The officers for the ensuing year are: *President*, B. D. Halsted; *Vice-President*, R. A. Harper; *Treasurer*, C. A. Hollick; *Secretary*, G. F. Atkinson. *Members of the Council*; B. D. Halsted, B. L. Robinson, R. A. Harper, C. A. Hollick, G. F. Atkinson, C. E. Bessey, F. V. Coville.

An important step was taken by the Society in appointing a committee to consider the best means of realizing the purposes of the Society, 'in the advancement of botanical knowledge,' as defined in the constitution. Among other things this committee will consider the uses to which the accumulating funds of the Society may be put. The committee will report at the next annual meeting of the Society.

GEO. F. ATKINSON,
Secretary.

SCIENTIFIC BOOKS.

PUBLICATIONS OF THE EARTHQUAKE INVESTIGATION COMMITTEE—IN FOREIGN LANGUAGES, NUMBERS 3 AND 4 TOKYO—1900.

THERE is one science which the Japanese have practically made their own. Blessed or cursed (according to how you look at it), by the frequent occurrence of earthquakes, and blessed (certainly) by the presence of a large number of able and enthusiastic students of physical science, Japan has become within twenty years a vast seismological laboratory in which seismic phenomena are being studied as they never were before. Indeed, modern seismology had its birth there, and there it has been and is being most carefully nurtured. About twenty years ago there were in Japan a considerable number of foreigners employed as professors of engineering, geology, physics, etc., and of necessity they became interested in the one characteristic natural phenomenon, the unpleasantly frequent manifestations of which none of them will ever forget.

In the observational study of earthquakes one of them, Professor John Milne, F.R.S., now residing on the Isle of Wight, then Professor of Geology in the School of Engineering, exhibited a zeal and enthusiasm together with untiring patience and fertility of resource beyond all others, and mostly through his efforts the 'Seismological Society of Japan' was organized. In its organization and maintenance the foreign professors received the hearty cooperation of the Japanese officials in the University and out of it. For several years the society issued annual volumes of Proceedings, the great value of which has been everywhere recognized. The gradual and finally almost complete withdrawal of foreigners from the educational work of the country resulted at last in the suspension of the active work of the society, but happily this did not occur before the Japanese had come to realize fully the importance of the work it had done, and, indeed, not until a number of their own young men had been fully trained to carry that work on.

In 1891 official interest in seismology took definite form in the passage of a vote by the Chamber of Peers or House of Lords, upon the initiative of one of its members Dr. Dairoku Kikuchi, now President of the Imperial University of Japan. By a large majority the Cabinet was urged to appoint an 'Earthquake Investigation Committee,' and on June 25, 1892, an Imperial Ordinance was promulgated establishing such a Commission and naming its members. Its duties were defined in a general way in this Ordinance and the payment to its members of a small annual salary was authorized.

The Committee prepared a very elaborate and comprehensive scheme of work which it has followed pretty closely up to the present. The President is Dr. Kikuchi, and Dr. Omori, of the Faculty of Sciences of the Imperial University, is Secretary. There are nearly thirty members, including professors of pure and applied sciences in the University, engineers, architects, etc.

It has been the wise practice of the Committee to publish its principal proceedings and most important papers in foreign languages and of the two under review No. 3 is mostly in the French language and No. 4 is in English.

One of the principal objects of the Committee is to consider the practical aspects of seismology with a view to a lessening of the loss of life,

damage to buildings and other structures, as far as may be found possible, so that much attention has been given to studies of resistance of materials of construction and to the effect of actual earthquakes upon existing structures of various kinds. No. 3 consists, in the main, of an account of a most elaborate and interesting experimental investigation of some of the more important physical properties of bricks, and briquettes of cement, mortar, etc., especial attention being given to those qualities which give strength and stability against seismic disturbance. This report is by S. Tanabe, a member of the Committee, and is a valuable contribution to our knowledge of the subject.

There is also, in the same volume, a short description by B. Mano of a machine by which a platform or 'shaking table' is made to oscillate as it would during the passage of a series of seismic waves, the horizontal and vertical motions being produced independently, each capable of adjustment as to amplitude and frequency, so that almost any kind of disturbance may be imitated, except minute earth 'tremors.' The motive power consists of two steam engines, and as many as 270 oscillations per minute may be maintained. There is also a brief note on the damage suffered by tall chimneys in the earthquake of June, 1894, and in that of October, 1893. In the case of the latter 230 chimneys in all were examined, ranging in height from 30 feet to 150 feet. Of these 53 suffered serious injury, the highest percentage being for those between 60 feet and 80 feet high. The volume closes with a paper in English on 'The Scope of the Volcanological Survey in Japan,' by Dr. B. Koto, member of the Committee, who has undertaken to study the geological aspects of the seismic problem. For the great majority of earthquakes the author rejects the volcanistic hypothesis and adopts the *tectonic*, believing that seismic disturbances are intimately related to the process of mountain building.

No. 4 begins with a condensed statement on the 'Construction of Earthquake-proof Wooden Buildings.' Although very brief, this paper is of great interest, and as nearly all houses in Japan are built of wood it must prove to be of great practical value. Rules for the making of joints, the construction of frame work and especially of roof framing are given with sufficient detail and clearness (aided by numerous illustrations), and particular emphasis is placed on the character of the foundation. Even ordinarily constructed wooden houses are damaged less by earthquake disturbances than structures of brick or stone, and when built according to the rules and suggestions given in this paper they will be generally immune except during unusually violent shocks. The worst part of an ordinary Japanese house, from the seismic standpoint, is the heavy tile roof, and the importance of making the roof as light as possible, and of having the tile securely fastened, is dwelt upon in this compendium. The use of iron plates and straps, with bolts, in the formation of joints is strongly advised. It may be interesting to note here that the new palace for the use of the Prince Imperial is to be a modern 'structural steel' affair, the material having been obtained in this country, and in the structural plans, made by American architects, especial care has been exercised to provide against damage by earthquake. By the use of numerous cross-braces and 'ties' it is made to resemble somewhat a huge steel basket which, although it may, and indeed, should be capable of a little elastic yielding, can never be seriously injured in any imaginable seismic disturbance.

Anent the generally damaging effect of earthquakes upon brick buildings Dr. F. Omori discusses the records of a number of disturbances as shown by two of Professor Ewing's horizontal pendulum seismographs, one of which was set up on a wall of a large brick building, known as the Engineering College, and the other on the ground near by. Ten earthquakes were thus observed and recorded, none being very strong. The results appear to show that in comparatively long period oscillations, that is to say those somewhat above .5 second, there was no noticeable difference in amplitude between those of the second story of the brick building and those of the ground, while with quick period motions the movement was greater on the wall of the building than on the ground, the average amplitude of the former being double that of the latter. Omori

calls attention to the fact that injury to brick buildings by earthquakes is nearly always much greater in the upper stories than in the lower, and he illustrates this by photographs of the condition after the great earthquake of 1891 of the Aichi Cotton Mill and the Post and Telegraph Office, both at Nagoya. The Charleston earthquake in 1886 afforded many examples of this.

Omori furnishes two very interesting notes on the great earthquakes of 1891 and 1894. These are the most violent disturbances that Japan has suffered in recent years, and that of October 28, 1891, was probably at least equal in intensity to any other earthquake of which we have authentic record. Its greatest activity was displayed in the provinces of Mino and Owari. The land area disturbed was about 250,000 square kilometers, and as the mean radius of propagation was about 520 kilometers the total shaken area was about double the area of the whole empire. The total number of people killed was 7,000, and 80,000 houses were entirely destroyed. The fact that only one life was lost for every 11 houses destroyed illustrates (when compared with the effects of earthquakes in brick- and stone-building countries) the greater safety of wooden houses which, even when destroyed, afford ample warning and time to enable their inmates to escape.

The actual motion in this earthquake was nowhere satisfactorily recorded on seismographs, but Omori has made up for this lack as far as possible by the observation and calculation of a large number of overturned stone lanterns and tomb stones, noting as well those not overturned. The horizontal acceleration necessary to overturn is calculated by West's formula which is very simple and unquestionably very nearly correct under the conditions considered.

It is

$$a = \frac{x}{y} g$$

in which g is the acceleration due to gravity, and x and y the horizontal and vertical coordinates of the center of gravity of the column, the origin being the edge about which overturning takes place. It is assumed that the motion is entirely horizontal which introduces no sensible error except for points, very near the epifocus. Results are computed for about sixty points in the disturbed area, and in several instances a horizontal acceleration of over 400 centimeters per second, is shown. The seismograph at Nagoya, one of the principal points shows that the complete period of the principal vibrations was about 1.3 seconds, and as the maximum acceleration there was 260 cm., it follows that the range or amplitude of vibration of the earth particle was between 23 cm. and 24 cm.

The earthquake of June 20, 1894, although the most violent experienced in the Tokyo district since 1855, was much less strong than that of the Mino-Owari district referred to above. Twenty-six persons were killed and 171 were wounded. Fortunately the disturbance was very satisfactorily recorded by a strong-motion seismograph at the Seismological Observatory in Tokyo. The actual amplitude of horizontal motion was 7.3 cm., and the maximum acceleration was about 100 cm. per second. In the greater shock of 1891 this was probably not less than 1,000 cm. per sec. per sec.—being a little greater than the acceleration due to gravity.

Dr. H. Nagaoka has a very interesting paper on the experimental determination of the elastic constants of rocks, leading to important conclusions relating to the velocity of seismic waves. From observations made in Italy and also in Japan, Omori has concluded that the velocity of the first tremor is generally as high as 13 kilometers per second, which is surprisingly great, the principal shocks usually showing a speed of 3 kilometers to 4 kilometers per second.

Nagaoka discusses the conditions under which the very high velocities may occur, and one cannot avoid being impressed with the great value of earthquake observations as a means of ascertaining the nature and conditions of the interior of the earth.

The greatest part of No. 4 consists of an account, by Omori, of an elaborate series of 'Experimental Studies upon Fracturing and Overturning Columns,' and this is not only one of the most interesting, but perhaps the most important paper in the whole series. In this investigation the 'shaking table' already referred to was made use of and columns of considerable dimensions and various materials were used. Many were of dimensions equal to those

of the stone lanterns and tombstones made use of in computing the intensity of the Mino-Owari earthquake. The accelerations necessary to overturn were also calculated by West's formula, and it is surprising to see how closely they accord with those obtained from the graphic record of the 'shaking table.'

Because the contents of these volumes are made up of carefully conducted observations of actual and very strong earthquakes, for the first time recorded by means of satisfactory instruments, together with elaborate experimental investigations of important related phenomena, and because all these results are fully discussed with remarkable skill and keen scientific insight, it is, perhaps, not too much to say that they constitute the most valuable contributions yet made to the literature of seismology.

Even those who know the men who are doing this work, through familiar association and often close personal relations, cannot avoid a feeling of astonishment at the extraordinary performances of a people whose contact with the world at large has been only that of the present generation, and with whom the so-called civilized nations have been strangely and unreasonably unwilling to treat on a basis of equality until within three or four years. When I reflect that seismology is only one of the many sciences in which in original research the Japanese are well in the front rank, and this, too, without the inspiring example of an ancestral Galileo, Newton, La Place, Humboldt or Franklin, I wish to do figuratively what I have done many times actually—I take off my hat to an oriental nation that in peace or in war need ask no odds of Europe or America.

T. C. MENDENHALL.

Rapports présenté au Congrès International de Mécanique appliquée; Exposition Universelle de 1900. Tome I. CH. DUNOD, Editeur. Paris. 1900. 8vo. Pp. 546.

The various congresses of the Paris Exposition of 1900 are now bringing out their published papers and discussions, and the royal octavo volumes of the Congress of Applied Mechanics are finely illustrative of the character of the work performed at these conventions and of the manner in which it is to be published. Of the innumerable books printed relating to the Exposition, these are the most valuable and, to the serious student of that great cyclopedia, most interesting. The 'questions' discussed in Vol. I. are nine in number; 'Organization of Works'; 'Organization of Mechanical Laboratories'; 'Mechanical Applications of Electricity'; 'Hoisting Apparatus'; 'Hydraulic Motors'; 'Sectional Boilers'; 'High-speed Engines'; 'Heat Motors'; 'Automobilisme.'

The first topic is discussed by M. Touissant, who presents a study of the manufacturing establishment generally, and Mr. Dickie, who gives a most interesting account of the organization and administration of the Union Iron Works of San Francisco, the birthplace of the famous battleship *Oregon*, and the source of innumerable steamships, steam-engines and pumping and winding engines, and of mining and manufacturing machinery in enormous amount. M. Boulvin discusses the organization of mechanical laboratories, and his valuable paper is introductory to that of Dwelshauvers, who describes that of the University of Liège, organized by him after years of struggle and strife with the ultra-conservative administration of the University and the Government. The evolution of the mechanical laboratory in America, as an element of technical instruction, is described by Thurston and includes papers by a number of representatives of engineering schools in the United States, giving accounts of an equal number of the most extensive and interesting laboratories of that class in our country. The development of the laboratory of applied mechanics and its accessories as a means of instruction, primarily, and as an item in the equipment of the technical school and as an essential element of the curriculum, was first effected satisfactorily in the United States. The European schools are now coming to the same plan in rapidly increasing numbers, often modeling after our own in both equipment and methods of employment. Another instructive division of this subject is discussed by Commandant Mengen, who tells of the organization and the details of equipment of the laboratory of the ordnance department of the French army, which is very extensive

and complete and is evidently conducted in a modern and fruitful manner.

The third 'question' includes a paper by Dr. Kennelly, describing mechanical applications of electricity, especially as observed in the United States. Messrs. Delmas and Henry discuss the use of the current in hoisting machinery and in the establishments of public works departments. M. Bassères discusses the fourth question and especially the work of the 'Compagnie des Fives-Lillie.' Hydraulic motors, as constructed in Switzerland, the home of that form of prime mover, 1889–1900, are reported upon by M. Prazill. M. Rateau writes of their theory and construction as illustrated by contemporary practice in general.

Dr. W. F. Durand takes up the sixth topic and gives an account, complete and exact, of the water-tube boilers employed in the United States, and M. Brillié also discusses the 'chaudieres a petits éléments,' their classification, efficiency, operation, with characteristic thoroughness. MM. Lefer and Lecornu write of high-speed engines and of regulators, the former including the ancient Greek type, just revived, the steam-turbine. 'Thermic Motors,' apparently only intending to include the gas-engines in the class, are the subject of valuable papers by MM. Diesel, who reports on his own invention and construction; by Mr. Donkin, who discusses those employing the waste gases of the blast furnace; and by M. Witz, the well known authority on that class of motor, who tells of gas-engines of large power employed in metallurgy. The final discussion in this volume is that of 'automobilisme,' by MM. Rochet, Cuénot and Mesnager.

All the papers here published have special value in their several departments of applied science and some of them are extremely important. The contributors to the volume are usually French writers and practitioners of authority; a few are American, and we recognize the name of but one German in the list. The German government took a leading part in the Exposition and German exhibitors abounded, as did German visitors; but the scientific men of Germany, in this department, at least, seem to have held aloof.

The book is a fine sample of the style and finish of the French official document. In paper, type and finish, and illustration, while not what a French critic would consider illustrative of a high class of bookmaking, it is, for its place and purpose, most excellent. In many cases of condensation and of abstracting, on the part of the editors, as especially in the case of the descriptions of American mechanical laboratories, where the original contained very extensive and very extensively illustrated details, the necessary work of merciless condensation has been, in the main, very well done. The translations from the English into the French are, so far as a first rapid survey would indicate, excellently performed. The collection will have great and permanent value to the engineer and to the professor of engineering, as well as to all having interest in these divisions of applied mechanics.

R. H. Thurston.

The Antarctic Regions. By Dr. Karl Fricker. Translated by A. Sonnenschein. New York, The Macmillan Company. 1900. Pp. xii + 292. With many maps and illustrations. Price, $3.00.

In view of the widely extended interest in the Antarctic region at the present time, it would seem as though it would almost be unnecessary to say that this was a timely production. It is, however, not the only requisite of a book that it is timely. Its substance should be of a high character and its form of statement should be clear. In this particular case, the historical portion of the work is good, but its character is marred by too great condensation. This fact alone would make it a poor book to put in the hands of the general reader, who is looking for pleasure as well as for information. Even if the original work was intended for the scientific man, the translator should have had tact enough to recognize the fact that it was not at all necessary to follow the German construction of the sentences too closely. A good translation should take some account of the spirit of the language into which the work is to be rendered, and not make its perusal a burden by the introduction of too many parenthetical sentences. Of course in such a work as this much new information is not to be expected, and the major portion of

the book is given over to a historical summary of the various voyages to the South Polar region. But that is no reason for closing this section of the book with the following sentence (p. 131):

"This survey indicates what parts of the Antarctic regions have principally been visited, and sums up how much or how little has been achieved by each attempt. It will be the aim of the subsequent pages to gather into a whole the results of all these explorations so far as their fragmentary nature renders such a task possible."

This portion of the book is followed by a description of the 'conformation of the surface and geological structure,' which would be a very acceptable piece of work were it not for the cumbersome English sentences which defy all attempts to parse them.

A splendid opportunity to offer a summary of our knowledge of the climate, the structure of the ice, the fauna and flora is simply annihilated by such sentences as the following (p. 250): 'The non-melting of the snow is of necessity accompanied by a change in its transformation.'

Again, scientific men do not usually speak of a species of animals being 'extirpated,' as they are said to be on pages 270 and 273.

The maps and charts are, however, the redeeming features of the book. They form a very interesting collection of illustrations and are worthy of a better fate than burial in such ponderous and heavy verbiage.

It is also to be regretted that in giving a list of books, articles and maps upon this subject, no attempt was made to make the list as nearly complete as possible. In these days of careful bibliographical work the preparation of such a list would have been a comparatively easy task. Furthermore, a labor of this character would have been very much appreciated by the scientific world, and it is a pity that it was not done.

By what has been said above, it is not intended to produce the impression that the book is without merits. It will be a useful compend for a person who desires to become acquainted with the leading facts in connection with Antarctic investigations, but it will never be a book of popular interest. In the scientific summaries too little has been given to satisfy the scientific man, and it is therefore evident that there is still an opportunity left for a book which will satisfy these conditions.

WILLIAM LIBBEY.

Physiology for the Laboratory. By BERTHA MILLARD BROWN. Boston, Ginn & Co. 1900. Pp. viii + 167.

A Syllabus of Elementary Physiology with References and Laboratory Exercises. By ULYSSES O. COX. Mankato, Minn., Free Press Printing Co. Pp. viii + 167.

If one were to judge by the number of books on 'Practical Physiology' that appear yearly, it would seem that the long-hoped-for day had come in which Physiology had become a laboratory study in all academic grades from the grammar school to the university. Even if it fulfills the ideal of its author only, each book in this field, if well done, is to be welcomed, for it means at least an attempt in the right direction.

Of the two books now before us Miss Brown's is the more modest. In less than 150 pages there are given the essential experiments in a course in Vertebrate Physiology, presumably for the high school or normal school. A chapter on the cell and one on the bacteria are added. The matter is in large part purely physiological, but the dissection of the various organs is included. Vivisection is excluded except the slight amount that is involved in a study of reflex action in the brainless frog. The directions simply point the way, and the chosen ground is well covered. A few corrections should be made: The chromosomes are said to 'be scattered through the protoplasm'; epidermis is 'the outer, dead skin'; the expanded portion of the external ear is misnamed the 'concha,' while the reflex character of the knee-jerk is settled by requiring the student to trace the course of the nerve impulse.

The book by Mr. Cox consists of a syllabus with references to reading, and a series of laboratory exercises. The syllabus is a detailed but crudely expressed classification of the conventional subject-matter of Physiology, of which students could make little use. The references are chiefly to well-known American and English

text-books, most of which are good but some of which are sadly out of date. The laboratory exercises partially cover the conventional elementary ground, but are inferior to those of Miss Brown and of other authors. Unfortunately the book is marred by slovenly English, colloquial expressions and typographical errors.

FREDERIC S. LEE.

Physiology, illustrated by Experiment. By BUEL P. COLTON. Boston, D. C. Heath & Co. 1900. Pp. xiii + 386.

This book is intended as a 'Briefer Course' of Mr. Colton's 'Physiology, Experimental and Descriptive.' As an elementary text-book for secondary schools it can be recommended. It contains an unusually large amount of matter, concisely, briefly, and upon the whole attractively presented. It is preeminently physiological and hygienic as distinguished from anatomical. Its language is not overburdened with technicalities. Its directions for practical work are limited, but this is excusable in view of the many satisfactory laboratory books now in existence. Most of its figures and diagrams are excellent.

The treatment of the subject of alcohol, while fairly moderate as compared with that of some writers of text-books, is somewhat intemperate in its use of adjectives. At the beginning of the chapter devoted to this subject the bald statement is made that 'alcohol is not a food.' At the close of the chapter it is allowed, on the authority of well-known quoted writers, that 'technically it may be called a food.'

FREDERIC S. LEE.

FOLK-LORE IN BORNEO.

DR. WILLIAM HENRY FURNESS 3d, had privately printed an attractive little volume called 'Folk-lore in Borneo: A Sketch,' in which is given a brief report of an ethnological field that has acquired a new interest because of the recent discoveries made in the group of islands to which Borneo belongs. The influence of a tropical environment is noted by the author in the Kayan myth of creation, which he narrates as a 'purely Bornean' product, and contrasts it with the Dyak account of the genesis of the race, wherein he discerns Malay influence. Among the interesting pages of the book are those which tell of head-hunting, 'the one ruling passion of the people.' The tradition of its origin is given, and the author thoughtfully remarks: "It is not unfair to infer from this tradition that they have a crude, germinal sense of the barbarity of their actions, in so far as they think it necessary to invent an excuse to palliate that savage love of trophy-hunting which seems inborn in mankind." And he points out how the native beliefs concerning the five peculiar regions in 'the land of departed spirits' tends to conserve the practice of the head-hunting 'rite.' Among the many interesting subjects touched upon are the connection between the Pleiades and agriculture; the omen birds and the devices the people practice to avert bad luck; the function of fire as a 'go-between of man and the birds'; and the glimpses of a river cult among these natives. The illustrations really illustrate the text; they are admirably selected, and the pictures of old and young, men and women, inspire confidence as types, as they are without exaggerated peculiarities. The book is a welcome addition to the literature of folk-lore.

A. C. F.

DISCUSSION AND CORRESPONDENCE.

NEWSPAPER SCIENCE.

TO THE EDITOR OF SCIENCE: I have had so much satisfaction in the review and criticism recently published in SCIENCE, of Mr. Tesla's magazine article on 'Human Energy' that I cannot avoid making public acknowledgment of my appreciation of its justice and timeliness, especially the latter. Is it not the imperative duty of men of science to do what the author of this review has done, more frequently than they have during the past ten years?

Within this decade there has been an enormous decrease in the cost of publication and especially in the expense of illustration, and this has brought about a deluge of reading matter of such infinite variety and general worthlessness that the formation of a society for its systematic suppression is worthy of serious consideration. With the daily newspapers it has been distinctly an era of sensationalism.

A reporter for a daily paper recently de-