seismological Society to those published by the Investigation Committee, and we have eighty-three publications, the greater number of which are volumes, as Japan's contribution to recent seismological progress.

In consequence of not being acquainted with researches carried out in the Far East—and we do not refer to those which Japan for the benefit of her own people has published in Chinese characters—it is not uncommon to find seismologists in Europe reproducing as novelties the *faits accomplis* of past history. Had Prof. Odone read the *Transactions* of the Seismological Society of Japan, it is not likely that in a recent number of the *Bollettino* he would have given, with drawings almost identical with those published in Japan, a description of a method by which the relative motion of two points of the earth's surface might be measured; neither should we find in the last number of the same journal a description, quoted from the *Comptes rendus*, January 26, 1903, of a new system by which record receiving surfaces could be set in movement, and therefore ready to receive the record of an earthquake before the earthquake itself arrived to actuate the indices of a seismograph. In 1884 in Japan nine stations were electrically connected, so that an earth movement at one of them resulted in the release of clockwork at all the others (*Trans.* Seis. Soc., vol. x.).

Since then the system has been greatly extended, and at stations considerable distances apart record receiving surfaces are set in motion before the pointers resting on the same have been actuated by earth movements. That work of this description, which was referred to over and over again in publications issued twenty years ago in Japan, should in 1904 be reproduced in Europe as original indicates that the work has at least had some slight recognition. The main point at issue, however, is that the veil of Chinese cryptograms which has hidden so very much of the work done in the Far East has by means of an index been partly raised, and if at Strassburg or at any other institution this work can be rendered available to seismologists who read a European language, the same will from "many an error free us," and be most gratefully received.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The following appointments of university lectures are announced:—Chemistry, Messrs. W. J. Sell, F.R.S., and H. J. H. Fenton, F.R.S.; organic chemistry, Mr. S. Ruhemann; petrology, Mr. A. Harker, F.R.S.; invertebrate morphology, Mr. A. E. Shipley, F.R.S.; physical anthropology, Mr. W. L. H. Duckworth; palæozoology, Mr. H. Woods.

The new Balfour student is Mr. R. C. Punnett, of Caius College. A grant of 50*l.* from the Balfour fund has been made to Mr. L. Doncaster, King's, in furtherance of his researches on sex and heredity.

Messrs. C. Shearer and W. E. Agar have been nominated to occupy the university's table at the Naples Zoological Station.

The special board for biology proposes that Mr. J. W. Clark should be re-appointed a manager of the Balfour fund for a period of ten years.

The original researches of Messrs. R. Hosking, W. Makower, G. Owen, and F. Rogers, advanced students in experimental physics, and in engineering, have been approved by the special board for physics and chemistry as of distinction; they will receive certificates qualifying them for the B.A. degree for research.

Five candidates have gained the university diploma in agriculture; seven have qualified in the first part of the examination.

Mr. H. M. Chadwick, Clare, Mr. C. H. W. Johns, Queens', Dr. A. Macalister, St. John's, and Dr. F. H. H. Guillemard, Caius, have been appointed members of the new board of anthropological studies.

Dr. D. MacAlister, St. John's, has been appointed assessor to the regius professor of physic. Prof. Darwin, Trinity, and Prof. Larmor, St. John's, have been appointed electors to the Isaac Newton studentship in astronomy and physical optics.

MR. PERCY F. KENDALL has been appointed professor of geology in the University of Leeds, and Dr. J. B. Cohen has been appointed professor of organic chemistry in the same university.

MRS. AMANDA W. REED has, says *Science*, provided in her will for the foundation of an institution at Portland, Oregon, to be known as Reed Institute, in memory of her husband, the late Simon G. Reed. The bequest will amount to about 400,000*l.* Her will specifies that the institute shall combine instruction in the fine arts, sciences, and manual training, and that it shall be conducted with especial regard to the needs of young men and women compelled to earn their own living.

NEW science buildings, which by special permission of Lord Kelvin have been called the Kelvin Science School, are to be opened by Sir Douglas Fox at Trent College, Derbyshire, on June 29. The new science school contains six large rooms and three small ones; these include a room for manual instruction in wood and iron, a physical laboratory, a lecture theatre to seat eighty, a balance room, a chemical laboratory for twenty-four students, and a biological laboratory for sixteen students.

A PAPER read by Prof. Israel C. Russell before the Research Club of the University of Michigan in January last is printed in *Science* for June 3. After referring to the triumphs of science in the last century, Prof. Russell remarked:—"The intellectual tide-gauges of the world give no suggestion that the nineteenth century wave of discovery has culminated. On the contrary, there is abundant evidence to show that the rate of intellectual development is still on the increase, and that yet more important conquests in the domain of the unknown than have illuminated the past will be made in the future." The recognition of the importance of research by the United States is naturally emphasised in the paper, and three important steps in this direction are marked by what Prof. Russell called "enduring movements," viz. the *American Journal of Science*, which appeared first in 1818, the Smithsonian Institution, and the Carnegie Institution. Speaking of the place of research in the university, Prof. Russell expressed his agreement with the dictum of Sir Norman Lockyer, that "research is now generally acknowledged to be the most powerful engine of education that we possess."

THE twenty-eighth annual exhibition of work executed in the public elementary schools founded by the late London School Board, and now administered by the London County Council, was held from June 13 to 18 at the Medical Examination Hall, Victoria Embankment. As in previous years, one section of the exhibition was devoted to the science work done in these schools. The exhibits were chiefly pieces of apparatus and working models made or arranged by pupils and teachers. It was satisfactory to notice that the work of pupils and teachers was this year kept separate, and the confusion which in some former years resulted from an indiscriminate intermingling of the exhibits of teachers and taught was fortunately avoided. Much of the work shown was the joint product of the science

departments of the schools and of the manual training centres, and the standard of excellence attained may be taken as proving that good results follow the correlation of the instruction in science and in manual work. The total number of exhibits was unusually small, and it is difficult to find a reason for the inclusion among them of scientific instruments obtained from manufacturers. The collection of exhibits, though interesting and from some points of view satisfactory, did not succeed in conveying an adequate idea of the work in science accomplished in the schools. The man of science interested in education would have obtained a better general idea of the scope of the science work in the council's day and evening schools had typical laboratory note-books and typical syllabuses of work done been exhibited. There was, however, evidence enough to show that the claims of science to a place in the curriculum of the public elementary schools of London are recognised by the London Education Committee.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 2.—"On the Magnetic Changes of Length in Annealed Rods of Cobalt and Nickel." By Shelford **Bidwell**, F.R.S.

The magnetic changes of length in annealed iron were described by the author in 1894 (*Proc.* Roy. Soc., vol. lv. p. 228). When subjected to a longitudinal field gradually increasing from a small value, an ordinary iron wire is at first extended, then it recovers its original length, and finally becomes shorter than when unmagnetised. In annealed iron the maximum extension is diminished, and contraction begins in a weaker field, the change-of-length curve being lowered. In the case of a thoroughly well annealed specimen, contraction began in a very weak field without any preliminary extension. Similar experiments have now been made with cobalt and nickel. Cobalt in the ordinary condition behaves oppositely to iron, contracting in weak fields and lengthening in strong ones. It was found that a well annealed rod of cast cobalt contracted uniformly in fields up to 1360 units (the highest reached), the retraction curve being a straight line. This confirms an observation published last year in Japan by Honda and Shimizu. For a specimen of rolled cobalt, however, the change-of-length curve retained its general form, but was considerably lowered; in a field of 1750 the ascending limb was still below the axis of H and nearly parallel to it; probably, therefore, there would never be any elongation, however strong the field. The most noteworthy effect of annealing upon the retraction curve for nickel is an increase in the abruptness of its descent, which may be due merely to greater magnetic susceptibility. Thus it appears that well annealed specimens of iron, cobalt and nickel all undergo contraction when longitudinally magnetised.

Mineralogical Society, June 7.—Dr. Hugo Müller, president, in the chair.—The Rev. Mark **Fletcher** contributed a note on mispickel from Sulitjelma Mine, Norway, containing about 1·32 per cent. of cobalt, and showing the forms {011}, {012}, {110}.—Mr. G. F. Herbert **Smith** exhibited a hand-refractometer of the Bertrand type, in which the curvature of the focal surface had been reduced by means of a correcting lens, with a consequent improvement in the definition of the shadow edges.—Prof. H. A. **Miers** gave an account, illustrated by numerous lantern slides, of the development of the Kimberley Diamond Mines. He traced the changes in the methods of working from the first surface diggings to the time when the blue-ground was brought to the edge of the pit by a "cobweb" of wire ropes stretching from the numerous independent claims into which the mines were split up, and showed how the increasing difficulties involved in this method led to the final consolidation of the mines under Beit and Rhodes, and to the initiation of the present system of mining, which consists in sinking shafts on the edge of the pit, and running cross-cuts into the blue-ground. He referred finally to the recent discovery of blue-ground in the neighbourhood of Pretoria.

Faraday Society, June 9.—Dr. J. W. Swan, president, in the chair.—The electric furnace: its origin, transformations and applications, part i.: M. Adolphe **Minet**. The paper discusses the growth of the furnace from the historical point of view, and then proposes a new classification, which is worked out in minute detail in the form of a table. A full bibliography of the electric furnace completes this section of the paper.—A form of porous diaphragm convenient for laboratory use: Dr. F. M. **Perkin**. It consists of two perforated concentric porcelain cylinders packed in between with brown paper, asbestos, or other material, depending on the use to which the diaphragm is to be put.—The hard and soft states in metals: G. T. **Beilby**. The views advanced by the author are based on his earlier observations on surface flow in crystalline solids. The evidence afforded by the micro-structure has been supplemented by observations on the other properties of metals in the hard and soft states, and the view is now advanced that these states are perfectly distinct phases. This is shown by the mechanical, electrical, optical, and thermochemical properties, as well as by the micro-structure.

Royal Meteorological Society, June 15.—Capt. D. Wilson Barker, president, in the chair.—Effects of a lightning stroke at Earl's Fee, Bowers Gifford, Essex, April 13: Rev. C. F. **Box**. A thunderstorm occurred during the early morning hours, and about 3 a.m. there was a blinding flash, lighting up the whole neighbourhood for miles around, followed immediately by a crashing explosion. One person stated that he saw what appeared to be a cylinder, and another person a ball of fire, descend and then explode, "casting darts" in all directions. On careful examination in daylight, it was found that in an oatfield, which had recently been dredged, there were three distinct sets of holes ranging from 9 inches down to about 1 inch in diameter. The holes, which were perfectly circular, diminished in size as they went downwards, and remained so on to the perfectly rounded ends at the bottom. Upon digging sectionally into the soil, which is stiff yellow clay, it was found that the holes were "as clean cut as though bored with an auger." An interesting discussion followed the reading of this paper.—An instrument for determining the true direction and velocity of the wind at sea: A. Lawrence **Rotch**.

PARIS.

Academy of Sciences, June 13.—M. Mascart in the chair.—Muscular displacement applied to carrying a load without displacement, the statical work of muscle. The comparison of this internal work with the resulting expenditure of energy, and influence of the magnitude of the load: A. **Chauveau**. Use was made of the respiratory coefficient in measuring the energy expenditure, and this was found to increase faster than the load sustained, although for small loads these were found to be nearly proportional.—The influence exercised by small variations of external actions on a system affected by hysteresis and defined by two variables: P. **Duhem**.—On the property possessed by a considerable number of bodies of projecting a ponderable emanation spontaneously and continuously: R. **Blondlot**.—A photographic study of the spectrum of the planet Jupiter: M. **Millochau**. The photographs were taken with a spectrograph attached to the large telescope of the Observatory of Meudon (84 cm. diameter), and the spectra obtained extended from the F line to the C line, means being taken to allow of a comparison of the spectra from the bands with that from the other parts of the disc. The presence of water vapour is clearly proved.—Remarks on the preceding communication: J. **Janssen**.—On a class of differential equations with multiform integrals: Pierre **Boutroux**.—Energy in statical reactions: Eugène **Lebert**. A discussion of the results of M. Chauveau on the "statical work" of muscle.—On the index of refraction of solutions: C. **Chéneveau**.—Contributions to the study of the n- and n_1-rays: Jean **Becquerel**.—On the forms of high frequency lighting between platinum wires of small diameter: André **Broca** and M. **Turchini**.—The action of the n-rays on pure water: Julien **Meyer**. Experiments are described leading to the conclusion that pure water, submitted to the action of the n-rays, becomes itself a source of n_1-rays.—On the measurement of the mobility of the ions in gases by a null method: Eugène **Bloch**. The method of MacClelland, improved by Zeleny, is modified by conversion into a null method, which much extends the field of its application.—The atomic weight of nitrogen: the analysis of nitrogen