Henry Frowde at the price of one shilling net, should be obtained by everyone interested in the history of science.

IN a communication published in the May number of the *Transactions* of the American Microscopical Society, Messrs. Whipple and Parker discuss the connection between the amounts of oxygen and carbonic acid dissolved in natural waters and the occurrence in these of microscopic organisms. It has long been known that exhaustion of nitrates takes place in ground water supporting a vigorous growth of algæ, and it has been assumed that nitrates are the fundamental factor in the development of these. Nitrates are indeed important, but the inadequacy of this explanation became manifest when it was observed that some water, comparatively poor in nitrates, at times supported large growths of algæ. The authors point out the apparent importance of carbonic acid, and express the opinion that the algæ are influenced by it more than by the nitrates. The study of the number of organisms in water at different depths has given some interesting results. Water taken from Lake Cochituate was found to contain the following numbers of Mallomonas per cubic centimetre :—

Depth in feet ...	0	10	30	30	40	50
No. of organisms	0	0	1454	548	112	88

At the surface and throughout the circulating water above the thermocline, oxygen was abundant, but carbonic acid was absent. Near the bottom of the lake there was carbonic acid, but no oxygen, whereas just below the thermocline both gases were present, and as Mallomonas is a chlorophyll-bearing organism it found there conditions favourable for its development.

THE additions to the Zoological Society's Gardens during the past week include two Kusimanses (*Crossarchus obscurus*), a White-crested Tiger Bittern (*Tigrisoma leucolophum*), a Great-billed Touracou (*Turacus macrorhynchus*), a Sharpe's Wood Owl (*Syrnium nuchale*) from West Africa, presented by Mrs. Hurst; a Mute Swan (*Cygnus olor*), a White-fronted Goose (*Anser albifrons*), four Widgeon (*Mareca penelope*), two Pintails (*Dafila acuta*), four Pochards (*Fuligula ferina*), six Common Ducks (*Anas boscas*) European, two Black Swans (*Cygnus atratus*) from Australia, presented by Mr. W. N. McMillan; a Persian Gazelle (*Gazella subgutterosa*) from Central Asia, presented by Mr. B. T. Ffinch; two Emperor Boas (*Boa imperator*) from Central America, presented by Dr. Hans Gadow, F.R.S.; a Thick-tailed Opossum (*Didelphys crassicaudatus*) from La Plata, a Blue-fronted Amazon (*Chrysotis oestiva*) from South America, deposited.

OUR ASTRONOMICAL COLUMN.

VARIATION IN MAGNITUDE OF α ORIONIS.—Mr. D. E. Packer, of Birmingham, has recorded, in a letter to No. 1961 of the *English Mechanic*, the observation that α Orionis is increasing in brightness. Although a known variable, its general variations for the past thirty years have been so minute as to attract no particular attention, but Mr. Packer says that, on the night of October 15, the star was distinctly brighter than Capella and only slightly less bright than Sirius.

Herschel recorded very marked variations in the magnitude of this star between 1836 and 1840, and Sir W. Huggins noticed variations in its spectrum during a second period of variability, 1849–1852. Mr. J. E. Gore confirms Mr. Packer's observations.

THE NEBULA AROUND NOVA PERSEI.—Prof. C. D. Perrine publishes, in the *Bulletin* (23) of the Lick Observatory, several reproductions, and the measures, of the excellent photographs of the nebula around Nova Persei which were obtained with the Crossley reflector, and he also discusses the striking changes observed in the condensations of the nebula.

From measurements of the negatives obtained on March 29, 1901, and January 10–11, 1902, respectively, it appears that the inner ring of nebulosity is expanding radially, at an average rate of 1″·4 per day, whilst the outer ring is similarly expanding 2″·8 per day. These measurements of the inner ring would carry it back to the Nova on February 8, 1901, whilst the outer ring is similarly carried back on February 16–17; both the plates give the same dates. This does not imply the prior formation of the inner ring, for, considering the uncertainties of measurement, Perrine suggests their contemporary origin.

Many suggestions have been made to explain the apparent velocities of parts of the nebula, the two chief explanations being the transition of material particles, and the propagation of a wave of light through, and reflection from, the fine particles of matter making up the nebula. The former seems unlikely, because the movement contains a large tangential factor, whilst the latter theory would have to presume largely variant velocities of the light waves, a presumption which is inconsistent with our present knowledge of light. In order to test the "reflection" theory, Prof. Perrine introduced a double-image prism between the plane mirror of the Crossley reflector and the photographic film, and found that the light was not polarised, *i.e.* the two images were of equal intensity. On polarising the light from α Lyræ and treating it in the same manner, he found that the mirrors of the instrument had practically no effect on polarised light.

The final result points to the existence of little or no polarisation in the light from condensation D, and, with less certainty, in that from condensation A, and therefore refutes the reflection theory.

CORONAL DISTURBANCE AND SUN-SPOTS.—In No. 98 of *Popular Astronomy*, Prof. Perrine demonstrates the close connection between the coronal disturbance, photographed at Sumatra during the total eclipse of 1901, and the group of sun-spots and extensive faculæ which came round the limb of the sun on May 19.

From photographs of the solar disc obtained at Dehra-Dun, India, between May 18 and 28, inclusive—of which copies were kindly supplied to Prof. Perrine by the Astronomer Royal—it is seen that a fairly large group of spots and faculæ came round the limb on May 19, and that at the time of the eclipse this group would be very near to the limb. The position angle of the spot, as projected on to the limb, was 60°·2, whilst that of the apex of the coronal disturbance was 60°·0, and during the eleven days under observation this was the only group of spots photographed. This shows conclusively that the spot and the coronal disturbance were in the same line of sight, and further reductions have shown the probability that the origin of the coronal disturbance was also near to the limb at the time. The long, thread-like prominence seen projected almost tangentially from the sun's limb during the eclipse appears to have emanated from the same group of spots and faculæ, so that, in this case at least, all these phenomena appear to have had a common origin.

This aggregation of related phenomena seemed to point to the possibility of the existence of a great disturbance in the solar atmosphere on this date, and a further investigation was made in order to discover if any measurable displacement of the coronal masses took place in the disturbed region. The photographs compared were taken at an interval of five minutes, and no measurable displacement can, with certainty, be traced thereon; from this we may conclude that the velocity across the line of sight was less than twenty miles per second. A comparison between the photographs obtained at Mauritius and Sumatra, respectively, with an interval of one-and-a-half hours, would probably decide this question of movement.

THE VARIABLE STAR 13, 1902, LYRÆ.—Further observations of this Algol variable have given the following results :—

Approximate position for 1900, 19h. 12m. 31s. +32° 14′·8. Range of magnitudes, 10·98 to about 12·8. Period, 3d. 14h. 22m. 23s. ·5.

The Variable Star Committee of the Astronomische Gesellschaft has assigned to this star the designation R.V. Lyræ (*Astronomische Nachrichten*, No. 3821).

NEW VARIABLE STAR, 15,1902, DELPHINI.—Dr. Anderson, of Edinburgh, has communicated to No. 3821 of the *Astronomische Nachrichten* his observation that a star, not mentioned in the B.D., but having the approximate position R.A. = 20h. 34m. 43s., Dec. = + 11° 21′·5 (1855·0), has proved to be a variable.

Assigning the magnitudes 9·5, 9·7 and 11·2 to B.D. + 11°·4353, B.D. + 11° 4358, and a star having the approximate position

20h. 34m. 37s. + 11° 18′·5, respectively, the following magnitudes have been observed for the newly discovered variable :—

Date, 1902.		Magnitude.
September	4	9·6
,,	6	9·6
,,	24	9·8
,,	25	9·8
October	7	10·2

EDUCATION AT THE BRITISH ASSOCIATION.

THOUGH the youngest offspring of the British Association, the Section of Educational Science has developed so rapidly that its growth in strength and influence is being watched with interest not unmixed with anxiety by several of the older sections. Most of the meetings devoted to the discussion of educational topics were largely attended this year, and all of them have been reported in detail, thus showing that science in education and education in science appeal to a wide public. The Section provides a platform on which it is possible, not only to state the place science should occupy in the curricula of school and college, but also to describe the character of the instruction which should be given, and to construct an organic educational science out of the disjointed body of opinion. It is easy to see that, rightly directed, the work of the Section may have an important influence in determining lines of progress in education ; and the success so far achieved justifies faith in the promise of the future.

One characteristic of the proceedings of the Section is especially noteworthy. Instead of accepting a variety of papers on diverse disconnected subjects, each meeting has been devoted to the discussion of a specific matter introduced by one or two papers. Attention has thus been concentrated upon definite points, and it has been possible to obtain the expression of competent opinion around them. Imperfections of scope and method have been pointed out, difficulties described and reforms advocated with a breadth of view and maturity of experience which command the attention of the educational world.

As an instance of the effect of the work of the Section, mention may be made of the discussion on the scope and teaching of elementary mathematics, opened last year by Prof. Perry, which led to the appointment of a committee with Prof. Forsyth as chairman. In the report presented by this committee, several desirable reforms were indicated, all of them of a kind capable of adoption by teachers and examiners. The committee considers that different methods of teaching mathematics might be adopted for different classes of students, and corresponding types of examination should be used. Emphasis is laid upon the recommendation that the teaching of demonstrative geometry should be preceded by the teaching of practical and experimental geometry, together with a considerable amount of accurate drawing and measurement. In demonstrative geometry, no single book should be placed in a position of authority, nor should there be a single syllabus in control of all examinations. It is recommended that some association of arithmetic and algebra with geometry is desirable in all cases where this may be found possible. Examining bodies are advised that no candidate should be allowed to pass unless he gives evidence of some power to deal with questions not included in the text-book adopted. With regard to arithmetic and algebra, regret is expressed that the decimal system of weights and measures has not been adopted in this country. Graphical methods should be used wherever possible, and tables of simple functions should be introduced as soon as the student is capable of understanding the general nature of the functions tabulated.

In opening the discussion on points arising from this report, Mr. A. W. Siddons described the recommendations of the Mathematical Association Committee, of which he is honorary secretary. Like the British Association Committee, that of the Mathematical Association recommends that a first introduction to geometry, and to each new branch of geometry, should be experimental with the use of instruments and numerical measurements and calculations. So far as deductive geometry is concerned, Mr. Siddons pointed out that there seem to be four alternatives :—(1) To have no one syllabus placed in the position of authority; (2) to replace Euclid by *one* standard syllabus; (3) to modify Euclid by omission and readjustment; (4) to retain Euclid in its present form.

The Mathematical Association Committee has recommended the adoption of a modified Euclid ; it is considered that the time is not yet ripe for the proposal of a standard to be adopted finally in place of Euclid. The modifications proposed include :—(1) The omission of some propositions which do not help on the course or which should be regarded as axiomatic ; (2) improved methods of proving other propositions, including the use of hypothetical constructions ; (3) the addition of a few propositions ; (4) the adoption of Playfair's axiom and the "limit" definition of a tangent ; (5) the use of angles greater than two right angles ; (6) that the exact treatment of incommensurables be regarded as a branch of higher mathematics.

The discussion upon the two reports was distinguished this year by the fact that mathematical masters from several public and other large schools were present and took part in it. It is evident from the opinions expressed that reforms in the directions advocated by the two committees would be welcomed by many teachers.

Mathematical ideas can be obtained by means of Froebel's boxes of geometrical solids and simple plane figures, but the school work after the kindergarten is not usually conducted on the same sound and systematic plan. An address on the subjects to be taught as science in schools and the order in which they should be taken, given by Dr. C. W. Kimmins, indicated desirable directions of study. Dr. Kimmins pointed out that the great reforms which have taken place in recent years in the teaching of science in schools have been due in large measure to the British Association report on the teaching of chemistry. Similar reports are needed on the teaching of other subjects suitable for instruction in schools, and it is hoped that the committee appointed on the teaching of botany will be of value in this connection.

Dr. Kimmins suggested that the interval between the kindergarten (pupils five to eight years of age) and the experimental science course should be utilised for suitable nature-study teaching. During this interval, thorough instruction should be given in practical mathematics, including the mensuration which is generally taken as part of the experimental science course. This should be given in the time devoted to mathematics, not science. Finally, it was considered that the subjects requiring special attention are the teaching of natural history and botany, and the correlation of science and art teaching.

When experimental science is introduced into schools, the best course of practical instruction to follow is one based upon heuristic principles, such as that which has been introduced into Irish national schools. Mr. W. Mayhowe Heller, who has organised the work, described the methods and results of the scheme. The Commissioners of National Education, in taking steps to introduce practical instruction into their schools, are attempting to do the work accomplished in the towns of England and Scotland by local educational enterprise. In elementary science, the typical course for boys and girls is based on the 1889 recommendation of the British Association Committee. Teachers attending training courses have to perform all experiments of the course themselves. Free equipment grants of apparatus for manual instruction and elementary science are given to necessitous schools. Very few schools at present have laboratories, but at the same time a great deal of individual experimenting can be accomplished. Object lessons are allowed as a substitute for a systematic course of instruction in experimental science, but these must attempt to achieve the same results as the science lesson, viz. accurate habits in observation, work, description and reasoning. Practical instruction of this kind is of the highest importance to Ireland ; for upon its successful introduction into the national schools depends the future of technical instruction.

The position of science in Irish intermediate schools was brought before the Section in two papers, one by Mr. R. M. Jones, head-master of the Royal Academical Institution, and another by Mr. T. P. Gill, secretary of the Department of Agriculture and Technical Instruction. Mr. Jones gave a survey of the working of the new scheme of intermediate education and indicated the probable tendency of developments. Practical work in physics and chemistry has been introduced into intermediate schools, the scheme followed being that of the Department of Agriculture and Technical Instruction. The result is that laboratories in which simple measurements and weighings can be conveniently carried on have been provided in many