Lastly, there comes a well-illustrated section on milk products and the methods of working them up for market. So important is cleanliness in working that several pictures are given of modern cow-sheds built on the best possible principles; in one, indeed, the cowman is shown cleansing the cow with a special vacuum cleaner! This section will probably prove most interesting to English readers, as it gives fairly full outlines of the German factory methods.

A few misprints are inevitable, but how did this wonderful piece of Greek on p. 12 pass the proof-reader "kohlenhydrate (von $\lambda\gamma\delta\omega\phi$ hydor=griechisch wasser)"?

E. J. R.

Theoretical Mechanics. By P. F. Smith and W. R. Longley. (Ginn.) Price 10s. 6d.

UNTIL the student has acquired a certain manipulative dexterity, it is impossible to preserve a proper continuity of thought in the development of the application of infinitesimal theory of mechanics or any other applied science. The authors are therefore justified in assuming that the reader comes to this subject equipped with a thorough working knowledge of the methods of the calculus. In the opening chapter a good account is given of the means for obtaining centres of gravity and moments of inertia of plane and solid figures; no mention is made, however, of the application of orthogonal projection to the theory of the centroid. Chapters ii.-iv. deal with the principles of rectilinear and curvilinear motion in a most attractive fashion; as an example, the motion typified by $x = a \cos kt$ is considered, the equation $d^2x/dt^2 = -k^2x$ is deduced, and the properties of harmonic motion are then obtained in a simple fashion; a similar treatment is applied to damped vibrations. This is followed by an exposition of work, energy, and impulse. Chapters vi.-ix. discuss the motion of a particle under constant forces, central forces, in a harmonic field, and against a resisting medium. The volume closes with a brief account of the equations of rigid dynamics and the principles of equilibrium of a coplanar system of forces with special reference to the catenary.

The examples, which are very numerous, are mainly numerical and practical, and so chosen as to require a minimum of analytical power. This feature renders the book eminently suitable for the senior divisions of secondary schools, where the true understanding of the ideas of mechanics is the chief object. It is to be regretted that practically no English text-book has treated the subject on these lines, a fact which is due mainly to the action of the universities in excluding the simpler applications of particle and rigid dynamics from their entrance scholarship examinations. We hope that the time is not far distant when this restriction will be removed.

The Anatomy of the Honey Bee. By R. E. Snodgrass. (U.S. Department of Agriculture, Bureau of Entomology, Technical Series, No. 18.) Pp. 162. (Washington: 1910.)

In this modest pamphlet the author has given to entomologists an original, trustworthy, and excellently illustrated account of the structure of the honey bee, and another instance has been furnished of the scientific thoroughness that characterises the publications of the United States Department of Agriculture. Many volumes have been written on the honey bee, yet no surprise can be felt that Mr. Snodgrass has been able to add new points to our knowledge and to correct errors in the work of his predecessors. A feature of value to the serious student is the general survey of the external structure of a typical insect which the author has wisely given as an introduction to his account of the highly specialised modifications

to be found in the bee. He expresses scepticism as to certain positive statements that have been made on controverted details of physiology and reproduction; for example, "concerning the origin of the royal jelly or of any of the larval food paste . . . we do not know anything about it." There is a present-day tendency unduly to disparage the results obtained by former workers, and such a statement will strike many readers as extreme. Mr. Snodgrass's scepticism as to the parthenogenetic nature of "drone" eggs seems also unwarranted after the support which Weismann's researches, published ten years ago, afford to the generally accepted view.

G. H. C.

Practical Physiological Chemistry: a Book designed for Use in Courses in Practical Physiological Chemistry in Schools of Medicine and of Science. By Philip B. Hawk. Third edition, revised and enlarged. Pp. xviii+440. (London: J. and A. Churchill, 1910.) Price 16s. net

BOTH the first and second editions of Prof. Hawk's volume have been reviewed in these columns; the former in our issue of July 18, 1907 (vol. lxxvii., p. 268), and the latter in that of July 15, 1909 (vol. lxxxi., p. 67). The present edition has been brought up to date by the insertion of various additions and corrections, as well as by the inclusion of a number of qualitative tests and quantitative methods.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

Simulium Flies and Pellagra.

IN reference to Mr. Shelford's letter in NATURE of November 10, in which he directs attention to the difficulties in controlling and eradicating the flies of the genus *Simulium*, known generally as sand flies and black flies, it may be of interest to direct attention to certain experiments carried out in New Hampshire by Dr. C. M. Weed and Prof. E. Dwight Sanderson and their assistants in the control of these insects. The southern buffalo gnat, *Simulium pecuarum*, Riley, which attacks and kills many animals, such as horses, cattle, mules, sheep, poultry, dogs, &c., is well known. In certain parts of the United States, but especially in Canada, "black flies," generally *S. hirtipes*, Fries, and *S. venustum*, Say, make life far more intolerable than mosquitoes, and they are specially annoying when they occur in such resorts as the White Mountains.

In 1903 Dr. Weed and his assistant, Mr. A. F. Conradi, showed that the *Simulium* larvæ, although they live on the stones in running water, could be killed by the application of Phinotas oil. The destruction was so complete that the flies were practically eradicated in the locality in which the experiments were carried out (see "Experiments in Destroying Black Flies," Bull. No. 112 New Hampshire Agric. Exp. Sta., 1904). A floating oil such as kerosene is manifestly useless for the destruction of larvæ having such habits as *Simulium*, and the efficacy of Phinotas oil is due to the fact that it has the property of sinking to the bottom in water, thus destroying the larvæ which are stationary on the stones. Further experiments have been carried on more recently in the White Mountains by Prof. E. Dwight Sanderson, and he also found that Phinotas oil applied to the running streams was effectual in the destruction of the *Simulium* larvæ (see "Controlling the Black Fly in the White Mountains," E. D. Sanderson, *Journal Economic Entomology*, vol. iii., p. 27, 1910). There still remains, however, much experimental work to be done with regard to the effect of the oil upon the fish, the details of the life-histories of the species of *Simulium*, and the practical methods to be used in applying the oil.

If Dr. Sanbon's results are confirmed, and the *Simulium*

theory is certain to form the basis of a careful and complete series of investigations, not only in Europe, but also in those regions in Africa and America where pellagra also occurs, these experiments and results on the destruction of the *Simulium* larvæ will be of no little practical importance in the prophylaxis of the disease, whether a definite pathogenic organism is discovered, or the case proves to be analogous to that of *Stegomyia* or yellow fever.

C. GORDON HEWITT.

Division of Entomology, Ottawa, November 21.

The Song of the Siamang Gibbon.

THE Zoological Society has recently received on loan an almost adult example of the siamang (*Symphalangus syndactylus*); and since I can find no adequate description of the voice of this ape in the books I have consulted, I think the following description may be interesting to readers of NATURE.

The siamang differs from all other gibbons in having a pair of laryngeal vocal sacs visible externally on the throat as an undivided pouch of loose skin. When the animal is in full song the pouch becomes inflated into an immense oblate spheroid much wider from side to side than from above downwards, and comparable in size to the entire head of the gibbon. A feeble imitation can be made of the booming that comes from this pouch by uttering a guttural monosyllabic "ooo" with cheeks inflated and lips compressed. It is not unlike the sound produced by a large bubble of air bursting on the surface of water confined in a narrow space like a rain-water pipe. In addition to this there are two very distinct cries apparently quite independent of the vocal sac and uttered with the mouth open. One is a shrill, piercing bark, like the monosyllable "haow," cut off sharply by the abrupt closing of the lips. The other is a prolonged, unearthly wailing shriek—"ahh—o"—resembling more than any familiar sound to which I can compare it the "miaou" of a cat multiplied ten times in volume. It starts on a high pitched note with the mouth widely stretched, and gradually descends the scale as the jaws are closed. There are two variations of this shriek, one being a note or two higher and more piercing than the other.

The song usually begins with a low and gentle booming punctuated by an occasional staccato bark. As the excitement rises the ape starts to move, and swings round the cage barking vigorously and repeatedly, and now and again uttering the wailing shriek, the loud booming from the now fully expanded vocal sac going on all the while like a resonant bass accompaniment. The noise is deafening and terrific, and I shall not easily forget the consternation of the chimpanzees and the look of mild surprise that pervaded the usually expressionless faces of the orang-utans when they heard it for the first time in the apes' house.

The voices of Mammalia have never, I believe, been carefully studied and compared; yet they are worthy of the closest attention as a criterion of specific relationships. The cry of the siamang, for instance, is quite different from that of the Hainan, Hoolock, and Wau-wau gibbons, and each of these species has its characteristic song. I have elsewhere pointed out that the bray of Grévy's zebra betrays pronounced asinine affinities, and equally forcibly attests remoteness of kinship between that species and the quagga Equidæ; that the likeness between the roar of the lion and the tiger on one hand and of the jaguar and the leopard on the other confirms the conclusion that these species are respectively closely allied, and that these four great cats form, with the probable inclusion of the ounce, a special group of Felis characterised by a roaring voice correlated with a peculiarly modified hyoid apparatus; that the friendly purr practised by the puma, cheetah, caracal, common cat, and other species which, be it noted, never roar, distinguishes them from lions, tigers, and leopards, which never purr. To the casual observer the Cape hunting dog (*Lycan*) is more like a hyæna than a wolf, but the moment he barks and growls it is needless to look at his teeth and skull to detect his cousinship to Canis; and I have recently noticed identity in all essential respects between the raucous growl of a frightened cervine wallaroo (*Macropus*) and that of a nervous Tasmanian wolf (*Thylacinus*). In this last instance we have vocal

likeness associated with deep-seated ordinal resemblances, and apparently persisting despite great divergences in other structural features and in habits.

Zoological Society.

R. I. Pocock.

On the Simultaneity of "Abruptly-beginning" Magnetic Storms.

IN the first number of *Terrestrial Magnetism and Atmospheric Electricity* for the present year, Dr. Bauer has written two papers, in which he believes he can prove the following (p. 20):—

"Magnetic storms do not begin at precisely the same instant all over the earth. The abruptly beginning ones, in which the effects are in general small, are propagated over the earth more often eastwardly, though also at times westwardly, at a speed of about 7000 miles per minute, so that a complete circuit of the earth would be made in $3\frac{1}{2}$ or 4 minutes."

Dr. Bauer bases this result upon an investigation of two magnetic storms of Birkeland's "positive equatorial" type, namely, the storms of May 8, 1902, and January 26, 1903. In the latter he makes use of a table in Birkeland's "The Norwegian Aurora Polaris Expedition, 1902-3."

In the following number Dr. Faris made a more thorough investigation of this circumstance, taking fifteen different abruptly beginning storms, recorded at the Coast and Geodetic Survey magnetic observatories, in which he considers that he found Dr. Bauer's result confirmed.

Upon this foundation Bauer then develops the "Ionic Theory of Magnetic Disturbances" (*loc. cit.*, p. 111), of which the principal advantage over Birkeland's corpuscular theory is supposed to consist in the being able to give a natural explanation to time differences such as these, which Birkeland's theory, in his opinion, cannot do.

Notices of these papers appeared in NATURE of August 11.

As it appears that a number of the perturbations described by Dr. Faris are some that I studied last summer when making an investigation of magnetic equatorial storms at the magnetic observatory in Potsdam, a comparison may be of some interest. I determined also the time of the commencement of a number of positive equatorial storms as accurately as possible for another purpose, and without any knowledge of Dr. Faris's work, so that the measuring of the time was entirely independent of it, a circumstance which may be worthy of note.

It may be remarked with regard to the exactness with which the time can be determined by the Potsdam curves that the length of an hour upon the magnetograms is about 20 mm., and that thus one minute answers to about $\frac{1}{3}$ mm. If we then take into consideration all the errors that may creep in because the curves, the time-marks, and the points considered are not so sharply defined as might be wished, and further all the errors that may be due to changes in the paper in developing, owing to the fact that the paper has perhaps not laid quite straight on the roller, &c., it will be evident that where there are no exact automatic time-marks upon the curve itself, one minute will at any rate be the *lowest* limit for the accuracy that under favourable conditions can be counted upon.

There might very easily be an uncertainty of several minutes if, for instance, the base-line is not exactly straight, but is slightly curved, if the parallax cannot be determined exactly, and so forth. Unfortunately, neither Dr. Bauer nor Dr. Faris has stated anything as to how the time in the various cases can be given exactly, a point upon which, it would be thought, it was highly important to be clear.

In the equatorial storms that I have studied, and especially those that are also found in Dr. Faris's Table I. (*loc. cit.*, p. 101), the point at which they commenced is especially clear in H. The deflections in D and Z, on the other hand, are very slight, and in consequence the beginning there is far less clearly defined.

It is therefore the beginning in H that is especially suitable for employment in a comparison such as this, and this was what I especially investigated. It will *a priori* be perceived that the results obtained by employing the other two components must be far more uncertain. In the table below I have compared the means of the values found by Faris for the five American stations that he has considered with those I measured out by the aid of the