of the state of our knowledge on animal entozoa and their economic importance.

The volume presents evident signs of haste in issue from the press. Some of the papers teem with misprints, some are characterised by an almost complete absence of punctuation, while again, in many instances, the language used and the construction of the sentences are so slip-shod as to render them almost meaningless. The volume has a number of excellent illustrations of the staff of the various departments, but the glazed paper on which the book is printed is very trying to the eyes. We may note, too, that on the title-page and cover the laboratories are called "the Veterinary Bacteriological Laboratories," though in the introductory chapter they are termed the "Veterinary Research Laboratories," a better term, we think, for, as we have seen, the work is by no means confined to bacteriology. The laboratory has, we feel sure, under its distinguished head a great future before it, and we venture to offer our heartiest congratulations on its new career.

HALLEY'S COMET.

A LARGE number of publications dealing with observations of Halley's comet have appeared during the last week or two, and from them we extract a few of the more important results.

Prof. Barnard, in No. 4431 of the *Astronomische Nachrichten*, deals with the observations he made during the time when the comet was at its least distance from the earth. The observations in the early morning were greatly interfered with by clouds and smoky skies, but the conditions were better after May 17. Prof. Barnard pays particular attention to the observations made during the early mornings of May 18 and 19, and directs attention to a bright pillar of a luminous character seen near the south-eastern horizon. The main feature was the rather broad beam of light, resembling the beam of a searchlight, which stretched obliquely from the eastern horizon to the Milky Way in Aquila, a length of 107°. Between 2h. and 3h. a.m. this was very conspicuous, and Prof. Barnard describes its dimensions and position with respect to neighbouring stars, showing that it was considerably inclined to the ecliptic. This is evidently the phenomenon referred to generally as the tail, but to the observers at Yerkes there appeared the other mass of luminosity, apparently quite separate from the beam, that extended to the south-eastern horizon. Not having been able to observe the comet regularly prior to August 18, Prof. Barnard hesitates to make a definite proposition, but he suggests that this phenomenon was the main tail, whilst the bright beam was only a separate streamer. It involved the ecliptic, and observations on August 19 showed it to be a real phenomenon connected with the comet; at 2h. 20m. a.m. it showed a more definite upper edge, bounded, roughly, by the stars β and γ Piscium and η and ζ Aquarii, and it joined the brighter beam near γ Pegasi. Observations made earlier in May showed several streamers, of which the long bright beam seen on May 18 may have been one, and they also indicated that on May 18 the breadth of the main tail should have been much greater than the beam actually was. Should Prof. Barnard's surmise prove correct, the evidence for the earth's passage through the tail about May 19 would be greatly strengthened.

Curious sky effects during May 19 were also recorded, and were unusual enough to suggest a connection with the comet. At noon, and for several hours afterwards, a horizontal bar of brilliant prismatic colours, with the red uppermost, was seen in the south at an altitude of about 20°, and around the sun was a prismatic halo of 22° diameter.

After its passage, the comet was a brilliant object at Williams Bay, and to Prof. Barnard "it far exceeded all expectations as a spectacular display." On May 26 the tail could be traced to a distance of 63°, and for 25° of its length was very conspicuous. On May 20 the head was about $\frac{1}{2}$° in diameter, and appeared like a nebulous star with a yellowish colour, but on May 24 it was recorded as bluish-white. On this date, however, there was apparently a double nucleus. To the naked eye and with opera-glasses there appeared a nucleus of sensible diameter and of a beautiful bluish-white colour, whilst in the 5-inch finder this was seen to be but an intense nebulosity surrounding a smaller, well-defined nucleus of eighth or ninth magnitude, and of a decidedly yellow colour. Thus naked-eye and telescopic observations on that date would refer to two different nuclei of opposite colours. For several nights about May 27 the tail appeared to diffuse northwards as high as Jupiter, and on a photograph taken on June 6 it is seen that the comet had discarded its tail, which was drifting away from it, and had formed a new one at a slightly different position-angle.

In the same journal Herr Sykora records an observation of the comet on the solar disc at 20·95h. (M.T. Tashkent) on May 19. A 13-cm. image of the sun was projected, and the comet was seen, like a finger-mark on paper, with a diameter of 1 cm.; during the three minutes that observations were not prevented by clouds, the relative motion of the supposed cometary image was about 0·5 cm.

Dr. Hartmann also contributes a note on the measures of the surface brightness of the comet made at Sonnwendstein. First he suggests that, instead of such indefinite terms as "bright," "faint," &c., a definite scale of standardised surface-brightnesses should be employed, the standard unit being referred to a definite illumination produced by a standard lamp under defined conditions. This unit is called a *phos* (*ph.*), a thousandth part of it a *milliphos* (*mph.*), a millionth part a *microphos* (*mkph.*); for the multiples the prefixes *kilo-* and *mega-* are suggested. Then he describes a method of using the photometer where the image of the object is seen through a hole pierced in a mirror fixed in the focal plane of the objective. By measured variations of the source of illumination, the surface of the mirror is brought to the same brightness as the focal image of the object. Again, by using suitable screens, the different radiations from any object may be directly compared, and for Jupiter Dr. Hartmann finds a range from red to green of 27 to 68 mph. (milliphos).

The results obtained by this method, comparing various parts of the comet on different dates, are very interesting. They are too numerous to give fully here, but one or two examples will serve to illustrate them. May 23, 9h. 2m. (M.E.T.), mean brightness of nucleus and the surrounding area of 22″ diameter: white, 220 mkph., yellow, 180 mkph., green, 410 mkph.; 9h. 27m., nucleus alone: white, 620 mkph., red, 360 mkph., orange, 630 mkph., yellow, 730 mkph., green, 1350 mkph. On May 26 a number of observations, including the nucleus, the area surrounding it, and the tail, were made, and for the tail, at 3m. 42s. in R.A. behind the head, a value of 0·22 mkph. was found. For comparison, Dr. Hartmann found on May 31 that the surface brightness of the Ring Nebula was 1·2 mkph., and for the inner space 0·6 mkph.; a bright area of the Milky Way, in Cygnus, gave a value of 0·05 mkph.

M. Antoniadi suggests that the tail, seen by Prof. Eginitis, turned towards the sun on May 20, was only a minor sheath; his observations, and those of Dr. Hartmann and others, show the tail as a sickle-shaped object with its *convex* side turned sunwards.

That the comet was a fine spectacle at Tokio is shown by a table giving the magnitude, length of tail, &c., as seen by Mr. K. Saotome, of the Tokio Observatory, reproduced in the *Astronomische Nachrichten*.

In No. 4433 of the same journal Drs. Cowell and Crommelin discuss the different elements published by various calculators for the 1910 osculation. These agree fairly well except in the value given for the mean motion (μ), in which there are grave differences. M. Iwanow adopted Pontecoulant's value for 1835, which the Greenwich observers have shown to be 0·05″ in error, and should therefore have arrived at a perihelion date differing from theirs by about one month. That this is not so indicates that some serious error crept into his calculations, and it is suggested that, as the difference is so important from a gravitational point of view, the discordance should not be allowed to remain unproved. Mr. Merfield and Messrs. Crawford and Meyer appear to have deduced their value of μ from the recent observations alone, a procedure which Drs. Cowell and Crommelin deprecate as untrustworthy; and the value obtained by the Berkeley computers is enormously in error. According to the Greenwich calculators, the value for 1910 is $\mu = 46{\cdot}6747''$, but this cannot yet be accepted as definitive.

A number of observations of the comet's brightness, made by Prof. Wendell, Mr. Leon Campbell, and Dr. Holetschek, are also published in the *Astronomische Nachrichten*, and the Harvard observations are plotted with the theoretical curve derived from the formula $1/r^2\Delta^2$; this shows very plainly the physical action produced by the solar rays as the comet got nearer the sun, the magnitudes increasing during this period beyond the rate demanded by the formula.

In No. 1, vol. xxxii., of the *Astrophysical Journal* Mr. Slocum describes the observations of the sun made at the Yerkes Observatory on May 18 and 19. Direct photographs and spectroheliograms are reproduced, and will serve as comparisons for any phenomena that may be attributed to cometary influence; nothing abnormal was noted.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

DR. H. WREN, of Birkbeck College, has been appointed professor of pure and applied chemistry at the Municipal Technical Institute, Belfast.

MR. J. M. CAIE, organiser in Inverness and Ross for the North of Scotland College of Agriculture, has been temporarily appointed lecturer in agricultural education in the college in the place of Mr. R. B. Greig, who has gone to Australia as a member of the Agricultural Commission.

NEXT session will be the hundred and fifteenth of the Glasgow and West of Scotland Technical College. In 1886 the present college was formed by the amalgamation of several institutions, including Anderson's College, which dated from 1796. The new calendar provides abundant evidence of the flourishing condition of the various departments included in the college. The first section of the new buildings, consisting of five large wings, we notice, was opened in 1905. The second section was opened in 1908, and comprises the main entrance hall, additions to the library and mechanics' laboratories, class-rooms for the decorative trades, and laboratories for dyeing, bleaching, &c. The third section was opened in the following year, and contains additional accommodation for civil engineering, engineering drawing, and other subjects. The fourth section will, it is expected, be ready for the coming session, and within it provision will be made for the department of textile manufacture. The plan of confining each department to one floor has been followed in nearly every case, with the result that the internal arrangements are well adapted to promote efficiency in working. The whole building comprises over seven acres of floor space, and forms one of the largest structures in Great Britain devoted to education.

THE sixth annual report of the Education Committee of the County Council of the West Riding of Yorkshire deals, among other matters, with the part the committee has taken in providing university and technical education in the area for which it is responsible. The grants of 4500*l.* to the University of Leeds and 1500*l.* to the University of Sheffield have been continued. In addition to these sums, the University of Leeds has received 775*l.* to provide extension science lectures, instruction in coal mining, and free studentships for disposal by the County Council; and the University of Sheffield 500*l.* for Saturday mining courses and other purposes. So far as technical education is concerned, the greatest difficulties continue to be encountered in the rural portions of the Riding, where the meagreness of population and the prevailing conditions of life and work are less favourable to the successful maintenance of evening schools than in the more populous areas. In the mining districts the difficulty, which has always been a serious one, of maintaining regular attendance, has been accentuated during the session owing to the operation of the Eight Hours' Act rendering it almost impossible for students to change their shifts. The committee has the matter under consideration, and hopes to find a solution of the problem before the opening of the coming session. A satisfactory increase in the proportion of students attending for group courses of instruction is again reported. Practically all the West Riding schools are now organised on this basis, with the result that the educational equipment of the students is much more effective than when attendance for isolated subjects was the general rule.

THE issue of *Science* for August 19 last contains an article providing tables giving data in regard to the degrees of doctor of philosophy conferred by the universities of the United States. There were conferred this year 353 degrees, not quite so many as in the three preceding years, when the numbers were 366, 378, and 387. Almost exactly half the degrees conferred last year were in science. The universities, however, differ considerably in the relative importance of their work in science. Chicago appears to be the best balanced; it has conferred just half its degrees in the sciences and half in other subjects. At the Johns Hopkins and Cornell about 60 per cent. of the degrees are in the sciences, whereas the percentage is about 40 at Harvard, Yale, Columbia, and Pennsylvania. There is not a preponderance of the sciences in the State universities, the percentage of degrees at Wisconsin being only 37 and at Michigan 38. Boston University appears to have conferred only three scientific degrees out of seventy-four. There was this year a large fall in the number of degrees in science conferred by Columbia, eleven, as compared with twenty-one and twenty-three in the two preceding years. Cornell, on the other hand, conferred this year twenty-seven degrees in science, surpassing all the other universities. Interesting particulars as to the varying popularity of different subjects of science are given. Chemistry, with forty-eight degrees, leads, having about double the numbers in physics, zoology, psychology, and mathematics. Botany comes next, and there is then a considerable drop to geology, followed by physiology and astronomy. In the case of the subjects not ranked under the natural and exact sciences, most degrees have been given in English history, economics, and philosophy.

ON September 6 the *Times* published its first Educational Supplement, and if subsequent issues reach the same high standard of interest and usefulness, these supplements should do a great deal to educate the general public in educational matters and to develop an intelligent appreciation of the importance of securing for this country as efficient a system of national education as can be found anywhere. The articles, which are numerous, deal with many aspects of a complex problem; they are all, moreover, inspired by a broad outlook and a desire to assist the attainment of efficiency. Great prominence is given to the work of secondary schools and universities, and the importance of securing the right relationship between these grades of education is emphasised. One article, entitled "New Universities and New Schools," comes appropriately after the address of the principal of the University of London to the British Association last week. It deals with the difficult question of where the work of the secondary school should end and where that of the university should begin, and endeavours to make clear what precisely may be expected of a student desiring to matriculate. The writer properly maintains that it ought not to be impracticable to devise a leaving certificate in which both the views of schoolmasters and the university authorities are represented. The passport of entry to the university must certify both that the student is fit to leave school and that he has this or that range of abilities and equipment to enable him to undertake the work expected of him. The new venture deserves to succeed, and we commend this first issue to the attention of all who are interested in educational matters.

THE forthcoming opening of the winter session of work at the technical colleges throughout the country is, as usual, preceded by the publication of a large number of new calendars and prospectuses. Among these, that of the Municipal School of Technology, Manchester, takes a prominent place by reason of the completeness of its provision of instruction in every phase of technical education which is likely to appeal to students in south Lancashire. This calendar, which runs to some 520 pages, shows that the school is fulfilling thoroughly its object of providing instruction in training in the principles of science in their application to the industrial arts. We are glad to notice that the authorities here insist that it is impossible for a student to obtain full benefit from the courses of