and species. Dr. Holland finds it to be made up of certain genera possessing great capabilities for migration, and apparently a strong power to resist change under varying conditions. The other collections of Lepidoptera described by Dr. Holland in the excerpt referred to, were obtained from Somaliland, by Mr. W. A. Chanler and Lieut. von Hoehnel; and from Kashmir, by Dr. Abbott.

THE Connecticut Agricultural Experiment Station was established in 1877 "for the purpose of promoting agriculture by scientific investigation and experiment." The nineteenth annual report, containing an account of the work carried on during 1895, shows that both the science and practice of agriculture are advanced by the researches at the Station. The papers on the agricultural value of fertilisers and the availability of nitrogen alone furnish the materials for a liberal education in agriculture. Hundreds of analyses have been made in the chemical laboratory, while diastase—the sugar-forming ferment of sprouting seeds—and the proteids of the potato, malt, pea, vetch, and other plants have been studied, and new results obtained with reference to them. Experiments on the efficacy of the corrosive sublimate treatment of potato seed, where the land which is planted with potatoes is already fully infested with the potato-scab fungus, showed that the treatment was of little avail in preventing scab upon the crop. It was found that the addition of lime in quantities to the soil of the experimental field increased the amount of scab. The dreaded San José scab appeared in Connecticut for the first time in 1895, and great credit is due to the State Experiment Station for the prompt and thorough manner in which they gave nurserymen information regarding the occurrence, characteristics, and life-history of the insect, and the methods which have proved successful in eradicating it. Many other matters occupied the attention of the staff of the Station during the year covered by the report, and the results have been made known to the farmers of Connecticut. All the work proper to the Station that can be used for the public benefit is done without charge. Further, we read: "Every Connecticut citizen who is concerned in agriculture, whether farmer, manufacturer, or dealer, has the right to apply to the Station for any assistance that comes within its province to render, and the Station will respond to all applications as far as lies in its power." This announcement is sufficient guarantee that the Station is never in want of subjects for investigation, and the *Bulletins* and Reports published from time to time testify to the great value of the work undertaken and results obtained.

THE additions to the Zoological Society's Gardens during the past week include three Indian Stock Doves (*Columba eversmanni*), a —— Duck (*Nyroca baeri*), three —— Hemipodes (*Turnix dussumieri*) from India, presented by Mr. Frank Finn; a Peba Armadillo (*Tatusia peba*) from South America, eight Bell's Cinixys (*Cinixys belliana*) from Angola, a Maximilian's Terrapin (*Hydromedusa maximiliana*) from Brazil, a Madagascar Boa (*Pelophilus madagascariensis*), a Madagascar Tree Boa (*Corallus madagascariensis*) from Madagascar, deposited; two Plantain Squirrels (*Sciurus plantani*) from Java, an Occipital Vulture (*Vultur occipitalis*) from Africa, two Burmeister's Cariamas (*Chunga burmeisteri*) from the Argentine Republic, two Crowned Partridges (*Rollulus cristatus*) from Malacca, twelve Spotted Tinamous (*Nothura maculosa*) from Buenos Ayres, two Chilian Teal (*Querquedula creccoides*) from Antarctic America, two Shamas (*Cittacincla macrura*), a Malabar Green Bulbul (*Phyllornis aurifrons*) from India, a —— Sand Snake (*Psammophis schokari*), a Hissing Sand Snake (*Psammophis sibilans*) from Egypt, purchased; a Brush-tailed Kangaroo (*Petrogale penicillata*), two Spotted Pigeons (*Columba maculosa*), two Triangular-spotted Pigeons (*Columba guinea*), two Vinaceous Turtle Doves (*Turtur vinaceus*), bred in the Gardens.

OUR ASTRONOMICAL COLUMN.

DECLINATIONS OF FIFTY-SIX STARS.—The definitive declinations and proper motions of fifty-six stars have been determined at the Columbia College Observatory (*Contributions*, No. 8). The stars in question were selected by Profs. Fergola and Jacoby for observation at Naples and New York by the Talcott method, for the determination of the variation of latitude, and for the calculation of the constant of aberration by Küstner's method. Prof. Jacoby commenced the investigation, but ill-health compelled him to relinquish it, and it was continued by Mr. Davis. The discussion of the declinations was undertaken with the object of obtaining results based upon all available observations, so as to make this part of the work of value as an independent research. The memoir involves observations recorded in no less than 130 star catalogues, and represents an enormous amount of painstaking computation.

GRAPHICAL PREDICTION OF OCCULTATIONS.—The usual methods of deriving the local circumstances of an occultation, either graphically or by calculation, are somewhat lengthy and tedious, but a new construction, described by Major Grant, R.E., in the June number of the *Geographical Journal*, is rapid, simple, and sufficiently accurate for most purposes. With the aid of a convenient diagram the parallaxes in declination and right ascension of any heavenly body are readily determined, and when applied to the moon the elements of an occultation are easily deduced. It is stated that after a little practice the whole process can be performed in about twenty minutes, and that, with moderate care, the error of the time of disappearance or reappearance should not exceed ten minutes, while the angles of ingress and egress need not differ more than one or two degrees from those calculated. Separate copies of the paper, with the diagrams suitably mounted, can be obtained on application to the Royal Geographical Society.

MASS OF THE ASTEROIDS.—In a paper under the title of this note (*Ast. Nach.*, No. 3359), G. Ravené attempts to determine the most probable mean value of the total mass of the minor planets, on the basis of the secular perturbations of the perihelion point of Mars. The best result given in Newcomb's recent work on the subject (*Bull. Ast.*, xiii., January 1896), shows that the perihelion motion of Mars is not entirely that given by theory, unless an empirical amount of about 5″·55 in a century be taken into consideration. It is obvious that at least part of these perturbations may be attributed to the disturbing force of the minor planets, and this is rendered more probable when Barnard's recent measures of the diameters of the four chief asteroids are taken into account. From these it was concluded that the asteroids are by no means so small as the previous photometric measurements had indicated, and it is not certain that such data are useful for a precise estimate of the mass of these small bodies.

An asteroid like Ceres, having a diameter of about 485 miles, will have a mass of about 1/4000th part of the earth's mass, if we assume it to have an equal density. It is thus quite likely that in a considerable length of time the total mass of all the asteroids will be sufficient to cause appreciable perturbations of the elements of a neighbouring planet.

In considering the theory of this action, it is assumed that the asteroids are distributed in an elliptical ring round the sun, and by noting the excess of perturbation produced on neighbouring bodies, using Gauss's method for calculating secular perturbations, the mean mass of the ring is found to be = 1/37,130,000 the sun's mass, or = 1/115 the earth's mass.

VARIABLE STARS.—Harvard College Observatory *Circular*, No. 7, gives particulars of the discovery of seven new variables, and also of the confirmation of variability in three stars previously suspected by other observers. Three of the variables have spectra of the *third* type, showing also bright hydrogen lines. Three others have spectra of the *fourth* type. The star −33° 14076 was found to be variable by Colonel E. E. Markwick, of Gibraltar, but no photographic confirmation was obtained until Mrs. Fleming ascertained that a star having a peculiar spectrum was identical with this. Detailed examination of all the plates of this region, eighty-nine in number, then showed it to vary in magnitude from 11·3 to 6·4. The spectrum of the star has bright lines which show evidence of change.

A large number of observations has been made with the meridian photometer to determine the forms of the light

curves of variable stars of the Algol type. S. Antliæ has usually been regarded as belonging to this class, and is specially interesting on account of its short period of 7h. 46·8m., and because it is said to retain its full brightness for *less* than half its period, this last peculiarity being opposed to the probability of the variation being due to a dark eclipsing body. On constructing a curve from a series of 177 measures, the conclusion is that S. Antliæ is not a star of the Algol type, but its light is *constantly* changing, and that it should rather be classed among the variables of the δ Cephei or η Aquilæ type. An interesting feature of the light curve for this star is that the increase of light is slower than the diminution. As this ratio (0·62) in most other short-period variables is from 0·20 to 0·33, there seems reason for dividing the two classes.

The star β Lyræ is commonly regarded as a variable of short period of the same class as the above. "Observations of its spectrum, however, show that two or more bodies, revolving round each other, are present. The light curve found by Argelander may be closely represented by assuming that the primary minimum is caused by the eclipse of the brighter body by the fainter, and the secondary minimum by a similar eclipse of the fainter body by the brighter. This star should therefore be taken from the class of ordinary short-period variables and included among the stars of the Algol type." Lockyer finds, however, that there is evidence of greater complication in the system; and the theory of eclipses alone fails to account satisfactorily for the velocities in the line of sight which are obtained from the measurements of photographs of the spectrum of the star.

AWARD AND PRESENTATION OF THE RUMFORD PREMIUM.

IN conformity with the terms of the gift of Benjamin, Count Rumford, granting a certain fund to the American Academy of Arts and Sciences, the Academy is empowered to make, at any annual meeting, an award of a gold and silver medal, being together of the intrinsic value of three hundred dollars, as a premium to the author of any important discovery or useful improvement in light or in heat, which shall have been made and published by printing, or in any way made known to the public in any part of the continent of America, or any of the American islands; preference being always given to such discoveries as shall, in the opinion of the Academy, tend most to promote the good of mankind.

At the annual meeting of 1885, the Academy awarded the Rumford premium to Thomas Alva Edison for his investigations in electric lighting, and the presentation of the medals took place at the meeting of May 13, 1896.

Vice-President Goodale, in presenting the medals, made the following remarks:—

"It would be highly presumptuous for one whose knowledge of physics is of the most elementary character to occupy the time of the Academy by any statement of his own in conveying these medals. Happily such a course is unnecessary. The Chairman of the Rumford Committee has placed at our command a brief statement which makes clear the ground of the award.

"'The Rumford Committee voted, June 22, 1893, that it is desirable to award the Rumford medal to Thomas Alva Edison in recognition of his investigations in the field of electric lighting, and they confirmed this vote on October 9, 1893, in the following words: "Voted for the second time to recommend to the Academy that the Rumford medal be awarded to Thomas Alva Edison for his investigations in electric lighting."

"The Committee reached the conclusion expressed by these votes after long deliberation and after careful sifting of all the evidence which was at their disposal in regard to Mr. Edison's claim for priority in the construction of the incandescent lamp, the conception of the central lighting station together with the multitude of devices, such as the three-wire circuit, the disposition of the electric current feeders, and the necessary methods for maintaining the electric potential constant.

"The Committee felt that they could not decide upon Mr. Edison's claim for priority in any particular invention in this new industry. Indeed, Courts of Law, after prolonged litigation, have found it difficult to decide how far Mr. Edison was in advance of contemporary workers. The task given to the Rumford Committee to decide who is most worthy of the Rumford medal, especially in the field of the application of electricity for the production of light and heat, is not an easy one. The number of investigators is now so large that it is no longer possible, in general, for one man to claim to be the first to apply electricity to a new field. The successful application is the result of many minds working on the same problem. Although the Committee did not feel justified in expressing the opinion that Mr. Edison invented the incandescent carbon filament lamp, or that he was the first to arrange such lamp in multiple on the circuit, thus producing what is popularly termed a subdivision of the electric light, or that the Edison dynamo had greater merits than the machine of Gramme and Siemens and others; still, they are convinced that Mr. Edison gave a great impulse to the new industry, and that he was the first to successfully instal a central electric lighting plant with the multitude of practical devices which are necessary. They believe that this impulse was due to his indefatigable application, to his remarkable instinct in whatever relates to the practical application of electric circuits, and to his inventive genius. They, therefore, have unanimously recommended to the Academy to bestow the Rumford medals upon him, feeling that the work of Mr. Edison would especially appeal to the great founder of the medals—Count Rumford—if he were living.

"The Academy has accepted the report of the Rumford Committee, and has voted to confer the gold and the silver medal upon Mr. Edison. The recipient finds it impossible to be present at this meeting of the Academy, and has requested Prof. Trowbridge to act as his proxy and to receive the medals for him.

"In the name of the Academy, I beg you, Prof. Trowbridge, to accept the charge of conveying these medals to Mr. Edison's hands. It would be most ungracious for us who are assembled in this room, which is flooded by this steady and brilliant electric light, to withhold our personal thanks for what Mr. Edison's investigations and practical activities have done for us all. And, hence, I may venture to say that our thanks and all good wishes are to be conveyed with the Rumford medals."

Prof. Trowbridge replied as follows:—

"Mr. President, and gentlemen of the Academy, I accept the medals for Mr. Edison; and at his request I wish to express his deep sense of the great honour the Academy has conferred upon him. His work in the field of electric lighting has been the subject of prolonged litigation, and at times he has had doubts, in reading the opinions of learned experts, whether his work has been original, or whether he had really contributed anything to the world's progress. The recognition of his labours by the American Academy of Arts and Sciences, regarded by Count Rumford in his gifts as the coequal of the Royal Society of London, is, therefore, especially grateful to him. Acting as his proxy, I thank the members of the Academy for the distinction which they have, by their votes, conferred upon him."

CAUSES OF DEATH IN COLLIERY EXPLOSIONS.

A REPORT, by Dr. John Haldane, on the causes of death in colliery explosions, with special reference to the Tylorstown, Brancepeth, and Micklefield explosions, was published in a Blue-book a few days ago. The report contains a vast amount of valuable information on the composition of after-damp, the action on men and lights of the gases present in, or mixed with, after-damp, the action of after-damp, heat and violence, along the track of an explosion, the distribution of after-damp and other gases in a mine after an explosion, the distribution of smoke in underground fires, the positions at which bodies are found after an explosion, and the means of saving life in colliery explosions and fires. To understand the dangers to life after a colliery explosion, and the possibilities of escaping these dangers, it is necessary to have a clear idea of the action, both on men and lamps, of the gases which are likely to be present in the air of the mine. These gases, so far as is known, are carbon dioxide, carbon monoxide, nitrogen, fire-damp, and sulphurous acid. Oxygen may be deficient or absent. Dr. Haldane discusses the effects of these gases *seriatim*, and the information he brings together, as well as his own careful observations, should be valued by colliery managers, while it will certainly interest chemists and physiologists.

In the case of the Tylorstown explosion, which, Dr. Haldane says, was evidently propagated through the three pits by coal-dust, fifty-seven men were killed. Of this number fifty-two, or 91