of the students often are premedical students, the course should be so arranged that continuity with human anatomy and embryology is attained.

One of the greatest difficulties is the inconsistency in terminology in current text-books and manuals on the various vertebrate types. Consideration of a single organ system will illustrate this. In an anatomical work of recent date, admirable in execution and illustration, the mesonephros of the shark is called a "kidney," without any qualification or explanation of the term. The same criticism applies also to many manuals in use in courses in elementary zoology, in which the mesonephros of the frog is fully discussed as a "kidney." In other manuals the accessory nephritic duct of the shark is usually called a ureter, although it has no relation to the ureter of the amniotes.

In dealing with the genital system, the old term vas deferens is used almost exclusively in disregard of the preferable B.N.A. term "ductus deferens." The latter the medical student must know. At the base of the ductus deferens or Wolffian duct of the shark and the amphibian is a small dilatation which is called the "seminal vesicle." This term the student learns, and perhaps remembers, only to discover later that this terminal dilatation is not comparable to the seminal vesicle of human embryology, but corresponds to the ampulla ductus deferens, the mammalian seminal vesicles being evaginations of the Wolffian duct, which occur only in certain mammals, including man. In a like manner the enlargement of the oviduct of many amphibians is called a uterus, although it is more nearly homologous to the shell gland of certain sharks, and certainly should never be confused with the eutherian uterus.

This same criticism of terminology may be extended in a similar manner to the other systems and is the source of much confusion to the student. Assuming that the premedical student will carry some small bits of information and some few anatomical terms into the first year of medicine, it is evident that he must not only learn more terms, but must unlearn and relearn many of those current in general zoology and comparative anatomy. Otherwise he will not gain a clear idea of the homologies between the organs of the lower classes of vertebrates and man, and will lose one of the most valuable lessons of comparative anatomy—the position of man in a phylogenetic system. It is just as easy to present accurate terms in the first instance when all terms are new and equally unfamiliar to the student, as to use those which are anatomically incorrect and which must be abandoned later.

EARL THERON ENGLE

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LUMINOUS SPIDERS

THE issue of August 21 contains a very interesting letter from Barnum Brown on his discovery in Central Burma of a luminous spider whose abdomen glowed with light while "fireflies sparkled here and there." May not this be analogous to the effect obtained by that prank of childhood when we caught and fed fireflies to the ordinary hop toad and then turned him loose on the lawn in front of the veranda to the consternation of the older folks, who could see but not comprehend the bouncing light. Maybe the spider had feasted plentifully on the abundant fireflies.

EDWARD PIERCE HULSE

In my opinion, there are three explanations of this luminosity: First, the eating of the luminous portions of fireflies by the spiders; second, injection by bacteria or fungi; third, a true luminous organ. Mr. Hulse touches upon the first possibility in his letter and the answer to this, I think, is to be found in the habits of spiders. Spiders are provided with sucking mouth parts, and do not devour the material as a whole. If this individual had selected only the luminous portions of fireflies, light would have shown not only on the abdomen, but through the thorax and head as well. I think the answer to the second possibility, injection by luminous bacteria and fungi, would hold equally true, that both thorax and head would have shown luminosity had the spider been injected. As a matter of fact, I was sufficiently close to determine accurately that only the abdomen glowed. I think that it was definitely provided with a true luminous organ.

BARNUM BROWN

SCIENTIFIC BOOKS

Telephone Communication. By C. A. WRIGHT and A. F. PUCHSTEIN.

"TELEPHONE Communication," written by Professor C. A. Wright in collaboration with Professor A. F. Puchstein, is a text-book intended for use in engineering schools. It deals primarily with the functioning of a telephone system in transmitting and reproducing speech sounds. In this connection it discusses sound, the operation of telephone transmitters and receivers in performing the conversions between sound and electrical energy; the transmission of electrical currents in lines and impedance networks, and the means of measuring and specifying the transmission efficiency of telephone circuits and apparatus.

One of the four parts of the book is devoted to recent developments in telephony, namely, the vacuum tube amplifier and its application to telephone lines, the carrier current system of multiplexing telephone lines and radio telephony. One chapter is given to measurements made in testing and maintaining telephone circuits, and one to interference between telephone circuits and from electric power lines into telephone circuits. In addition, brief discussions are given of the history of the telephone and the kinds, requirements and value of telephone service. Each chapter ends with a list of illustrative problems for the students and recommended references for the instructor, and the book closes with two appendices covering electrical fundamentals and laboratory problems.

Although the authors have by design practically eliminated references to the important signaling and switching functions of telephone systems, and to the economic and commercial phases of the communication business, it will be evident from the foregoing outline of the book that the scope is still rather ambitious for one volume. Illustrative of the range of material, statements, many of which are very brief, are made regarding such diverse subjects as electron theory, dynamic characteristics of vacuum tubes, legal aspect of the inductive interference problem, acoustics of rooms, fundamentals of good telephone service, radio broadcasting, construction of loading coils, and value of electrical communication service. While the book will undoubtedly give the reader some comprehension of the complexity of the problems of telephone communication, it is questionable whether the authors have not detracted from the value of their work by the attempt to cover too much ground. In attempting to say something on many topics they have been forced to treat many matters very casually.

The consideration is in general descriptive, although certain sections, such as those dealing with line transmission and filters, lead rather naturally to mathematical treatment. In discussing apparatus and systems the authors have wisely chosen to devote their material largely to an exposition of function and operation and to avoid detailed descriptions of the particular embodiments which have been used. The descriptive treatment of most of these subjects is probably the best that has yet been published under one cover. The technical discussions, as indicated above, suffer in many cases from lack of sufficiently extensive treatment. For example, it is doubtful whether from the material given on the propagation of electric waves over lines the student will get more than a superficial understanding of this subject. It would seem reasonable in a course such as one in which this text would be used that one of the main objects would be to ground the student thoroughly in the theory of the distribution of electrical currents and voltages in lines and circuits. In this connection it should be noted that the much used equivalent network method of handling lines, apparatus and circuits is not brought in. Some of the important theorems, such as Thevenin's, regarding transmission and circuits are not given.

In places the technical treatment is apparently lacking in clearness of conception. As an illustration, in explaining filters, the expression is frequently employed of filters offering "very high impedances" to currents of various frequencies, as synonymous with causing high attenuation. As a matter of fact the attenuation caused to certain frequencies by the introduction of a filter into a circuit may be very high and yet the impedance of the filter may be very low. This difficulty is probably due to a lack of appreciation of the distinction between resonant circuits and a wave filter, as the structure shown in Figure 128 is not a wave filter as ordinarily defined, since its attenuation constant is zero at all finite frequencies.

In discussing practical matters, the information given is in many cases wrong or misleading. For example, on page 9 it is stated that "practically all long telephone circuits are now loaded." In this country the longest and most important open wire circuits are not loaded. In a table on page 210 the critical frequency for loading in the United States is given as 2,200 cycles. In a sentence just above the table it is stated that "more recent practice has provided for critical frequencies of 2,800 and 5,600 cycles." These latter values and not 2,200 cycles are standard for practically all the loading now being applied in this country.

With regard to interference effects between power and telephone lines, it is stated that "If all the electromotive forces and currents in properly constructed distribution systems varied according to a sine wave no interference of a serious nature would occur." This of course ignores low frequency induction which, at times of abnormal flow of current due to grounds or short circuits on power systems, may cause operation of signaling and protective apparatus on telephone systems.

A section of the chapter on interference is devoted to the legal aspects of the inductive interference problem, and this indicates in a general way the trend of the legal opinion regarding the rights of the utilities involved. While this is an important aspect of the problem it has generally been found that cooperative action between the utilities concerned brings much better results than an attempt to determine solutions

in the courts. The great progress which has been made in the national and local cooperative movements now being carried on between the various wire-using utilities seems to justify this conclusion.

With the necessarily limited treatment which many of the subjects receive, it is obviously possible to raise the question as to whether some of the things which are omitted are not equally or more important than those which are included. The bearing of this and some of the other comments on the usefulness of the book in particular courses is naturally somewhat dependent upon the ideas of the instructor as to what he desires to teach.

To the matter of the justification for trying to teach in college a particular business to the student, and specifically in this case the telephone business, much thought has been given by various educators and engineers. From the standpoint of many communication engineers, the conclusion has been that such an attempt is not justified and that the instructor would do better to endeavor rather to impart to the student a good understanding of fundamental principles. A working knowledge of the theory of propagation of electric waves, for example, is useful not alone in telephone work but also in other fields. The instruction in this theory should be accompanied by illustrations of its various applications. Messrs. Wright and Puchstein have provided considerable material for such illustrations drawn from the field of telephony.

Despite questions, such as those indicated above, which can be raised against parts of the book, it will undoubtedly serve a useful purpose as an instruction manual since much of the material is distinctly an addition to that hitherto available for student use.

Le métabolisme de base. By ÉMILE F. TERROINE (Strasbourg) and EDGARD ZUNZ (Bruxelles). Presses universitaires de France, 1925, pp. 1–187.

THIS is the best book on the subject of metabolism published in a foreign language. It deserves high commendation on account of its full consideration of world literature, a treatment nowadays so unusual as to warrant special praise. It is indeed a pleasure to read in the French language exact reports of the work of Rubner, Benedict, Du Bois and others. An excellent critical review of the law of surface area as the standard by which basal metabolism may be measured leads the authors to the acceptance of this standard. Possibly more space than is necessary is devoted to the discussion of Newton's law of cooling as being the determinative factor in basal metabolism, because for many years no one has so considered it. The reviewer notes with regret, but not surprise, that his own experiments on the specific dynamic action of sugar and amino-acids are not fully understood. The cost of this excellent volume is 20 francs (94 cents), which is in striking contrast to charges inflicted upon foreigners by German publishing houses.

GRAHAM LUSK

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLE AND EFFICIENT HYDROGEN ELECTRODE

THE writer, during his studies of the hydrogen ion concentration of certain Hawaiian soils and pineapple plant fluids, constructed a hydrogen electrode which proved very efficient and satisfactory in every respect for the work. This electrode was found to reach equilibrium in relatively less time than certain other well-known electrodes, and it is on account of this single merit that a description of its construction and operation is given herewith.

The principle on which the electrode is operated does not differ from that of other forms. The con-

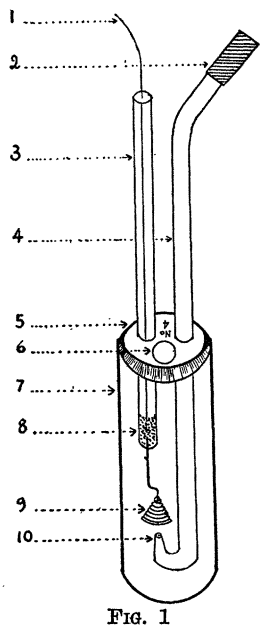

FIG. 1

struction of the entire apparatus (Fig. 1) is very simple. It consists of a cell (7) made of a flat bottom glass tube 7.5 cm long and 2.5 cm in diameter, an electrode supporter (3) made of a glass tube 10 cm long and 0.5 in diameter, a hydrogen gas conductor (4) made of glass tubing, 15 cm long and 0.5 in diameter, and a No. 4 rubber stopper (5) through whose three holes are suspended the electrode-supporter, the hydrogen-gas-conductor and the salt bridge