index are to flow directly into the lap of the individual scholar, seated at his own desk in his private sanctum, enabling him to discard (not inappropriate word) to the limbo of the great libraries everything that does not directly concern him, while filing within reach of his finger-tips absolutely everything (pardon the optimism of an enthusiast) that he may intimately desire.

How can so Utopian a consummation be most speedily attained?

Let universities and colleges, and all manner of learned institutions and societies, at once appoint committees similar to the Harvard committee (though of course not limited to the natural and physical sciences, since the project of the Royal Society will form only a portion of the great undertaking), to accomplish three preliminary objects:

1. To arouse an intelligent and earnest interest in the subject.

2. To induce the Smithsonian Institution to assume the American leadership of the movement.

3. To convince publishers—primarily the publishers to the respective institutions concerned—of the importance of printing, on slips of the standard size, No. 33, of the American Library Bureau ($7\frac{1}{2}$x$12\frac{1}{2}$ cm., 3x5 in. approximately), summaries of their current publications for distribution as publishers' announcements. This size of slip is already widely in use, both publicly and privately, and may well prove to be of the dimensions ultimately adopted by the authorities of the projected international index. A beginning of these publishers' announcements has already been made by Messrs. D. C. Heath & Co., at the personal request of the present writer, and has been favorably submitted to the attention of the Secretaries of the Royal Society by Professor Bowditch, chairman of the Harvard committee. Other leading American publishers have heartily favored the idea of these card announcements and have promised to introduce them into use.

Columbia College has within a few days appointed, through its University Council, a committee to further the interests of the proposed International Coöperative Catalogue of Scientific Literature.

Yours very truly,

HENRY ALFRED TODD.

COLUMBIA COLLEGE, March 2, 1895.

PITHECANTHROPUS ERECTUS.

EDITOR OF SCIENCE—*Sir*:

In my letter of February 14th occur two expressions which need amendment. For the phrase 'divergent roots,' p. 240, 1st col., first line, read 'divergent root stems;' and for the phrase 'is wider than long,' p. 240, 2d col., fifth line, read 'is much wider than long.'

Yours truly,

HARRISON ALLEN.

PHILADELPHIA, March 4th, 1895.

SCIENTIFIC LITERATURE.

Electrical Engineering, for Electric Light Artisans and Students. By W. SLINGO and A. BROOKER. New and revised edition, London, 1895. Longmans. Price, $3.50.

The object of this work is to cover general electrical engineering, and, taken as a whole, it is probably the most successful attempt yet made in this direction. The demand for a satisfactory general treatment of the applications of electricity is a very large and important one, and anything which supplies this demand is more than welcome. It is very doubtful whether any single work is ever likely to be published which will completely set forth the numerous and rapidly developing branches of electrical science and industry. Nothing short of an encyclopædia of many volumes could be expected to accomplish this result. A general discussion of the most important principles and uses of electricity, particularly if it is not attempted to cover all branches, is a far more practicable problem, as the success of this volume demonstrates.

A work of this kind, however, is somewhat limited in its scope, since it is not intelligible to the ordinary untechnical reader, and is not of much use to the professional electrical engineer, who requires a more thorough and detailed study of each subject than is possible in a general treatise. This work would therefore be suited to one who had a certain amount of technical knowledge but who was not a specialist in electricity, for example, a mining or mechanical engineer, or a young man who had received a certain amount of electrical education at a technical or trade school and who wanted to learn more by his own efforts. It would also be useful as a text-book wherever a general course in electrical engineering is given. But in the opinion of the reviewer, a general treatment running from one subject to another is not the best way to educate electrical engineers of the highest type. This requires a careful and special study of each branch, aided by lectures and laboratory work, and the text-books should be entirely devoted to one subject, or, in fact, several books, each devoted to a small part of any one branch, is often preferable.

The authors of this book have had considerable experience as teachers and also the advantage of correcting and extending the contents of the first edition, which appeared in 1890, with the result that the new edition is well arranged and expressed and in most cases is brought reasonably well up to date. The first six chapters are devoted to general principles, units and methods of measurement. The next six chapters contain a treatment of dynamos and motors which is very satisfactory, considering the limitation of space. Transformers, secondary batteries, arc and incandescent lamps, are also well explained; but the last chapter, on 'Installation equipment, fittings, etc.,' is very meagre and the least satisfactory portion of the book. In fact, the principal criticisms would be that each element or device is explained as a separate thing, and no methods for combining these into systems are given. Nevertheless, it is a fact that the general design and arrangement of electrical apparatus is fully as important as the merits of each particular element. For example, the laying-out of a central station, or even a small isolated plant, determines its success or failure fully as much as the quality of the individual dynamos, lamps, or other particular parts of the plant.

The various systems for transmitting and distributing electric power, which is probably the most important branch of electrical engineering, are barely touched upon. In short, we may say that electrical engineering in its broadest sense is not covered, and probably was not intended to be covered, by this work. The subjects of electro-chemistry and electro-metallurgy, which now appear to be on the eve of important development, are not discussed. Telegraph and telephone apparatus and methods are not even mentioned.

These omissions, which are doubtless intentional and probably necessary, indicate that a complete treatise on electricity and its applications is almost an impossibility.

A few mistakes are noted; for example, on page 17, the International Ohm, adopted at the Chicago Electric Congress of 1893, is defined in terms of a column of mercury 106.3 centimetres in length and one square millimetre in cross section, whereas, the statement actually adopted was 'a column of mercury at the temperature of melting ice, 14.4521 grammes in mass, of a constant cross-sectional area and of the length of 106.3 centimetres.' This was intended to be exactly equivalent to a cross-section of one square mm., but it was put in this form because mass is more easily and accurately determinable than cross-section. Another somewhat serious mistake, since it is fundamental, is the statement on page 18, that specific resistance is 'the resistance of any particular substance as compared with the resistance of a piece of some other conductor, such as silver, both being of unit dimensions.' As a matter of fact, specific resistance, which is a very important term, is the resistance in ohms of a unit volume, and is entirely independent of any particular standard substance. The use of the term 'magnetic resistance,' on pages 219 to 221, is open to objection, since the term 'reluctance' is now almost universally employed to distinguish this quantity from electrical resistance.

Taken as a whole, however, the errors are not numerous, and the work is recommended as a text or reference book for those who desire to learn the principles, general construction and action of the various kinds of electrical machinery and instruments, with the exceptions already noted. F. B. CROCKER.

PHYSIOLOGICAL PHYSICS.

On the Spontaneous Heating and Ignition of Hay. BERTHELOT. Ann. Chim. Phys., 7, 2. p. 430. 1894.

The author finds that poorly dried hay may ignite when the rise in temperature is only to 140° C. (280° Fh.). The evolution of heat necessary for this rise of temperature is due to the absorption of oxygen in spite of the interrupted sprouting, which will only take place when the hay is quite wet. The chemical process involving this absorption of oxygen may continue until the hay is thoroughly dry.

Druck und Arbeitsleistung durch Wachsende Pflanzen. W. PFEFFER. Abh. d. Math.-Phys. Kl. der K. Sachsicher Gesellschaft der Wiss., 20. p. 235. 1893.

Mr. Pfeffer investigated very carefully and ingeniously the pressure exerted by parts of plants in growth, and found, for example, that a root point could exert a pressure of 10–15 atmospheres. He ascribes these forces to osmotic pressure, and criticises the view concerning the growth of the cell-wall, which ascribes it to simple plastic expansion.

La Lumière Physiologique. R. DUBOIS Rev. gén. des Sciences, 5. p. 415 and p. 529. 1894.

Part first contains a review of light emitting organisms, and a description of the organs involved. In part second the author treats the subject of the emission more thoroughly, describing the character of the light radiated, and finds that the brightest Pyrophorus radiates 1, 4×10^{-7} calorie in ten minutes.

The author summarizes his extensive investigations as follows:

Neither a perfect organ nor a perfect cell is necessary for the coming and going of the light. The cell produces the photogenic substance which, once formed, may light or not, according to the conditions surrounding it.

They must fulfill the conditions necessary for life, must contain oxygen and water, and have a suitable temperature.

The light (luminous energy) is found to be 90% of the total energy radiated.

Dubois made a fluorescent substance from the blood of Pyrophorus, which, like that from the animal itself, lost its peculiar property on being treated with weak acetic acid and regained it on treatment with ammonia.

All the causes which excite or destroy the activity of the protoplasm have a similar effect upon the production of the physiological light.

The production of light depends upon the change of living protoplasmic granulations into the condition of lifeless crystalline matter.