

operation. The work is an important and valuable contribution to the literature of metallurgy.

C. H. D.

*Index Zoologicus No. II.* Compiled (for the Zoological Society of London) by C. O. Waterhouse and edited by David Sharp, F.R.S. Pp. vi+324. (London: Printed for the Society, 1912.) Price 15s.

THE subtitle of this volume describes its scope; it runs: "An alphabetical list of names of genera and subgenera proposed for use in zoology as recorded in the 'Zoological Record,' vols. 38-47 inclusive (1901-1910), and the zoology volumes of the 'International Catalogue of Scientific Literature,' annual issues 1-10, together with other names not included in previous nomenclators." The first volume was published in 1902, and the primary object of the present work is to serve as an index to the intervening ten years, but it is also planned so as to be with Scudder's "Nomenclator" a complete register of the names of genera and subgenera proposed for use in zoology. The editor of this volume points out that 140,000 names have been, up to the present time, proposed for the genera and subgenera of zoological taxonomy.

*Systèmes Cinématiques.* By Prof. L. Crelier. Pp. 100. (Paris: Gauthier-Villars, 1911.) 2 francs. (*Scientia*. Janvier, 1911. Phys.-Mathématique. No. 31.)

UNDER the above title, the author investigates the motion of a right-angle one side of which passes through a fixed point, while the vertex describes a fixed right line or circle, that of a rod sliding between axes at right-angles, that of a crank connecting rod, and so forth; altogether, six methods of generation are investigated. The curves associated with these moving systems include the base and rolling centrodes or loci of the instantaneous centres, the envelope of the moving line and those of other lines associated with it, the trajectories of various points of the figure, and certain envelopes of their tangents. In this way a large number of curves are obtained, possessing interesting properties; of course, many of these are already well known. The figures in the book are rather complicated. The book contains a portrait of Col. Mannheim and a short bibliography.

*Internal Secretion and the Ductless Glands.* By Prof. Swale Vincent. With a preface by Prof. E. A. Schäfer, F.R.S. Pp. xx+464. (London: Edward Arnold, 1912.) Price 12s. 6d. net.

PROF. SWALE VINCENT is well known as an investigator who has devoted much attention to one of the most interesting chapters of physiology, namely, that which deals with the group of organs, formerly so mysterious, which are known as the ductless glands. The adrenal bodies, the thyroid and parathyroids, the thymus, the pituitary, pineal, carotid, and coccygeal bodies are the principal ones treated, but, as is well known, internal secretions are also formed by glands which possess ducts, and so we also have chapters on the

pancreas, liver, kidney, and reproductive organs. The literature of the subject is enormous, and in presenting a lucid and terse account of the recent progress of science, and in ferreting out the 3000 or more references which deal with it, the author has, as Prof. Schäfer says in his preface, laid us under a deep debt of gratitude. W. D. H.

*A Laboratory Manual of Agriculture for Secondary Schools.* By Prof. L. E. Call and E. G. Schafer. Pp. xv+344. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1912.) Price 4s. net.

THIS book is issued to supply the demand that has arisen for laboratory exercises in the teaching of agriculture in the United States. Directly agriculture becomes a school subject (and it is for secondary schools that the book is intended), it becomes necessary that the teacher should be provided with a number of simple experiments within the capacity of the scholars and of the school equipment. Of course, the out-door observations must still remain the essential groundwork of the instruction, but a well-chosen course of laboratory experiments can be arranged to bring out the main principles and illustrate the working of the individual factors involved.

The lessons deal with soils, crops and animals. For convenience of working they are arranged in calendar form, beginning in September and continuing through to May, with an "extra" for Arbor Day. They have actually been carried out in schools, so that they are known to be workable.

The soil experiments deal mainly with the moisture relationships, which in Kansas play a large and sometimes a controlling part in soil fertility. The crops studied include the cereals, cowpeas, cloves, lucerne and potatoes: the exercises range over the germination of the seed, the development of the root and seed, and the examination of the harvest. The animal section is based on the score-card method, devised in America and found so useful that it has been introduced into this country.

Teachers of agriculture will find many useful and suggestive lessons in the book, and it will serve as an excellent example of the standard of instruction aimed at in the American schools.

#### LETTERS TO THE EDITOR.

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#### An Effect due to the Sudden Great Increase of Pressure.

IN the course of some experiments on the mapping of the lines of electric force between two charged conductors, a remarkable effect, due to the sudden very great rise in pressure in the oil separating them, occurred. The conditions of the experiment necessitated the use of two pointed strips of tinfoil, separated by an interval of 1/16 in., laid on a sheet of glass

with a drop of turpentine, to act as an insulator, between them. On this was laid a thin cover-glass, as used for covering objects when mounted for the microscope. Unintentionally the potential between the two tinfoil strips rose high enough to permit a spark to pass through the oil between them, and when this occurred a small piece was blown out of the centre of the cover-glass, being about  $1/16$  in. in diameter on the upper side and about half this on the lower, the piece of glass having the appearance of a small truncated cone. The cover-glass was only held down by the film of oil separating it from the strips of tinfoil; yet the fragment of glass was ejected with considerable force.

The cause of the effect may be explained as follows: the energy liberated from the spark was sufficient to cause the pressure to rise rapidly to a high value in the confined space, either by decomposing the oil and heating the liberated gas, or by forcing away the oil along its path, and so compressing it. (We are, however, not concerned here with the question as to whether the pressure on the glass cover had its seat in the oil alone or in the gas liberated from the oil, but only with the fact that the passage of the spark through the oil gave rise to a series of events which culminated in the forcing out of a plug of glass from the cover.) As the time during which the spark lasted was almost negligible, the rate at which the pressure rose near the spark was great enough to send out a pulse of pressure through the oil. This pulse striking the thin cover-glass had sufficient energy stored in it to cause the small piece of glass to be removed from it.

This effect is the converse of that noted by Mr. J. Y. Buchanan during the voyage of the *Challenger* in 1873, and repeated by him while on board the yacht of H.S.H. the Prince of Monaco, the *Princesse Alice*, in the summer of 1902 (see Proc. Roy. Soc., 1903, vol. lxxii., p. 88; or NATURE, 1903, vol. lxxiii., p. 334). I will quote from Mr. Buchanan's paper:—"The brass tube (Figs. 1 and 2, plate i.) above referred to was the case for holding a piezometer which was accidentally broken. With it I repeated the experiment which I had made in the *Challenger*, with this difference, that I used only one sealed glass tube. It was an ordinary pipette of 50 c.c., sealed up at both ends close to the body. It was wrapped in a piece of muslin and loosely packed with cotton waste so as to occupy the middle of the brass tube.

"The length of the brass tube was 33 cm., and its diameter  $4\frac{1}{3}$  cm. Its weight without the cover was 350 grams. Both the top and the bottom are pierced with many holes so as to allow passage to the water.

"Thus charged, it descended on the sounding line to a depth of 3000 metres, and when it came up it was evident from its appearance that the experiment had succeeded. As in the experiment on board the *Challenger*, the glass had been converted into a snow-white powder. The external effect also was confined entirely to that part of the brass tube which had been occupied by the sealed glass tube. Above and below it there was no disfiguration."

In this case it was easier for the water outside to distort the brass tube than to flow through the perforated caps covering the ends, and so fill the space lately occupied by the glass bulb. In the case of the punctured cover-glass the pressure rose so suddenly on the spark passing through the oil that there was not sufficient time to raise the glass as a whole, or to push away the film of oil lying between it and the glass slide, with the result that a minute piece of glass was forcibly blown out. Had the cover-glass possessed the ductility of brass, there would perhaps

have been a bulge formed instead of a piece being bodily removed.

On another occasion I had a practical demonstration of the power given out by a spark. It was in the early days of wireless telegraphy, and I had constructed an oscillator of a simple type, consisting of a pair of brass balls immersed in paraffin oil, the oil and balls being contained in an inverted bottle from which the bottom had been removed. The bottle was about  $2\frac{1}{2}$  in. in diameter, and about 4 in. deep, and the balls were situated at the centre, one above the other, and  $\frac{1}{8}$  in. apart. I had not passed more than about a dozen sparks between the balls when suddenly the glass was shattered. The large end of the bottle was open, and the free surface of the oil was about  $2\frac{1}{2}$  in. in diameter. We have in this case direct evidence of a pressure being transmitted in the form of a pulse, or single wave, to the glass containing vessel of an intensity sufficient to cause it to break. The cause of this pressure was the spark passing from ball to ball through the oil, and while passing pushing away the oil on all sides with a rapidity which gave rise to a pulse of pressure. This pulse travelled outwards with great velocity, and contained such a store of energy that on striking the sides of the vessel it was sufficient to rupture the glass. The potential energy of the original electric charge was converted into the kinetic energy of the spark, and this in turn was transformed into the energy of the pulse, which was finally transferred to the glass. As the amount of energy was too great for the glass to hold, it found an outlet in shattering the vessel.

The "pressure in an electric spark" is a term by no means uncommon in scientific literature, yet but little attention is paid to the effects which this pressure exerts on surrounding objects, as, for example, when a tree or house is struck by lightning. They all belong to the type mentioned above.

In conclusion, I would recommend a careful study of the paper by Mr. J. Y. Buchanan referred to above to those interested in the subject of the sudden relief of great pressure.

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### The Halo in the Ricefield and the Spectre of the Brocken.

IN connection with the curious Japanese phenomenon of the halo seen around the head of the shadow of a person standing in a ricefield in early morning (NATURE, p. 419, December 12, 1912), it may be of interest to recall that some recent balloon voyagers have reported observations of a bright halo surrounding the shadow of the car thrown upon a horizontal cloudfield by oblique solar rays. Coloured diffraction rings are sometimes seen surrounding the head of the "spectre of the Brocken," but for these to be visible theory requires that the drops constituting the mist should be of uniform size. In an article in the *Meteorologische Zeitschrift* (p. 282, June, 1912; see also *Science Abstracts*, p. 574, December, 1912), by Prof. F. Richarz, discussing the theory of the subject, reference is made to an observation by Dr. Bieber from the balloon *Marburg* of a halo around the shadow, and also to other verbal communications of a similar character. Prof. Richarz's article is followed by another describing a photograph taken by Dr. Wegener of a series of three diffraction rings seen around the shadow of the same balloon, the *Marburg*, on another voyage. The centre of the rings was the point corresponding to the shadow of the eye, or of the camera objective. On calculating the