

In connection with the suggestion of the variability of the spectrum, it is important to secure further observations. If the existence of the bright line at some periods be established, we may then safely conclude that the luminosity of the zodiacal light is not entirely due to reflected sunlight.

A. FOWLER.

OBSERVATIONS OF ζ URSAE MAJORIS AND β AURIGÆ.—The periodic duplicity of the K line in the spectra of these stars before noted (January 23, p. 285) led Prof. Pickering to conclude that the time of revolution of the former system was 104 days. In the current number of the *Sidereal Messenger*, however, Prof. Pickering adds a note, dated January 11, 1890, in which he records that later observations make it probable that the period of ζ Ursa Majoris is 52 days instead of 104, and that its orbit is noticeably elliptical. The velocity of the components of β Aurigæ seems to be 150 miles per second, their period 4 days, their orbit nearly circular, with a radius of 8,000,000 miles, and their masses 0.1 or 0.2, that of the sun being unity.

COMET BROOKS (*d* 1889).—The following ephemeris is given by Dr. Knopf in *Edinburgh Circular* No. 5, issued on the 22nd inst. :—

1890.	R.A.	Decl.	1890.	R.A.	Decl.
March. h. m. s.		° ' "	March. h. m. s.		° ' "
1 ... 2 22 54 ...		+17 58.6	15 ... 2 49 26 ...		+20 8.0
3 ... 26 40 ...		18 17.9	17 ... 53 17 ...		20 25.3
5 ... 30 26 ...		18 36.9	19 ... 57 8 ...		20 42.3
7 ... 34 13 ...		18 55.6	21 ... 3 0 59 ...		20 59.1
9 ... 38 1 ...		19 14.1	23 ... 4 51 ...		21 15.6
11 ... 41 49 ...		19 32.3	25 ... 8 43 ...		21 31.8
13 ... 45 37 ...		19 50.3			

The brightness on March 1 = 0.24, and on March 25 = 0.17, that at discovery being unity.

NEW SHORT-PERIOD VARIABLE IN OPHIUCHUS.—Mr. Edwin F. Sawyer announces the discovery that the star 175 (*Uranometria Argentina*) Ophiuchi, R.A. 17h. 45m. 57s., Decl. - 6° 6' 7" (1875.0), is a variable of short period (*Astronomical Journal*, No. 210). The range of variation appears to be from 6.2m. to 6.95m., and the period slightly greater than 17 days.

OBSERVATIONS OF THE MAGNITUDE OF IAPETUS.—In the January number of *Monthly Notices* is found an interesting communication to the Royal Astronomical Society by Mr. Barnard, of the Lick Observatory, on the eclipse of this outermost satellite in the shadows of the globe, crape ring, and bright ring of Saturn. By frequent comparison of the light of Iapetus with that of Tethys and Enceladus, the effect of the shadow of the crape ring on the visibility of the satellite was tested, seventy-five comparisons being made. It was found that, after passing through the sunlight shining between the ball and the rings, Iapetus entered the shadow of the crape ring. As it passed deeper into this, there was a regular decrease in light until it disappeared in the shadow of the inner bright ring. From the observations it appears that the crape ring is truly transparent, the sunlight sifting through it. The particles composing it cut off an appreciable quantity of sunlight, and cluster more thickly, or the crape ring is denser, as it approaches the bright rings.

GEOGRAPHICAL NOTES.

At the ordinary meeting of the Royal Geographical Society, on Monday, Mr. C. M. Woodford read a paper on "Further Explorations of the Solomon Islands." He has visited these islands three times, and in the present paper he described what he saw during his third visit, in 1888. He took up his residence in the small island of Gavotu, off the coast of Gola, or Florida Island, a place centrally situated for visiting Ysabel, Guadalcanar, and other islands. He stayed with a trader named Lars Nielson, who had since been killed and eaten by the natives, as had also three of his boys. Since last June no fewer than six white men had been murdered by the natives of the Solomon Group, out of a total white population estimated at about thirty. Mr. Woodford's principal object in his last journey was to identify the places visited by the Spanish Expedition under Mendana that discovered these islands in the year 1568. In this, he thought he might say, he had been entirely successful. The Spaniards related that when they were between Florida and Guadalcanar they passed an island in the centre of which was a burning volcano. This island was now conclusively identified

with the Island of Savo. The lecture was illustrated with photographs of natives of Guadalcanar and other places, as well as specimens of rude architecture, by means of the dissolving-view apparatus.

ACCORDING to the Copenhagen correspondent of the *Frankfurter Zeitung*, an Expedition for the exploration of Greenland will start next summer from Denmark. The plan of work has been arranged by the Naval Lieutenant Ryder. The party will consist of nine persons. They will have three boats, and a steamer will convey them to the eastern coast as soon as the condition of the ice will allow of a landing. It is proposed that the region lying between 66° and 73° north latitude shall be explored in the course of the summer, and that the party shall push as far as possible into the interior. Sledges will be employed during the winter. The Expedition will be provisioned and equipped for two years, at the end of which time the steamer will return to take them away, cruising along the east coast till they get down to the shore. The expenses have been estimated at from 250,000 to 290,000 kroner (equal to from about £13,900 to £16,100), and the project is so popular, and looked on so favourably by the Government, that it is practically certain that the Diet will grant the money.

THE Geographical Society of Vienna issues a circular letter, dated February 1890, announcing the election of officers made last December. The new President is Herr Hofrath Ritter von Hauer, Intendant des naturhistorischen Hofmuseums.

LOCUSTS IN INDIA.

IN 1889, parts of Sind, Guzerat, Rajputana, and the Punjab were much troubled by locusts. A report on these destructive creatures is being prepared under the direction of the trustees of the Indian Museum, Calcutta; and, in the hope that information about them, with specimens, may be obtained from persons who have had opportunities of observing them, Mr. E. C. Cotes, of the Indian Museum, has issued a preliminary note, summing up some of the principal facts that have already been brought together. This note is very interesting, and has been compiled chiefly from the records of the Revenue and Agricultural Department of the Indian Government.

The generally received idea is that the locust which invades India belongs to the species usually spoken of as *Acridium peregrinum*, and supposed to have been the locust of the Bible. The identity of Indian locusts has not yet, however, been definitely ascertained, and this is one of the points which require elucidation. As far as we at present know, there seems reason to believe that while *Acridium peregrinum* extends its ravages into the dry plains of the Punjab and Rajputana, the locust which proved injurious in Madras in 1878, and in the Deccan in 1882-83, belongs to a very different species, which is probably *Acridium succinctum*. In order to settle the question it will be necessary to examine further specimens taken from destructive flights which have appeared in various localities, the material in the Indian Museum being at present insufficient.

Dealing with the natural history of locusts generally, Mr. Cotes observes that all the different species which occur in various parts of the world breed permanently in barren elevated tracts where the vegetation is sparse. In years when they increase inordinately they descend in flights from their permanent breeding-grounds upon cultivated districts, where they destroy the crops, lay their eggs, and maintain themselves through one complete generation, but are unable to establish themselves permanently, usually disappearing in the year following the invasion, to be succeeded, after an interval of years, by fresh swarms from the permanent breeding-ground.

Generally speaking, the life circle of a locust extends through one year, in which period it passes through its various stages of egg, young wingless larva, active pupa, and winged locust, which dies after laying the eggs that are to produce the next generation. The eggs are laid in little agglutinated masses in holes, which the female bores with her ovipositor in the ground. In temperate climates the eggs are usually deposited in the autumn, but in sub-tropical countries, such as India, where there is but little winter, the winged locusts live on through the cold season, and only die off after depositing their eggs in the following spring. In this case the eggs hatch after lying in the ground for about a month. In both temperate and sub-tropical regions

alike, the young wingless locusts, on emerging from the eggs in the spring or summer, feed voraciously and grow rapidly for two or three months, during which period they moult at intervals, finally developing wings and becoming adult. The adult insects fly about in swarms, which settle from time to time and devour the crops. The damage done by locusts is thus occasioned in the first instance by the young wingless insects, and afterwards by the winged individuals into which the young are transformed after a couple of months of steady feeding.

In Rajputana and the Punjab in 1869 the flights were said to have come chiefly from the vast tract of sand hills (*Teeburs*) between the Runn of Kutch and Bhawalpore, and partly from the Suliman Range in Afghanistan. Locusts were reported as usually to be found in the autumn in the *Teeburs*, and it is thought that this tract is probably a permanent breeding-ground. The whole question, however, of the permanent breeding-grounds of these locusts is one that requires further investigation. The winged flights appeared throughout Central Rajputana in the latter part of the hot weather, and laid eggs which hatched as the rains set in; the old locusts dying after they had deposited their eggs. From these eggs were hatched young locusts which became full grown and acquired wings in August and September. The eggs laid by the original flights at the end of the hot weather were distributed throughout the whole of Central Rajputana, and a vast amount of injury was done, the crops being damaged, in the first instance, by the young locusts before they acquired wings, and afterwards by the winged swarms which flew about the country and settled at intervals to eat what had escaped the ravages of the young wingless locusts.

In the Punjab, flights of locusts, from the Suliman Range, Afghanistan, appeared in the western border, in the end of April and in May. Eggs and young locusts were also found about this time near the hills in the sandy tracts of the same district. The flights seem generally to have moved from west to east, and by July to have spread themselves throughout the Punjab; but the laying of eggs and the hatching out of young went on, at least in the south-east, throughout August and September.

In Bombay, locusts were noticed in May and June 1882, in the south-west of the Presidency; but they attracted little attention, such swarms being annual visitors of the Kanarese forests, and neither in Kanara nor in Dharwar did they cause any material injury. With the setting in of the south-west monsoon, however, they spread in flights over the Presidency to the north and north-east, and early in the rains proceeded to lay their eggs and die. These eggs hatched in the end of July and beginning of August, and the young locusts did a large amount of damage, over a wide area, through the months of August and September. In the early part of October, with the setting in of the north-east monsoon, the young locusts, which had by this time acquired wings, took flight, and travelled with the prevailing wind in a south-westerly direction, doing some injury in the Poona Collectorate as they passed. They then struck the Western Ghâts, and spread slowly over the Konkan in November, and thence travelled into the Native States of Sawantvadi and the Kanara district. During the remainder of the cold season and the following hot weather (December 1882, to the end of May 1883), the flights clung to the Ghâts, occasionally venturing inland into Belgau, Dharwar, the Kolhapur State, and Satara, and devouring the spring crops in the Coast Districts, but ordinarily keeping in the vicinity of the hill ranges. With the commencement of the south-west monsoon, in the latter part of May 1883, the flights began to move in a north-easterly direction, as they had done the preceding year, but in larger numbers.

At the commencement of the rains they began to alight in vast numbers over an immense tract of country, comprising six Deccan Collectorates and three Coast Collectorates. They deposited their eggs and died; and early in August the young locusts hatched out in countless numbers, but were apparently more backward, and possessed of less strength and stamina than were those of the previous year. The unusually heavy rainfall killed vast numbers of them in some parts of the country, and elsewhere the insects seemed stunted and feeble, and grew but slowly. They were destroyed in vast numbers by the vigorous measures initiated by Government officers, and were also said to be diseased and attacked by worms and other parasites. As late as November, the mass of the young locusts appeared still unable to fly, and made no general move, as they had done the year before, towards their permanent home in the south-west. The invasion was in fact at an end, and though swarms appeared in

Sawantvadi in 1883-84, no further injury of a serious nature seems to have occurred.

The injury occasioned to the rain crops by the locusts was very considerable, over a great portion of the Deccan and Konkan, both in 1882 and 1883. But it was found, at the end of the invasion, that abundance of the cold weather crops had compensated to so great an extent for the injury done to the rain crops, that, on the whole, no very widespread suffering had arisen.

In 1878, when the Madras Presidency was invaded, the young locusts began to appear in January, and were found in great numbers in different districts from then on till September and October, the earlier swarms being found in the west and south of the Presidency, and the later ones in the north and east. Winged locusts were first observed, in the end of March and beginning of April, in the hills to the south-west (Wynaad and Nilgiri), where they may be supposed to breed permanently. Thence, aided by the south-west monsoon, they gradually worked their way over the Presidency to the east and north, finally disappearing about November and December.

The information hitherto obtained hardly justifies any very decided conclusion as to the life history of the locust. But it may be noticed that locusts were observed pairing in the Salem District, in the latter part of June, and also that the young locusts, which were found, in the early part of May, in the Udamalpet *Taluk*, were supposed to be the offspring of the large flights of winged locusts which had appeared in the preceding February in the same *taluk*. The connection between the autumn broods of locusts and those which appeared in the early part of the year has not been made out satisfactorily.

Mr. Cotes ends his paper with an account of the chief measures which have at different times been adopted in India against locusts, pointing out that, the locust of North-West India being distinct from that of South-West India, measures found useful in one invasion are not necessarily applicable in another.

FIELD EXPERIMENTS ON WHEAT IN ITALY.¹

PROF. GIGLIOLI, of the Agricultural College at Portici, a graduate of the Royal Agricultural College, Cirencester, has given to the Association of Proprietors and Farmers of Naples a voluminous and most carefully compiled Report on the results of the first year's experiments on wheat-growing at the experimental field of Suessola, about six kilometres from Acerra. The field is on the estate of Count Francesco Spinelli, who generously lends it to the Association for experimental purposes. The district was celebrated in olden time for its fertility, but was afterwards long neglected on account of its marshy nature, and the land became sour and productive of disease. Now, again, drainage and improved cultivation have changed these marshes into some of the best land of a fertile district. The soil of the experimental field is easily worked, friable, and bears a good natural vegetation; no analysis of it, however, is furnished. Giglioli points out that it is in too high condition at present for comparative manuring experiments, but admirably suited for comparing different varieties of corn and different methods of sowing and cultivation, as by dibbling and the Lois-Weedon system.

There are in all 102 plots devoted to trying the effects of different manures, each plot being about 43 square metres; 18 unmanured plots of a similar size devoted to different varieties of wheat; and 3 plots, each about twice the above-mentioned size, used for different methods of seeding and cultivation. Paths were made round each plot, the paths being at rather a lower level than the plots themselves. The author discusses the question of large and small plots, but concluded that under the conditions obtaining, small plots were the best for use here.

On the 102 manured plots, Scholey squarehead wheat was sown, with a great variety of manures—organic, nitrogenous, phosphatic, and potassic; but it was afterwards found this variety of wheat was, unfortunately, not well suited to the climate and to the general purpose of these experiments.

The 18 varieties experimented with, on the second series, included several well-known English varieties, such as Hallett's pedigree white and red wheats, Chiddam, golden drop, Hunter's

¹ "Resultati del Primo Anno di Esperimento sulle Varietà e sui Concimi del Frumento al Campo Sperimentale di Suessola nell' Anno Agrario 1887-88." By Italo Giglioli. Pp. 508. (Naples, 1889.)