

photographic plates and metal pieces in the body, for example, needles, bullets, etc., can be found by this method. It will be a matter of the future to learn whether the rays have psycho-physiological effects.

The newspapers report that the whole thing was discovered by mere chance. Röntgen saw the effects on photographic papers which by chance were near to a covered tube during the discharge. This chance origin is not probable, as Lenard, the assistant of Hertz, has been working in the same direction for a long time, and many preparatory experiments by Röntgen himself cleared slowly the way. But suppose chance helped. There were many galvanic effects in the world before Galvani saw by chance the contraction of a frog's leg on an iron gate. The world is always full of such chances, and only the Galvanis and Röntgens are few.

HUGO MÜNSTERBERG,
Harvard University.

FREIBURG, BADEN, January 15, 1896.

SCIENTIFIC NOTES AND NEWS.

PROFESSOR RÖNTGEN'S DISCOVERY.

THE transmission through wood and other substances of the rays from a Crookes' vacuum tube, discovered by Prof. Röntgen, is reported to have been confirmed by Prof. Klupathy of Pesth, Prof. Domalip of Prague, Prof. Cermak of Gratz, and Mr. A. A. C. Swinton of London. The photographs have been exhibited before several scientific societies and by Prof. Röntgen to the Emperor of Germany, from whom he has received a decoration.

Mr. Swinton writes to the *Standard* that with Mr. J. C. M. Stanton he has obtained distinct proof that the radiations in question do pass easily through various substances that are quite opaque to ordinary light, and do produce strong impressions upon ordinary photographic plates entirely incased in light-proof material. Indeed, all substances that he has so far experimented on in his laboratory appear to be transparent to these radiations, even sheets of ebonite, carbon, vulcanized fibre, cop-

per, aluminium and iron, though there is considerable variation in degree. It is thought that the new method of photography may have important applications, not only in surgery, but also in metallurgy, by revealing flaws, inequalities and fractures in metals.

Hertz discovered that cathode rays pass through metal films not translucent to ordinary light, and that Dr. Lenard and others have published careful experiments on the subject. Attention has been called to Prof. Zeugen's having photographed Mt. Blanc, in 1885, by the cathode rays. Prof. Röntgen, however, states that the rays discovered by him, which he calls X-rays, are not cathode rays, as they are not refrangible nor affected by magnetic influences, but that they are more probably longitudinal waves in the ether.

While Hertz and Lenard hold that the cathode rays are vibrations in the ether or even light of short wave-length, Crookes and J. J. Thomson have urged that the rays are negatively charged matter traveling with great velocity. M. Perin reported to the Paris Academy, on December 30th, experiments which tend to show that the latter view is correct, and some relation will probably be found between cathode rays and the X-rays.

PHYSICS.

By constructing what might be termed a reversed level, A. Toepler obtains an instrument which he calls a 'pressure level.' It consists of a tube bent to a slight angle at its middle point; the two ends are equally inclined to the horizontal. A short column of a light liquid fills the central portion of the tube. It will be readily seen that if the two open ends are connected with two receivers of any sort, the liquid will, by its position, give the difference of pressure in them. This method of differentially measuring pressures, Mr. Toepler applies (*Wied. Ann.*, Vol. 56, 1895) to measure the difference in weight of two columns of air at different temperatures but both under the same pressure. A long series of determinations of absolute temperatures bears witness to the efficacy of this method, and theoretical considerations remove some apparent objections and give to it certain advantages over the ordinary form of air thermometer.

THE old question as to the existence of Volta's 'contact electricity' is again taken up by C. Christiansen (*Wied. Ann.*, 56, 1895.) who, with an apparatus employing the drop electrode, has investigated the behavior of magnesium, aluminum, cadmium, zinc, tin, lead, iron, platinum, nickel, copper, mercury and carbon in atmospheric air, hydrogen, carbonic acid gas and oxygen, and arrives at the conclusion that oxygen may be, if it is not always, the cause of potential differences between metals in contact, and he is of the opinion that it is a polarization by the gas, just as oxygen or hydrogen polarizes platinum.

G. Meyer investigated an allied subject with the Lipmann capillary electrometer testing the combinations of mercury, and lead, copper, tin and zinc amalgams in sulphuric and hydrochloric acids, potassium chloride, iodide and sulphocyanide, and sodium sulphide. A further contribution to our knowledge of the dielectric constant is made by S. Silberstein, who has determined this constant for various mixtures of benzol and phenylethylacetate, and finds that the results agree well with the conclusions derived from theoretical considerations. (*Wied. Ann.* Vol. 56, 1895.)

W. H.

ASTRONOMY.

THE Astronomical Society of the Pacific has just published an account by Prof. Tucker, of the methods he is using for the investigation of the division errors of the Repsold circle of the Lick Observatory. We are glad to see the principle of using the auxiliary circle for the purpose of investigating the principal circle. This plan has many advantages, but its weak point of course is that the two circles are at some distance from each other and are read by different microscopes. It may not be generally known that a transit circle was constructed by Messrs. Cooke & Sons for Mr. Newall, under the superintendence of Mr. Marth, in which the divisions of the two circles could be brought into the field of view of one microscope simultaneously. The errors of that circle, however, were never investigated.

But it may be questioned whether the results ever justify the expenditure of the great amount of time and labor involved in such in-

vestigations as that of Prof. Tucker. Probably the same amount of energy given to observation of the stars, taking care of course to shift the circle from time to time, would be of greater benefit to astronomical science. Even if the division error of any given line could be determined with complete precision with the telescope pointed at the zenith, this division error would not hold true when the telescope is directed elsewhere. Nor is this brought about by flexure alone. It is found that if we determine the division errors of a straight scale, these errors are completely changed when the scale is reversed end for end. No doubt unavoidable differences in the illumination and the eye of the observer are responsible for these unfortunate facts. But facts they are, and the cause of much wasted labor.

THE 1890 volume of the *Annuaire* published by the Bureau des Longitudes has been issued. It contains the usual mass of material devoted to astronomical and other science. Among the appendices are articles by MM. Cornu and Janssen, which are of general interest. The list of members of the Bureau contains the names of two Americans: Dr. B. A. Gould and Mr. G. Davidson. The latter gentleman is described as 'directeur de l'observatoire de Californie et du Service geodesique.'

H. J.

GENERAL.

THE herbarium of the late Prof. Daniel Cady Eaton has been presented by his family to Yale University. The herbarium contains over 65,000 sheets, and is especially rich in North American ferns and mosses.

THE library of the University of Pennsylvania has acquired the scientific library of the late Prof. John A. Ryder. It has also secured the Bechstein Library of German Philology and Literature, containing about 20,000 bound volumes and pamphlets.

Nature states that Prof. Sollas, F. R. S., will leave in March for Sydney, to take charge of an expedition that is being dispatched to make deep borings in a coral atoll. The scheme, which is supported by a strong scientific committee, has been financed by the Royal Society to the extent of £800; and the government are placing a gunboat at the disposal of the party, to convey

them from Sydney to Funifuti, in the Central Pacific, which has been selected as the scene of operations. Mr. W. W. Watts writes to the same journal that it would have been impossible to undertake the work without the assistance of the Departments of Mines of the New South Wales government, which has granted to the committee a complete set of boring tubes and appliances.

THE Field Columbian Museum, of Chicago, will send a commission, including Professor D. G. Elliot, one of the curators, and Mr. C. A. Aikley, the taxidermist of the Museum, to Central Africa to collect zoölogical specimens. It is proposed to leave Chicago about March 1st, and to spend six months in Africa.

THE New York section of the American branch of the Society for Psychical Research will have its next meeting at Columbia College, on February 1st, at eight P. M. Prof. William James will preside and will make an address. Papers will be read by Prof. J. H. Hyslop on 'Experiments in Crystal Vision,' and by Prof. W. R. Newbold on 'Three Cases of Subconscious Reasoning.' A meeting will be held in Boston, at Allston Hall, on the preceding evening.

AT the annual meeting of the Anthropological Society of Washington, held January 21st, Prof. Lester F. Ward was elected President for the ensuing year; Surgeon General George M. Sternberg, Dr. Frank Baker, Mr. W. J. McGee, and Mr. George R. Stetson, Vice-Presidents; Dr. J. H. McCormick, General Secretary; Mr. Weston Flint, Secretary to the Board of Managers; Mr. Perry B. Pierce, Treasurer; and Mr. F. W. Hodge, Curator. Dr. Cyrus Adler, Mr. Joseph D. McGuire, Mr. James A. Blodgett, Dr. Washington Matthews, Dr. Thomas Wilson, and Prof. J. Ormond Wilson were elected Councilors. Dr. Robert Fletcher, Prof. Otis T. Mason, and Major J. W. Powell, former presidents of the Society, are *ex-officio* members of the Council.

AT the annual meeting of the Royal Meteorological Society, on January 15th, Mr. E. Mawley was elected President, and the retiring President, M. R. Inwards, delivered an address on Meteorological Observatories.

THE third course of annual lectures of the Linnæan Society, in connection with the American Museum of Natural History, is as follows:

January 14, 1896. *The Indians of Vancouver Island*. By Dr. Franz Boas, American Museum of Natural History.

January 18th. *The Origin and Distribution of North American Mammals*. By Prof. W. B. Scott, Princeton College.

March 3d. *Two Months in Greenland*. By Prof. William Libbey, Princeton College.

MR. C. E. BORCHGREVINK has sent his mineralogical collection from South Victoria Continent to Dr. John Murray, F. R. S. Mr. Borchgrevink holds that his specimens are especially valuable as proving the existence of an Antarctic continent.

THE cost of sending an expedition from the Lick Observatory to Japan to observe the approaching eclipse of the sun will be defrayed by Mr. C. F. Crocker, of San Francisco.

A CABLEGRAM to the daily papers states that Dr. Behring has discovered an anti-cholera serum, and announces that a public demonstration of its properties will be made at an early date.

WE learn from *La Nature* that the Venetian Society for the encouragement of pisciculture has secured, from the Aquarium of the Trocadero at Paris, spawn of the California salmon, to be placed in the streams of the province.

Nature states that Mr. John Donnell Smith is still in Nicaragua, in pursuance of his botanical explorations, which have already been so fertile in additions to the Central American flora, and that M. R. Schlechter is intending shortly to start on a two years' botanical exploration of the south and east of Africa. His program includes a prolonged stay in Namaland, the Transvaal, Coud-Bockeveld, Limpopo and Matabeleland as far as the Zambesi. Subscriptions for his collection will be received by Prof. Schumann, Botanical Museum, Grünewald str., Berlin. They will be at the rate of 35 marks the hundred.

LIEUT. E. ASTRUP, the Arctic explorer who was with Lieut. Peary on his first expedition to Greenland, was found dead on Jan. 19th in a valley in the Dovrefjeld Mountains, near Jer-

kin, Norway. He started from Christiania before Christmas to make an exploring trip on skis in the mountains. He had apparently been overcome by fatigue and cold. Lieut. Astrup was only 31 years of age.

AT a general meeting of the London Institution of Electrical Engineers, on January 16th, Mr. Crompton, the retiring President, gave up the chair to Dr. John Hopkinson, who delivered his inaugural address, reviewing at length the progress which had been made in the direction of practical applications of electrical knowledge during the past sixty years.

WE have received the first bulletin of the *Institut International de Bibliographie*, which will hereafter be published from the office of the Institute, 11 Rue Ravenstein, Brussels. It contains the address of Chev. Descamps given at the close of the recent International Congress of Bibliography, the rules of the Institute, the plans proposed for a general bibliography by MM. H. La Fontaine and P. Otlet, and notes on the decimal system of classification.

THE *Engineer* has offered a prize of a thousand guineas for a contest of horseless carriages to take place in England in October, and arrangements are being made by American manufacturers for a similar contest between Jersey City and Philadelphia with a prize of \$5,000, to take place as soon as the roads are in good condition in the spring.

ARRANGEMENTS have been made for the following lectures to be given before the Royal Institution before Easter: Dr. J. G. McKendrick, professor of physiology in the University of Glasgow, six lectures on 'Sound, Hearing and Speech'; Prof. Charles Stewart, Fullerton professor of physiology, R.I., eleven lectures on the 'External Covering of Plants and Animals: its Structure and Functions'; Mr. H. Marshall Ward, Professor of Botany in the University of Cambridge, three lectures on 'Some Aspects of Modern Botany'; Lord Rayleigh, professor of natural philosophy in the Royal Institution, six lectures on 'Light.' The Friday evening meetings will begin on January 17th, when a discourse will be given by Lord Rayleigh on 'More about Argon.' Succeding discourses will probably be given by Prof. Bur-

don Sanderson, Dr. John Murray, Dr. Edward Frankland, Prof. T. R. Fraser, Prof. Dewar and other gentlemen.

ACCORDING to the *Lancet* the trustees of the Bellahouston fund have made the following additional bequests to Glasgow Infirmary: 1. To the Royal Infirmary (1) a grant of £2,500 in supplement of an equal sum already paid by the trustees for the better equipment of the medical school; and (2) a grant of £7,500 towards the erection of a pathological museum and laboratory and another operating theatre, to be called the 'Bellahouston theatre.' 2. To the Western Infirmary (1) a grant of £3,500 for the erection of another operating theatre, to be called the 'Bellahouston theatre'; and (2) a grant of £5,000 towards the erection of pathological buildings. 3. To the Victoria Infirmary a grant of £6,000 for the erection and equipment of a dispensary for out-patients, to be called the 'Bellahouston dispensary.'

THE annual loss to Pennsylvania by forest fires is estimated by the State Forestry Commissioner to be at least \$1,000,000. He holds that the fires are always due to ignorance, carelessness or crime, and that these may be controlled.

THE multiplication of laboratories for the study of experimental psychology has nearly ceased, only because almost every school of any importance now possesses such a laboratory. It is already evident that a second era in this movement is beginning. A few weeks ago it was announced that the department of psychology at Cornell University had just taken possession of splendid new quarters on the fourth floor of Morrill Hall, comprising a series of nine rooms and some 4000 feet of floor space. Word now comes from Nebraska that psychology has just moved into the first floor of the new library building and occupies a series of five rooms with a floor space of about 3000 square feet. The rooms comprise a lecture room that will accommodate one hundred students; a study that may be used also as a private laboratory; a shop equipped with lathe and tools, to the value of about \$300 (this room is also used as laboratory at certain hours); and two large rooms for general laboratory practice, one of which has a small dark room cut off.

The building is by far the best constructed, not only of the University buildings, but of all the State buildings. The first floor is finished in hard pine, with two-inch hard maple floor laid in cement. One of the laboratory rooms is provided with three stone piers, extending directly into the ground with tops 20x24 inches. This same room has six windows, each $7\frac{1}{2} \times 4\frac{1}{2}$ feet. Double shades, white and black, regulate the light. One hundred and fifteen students are now taking work in psychology in the University of Nebraska.

UNIVERSITY AND EDUCATIONAL NEWS.

GROUND has been broken for the first of the four buildings of the new biological school of the University of Chicago, which is to be erected with part of the \$1,000,000 recently given by Miss Culver. It is proposed to erect special buildings for zoölogy, botany, anatomy and physiology, instead of one biological building, as planned before the receipt of Miss Culver's gift.

THE College of New Jersey, Princeton, will celebrate the 150th anniversary of its foundation in October next. It is proposed to hold an academic festival on October 20, 21 and 22, at which time it is said the name of the institution will be altered to Princeton University. An effort will be made to largely increase the endowment of the College, the money to be used chiefly in developing the University work.

ELIZA M. MOSHER, M. D., of Brooklyn, N. Y., has been appointed a professor of hygiene in the University of Michigan.

THE Fellows of the Royal College of Surgeons, London, on January 2, declared themselves, by a vote of 72 to 10, in favor of admitting women to the examinations and diplomas of the College.

VASSAR College has received \$8,000 from Miss Helen Gould for the foundation of a scholarship.

THE Senate of Toronto University has made a claim against the Province of Ontario, or the Dominion of Canada, for more than \$100,000.

THE University of Pennsylvania has received a gift of \$5,000 from Mr. Charles M. Swain and \$5,000 anonymously, the money to be used without restrictions.

THE will of the late Martin Brimmer, of Boston, to take effect on the death of his wife, bequeaths \$50,000 to Harvard University.

DISCUSSION AND CORRESPONDENCE.

THE METRIC SYSTEM.

EDITOR OF SCIENCE: I enclose a copy of House Bill No. 2758 in regard to the Metric System. This bill has been introduced by Hon. D. Harley, of Brooklyn, N. Y., after consultation with the Secretary of the American Metrological Society and officers of the U. S. Government (Gen. Duffield, Superintendent of U. S. Coast and Geodetic Survey; Professor Newcomb, of the Nautical Almanac Office, and Mr. Tittmann, of the Coast and Geodetic Survey), and others. The Committee on Coinage, Weights and Measures, of the House of Representatives, has the bill in charge. Hon. C. W. Stone is Chairman of the Committee.

It is hoped that those interested in the matter will urge on the Committee the great desirableness of a favorable report to the House.

J. K. REES.

AMERICAN METROLOGICAL SOCIETY,

OFFICE OF SECRETARY,

NEW YORK, January 24, 1896.

The bill to fix the standard of weights and measures by the adoption of the metric system of weights and measures is as follows:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That from and after the first day of July, eighteen hundred and ninety-seven, all the Departments of the Government of the United States, in transaction of all business requiring the use of weight and measurement, shall employ and use only the weights and measures of the metric system, as legalized by Act of Congress approved July twenty-eighth, eighteen hundred and sixty-six.

"SEC. 2. That from and after the first day of July, eighteen hundred and ninety-nine, the metric system of weights and measures shall be the only legal system of weights and measures recognized in the United States.

"SEC. 3. That the tables in the schedules annexed to the bill authorizing the use of the metric system of weights and measures, passed